

S. P. Bhattarai, N. H. Su and D. J. Midmore. 2005. Oxygation unlocks yield potentials of crops in oxygen-limited soil environments. ELSEVIER ACADEMIC PRESS INC, San Diego, 88: 313-+

Abstract: Subsurface drip irrigation (SDI) offers well-documented potential for improving water use efficiency in irrigated agriculture. However, SDI in common with other forms of irrigation is liable to exclude soil air (and therefore oxygen) around the root zone during and following irrigation events, thus reducing root function and crop performance. When SDI is practiced with oxygation (i.e., aerating the rhizosphere by way of the irrigation stream) it could transform the irrigation industry, for it provides a source of oxygen in a root environment that suffers from temporal hypoxia, and occasionally from anoxia. The oxygen is introduced into the irrigation stream by way of the venturi principle, or with solutions of hydrogen peroxide. Oxygation assures optimal root function, microbial activity, and mineral transformations, and leads to enhanced yield and water use efficiency under hypoxic conditions. It also improves plant performance and yield under irrigated conditions previously considered to be satisfactory for crop growth, and offers scope to offset some of the negative impacts of compaction and salinity, related to poor soil aeration, on crop growth. Representing minimal capital investment and recurrent costs, economic returns appear very favorable, as do associated benefits to the environment, measured as reduced drainage, containment of rising water tables, better nutrient use efficiency, and reduced demand by agriculture for irrigation water. The aeration status of irrigated soils deserves more attention than it has received in the past if we wish to unlock yield potential constrained by soil oxygen limitations and effect the yield increases essential to keeping pace with future food (and fibre) demand. (c) 2005, Elsevier Inc.

2: J. S. Lim, J. W. Hwang, C. Y. Choi, B. H. Kim and S. Park. 2005. A pilot-scale rotating drum biotrickling filter for removing gaseous styrene. TRANS TECH PUBLICATIONS LTD, Zurich-Uetikon, 277-279: 517-522

Abstract: A new type of biofilter, the rotating drum biotrickling filter (RDBF) system, was developed and operated to remove styrene from waste gas stream. Porous polyurethane foam sheets were used as a packing material for the RDBF and a pure culture of the Gram-positive bacterium *Brevibacillus* sp. SP1 was as an inoculum. The reactor showed a short start-up period of 18 days. Once uniform biofilms were developed on the packing, a high and stable removal of styrene over 95% was observed at an incoming concentration of 200 ppmv and a retention time of 0.5 min. The maximum elimination capacity was estimated to be 125 g/m³/hr. The outstanding performance was attributed to an efficient gas-liquid mass transfer and proper supply of nutrient solution to the packing during the rotation of the drum. However, this performance of the RDBF was not maintained longer than 7 days because of the clogging of the open pores in the polyurethane foam due to an excessive growth of the biofilms. This result indicates that the RDBF has great potential as a gas purification system if a proper method to control the biofilm growth is developed.

3: F. J. Manson, N. R. Loneragan, G. A. Skilleter and S. R. Phinn. 2005. An evaluation of the evidence for linkages between mangroves and fisheries: A synthesis of the literature and identification of research directions. CRC PRESS-TAYLOR & FRANCIS GROUP, Boca Raton, 43: 483-513

Abstract: There is a widely held paradigm that mangroves are critical for sustaining production in coastal fisheries through their role as important nursery areas for fisheries species. This paradigm frequently forms the basis for important management decisions on habitat conservation and restoration of mangroves and other coastal wetlands. This paper reviews the current status of the paradigm and synthesises the information on the processes underlying these potential links. In the past, the paradigm has been supported by studies identifying correlations between the areal and linear extent of mangroves and fisheries catch. This paper goes beyond the correlative approach to develop a new framework on which future evaluations can be based. First, the review identifies what type of marine animals are using mangroves and at what life stages. These species can be categorised as estuarine residents, marine-estuarine species and marine stragglers. The marine-estuarine category includes many commercial species that use mangrove habitats as nurseries. The second stage is to determine why these species are using mangroves as nurseries. The three main proposals are that mangroves provide a refuge from predators, high levels of nutrients and shelter from physical disturbances. The recognition of the important attributes of mangrove nurseries then allows an evaluation of how changes in mangroves will affect the associated fauna. Surprisingly few studies have addressed this question. Consequently, it is difficult to predict how changes in any of these mangrove attributes would affect the faunal communities within them and, ultimately, influence the fisheries associated with them. From the information available, it seems likely that reductions in mangrove habitat complexity would reduce the biodiversity and abundance of the associated fauna, and these changes have the potential to cause cascading effects at higher trophic levels with possible consequences for fisheries. Finally, there is a

4: R. S. Wotton. 2005. The essential role of exopolymers (EPS) in aquatic systems. CRC PRESS-TAYLOR & FRANCIS GROUP, Boca Raton, 42: 57-94

Abstract: Exopolymers (EPS) are exuded by single-celled and multicellular organisms. They consist mainly of carbohydrates that hydrate on contact with water and EPS are absorbent and often thixotropic. These properties result in a large number of uses: for attachments, as an aid to flotation, in locomotion, in feeding, for building structures, as the basis of biofilms, for protection against a number of harsh environmental conditions, as a barrier against attack by pathogens, parasitic organisms and predators, and in communication. In addition, EPS are found free in the water column where they form readily into gels and then into larger aggregates that are foci for biological activity and the breakdown of organic matter to provide nutrients. EPS are truly ubiquitous and are essential to the functioning of all aquatic ecosystems.

5: J. L. a. S. V. F. Carter. 2005. Setting limits: the development and use of factor-ceiling distributions for an urban assessment using macroinvertebrates.. Edition: R. H. G. L. R. Brown, R. M. Hughes, and M.R. Meador (eds)., American Fisheries Society Symposium 47,

There is no abstract for this article.

6: C. M. Tate, T.F.Cuffney, G. McMahon, E.M.P. Giddings, J.F. Coles, and H. Zappia. 2005. Use of an urban intensity index to assess urban effects on streams in three contrasting environmental settings. Edition: R. M. H. L.R. Brown, R. Gray, and M.R. Meador, American Fisheries Society, Symposium 47, Bethesda, Maryland., 291-315

Abstract: To assess the effects of urbanization on assemblages (fish, invertebrate, and algal), physical habitat, and water chemistry, we investigated the relations among varying intensities of basin urbanization and stream ecology in three metropolitan areas: the humid northeastern United States around Boston, Massachusetts; the humid southeastern United States around Birmingham, Alabama; and the semiarid western United States around Salt Lake City, Utah. A consistent process was used to develop a multimetric urban intensity index (UII) based on locally important variables (land-use/land-cover, infrastructure, and socioeconomic variables) in each study area and a common urban intensity index (CUII) based on a subset of five variables common to all study areas. The UII was used to characterize 30 basins along an urban gradient in each metropolitan area. Study basins were located within a single ecoregion in each of the metropolitan areas. The UII, ecoregions, and site characteristics provided a method for limiting the variability of natural landscape characteristics while assessing the magnitude of urban effects. Conditions in Salt Lake City (semiarid climate and water diversions) and Birmingham (topography) required nesting sites within the same basin. The UII and CUII facilitated comparisons of aquatic assemblages response to urbanization across different environmental settings.

7: . 2005. Monitoring nutrient mitigation at a container nursery wetland: A 3-year study. Hortscience 4(40): 1049-1049.

There is no abstract for this article.

8: M. A. Abira, J. J. A. van Bruggen and P. Denny,. 2005. Potential of a tropical subsurface constructed wetland to remove phenol from pre-treated pulp and papermill CD wastewater. Water Science and Technology 9(51): 173-176.

Abstract: The capacity of a pilot project subsurface flow constructed wetland in the tropics to remove phenol from pre-treated pulp and paper mill wastewater was studied under varying hydraulic retention times (HRT) with batch loading. Initial 15 months results indicate that removal efficiencies for phenol were variable 4 but on average reached 60% at 5-day HIRT and 77% at 3-day HIRT. It was thought that the longer retention (D time might have caused oxygen and nutrient deficiencies, which may have reduced removal performance. Although phenol was sometimes not detectable in the wetland outflow, on average values over the experimental period did not meet set national guidelines. In the ongoing study, the impact of varying hydraulic retention time and/or loading rate on the removal of phenols will be evaluated and the main removal process established.

9: R. H. Agnew, D. C. Mundy, T. M. Spiers and M. M. Greven,. 2005. Waste stream utilisation for sustainable viticulture. Water Science and Technology 1(51): 1-8.

Abstract: Field trials were established at four vineyards in January 1999 to evaluate the effects of four mulch mixtures on different soil and plant parameters. Mulches were made from wine industry and other commercially available plant and animal wastes. Soil, grape petioles, grape leaves and grape juice were analysed over three seasons. The mulches applied released considerable quantities of nutrients, which were available for use by the grapevines, Generally, the type of mulch used had little impact on the parameters that were measured and the greatest differences occurred between non-mulched and mulch treatments. Soil pH showed an increase at three of the four sites after application of mulch. Soil phosphorus increased moderately at one site and substantially at the other three sites in the first year and soil potassium levels increased dramatically at all sites in the first year. After the application of mulches in 1999 the petiole nitrate levels increased dramatically at all sites, however there were no differences in the second year. In the third year petiole nitrate levels were again high indicating that the differences between years was probably largely attributable to differences in rainfall received among the three seasons. Petiole potassium levels also increased after the application of mulch, however the increase was nowhere near as large as the increase in soil potassium. The use of mulch increased leaf nitrogen and potassium levels but not phosphorus levels. The use of mulch did increase juice potassium, however there was greater seasonal and site variation than variation due to the effect of mulch.

10: C. T. Agouridis, S. R. Workman, R. C. Warner and G. D. Jennings,. 2005. Livestock grazing management impacts on stream water quality: A review. Journal of the American Water Resources Association 3(41): 591-606.

Abstract: Controlling agricultural nonpoint source pollution from livestock grazing is a necessary step to improving the water quality of the nation's streams. The goal of enhanced stream water quality will most likely result from the implementation of an integrated system of best management practices (BMPs) linked with stream hydraulic and geomorphic characteristics. However, a grazing BMP system is often developed with the concept that BMPs will function independently from interactions among controls, climatic regions, and the multifaceted functions exhibited by streams. This paper examines the peer reviewed literature pertaining to grazing BMPs commonly implemented in the southern humid region of the United States to ascertain effects of BMPs on stream water quality. Results indicate that the most extensive BMP research efforts occurred in the western and midwestern U.S. While numerous studies documented the negative impacts of grazing on stream health., few actually examined the success of BMPs for mitigating these effects. Even fewer studies provided the necessary information to enable the reader to determine the efficacy of a comprehensive systems approach integrating multiple BMPs with pre-BMP and post-BMP geomorphic conditions. Perhaps grazing BMP research should begin incorporating geomorphic information about the streams with the goal of achieving sustainable stream water quality.

11: D. S. Ahearn and R. A. Dahlgren,. 2005. Sediment and nutrient dynamics following a low-head dam removal at Murphy Creek, California. *Limnology and Oceanography* 6(50): 1752-1762.

Abstract: We studied the impact of the removal of a 3-m dam on sediment and nutrient export. In the year after dam removal, sediment and nitrogen (N) export increased by an order of magnitude over the previous 2-yr mean. Longitudinal surface water samples were collected, sediments were cored, and the channel was surveyed during different seasons to determine the mechanisms driving sediment and nutrient dynamics in the recovering system. The majority of sediment transport occurred in pools and in the lowest 50 in of the 620-m restored reach. Phosphate export occurred primarily during large storms, with the restored reach acting as a phosphate sink during most flow conditions. The majority of surface water N originated from areas within the sediment wedge that had high extractable N concentrations (average $\text{NH}_4\text{-N} = 50 \text{ } \mu\text{g g}^{-1}$ and $\text{NO}_3\text{-N} = 38 \text{ } \mu\text{g g}^{-1}$) and dried out on a seasonal basis. Near the former dam site, year-round water saturation apparently inhibited nitrification and export of N as nitrate. This wetland area was the only portion of the restored reach that was an ammonium sink. After dam removal, N leaching from sediments occurred in autumn 2003 and again during the subsequent autumn, suggesting that N leaching from reservoir sediments is largely a seasonal process that may affect downstream aquatic ecosystems for a number of years.

12: D. S. Ahearn, R. W. Sheibley, R. A. Dahlgren, M. Anderson, J. Johnson and K. W. Tate,. 2005. Land use and land cover influence on water quality in the last free-flowing river draining the western Sierra Nevada, California. Journal of Hydrology 3-4(313): 234-247.

Abstract: and use and land cover across 28 sub-basins within the Cosumnes Watershed, CA (1989 km²) were correlated to nitrate-N and total suspended solids (TSS) loading between water years 1999 and 2001. The impact of human development on stream water quality was evident as both agricultural area and population density predicted TSS loading in a linear mixed effects model. In contrast to the TSS model, the nitrate-N loading model was more complex with agriculture, grassland, and the presence or absence of waste water treatment plants (WWTPs) all contributing. The lack of correlation between population density and nitrate-N loading indicates that human habitation of the landscape does not impact stream nitrate levels until a WWTP is built within the sub-basin. During dry water years the models predict a linear reduction in TSS loading but the correlations to agriculture and population density remain positive. In contrast, nitrate is positively correlated to grasslands during average water years and negatively correlated during dry water years. Analysis of constituent fluxes from the upper watershed versus the lower watershed indicates that silica is derived primarily from the uplands and that during dry water years the upper watershed is an important source of dissolved organic carbon (DOC) and nitrate. The lower watershed contributes the majority of the sediment and nutrients during both dry and average water years, the one caveat being that during dry years the lower basin becomes a nitrate sink. (c) 2005 Elsevier B.V. All rights reserved.

13: J. A. Aitkenhead-Peterson, J. E. Alexander and T. A. Clair,. 2005. Dissolved organic carbon and dissolved organic nitrogen export from forested watersheds in Nova Scotia: Identifying controlling factors. *Global Biogeochemical Cycles* 4(19): .

Abstract: Riverine nutrient export represents a transfer of terrestrial nutrients to lakes, estuaries and the near-coastal zone. In this study, we constructed regional predictive models for riverine dissolved organic carbon (DOC) and organic nitrogen (DON) exports. We used a subset of 10 watersheds to construct regional empirical models of DOC and DON export, reserving two watersheds for testing the predictive ability of each model. For the subset of 10 watersheds, mean watershed soil column C: N ratio explained 75% of the variance in DOC export and 73% of the variance in DON export ($p < 0.01$). Organic C: N explained 63% and 71% of the variance in DOC and DON exports, respectively. There was a stronger relationship between riverine DOC: DON ratio and mineral soil C: N ($R^2 = 0.77$ $p < 0.001$) than with organic C: N ($R^2 = 0.49$ $p < 0.05$), suggesting that decoupling of DOC and DON dynamics in rivers may occur when hydrologic flow paths favor organic layers. We suggest that mean watershed soil C: N ratio is likely to be an integrator of several controls on riverine DOC export including temperature and precipitation (climatic control), soil texture and nutrient status (edaphic control), vegetative species and their associated micro-flora (biological control) and watershed topography (topographical control). Soil C: N appears to be a useful tool for predicting variability in both DOC and DON flux at a regional scale.

14: C. a. A. C. Allan,. 2005. Nipped in the Bud: Why Regional Scale Adaptive Management Is Not Blooming. Environmental Management 3(36): 414-425.

There is no abstract for this article.

15: L. Y. Alleman, D. Cardinal, C. Cocquyt, P. D. Plisnier, J. P. Descy, I. Kimirei, D. Sinyinza and L. Andre,. 2005. Silicon isotopic fractionation in Lake Tanganyika and its main tributaries. *Journal of Great Lakes Research* 4(31): 509-519.

Abstract: Silicon isotopic measurements in Lake Tanganyika were performed using multiple-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) in dry plasma condition. Isotopic signatures are reported for dissolved ortho-silicic acid [Si(OH)(4)] collected during a 1-year-long surface waters survey in the southern basin along with several of the major tributaries. Deep-water Si isotopic profiles from a north-south transect cruise conducted in July 2002 are also described. The nutrient-like shape dissolved Si profiles and the isotopic disequilibrium between surface ($\delta(29)\text{Si} = 0.87 \pm 0.08$ parts per thousand) and deep waters (0.61 ± 0.05 parts per thousand) suggest the occurrence of biological isotopic discrimination induced by diatoms biomineralisation in a fresh water system. Short-term surface water Si isotopic and diatom biomass variations obtained during the 1-year bi-weekly monitoring (2002-2003) in the south confirms this biological effect. Five epilimnion biogenic opal samples also were analyzed. Their signature ($\delta(29)\text{Si}$ of 0.28 ± 0.12 parts per thousand) compared to those of surrounding waters are consistent with the diatom isotopic fractionation effect measured on marine tropical diatoms. This demonstrates the species and temperature independent character of the silicon isotope fractionations by diatoms. River signatures present variable dissolved Si concentrations which were positively correlated to $\delta(29)\text{Si}$ values in the range of previously published world river data. Because of its fast response to climate variability, nutrient dynamics, and limnological changes, $\delta(29)\text{Si}$ in siliceous organisms should be very useful in studying environmental changes and particularly the recent decline of diatom Si utilization in Lake Tanganyika.

16: E. W. Allen, E. E. Prepas, S. Gabos, W. M. J. Strachan and W. P. Zhang,. 2005. Methyl mercury concentrations in macroinvertebrates and fish from burned and undisturbed lakes on the Boreal Plain. Canadian Journal of Fisheries and Aquatic Sciences 9(62): 1963-1977.

Abstract: Methyl mercury (MeHg) concentrations in macroinvertebrates and fish were compared among five lakes in burned catchments and five reference lakes on the western Canadian Boreal Plain to determine the influence of forest fire on MeHg bioaccumulation. Two years after fire, MeHg concentrations in five of six aquatic taxa were similar in burned and reference lakes. Among a larger set of 12 lakes, MeHg concentrations in biota were negatively correlated with lake water pH, trophic status, and hardness, reflecting a pre-existing gradient in water chemistry. Biomagnification of MeHg (as determined by regression of MeHg concentration on baseline-adjusted $\delta(15)\text{N}$) was negatively correlated with lake water chlorophyll a concentration. A subsequent logging experiment interrupted by fire provided an opportunity to compare pre- and post-fire MeHg concentrations in aquatic biota. Three months after fire, biota MeHg concentrations had decreased by 32%-50%, and lake water ammonium concentrations had increased 11-fold relative to the previous year. In this nutrient-rich setting, fire may lower MeHg concentrations in aquatic biota over the short-term by inducing an increase in lake productivity that dilutes MeHg at the base of the food web.

17: M. Alvarez-Cobelas, J. L. Velasco, M. Valladolid, A. Baltanas and C. Rojo,. 2005. Daily patterns of mixing and nutrient concentrations during early autumn circulation in a small sheltered lake. *Freshwater Biology* 5(50): 813-829.

Abstract: 1. Autumn circulation in lakes is currently conceived to occur very rapidly, being controlled mainly by wind-power dynamics, decreasing irradiance and heat flux. In addition, autumn mixing is usually related to nutrient redistribution in the vertical column, resulting in its overall increase. To test these assumptions, mixing and nutrient dynamics in a Spanish small, wind-sheltered, mesotrophic, seepage lake were studied daily during autumn circulation. 2. The seasonal erosion of the pycnocline in Las Madres Lake was the outcome of vertical and horizontal exchanges of heat and matter. The overall mixing of the water column lasted 3 months, which was an unexpected period for a rather shallow lake. Two periods of mixing could be envisaged until full circulation was attained. First, a slightly faster period of pycnocline deepening than that predicted by the heat flux and wind stress model of Fisher et al. (1979) occurred for 41 days, mixing most of the water column down to within two meters of the bottom. Then a much slower process took place promoting frequent instability of the bottom layer and resulting in entire mixing in a further 52 days. 3. Vertically, the whole mixing process was a response to weak surface cooling, resulting from the mild air temperatures of the semiarid climate of the area, and weak wind stress, because of low wind fetch and high shelter. Horizontally, a gravity current transporting cold, denser water from western shallower areas of the lake and materials produced by the decomposition of organic matter of littoral origin may produce a bottom layer of increased density, thus impinging on vertical stability. Seepage inputs of water of roughly constant temperature might also have increased bottom density. Bottom density enhancement resulted in a double diffusion process. 4. Only in-lake nitrogen content increased until full circulation was attained, whereas carbon showed no trend and phosphorus declined. External processes, such as seepage exchan

18: T. Amemiya, T. Enomoto, A. G. Rossberg, N. Takamura and K. Itoh,. 2005. Lake restoration in terms of ecological resilience: a numerical study of biomanipulations under bistable conditions. Ecology and Society 2(10): .

Abstract: An abstract version of the comprehensive aquatic simulation model (CASIM) is found to exhibit bistability under intermediate loading of nutrient input, supporting the alternative-stable-states theory and field observations for shallow lakes. Our simulations of biomanipulations under the bistable conditions reveal that a reduction in the abundance of zooplanktivorous fish cannot switch the system from a turbid to a clear state. Rather, a direct reduction of phytoplankton and detritus was found to be most effective to make this switch in the present model. These results imply that multiple manipulations may be effective for practical restorations of lakes. We discuss the present results of biomanipulations in terms of ecological resilience in multivariable systems or natural systems.

19: Y. J. An, D. H. Kampbell, S. W. Jeong, K. P. Jewell and J. R. Masoner,. 2005. Impact of geochemical stressors on shallow groundwater quality. Science of the Total Environment 1-3(348): 257-266.

Abstract: Groundwater monitoring wells (about 70 wells) were extensively installed in 28 sites surrounding Lake Texoma, located on the border of Oklahoma and Texas, to assess the impact of geochemical stressors to shallow groundwater quality. The monitoring wells were classified into three groups (residential area, agricultural area, and oil field area) depending on their land uses. During a 2-year period from 1999 to 2001 the monitoring wells were sampled every 3 months on a seasonal basis. Water quality assay consisted of 25 parameters including field parameters, nutrients, major ions, and trace elements. Occurrence and level of inorganics in groundwater samples were related to the land use and temporal change. Groundwater of the agricultural area showed lower levels of ferrous iron and nitrate than the residential area. The summer season data revealed more distinct differences in inorganic profiles of the two land use groundwater samples. There is a possible trend that nitrate concentrations in groundwater increased as the proportions of cultivated area increased. Water-soluble ferrous iron occurred primarily in water samples with a low dissolved oxygen concentration and/or a negative redox potential. The presence of brine waste in shallow groundwater was detected by chloride and conductivity in oil field area. Dissolved trace metals and volatile organic carbons were not in a form of concentration to be stressors. This study showed that the quality of shallow ground water could be related to regional geochemical stressors surrounding the take. (c) 2005 Elsevier B.V. All rights reserved.

20: V. Anbumozhi, J. Radhakrishnan and E. Yamaji,. 2005. Impact of riparian buffer zones on water quality. Ecological Engineering 5(24): 517-523.

Abstract: Recent attention has focused on riparian forest buffer systems for filtering sediment, nutrients, and pesticides entering from upland agricultural fields. This paper summarizes the results of a field monitoring study done in Tokachikawa watershed in Hokkaido, Japan, Cisadane, Cianten and Citamyang sub-watersheds in Indonesia and Cauvery watershed, India to quantify the impact of riparian buffer zones on changes in stream water quality. A watershed approach was used to compare land use indicators - uplands, forests, riparian forest, livestock areas - to a wide range of surface water physical and chemical properties. Stream water physical property values increased from upstream to the confluence point, influenced by the upland and livestock land use activities. The greatest reduction in impairment of water quality was observed in buffer zones located along higher order streams where the gradient is very low, leading to slow groundwater movement. The lower stream water temperature in riparian buffer zones suggests that the shading effect is most pronounced in this area of the watershed. The results demonstrate the positive impact of forest buffer zones in reducing the influence of agricultural nutrients and chemicals on surface stream waters. Design and management considerations for establishing riparian zone land use are discussed. (c) 2005 Elsevier B.V. All rights reserved.

21: H. E. Andersen, B. Kronvang and S. E. Larsen,. 2005. Development, validation and application of Danish empirical phosphorus models. Journal of Hydrology 1-4(304): 355-365.

Abstract: Phosphorus (P) is the limiting nutrient for algae growth in most Danish lakes and coastal waters. Discharge of P from point sources has been reduced greatly, however, no trend in diffuse P loss has been detected. In spite of the overall reduction in P discharge, the ecological condition of most lakes and coastal waters does not comply with the objectives set by regional authorities. Thus, in order to achieve 'good ecological status' of surface waters, as required by the EU Water Framework Directive, there is a future need to reduce diffuse P loss. Consequently, water district managers will need tools for assessing diffuse P losses at the catchment scale. They will also need tools to help them select for each specific catchment the appropriate measures to reduce P losses. We suggest that empirical phosphorus models can be an important part of such a tool. A number of international empirical phosphorus models are reviewed. The development, validation and application of six Danish empirical phosphorus models for total phosphorus (TP), particulate phosphorus (PP) and dissolved reactive phosphorus (DRP) is described as a case study. Manageable parameters relating to agricultural practices are generally absent in the international models reviewed. In the Danish models such parameters play a relatively minor role compared to non-manageable parameters like soil type and hydrology. The importance of validating empirical models and of uncertainty assessments on model predictions is stressed. (c) 2004 Elsevier B.V. All rights reserved.

22: T. Andersen, O. Pedersen and F. O. Andersen,. 2005. Nutrient concentrations in a *Littorella uniflora* community at higher CO₂ concentrations and reduced light intensities. *Freshwater Biology* 7(50): 1178-1189.

Abstract: 1. Oligotrophic softwater lakes represent a special type of aquatic ecosystem with unique plant communities where generalisations from other aquatic plant communities to rising CO₂ in the water column may not apply. 2. In the present study, we set up large in situ mesocosms and supporting laboratory experiments with isoetid vegetation (*Littorella uniflora*) where water column CO₂ and light could be manipulated in order to test whether (i) light and CO₂ availability affect nutrient concentrations in isoetid vegetation, and (ii) if changes in light and CO₂ climate affect fluxes of inorganic nitrogen (N) and phosphorus (P) from sediment to water column, which potentially could result in increased growth of epiphytic algae. 3. The results showed that the standing stocks of phosphorus and nitrogen in the *L. uniflora* vegetation were significantly influenced by CO₂ concentration and light intensity. Both standing stocks of P and N were significantly higher in the mesocosm treatments with high CO₂ concentration than in those at low CO₂ concentration. Similarly, standing stocks of P and N enhanced with increasing light intensity. 4. Measurements of nutrient fluxes both in the field and the laboratory did not show any significant release of nutrients to the water column from plants or sediments at any of the light or CO₂ treatments. However, mats of epiphytic algae developed from the beginning of June to late September and caused a light reduction for the isoetid vegetation. 5. Increasing CO₂ concentrations in the water column may over time potentially result in a change in soft water plant communities.

23: C. J. Anderson and W. J. Mitsch,. 2005. Effect of pulsing on macrophyte productivity and nutrient uptake: A wetland mesocosm experiment. American Midland Naturalist 2(154): 305-319.

Abstract: A study was conducted to evaluate the effect of a pulsing hydrology on the productivity and nutrient uptake of an herbaceous riverine wetland. Pulsing effects were evaluated using 20 0.9-m(2) wetland mesocosms: 10 planted with *Schoenoplectus tabernaemontani* (C.C. Gmel) Palla and the other 10 planted with *Typha angustifolia* L. For each species, half the mesocosms were subjected to a 3-mo pulsing regime while the others were subjected to steady-flow conditions. Hydrology parameters were selected to approximate a pulsing experiment being carried out concurrently at two 1-ha wetlands at the research site. *Typha* wetlands were significantly more productive than *Schoenoplectus* wetlands; however no significant differences in productivity or morphology were observed between pulsed or steady flow wetlands among species groups. No significant differences in nutrient concentrations, uptake or uptake efficiency were detected among species groups either, however hydrology did influence plant tissue N:P ratios. For all wetland mesocosms, the mean NT ratio was 9.2 +/- 0.6 for steady flow wetlands and 11.7 +/- 0.5 for pulsed, suggesting that the steady flow wetlands were more N limited than pulsed wetlands. The potential applications and limitations of applying these results to the 1-ha wetlands study are discussed.

24: C. J. Anderson, W. J. Mitsch and R. W. Nairn,. 2005. Temporal and spatial development of surface soil conditions at two created riverine marshes. *Journal of Environmental Quality* 6(34): 2072-2081.

Abstract: The amount of time it takes for created wetlands to develop soils comparable to natural wetlands is relatively unknown. Surface soil changes over time were evaluated in two created wetlands (approximately 1 ha each) at the Olentangy River Wetland Research Park in Columbus, Ohio. The two wetlands were constructed in 1993 to be identical in size and geomorphology, and maintained to have the same hydrology. The only initial difference between the wetlands was that one was planted with native macrophytes while the other was not. In May 2004, soil samples were collected (10 yr and 2 mo after the wetlands were flooded) and compared to samples collected in 1993 (after the wetlands were excavated but before flooding) and 1995 (18 mo after the wetlands were flooded). In all three years, soils were split into surface (0-8 cm) and subsurface (8-16 cm) depths and analyzed for soil organic matter, total C, total P, available P, exchangeable cations, and pH. Soils in the two wetlands have changed substantially through sedimentation and organic accretion. Between 1993 and 1995, soils were most influenced by the deposition of senescent macroalgae, the mobilization of soluble nutrients, and the precipitation of CaCO_3 . Between 1995 and 2004, soil parameters were influenced more by the deposition of organic matter from colonized macrophyte communities. Mean percent organic matter at the surface increased from 5.3 \pm 0.1% in 1993, 6.1 \pm 0.2% in 1995, to 9.5 \pm 0.2% in 2004. Mean total P increased from 493 \pm 18 $\mu\text{g g}^{-1}$ in 1993, 600 \pm 23 $\mu\text{g g}^{-1}$ in 1995, to 724 \pm 20 $\mu\text{g g}^{-1}$ in 2004. Spatial analyses of percent organic matter (a commonly used indicator of hydric soil condition) at both wetlands in 1993, 1995, and 2004 showed that soil conditions have become increasingly more variable. High spatial structure (autocorrelation) between data points was detected in 1993 and 2004, with data in 2004 exhibiting a much higher overall variance and narrower range of spatial structure.

25: N. J. Anderson, E. Jeppesen and M. Sondergaard,. 2005. Ecological effects of reduced nutrient loading (oligotrophication) on lakes: an introduction. *Freshwater Biology* 10(50): 1589-1593.

Abstract: 1. The variable ecological response of lakes to reduced nutrient loading (oligotrophication) at sites in Europe and North America was discussed at a workshop held in Silkeborg (Denmark) in January 2003. Studies of lake oligotrophication were presented based on both long-term monitoring and data generated by palaeolimnological methods. 2. This introduction to the special issue provides short summaries of a series of the papers presented and their limnological context. Results show that the majority of lakes had approached a new equilibrium of phosphorus (P) and nitrogen (N) concentrations 10-15 years (P) and 0-5 years (N) after a major reduction in loading, irrespective of hydraulic retention time. Phytoplankton biomass decreased and a shift towards meso-oligotrophic species dominance occurred. The fish responded surprisingly fast to the loading reduction in most lakes. As a result, the percentage of piscivores increased and total fish biomass declined markedly, which may explain an increase in the body size of cladocerans and an increase in the zooplankton to phytoplankton biomass ratio seen in many of the lakes. 3. Monitoring has in general been initiated after the effects of eutrophication became apparent. In this context palaeolimnological techniques become very useful because they allow limnologists to extend time scales of coverage and to define restoration targets and baseline conditions. Moreover, lake sediments pre-dating anthropogenic disturbance can be used to examine ecological response to, for instance, climate variability, allowing problems associated with multiple stressors to be addressed. 4. It is concluded that there is a great need for a synthetic, holistic approach to studying lake oligotrophication, combining multiple techniques of palaeolimnological sediment analysis with detailed but temporally limited long-term monitoring of chemical and biological variables. This is important, not least to assess future responses to nutrient loading reduction

26: L. Andersson, J. Rosberg, B. C. Pers, J. Olsson and B. Arheimer,. 2005. Estimating catchment nutrient flow with the HBV-NP model: Sensitivity to input data. Ambio 7(34): 521-532.

Abstract: The dynamic catchment model HBV-N has been further developed by adding routines for phosphorus transport and is now called the HBV-NP model. The model was shown to satisfactorily simulate nutrient dynamics in the Ronnea catchment (1 900 km²). Its sensitivity to input data was tested, and results demonstrated the increased sensitivity to the selection of input data on a subcatchment scale when compared with the catchment scale. Selection of soil and land use databases was found to be critical in some subcatchments but did not have a significant impact on a catchment scale. Although acceptable on a catchment scale, using templates and generalization, with regards to emissions from point sources and rural households, significantly decreased model performance in certain subcatchments when compared with using more detailed local information. A division into 64 subcatchments resulted in similar model performance at the catchment outlet when compared with a lumped approach. Adjusting the imported matrixes of the regional leaching of nitrogen, from agricultural land, against mean subcatchment water percolation did not have a significant impact on the model performance.

27: A. A. Andreev, P. E. Tarasov, B. P. Ilyashuk, E. A. Ilyashuk, H. Cremer, W. D. Hermichen, F. Wischer and H. W. Hubberten,. 2005. Holocene environmental history recorded in Lake Lyadhej-To sediments, Polar Urals, Russia. *Palaeogeography Palaeoclimatology Palaeoecology* 3-4(223): 181-203.

Abstract: An 1180-cm long core recovered from Lake Lyadhej-To (68 degrees 15' N, 65 degrees 45' E, 150 m a.s.l.) at the NW rim of the Polar Urals Mountains reflects the Holocene environmental history from ca. 11,000 cal. yr BP. Pollen assemblages from the diamicton (ca. 11,000-10,700 cal. yr BP) are dominated by Pre-Quaternary spores and redeposited Pinaceae pollen, pointing to a high terrestrial input. Turbid and nutrient-poor conditions existed in the lake ca. 10,700-10,550 cal. yr BP. The chironomid-inferred reconstructions suggest that mean July temperature increased rapidly from 10.0 to 11.8 degrees C during this period. Sparse, treeless vegetation dominated on the disturbed and denuded soils in the catchment area. A distinct dominance of planktonic diatoms ca. 10,500-8800 cal. yr BP points to the lowest lake-ice coverage, the longest growing season and the highest bioproductivity during the lake history. Birch forest with some shrub alder grew around the lake reflecting the warmest climate conditions during the Holocene. Mean July temperature was likely 11-13 degrees C and annual precipitation-400-500 mm. The period ca. 8800-5500 cal. yr BP is characterized by a gradual deterioration of environmental conditions in the lake and lake catchment. The pollen- and chironomid-inferred temperatures reflect a warm period (ca. 6500-6000 cal. BP) with a mean July temperature at least 1-2 degrees C higher than today. Birch forests disappeared from the lake vicinity after 6000 cal. yr BP. The vegetation in the Lyadhej-To region became similar to the modern one. Shrub (*Betula nana*, *Salix*) and herb tundra have dominated the lake catchment since ca. 5500 cal. yr BP. All proxies suggest rather harsh environmental conditions. Diatom assemblages reflect relatively short growing seasons and a longer persistence of lake-ice ca. 5500-2500 cal. yr BP. Pollen-based climate reconstructions suggest significant cooling between ca. 5500 and 3500 cal. yr BP with a mean July temperature 8-10 degrees

28: D. G. Angeler, S. Martin, M. Rodriguez and J. M. Moreno,. 2005. Application-rate-dependent impacts of a fire retardant on zooplankton community structure of temporary ponds. *Marine and Freshwater Research* 2(56): 197-202.

Abstract: In the present study, we employed dry sediments in a temporary-pond microcosm experiment to evaluate the response of the zooplankton community after exposure to different application rates of the commercially available fire retardant, Fire-Trol 934. Application rates were selected to reflect ranges used during fire control/prevention operations in grasslands and shrublands in Mediterranean areas. Results show loss of water quality in terms of increased nutrient (total phosphorus and total nitrogen) concentrations, electrical conductivity and water colour. The magnitude of water-quality impact depended on FRC application rate and was most severe in the highest application rate treatment. The zooplankton community was significantly affected by the FRC treatments. In the control, a diverse assemblage of cladocerans, rotifers and ostracods developed, whereas the zooplankton community in all FRC treatments was depauperate, consisting only of a few species of rotifers. The lack of cladocerans, which are effective grazers of phytoplankton, could negatively affect ecosystem functioning and foster eutrophication effects through excessive algal growth, at least during the first weeks after temporary ponds fill with winter rains.

29: B. Arheimer, M. Lowgren, B. C. Pers and J. Rosberg,. 2005. Integrated catchment modeling for nutrient reduction: Scenarios showing impacts, potential, and cost of measures. *Ambio* 7(34): 513-520.

Abstract: A hydrological-based model (HBV-NP) was applied to a catchment (1900 km²) in the southern part of Sweden. Careful characterization of the present load situation and the potential for improved treatment or reduced soil leaching were analyzed. Several scenarios were modeled to find strategies to reach the Swedish environmental goals of reducing anthropogenic nitrogen load by 30% and phosphorus load by 20%. It was stated that the goals could be reached by different approaches that would affect different polluters and social sectors. However, no single measure was enough by itself. Instead, a combination of measures was necessary to achieve the goals. The nitrogen goal was the most difficult to attain. In order to be cost-effective, these measures should be applied to areas contributing the most to the net loading of the sea. This strategy could reduce the costs by 70%-80% when compared with implementing the measures in the entire catchment. Integrated catchment models may thus be helpful tools for reducing costs in environmental control programs.

30: G. B. Arhonditsis and M. T. Brett,. 2005. Eutrophication model for Lake Washington (USA) Part I. Model description and sensitivity analysis. Ecological Modelling 2-3(187): 140-178.

Abstract: Complex environmental models are often criticized as being difficult to analyze and poorly identifiable due to their nonlinearities and/or their large number of parameters relative to data availability. Others consider overparameterized models to be useful, especially for predicting system dynamics beyond the conditions for which the model was calibrated. In this paper, we present a complex eutrophication model that has been developed to simulate plankton dynamics in Lake Washington, USA. Because this model is to be used for testing alternative managerial schemes, the inclusion of multiple elemental cycles (org. C, N, P, Si, O) and multiple functional phytoplankton (diatoms, green algae and cyanobacteria) and zooplankton (copepods and cladocerans) groups was deemed necessary. The model also takes into account recent advances in stoichiometric nutrient recycling theory, and the zooplankton grazing term was reformulated to include algal food quality effects on zooplankton assimilation efficiency. The physical structure of the model is simple and consists of two spatial compartments representing the lake epilimnion and hypolimnion. Global sensitivity analysis showed background light attenuation, the maximum phytoplankton growth rate, the phytoplankton basal metabolic rate, the zooplankton maximum grazing rate and the grazing half saturation constant have the greatest impact on model behavior. Phytoplankton phosphorus stoichiometry (maximum and minimum internal concentrations, maximum uptake rate) interacts with these parameters and determines the plankton dynamics (epilimnetic and hypolimnetic phytoplankton biomass, proportion of cyanobacteria and total zooplankton biomass). Sensitivity analysis of the model forcing functions indicated the importance of both external and internal loading for simulating epilimnetic and hypolimnetic plankton dynamics. These results will be used to calibrate the model, to reproduce present chemical and biological properties of Lake Washin

31: G. B. Arhonditsis and M. T. Brett,. 2005. Eutrophication model for Lake Washington (USA) Part II - model calibration and system dynamics analysis. Ecological Modelling 2-3(187): 179-200.

Abstract: We developed a complex eutrophication model to simulate the current chemical and biological properties of Lake Washington (USA). The model reproduces the key epilimnetic and hypolimnetic temporal patterns of the system and results in a good fit between simulated and observed monthly values. The relative error of model estimates was below 20% for most of the water quality parameters (phytoplankton, phosphate, total phosphorus, total nitrogen, dissolved oxygen). Discrepancies between simulated and observed ammonium levels were mainly due to the explicitly modeled egestion of excess nitrogen during zooplankton feeding. This indicates that the relation between secondary production and nutrient recycling has significant effects on the fractionation of the major elements (C, N and P) and regulates their distribution between the particulate/dissolved and inorganic/organic pools. The model was forced by 1962 nutrient loadings, when the lake received large quantities of treated wastewater treatment effluent, and accurately predicted the phytoplankton community responses (phytoplankton biomass and cyanobacteria dominance) and the nitrogen and phosphorus annual cycles for these conditions. We used Monte Carlo simulations to reproduce the meteorological forcing (air temperature, solar radiation, precipitation and subsequent river inflows) that in large part regulates phytoplankton interannual variability for the last 25 years in the lake. We found three seasonal components (modes of variability). The first component (January, May, November, December) is associated with the conditions that determine the abundance of the herbivorous cladocerans; the second component (June-September) coincides with the summer-stratified period, and the third component (February-April) is associated with the initiation and peak of the spring bloom. Finally, an illustrative application of two scenarios of nutrient loading increase at 25% of the 1962 levels indicated that both phytoplankton and cyano

32: C. A. Arias, H. Brix and E. Marti,. 2005. Recycling of treated effluents enhances removal of total nitrogen in vertical flow constructed wetlands. Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering 6-7(40): 1431-1443.

Abstract: It is widely documented that vertical flow constructed wetlands are efficient for producing well nitrified effluent. However, because the treated effluent is oxygen saturated and has a low availability of carbon, the removal of total nitrogen is limited. We hypothesize that by recycling the fully nitrified effluent to the pretreatment unit and the sedimentation tank (where conditions are favorable for denitrification) the removal of total nitrogen from the wastewater can be enhanced. In order to assess the effects of recycling volumes, we monitored the nitrogen removal in an experimental vertical flow constructed wetland, consisting of a 2 m³ sedimentation tank, two vertical flow beds of 10 and 5 m², and the necessary pumping equipment and controllers to manage the loading and recycling volumes. The system was loaded with approximately 0.5 m(3) d(-1), and the recycling volumes evaluated were equal to the loading rate (100% recycling), as well as twice (200%) and three times (300%) the loading. The system produced a fully nitrified effluent independent of recycling rate. However, recycling increased removal of total-N in the system from ca. 1% removal when there was no recycling to 52%, 66%, and 68% removal with 100, 200, and 300% recycling, respectively. The optimal recycling rate seems to be 100-200%. At lower recycling rates, the removal of total-N was poor, and at higher recycling rates, the system became hydraulically overloaded, compromising both the denitrification capacity of the sedimentation tank and the nitrification capacity of the vertical bed.

33: J. G. Arnold and N. Fohrer,. 2005. SWAT2000: current capabilities and research opportunities in applied watershed modelling. Hydrological Processes 3(19): 563-572.

Abstract: SWAT (Soil and Water Assessment Tool) is a conceptual, continuous time model that was developed in the early 1990s to assist water resource managers in assessing the impact of management and climate on water supplies and non-point source pollution in watersheds and large river basins. SWAT is the continuation of over 30 years of model development within the US Department of Agriculture's Agricultural Research Service and was developed to 'scale up' past field-scale models to large river basins. Model components include weather, hydrology, erosion/sedimentation, plant growth, nutrients, pesticides, agricultural management, stream routing and pond/reservoir routing. The latest version, SWAT2000, has several significant enhancements that include: bacteria transport routines; urban routines; Green and Ampt infiltration equation; improved weather generator; ability to read in daily solar radiation, relative humidity, wind speed and potential ET; Muskingum channel routing; and modified dormancy calculations for tropical areas. A complete set of model documentation for equations and algorithms, a user manual describing model inputs and outputs, and an ArcView interface manual are now complete for SWAT2000. The model has been recoded into Fortran 90 with a complete data dictionary, dynamic allocation of arrays and modular subroutines. Current research is focusing on bacteria, riparian zones, pothole topography, forest growth, channel downcutting and widening, and input uncertainty analysis. The model SWAT is meanwhile used in many countries all over the world. Recent developments in European Environmental Policy, such as the adoption of the European Water Framework directive in December 2000, demand tools for integrative river basin management. The model SWAT is applicable for this purpose. It is a flexible model that can be used under a wide range of different environmental conditions, as this special issue will show. The papers compiled here are the result of the first In

34: A. H. Arnoldussen,. 2005. The effectiveness of agro-environmental schemes in reducing erosion. Land Degradation & Development 6(16): 541-546.

Abstract: Autumn and winter in Norway are the most vulnerable periods for erosion. The government aims to reduce the autumn tillage acreage and keep the soil covered by vegetation as much as possible during the winter period. The farmers get support to plough their land in spring; the level of this support is related to the erosion risk. Also, support is given to several technical measures aimed at preventing eroded material reaching streams and rivers. The Agricultural Environmental Scheme has been successful and Norway has reduced nutrient runoff by nearly 50 percent as required by the North Sea Agreement. However, more can be achieved. From January 2004 the counties and municipalities can further adapt the Agricultural Environmental Scheme to suit the protection of local watersheds. Copyright (c) 2005 John Wiley & Sons, Ltd.

35: K. A. Aronsson and N. G. A. Ekelund,. 2005. Effects on motile factors and cell growth of *Euglena gracilis* after exposure to wood ash solution; Assessment of toxicity, nutrient availability and pH-dependency. *Water Air and Soil Pollution* 1-4(162): 353-368.

Abstract: Wood ash application (WAA) to the forest has been suggested as a resource of nutrients for trees and for restoration of acidified soils and surface waters. However, studies of the effects of WAA on aquatic systems are few. This study investigated the effects of wood ash (1-25 g L⁻¹) on the unicellular flagellate *Euglena gracilis*, which has been proved to be a sensitive test organism for assessing environmental change. Long-term (7 days) growth studies and short-term (direct, 24 and 48 h) studies of different motile factors, using the automatic biological test system Ecotox, were conducted. The results show no indication of biotoxic effects due to wood ash (adjusted to neutral) treatments. However, when no adjustments of pH in wood ash solutions were made, inhibitory effects on motile factors and cell growth were observed at higher concentrations of wood ash (10-25 g L⁻¹) due to high pH (> 8). In tests with pH adjusted to neutral, enhanced motility was observed. These results indicate that high concentration of WAA could affect freshwater environments.

36: J. C. Auguet, H. Montanie, D. Delmas, H. J. Hartmann and V. Huet,. 2005. Dynamic of virioplankton abundance and its environmental control in the Charente estuary (France). *Microbial Ecology* 3(50): 337-349.

Abstract: The Charente River provides nutrient- and virus-rich freshwater input to the Marennes Oleron Basin, the largest oyster-producing region in Europe. To evaluate virioplankton distribution in the Charente Estuary and identify which environmental variables control dynamic of virioplankton abundance, five stations defined by a salinity gradient (0-0.5, 0.6-5, 13-17, 20-24, and higher than 30 PSU) were surveyed over a year. Viral abundance was related to bacterioplankton abundance and activities, photosynthetic pigments, nutrient concentration, and physical parameters (temperature and salinity). On a spatial scale, virus displayed a decreasing pattern seaward with abundance ranging over the sampling period from 1.4×10^7 to 20.8×10^7 viruses mL⁻¹ making virioplankton the most abundant component of planktonic microorganisms in the Charente Estuary. A good correlation was found between viral and bacterial abundance ($r(s) = 0.85$). Furthermore, bacterial abundance was the most important predictor of viral abundance explaining alone between 66% (winter) and 76% (summer) of viral variability. However, no relation existed between viral abundance and chlorophyll a. Temporal variations in viral distributions were mainly controlled by temperature through the control of bacterial dynamics. Spatial variations of viral abundance were influenced by hydrodynamic conditions especially during the winter season where virioplankton distribution was entirely driven by mixing processes.

37: S. T. Bacchus and P. J. Barile,. 2005. Discriminating sources and flowpaths of anthropogenic nitrogen discharges to Florida springs, streams and lakes. Environmental & Engineering Geoscience 4(11): 347-369.

Abstract: Surface discharges of anthropogenic nutrients historically have been the focus of Florida's water-quality regulations. Groundwater contributions to eutrophication of Florida's surface waters are a more recent focus. Florida's naturally oligotrophic springs, streams, and lakes are experiencing significant anthropogenic nutrient contamination resulting from groundwater discharges with elevated nitrate. Sources of nitrate contamination to these surface-water ecosystems include sewage effluent, industrial animal waste (concentrated animal feedlot operations) and inorganic fertilizers. In this study, stable nitrogen isotope ($\delta(15)\text{N}$) analysis of freshwater macrophytes was combined with basic knowledge of watershed and springshed land use and aquifer characteristics to provide evidence of nitrogen contamination sources and groundwater flowpaths. Selected naturally oligotrophic ecosystems included springs and a spring-run stream within the Ocala National Forest (ONF) and springs, a blackwater stream, and a sinkhole lake on or adjacent to state lands. Elevated $\delta(15)\text{N}$ values (similar to +8 to 12‰) in ONF macrophytes indicated nitrogen contamination from sewage effluent. Underground injections of effluent and other wastes at ONF's Alexander and Juniper Springs Recreation Areas are the sole source of contaminants flowing through the sandy, surficial aquifer at those study areas. Samples from springs on state lands indicated nitrogen contamination from various sources via regional groundwater flowpaths. At Lake Placid's state lands, a dairy-waste lagoon was the groundwater source of nitrogen contamination via the sandy, surficial aquifer. Bulow Creek $\delta(15)\text{N}$ macrophyte values (similar to +5 to 8‰) suggested contamination from both cattle and septic tank leachate. Results indicated that uptake of anthropogenic nitrogen occurred in invasive alien and nuisance native macrophytes in the four freshwater ecosystem types evaluated.

38: J. H. Bai, O. Y. Hua, D. Wei, Y. M. Zhu, X. L. Zhang and Q. G. Wang,. 2005. Spatial distribution characteristics of organic matter and total nitrogen of marsh soils in river marginal wetlands. *Geoderma* 1-2(124): 181-192.

Abstract: Contents of soil organic matter (SOM) and total nitrogen (TN) in the surface soils and subsurface soils were measured in five types of floodplains classified with different flood frequencies in river marginal wetlands of Erbaifangzi, China, in 1999. Contour maps and profile maps were constructed to describe the spatial distribution of SOM and TN in order to identify the influences of flood frequency on them. Results showed that spatial distributions of both SOM and TN were very similar in soil profiles (0-120 cm) of the five areas, decreasing gradually with depth except an accumulation peak in the flooded floodplain (B area). Also, the accumulation peak in the soil profile of B area was relevant to water table, nitrogen leaching, denitrification and mineralization. However, their horizontal distributions in surface soils (0-10 cm) were different in the five areas. Although the flood could bring the deposit of nutrients and sands, the highest content of SOM or TN did not appear in B area but in the floodplain with certain flood frequency. For example, SOM content (6.76%) in 5-year floodplain wetland was highest, and the highest content of TN (3666.4 mg/kg) appeared in 1-year floodplain wetland. However, SOM and TN contents in soils of B area were 4.08% and 2605.4 mg/kg, respectively. Soil clay content, wetland plant (*Phragmites australis*) litter inputs, soil moisture and water table greatly affected the spatial distribution of SOM and TN in floodplain wetlands. The ratios of carbon to nitrogen of wetland soils in this region were relatively lower than those in paddy soils. SOM and TN contents were significantly correlated with total phosphorus (TP) contents in floodplain wetlands except the 100-year floodplain wetland, but they were significantly influenced by soil pH values only in B area. Denitrification and ammonia volatilization were the main mechanisms resulting in nitrogen loss of surface soils in B area. Flood frequency significantly influenced the ecological

39: K. D. Baker,. 2005. Temporal assessment of nutrient contributions to waterways from feedlots. Applied Engineering in Agriculture 3(21): 517-528.

Abstract: Equations were developed to compute nutrient contributions on a daily basis to waterways from feedlots with stocking rates equivalent to up to 250 steers/ha (100 steers/acre), such as is common in the midwestern United States. The algorithm set uses recorded weather data (daily values) and other input values and computes mass and concentration of selected nutrients in runoff, considering spatial and temporal aspects. Methodology to divide a large feedlot which contains more than one drainage outlet was determined, so that the described algorithms may be used for any size feedlot. Equations from USDA, Natural Resources Conservation Service were adapted to determine curve numbers for frozen soil, or soil of any moisture, as well as to determine runoff from rainfall and snowmelt events. Equations from ASAE were adapted to determine manure production from temporally changing animal loads on the feedlot and to compute temporal changes in the manure pack on the feedlot. Equations from USDA, Agricultural Research Service were adapted to determine nutrient concentrations in runoff for each runoff event. Equations were developed to incorporate mechanical removal of waste from a feedlot, as well as to include decomposition of nutrients on the feedlot. Previously derived equations were revised to determine nutrient reduction in feedlot buffer regions and due to dilution from mixing stream flows. The algorithms described in this study were verified for mathematical stability and accuracy in a spreadsheet program.

40: C. Bakker, J. Rodenburg and P. Bodegom,. 2005. Effects of Ca- and Fe-rich seepage on P availability and plant performance in calcareous dune soils. Plant and Soil 1-2(275): 111-122.

Abstract: Ca- and Fe-rich seepage in wet dune slacks often sustains oligotrophic, species rich vegetation as a result of reduced P availability. While this effect has been attributed to pH buffering, we tested whether Ca- and Fe-rich seepage also immobilised P in calcareous soils with a strong pH buffer. Two oligotrophic species (*Carex flacca* and *Schoenus nigricans*) and two eutrophic species (*Calamagrostis epigejos* and *Molinia caerulea*) were planted in experimental sods. After 4 months supply with water of seepage or infiltration quality, with or without the addition of P, soil P fractions and a number of plant physiological responses were measured. A field validation was performed in a flow-through lake in calcareous dunes where the seepage flow had been restored recently. The readily available water soluble P fraction (P_w) was reduced by more than 80% by seepage, both in the greenhouse experiment and in the field, but the P Olsen-inorganic fraction was unaffected. All four test species had elevated N: P ratios in aboveground tissues when treated with seepage, indicating that seepage water had indeed reduced P availability to plants. Formation of dauciform roots by *Carex flacca* was diminished by P addition to less than 25% of treatments without P addition, indicating sensitivity to P availability, while seepage on average halved production of these root structures. Dauciform root formation by *Schoenus nigricans* was unaffected by the P addition and the hydrological treatment. Biomass of the test species in the experiment as well as vegetation biomass and relative abundance of oligotrophic species in the field were unrelated to seepage patterns, suggesting that compensatory mechanisms enabled the plants to sustain biomass production within the time frame of this experiment. In conclusion, Ca- and Fe-rich seepage can lower P availability in soils with a strong pH buffer. In the long term, this may create favourable conditions for species that have low P requirements or efficient

41: P. Banaszuk and A. Wysocka-Czubaszek,. 2005. Phosphorus dynamics and fluxes in a lowland river: The Narew anastomosing river system, NE Poland. Ecological Engineering 4(25): 429-441.

Abstract: The results of the weekly SRP and TP measurements in an anastomosing (cross-veining) reach of Narew River (NE Poland) over one annual cycle as well as measurements of P in river sediments are presented here. Mass balance studies were used to examine net gains and losses of P along the river reach. The P concentrations are found to be very variable throughout the year with maximum levels, reaching 0.21 mg L⁻¹, being observed during the low flows and minimum - during the flood events 0.04 +/- 0.008 mg L⁻¹. Results showed that phosphorus was retained within the river system during the high flows in winter and spring, whereas net export of P occurred in summer period mainly due to internal loading. Under summer low-flow conditions, high temperature and low redox potential facilitate P release from river bed sediments into both sediment pore waters and the water column. At this time, the Narew Anastomosing River System (NAS) provides an important P source, which can affect the downstream habitats by additional load of highly bioavailable P. It appears that NAS, through its specific character, can transform the water chemistry and transport rate, compared with river fragments located upstream and downstream. It provides an example of a discontinuity analogical to the shallow lakes in lowland river systems. (c) 2005 Elsevier B.V. All rights reserved.

42: P. Banaszuk, A. Wysocka-Czubaszek and P. Kondratiuk,. 2005. Spatial and temporal patterns of groundwater chemistry in the river riparian zone. Agriculture Ecosystems & Environment 2-3(107): 167-179.

Abstract: The nutrients dynamics and groundwater flowpaths were studied in a riparian zone of the Narew River valley (NE, Poland). On the monthly basis a transect of monitoring wells extending across cropland, a row of trees, grass belt and mire up to a river were sampled for NO₃⁻, SRP, Cl⁻, K⁺, Fe²⁺/3⁺. The Groundwater Modelling System (GMS) was used to assume the spatial and temporal aspects of groundwater movement. The highest concentration of nitrate, potassium and chloride were observed under the fertilized cropland. Their content diminished abruptly towards the wetland and the river. The soluble reactive phosphorus (SRP) concentrations were highest in groundwater of deeper peat horizons and in alluvial sands beneath the peat. Our results revealed that water infiltrating from the field is diverted into alluvial sands beneath the riparian soils and probably below the range of plants roots. Thus, the removal of agrochemicals does not take place in shallow, organic-rich sediments or soils of the riparian zone, but it occurs in sandy aquifer in the valley. Although tree and grassland strips do not play significant role in diminishing of groundwater pollutant transport they are important barrier for sediment-bound P transported from cropland with erosion and surface runoff. (c) 2004 Elsevier B.V. All rights reserved.

43: P. A. Barker, J. M. Pates, R. J. Payne and R. M. Healey,. 2005. Changing nutrient levels in Grasmere, English lake district, during recent centuries. *Freshwater Biology* 12(50): 1971-1981.

Abstract: 1. Historical nutrient changes in Grasmere were investigated using a 300-year record derived from six sediment cores. One core was investigated at high resolution for diatoms, total sedimentary phosphorus, and loss-on-ignition (LOI), and was dated using Pb-210 and Cs-137. Six other cores were scanned for magnetic susceptibility, diatoms and LOI to confirm the stratigraphic integrity of the primary record. 2. A rise in nutrient levels occurred after 1855 AD. This event was marked by a shift away from benthic diatom assemblages and a rise in *Asterionella formosa*. The onset of eutrophication from 1855 corresponds to the expansion of the local and tourist population in the area. 3. The replacement of *A. formosa* with *Cyclotella* spp. ca 1945-65 indicates reduced nutrient loads, possibly because of enhanced flushing brought about by the seasonal rainfall distribution. 4. After 1965 a step-wise increase in both absolute and relative amounts of *Asterionella* was found. High sedimentary P and diatom inferred TP confirmed the high nutrient loading of the lake. Nutrient increase is attributable to problems with the Grasmere village sewage system and the installation of a wastewater treatment works (WwTW) on the River Rothay in 1971. Modifications to the WwTW in 1982 caused an initial improvement, but have not led to a full recovery to pre-1965 ecological conditions. 5. The diatom record indicates a further improvement after 1990 by a return toward *Achnanthes minutissima*. 6. The sedimentary archive of sensitive sites provides important benchmarks against which to judge the attainment of water quality targets.

44: T. Barnes,. 2005. Caloosahatchee Estuary conceptual ecological model. Wetlands 4(25): 884-897.

Abstract: The Caloosahatchee Estuary is a large estuarine ecosystem, located on Florida's lower west coast, that supports a productive and diverse floral and faunal community. Major modifications to the hydrology of the Caloosahatchee watershed through water management, including water releases from Lake Okeechobee into the Caloosahatchee River, along with land-use transformations, increased development, and dredging for navigation, have resulted in alterations within the estuary. Changes in estuarine salinity, flows, and nutrient inputs, along with physical alterations to the estuary as a result of these stressors, can affect estuarine fishes and manatees, as well as benthic communities including several species of bivalves, such as oysters, scallops, and clams. Additionally, the submerged aquatic vegetation and mangrove shoreline habitat are affected through a variety of processes associated with these changes. As a result, these estuarine attributes can be used as indicators of restoration success.

45: C. Barranguet, B. Veuger, S. A. M. Van Beusekom, P. Marvan, J. J. Sinke and W. Admiraal,. 2005. Divergent composition of algal-bacterial biofilms developing under various external factors. *European Journal of Phycology* 1(40): 1-8.

Abstract: The influence of external factors other than nutrients on biofilm development and composition was studied with a combination of optical (Confocal Laser Scanning Microscopy, PAM fluorometry) and chemical methods (EPS extraction, HPLC, TOC determination). The development of algal-bacterial biofilms was followed from bare surfaces to mature biofilms in two water reservoirs on Dutch filtration dunes. Biofilms developed under the influence of grazing, light limitation or undisturbed by either of these two factors. Biofilms appeared similar at the beginning of the colonization period at the three sites and laser microscopy observations revealed the predominance of bacteria and capsular EPS (extracellular polymeric substances) in young biofilms. After 3 weeks development, the biofilms had a higher number of taxa; undisturbed biofilms presented the highest biomass, the longest developmental period and showed a significant correlation between organic carbon, chlorophyll and EPS production, indicating a close coupling between autotrophic carbon production and EPS. In light-limited biofilms, this coupling was weaker (although the organic carbon content was similar to that of the undisturbed biofilms) and a lower algal biomass was reached. Light-limited biofilms were mostly composed of diatoms, which are more efficient in low irradiances than green microalgae. Biofilms grazed by the snail *Potamopyrgus antipodarum* presented the lowest biomass level, but the highest proportion of EPS. Grazing seemed to favour the predominance of EPS-rich algae, as well as firmly attached diatoms. Although filamentous cyanobacteria were found in mature biofilms at the three locations, they were more abundant in the grazed biofilms. The differences in carbon uptake with respect to its allocation indicated that external factors influencing biofilm development affect the cycling and transport of carbon in biofilms and hence influence the effect of biofilm metabolism on the overlying water quality.

46: K. K. Bartz and R. J. Naiman,. 2005. Effects of salmon-borne nutrients on riparian soils and vegetation in southwest Alaska. *Ecosystems* 5(8): 529-545.

Abstract: Spawning Pacific salmon (*Oncorhynchus* spp.) contribute marine-derived nutrients to riparian ecosystems, potentially affecting characteristics of the associated soils and vegetation. We quantified these effects by comparing soil and vegetative characteristics upstream and downstream of natural migratory barriers on ten spawning streams in southwest Alaska. Mean $\delta^{15}\text{N}$ values-indicative of salmon-borne nutrients-were significantly higher in the O horizon and surface mineral soils downstream of barriers (near spawning reaches) than in soils upstream of barriers (near non-spawning reaches). However, the mean total N concentration in surface mineral soil was lower downstream than upstream. Mean foliar $\delta^{15}\text{N}$ values were higher downstream for three plant species (*Picea glauca*, *Salix alaxensis* and *Arctagrostis latifolia*) with contrasting physiognomies. Mean overstory stem density was 100% higher downstream, primarily due to a fivefold difference in the density of largediameter willows (*Salix* spp.). Mean understory stem density was 47% lower downstream, also driven by a difference in willow density. Mean ground layer non-vascular and dwarf shrub species covers were 28% and 73% lower downstream, respectively. of the ten soil and vegetative characteristics that differed upstream to downstream, two (O horizon and *Picea glauca* $\delta^{15}\text{N}$) were correlated with the density of spawning salmon. Collectively, the data suggest that salmon-borne nutrients alter riparian soils and vegetation, while factors unrelated to salmon are responsible for the ultimate expression of many community characteristics.

47: R. W. Battarbee, N. J. Anderson, E. Jeppesen and P. R. Leavitt,. 2005. Combining palaeolimnological and limnological approaches in assessing lake ecosystem response to nutrient reduction. *Freshwater Biology* 10(50): 1772-1780.

Abstract: 1. Palaeolimnological data and limnological time-series data are highly complementary. Sediment records extend time-scales, integrate subannual variability and expand the range of sites that can be studied, but they suffer from taphonomic biases and occasionally from uncertain chronology. Observational time-series data, on the other hand, are highly resolved but are very limited in extent both in space and time. 2. Palaeolimnological and observational data-sets need to be combined in oligotrophication research to establish (i) the past and present status of lakes needed to identify reference conditions; (ii) changes in ecosystem state; (iii) responses to nutrient reduction; and (iv) the potential role of other factors (e.g. additional stressors, climate change) that might confound predictions of future state.

48: D. J. Baumgardner, D. Steber, R. Glazier, D. P. Paretsky, G. Egan, A. M. Baumgardner and D. Prigge,. 2005. Geographic information system analysis of blastomycosis in northern Wisconsin, USA: waterways and soil. Medical Mycology 2(43): 117-125.

Abstract: Geographic information systems (GIS) are powerful tools for investigating the ecogeography of environmentally acquired infections. GIS technology was used to geocode and map cases of blastomycosis, by household, of human and dog residents of Vilas County, Wisconsin, USA. Human case households (n = 136) were from a comprehensive street address registry 1979 - 2001; human controls were 200 random-number selected households from 2001 county tax records. Dog cases (n = 116) were from a consecutive street address registry from a private veterinarian practice, Eagle River; dog controls were 200 random-number selected addresses from the 2001 total practice registry. Where geocoding was not available from existing maps, home sites were visited and geocoded using a handheld global positioning system (n = 61). Waterway characteristics were obtained from the Wisconsin Department of Natural Resources GNIS database, soil type data from the USDA. Data were analysed with chi-square and Mann - Whitney tests; cluster analysis with CrimeStat II software. A disproportionate number of human and dog cases were associated with waterways of the western Eagle River area. Human and dog cases were more commonly near waterways <500 m elevation (more nutrient rich) ($P \leq 0.001$ for both) and were associated with sands (prone to drought) ($P \leq 0.01$ for both). When the nearest waterway was a lake, case addresses were more commonly near lakes with < 7.6 m maximum depth (more lake mixing) ($P < 0.05$, humans and dogs) but mean depth, type and size of lakes did not differ from controls. Further studies are needed to clarify the nature of these associations.

49: F. Baunaure and G. Langsley,. 2005. Protein traffic in Plasmodium infected-red blood tells. M S-Medecine Sciences 5(21): 523-529.

Abstract: To survive within erythrocytes, Plasmodium parasites have to put into place different membrane and sub-cellular compartments in order to import different nutrients and to export proteins/antigens. Infected cells pose not only a major world health risk by killing two million people per year, but also a very interesting cell biology problem, as within the erythrocyte the parasite resides inside a vacuole called the parasitophorous vacuole and as a consequence, it is separated from the blood stream by three membrane barriers, its own plasma membrane, the parasitophorous vacuole membrane and the erythrocyte plasma membrane. In spite of these three barriers the parasite is capable of secreting antigens and importing nutrients, and to do this, it has developed a complex vesicular system that extends into the red blood cell cytoplasm to the plasma membrane. Understanding how the parasite controls this extensive vesicular traffic has driven research into Plasmodium Robs whose potential role is discussed.

50: M. M. Bayo, J. J. Casas and L. Cruz-Pizarro,. 2005. Decomposition of submerged *Phragmites australis* leaf litter in two highly eutrophic Mediterranean coastal lagoons: relative contribution of microbial respiration and macroinvertebrate feeding. *Archiv Fur Hydrobiologie* 3(163): 349-367.

Abstract: Eutrophication is probably the most conspicuous and worldwide man-made disturbance on lentic aquatic ecosystems. The increase of nutrient turnover, generally associated with decreased cycling, and species losses frequently occur as a consequence of eutrophication, with implications for the flow of carbon through food webs. In this study we investigated the process of decomposition of reed leaf litter in two heavily eutrophicated coastal lagoons, paying particular attention to the relative contribution of microbial respiration and macroinvertebrate feeding. Decomposition rates obtained for reed leaf litter at both lagoons were among the highest reported in studies using similar methods, and generally can be related to the high nutrient availability in the lagoons. In the hypereutrophic lagoon this rate was significantly higher than in the eutrophic one, a pattern that matched with a higher nutrient enrichment and microbial activity in leaf debris incubated in the first lagoon. Additionally, our results showed an overwhelming role of decomposer respiration compared to that of detritivore feeding in the process of decomposition at both lagoons. This strongly unbalanced proportional contribution, compared to other studies in streams and lakes, can be explained in terms of high microbial respiration, absence of invertebrate shredders, and relatively low density and weak detritivory of scraper gastropods. The absence of common shredders such as *Echinogammarus* and, especially, *Melanopsis praemorsa*, which would have greatly contributed to the flow of leaf carbon through the food web, may be attributable to the stress caused by eutrophication.

51: P. D. Beavers and I. K. Tully,. 2005. Nutrient reduction evaluation of sewage effluent treatment options for small communities. Water Science and Technology 10(51): 221-229.

Abstract: Small communities that are sewerred by either package sewage treatment plants or on-site sewerage facilities are finding that the ground and surface waters are being contaminated. Nitrogen, which typically is not removed in these conventional systems, is a major concern. This project evaluated the capability of four sewage treatment technologies to reduce the amount of nitrogen being discharged in the effluent to the receiving environment. The four sewage treatment processes evaluated include a recirculating sand filter, biofilter, slow sand filter and constructed subsurface flow wetland. These processes were evaluated for their capability to reduce nitrogen, phosphorus, BOD5 and TSS. The primary objective of the project was to evaluate the capability of these treatment processes to reduce nitrogen using biological processes nitrification and denitrification. This paper reports on the performance of these processes to reduce nitrogen. The study demonstrated that the biofilter was capable of removing from a primary treated influent 40% of the total nitrogen. For the same quality influent the recirculating sand filter was capable of removing 35% of the total nitrogen. Secondary treated effluent was fed to the slow sand filter and the subsurface flow wetland. There was a 52% reduction in total nitrogen through the wetland however there was virtually no reduction in total nitrogen through the slow sand filter.

52: M. Bechmann and P. Stalnacke,. 2005. Effect of policy-induced measures on suspended sediments and total phosphorus concentrations from three Norwegian agricultural catchments. Science of the Total Environment 1-3(344): 129-142.

Abstract: In Norway, agricultural subsidies have, since the late 1980s, been targeted to reduce soil erosion, transfer of soil particles and phosphorus (P) losses. The subsidies led to, e.g., a fourfold increase in the area not ploughed from 1991 to 2001 and a reduced P fertiliser consumption by 60%, especially in areas with high livestock density. Moreover, in the late 1980s agricultural point sources of P from storage facilities of manure and fodder were reduced. In this paper, we evaluate the effect of these policy-induced measures and changed agricultural practices on suspended sediment (SS) and total P (TP) concentrations in three agricultural catchments (1, 3 and 87 km). Results from the statistical trend analyses for the study period (14-17 years) showed weak, but statistically significant ($p < 0.05$), downward trends in concentrations of TP and SS in the two streams with a high initial TP or SS concentration. In the stream with low initial concentrations of TP and SS, however, no statistically significant trends were shown. The stream with the highest initial concentration of SS showed a statistically significant downward trend in both, TP and SS concentrations. The catchment with low initial concentration of SS and medium livestock density showed no detectable trends, while the catchment with high livestock density and low concentrations of SS in the stream showed a statistically significant downward trend in TP concentrations. The results from this study suggest that subsidies and mitigation measures can reduce concentrations of TP and SS in streamwater in highly polluted catchments, although the reduction is small compared to the variations. between catchments. (c) 2005 Elsevier B.V All rights reserved.

53: M. Becker and F. Asch,. 2005. Iron toxicity in rice-conditions and management concepts. Journal of Plant Nutrition and Soil Science-Zeitschrift Fur Pflanzenernahrung Und Bodenkunde 4(168): 558-573.

Abstract: Iron toxicity is a syndrome of disorder associated with large concentrations of reduced iron (Fe^{2+}) in the soil solution. It only occurs in flooded soils and hence affects primarily the production of lowland rice. The appearance of iron toxicity symptoms in rice involves an excessive uptake of Fe^{2+} by the rice roots and its acropetal translocation into the leaves where an elevated production of toxic oxygen radicals can damage cell structural components and impair physiological processes. The typical visual symptom associated with these processes is the "bronzing" of the rice leaves and substantial associated yield losses. The circumstances of iron toxicity are quite well established. Thus, the geochemistry, soil microbial processes, and the physiological effects of Fe^{2+} within the plant or cell are documented in a number of reviews and book chapters. However, despite our current knowledge of the processes and mechanisms involved, iron toxicity remains an important constraint to rice production, and together with Zn deficiency, it is the most commonly observed micronutrient disorder in wetland rice. Reported yield losses in farmers' fields usually range between 15% and 30%, but can also reach the level of complete crop failure. A range of agronomic management interventions have been advocated to reduce the Fe^{2+} concentration in the soil or to foster the rice plants' ability to cope with excess iron in either soil or the plant. In addition, the available rice germplasm contains numerous accessions and cultivars which are reportedly tolerant to excess Fe^{2+} . However, none of those options is universally applicable or efficient under the diverse environmental conditions where Fe toxicity is expressed. Based on the available literature, this paper categorizes iron-toxic environments, the steps involved in toxicity expression in rice, and the current knowledge of crop adaptation mechanisms in view of establishing a conceptual framework for future constraint analysis, rese

54: A. P. Bedford,. 2005. Decomposition of *Phragmites australis* litter in seasonally flooded and exposed areas of a managed reedbed. *Wetlands* 3(25): 713-720.

Abstract: Most studies on the decomposition of *Phragmites australis* have concentrated on permanently submerged or standing litter. The present study examines the dynamics of leaf and stem litter breakdown in seasonally flooded and permanently exposed areas in a managed reedbed. Seasonal flooding and summer drawdown are employed as part of the management to prevent litter accumulation. Fine mesh (0.25 mm) and modified design, coarse mesh (5-mm) bags were used. In the permanently exposed area, leaf and stem material lost 42% of their dry weight after 18 months and 47% after 30 months. In the seasonally flooded area, depending on mesh size, leaf material lost 74-79% and stem material 60-79% of its dry weight over the same time periods. Examination of individual breakdown rates demonstrated that fastest weight losses occurred following summer drawdown, with well-oxygenated, warm, damp litter. Drying of the litter and re-flooding of the reedbed led to slowing or complete cessation of breakdown. Maintenance of damp conditions throughout the summer exposure period would maximize breakdown rates.

55: J. Belnap, J. R. Welter, N. B. Grimm, N. Barger and J. A. Ludwig,. 2005. Linkages between microbial and hydrologic processes in arid and semiarid watersheds. *Ecology* 2(86): 298-307.

Abstract: Microbial activity in semiarid and arid environments is closely related to the timing, intensity, and amount of precipitation. The characteristics of the soil surface, especially the influence of biological soil crusts, can determine the amount, location, and timing of water infiltration into desert soils, which, in turn, determines the type and size of microbial response. Nutrients resulting from this pulse then create a positive feedback as increases in microbial and plant biomass enhance future resource capture or, alternatively, may be lost to the atmosphere, deeper soils, or downslope patches. When rainfall intensity overwhelms the water infiltration capacity of the plant interspace or the plant patch, overland water flow links otherwise separated patches at many different scales via the transport of nutrients in water, soil, and organic matter. For example, material carried from the plant interspace is often deposited under an adjacent plant. Alternatively, material from both of these patches may be carried to rills that feed ephemeral channels, thence to seasonally intermittent and, finally, perennial streams. These inputs can either be retained by the stream-riparian ecosystem or be exported in surface flow. However, in larger perennial streams, the fate of these material inputs is confounded by the impact of storm-driven flows on the extant aquatic biota, as flash floods can also represent succession-initiating disturbances to the stream-riparian ecosystem on a wide range of time scales. In contrast to uplands where precipitation initiates the microbial response, nutrient transfers can support a flush of plant uptake and microbial processing, triggered by high nutrient concentrations and changed nutrient form (e.g., nitrate or ammonium). The nature and strength of the linkages between the different ecosystem components define the structure and function of arid ecosystems. Losses of materials are natural processes, but it is problematic when conserving" syst

56: H. Bennion, J. Hilton, M. Hughes, J. Clark, D. Hornby, I. Fozzard, G. Phillips and C. Reynolds,. 2005. The use of a GIS-based inventory to provide a national assessment of standing waters at risk from eutrophication in Great Britain. Science of the Total Environment 1-3(344): 259-273.

Abstract: A three-tiered, hierarchical, risk-based prioritisation system was developed to assess the number of standing waters in Great Britain (GB) at risk from eutrophication. The scheme is based on four properties: importance, hazard, sensitivity to enrichment and sensitivity to recovery. Lake size, conservation status and legislative requirements were used to assess importance. The anthropogenic total phosphorus (P) load estimated from land cover, livestock and population data was used as a measure of the eutrophication hazard. Lakes with a retention time > 3 days were considered to be sensitive to enrichment. The Wederbum depth (an estimate of the average summer thermocline depth) was used to predict the potential response of a lake to nutrient reduction. Lakes which were mainly stratified or fully stratified during the summer were expected to respond quickly to remediation. An initial Tier 1 risk assessment was made for all standing waters in GB (approximately 14,300 with surface area greater than 1 ha), using the four parameters derived from nationally available, GIS-based data sources held in the GB Lakes Inventory. Of the 2362 important lakes in GB, the system identified 1736 with low hazard but under potential threat because of their high sensitivity to enrichment. The system assessed that the ecology of 212 was likely to be damaged by eutrophication owing to high hazard and high sensitivity but with relatively poor chance of recovery following remediation. A further 332 lakes were considered to be damaged but were likely to respond to rehabilitation. In summary, the risk-based prioritisation system performed well and provides a useful tool for assessing standing waters at risk of eutrophication on a national basis. Inevitably, however, the need for nationally available datasets at Risk Tier I results in data resolution issues and errors may occur. The results highlight the importance of data validation using lake-specific information at Risk Tier 2. (c) 2005 Elsevi

57: H. Bennion, P. Johnes, R. Ferrier, G. Phillips and E. Haworth,. 2005. A comparison of diatom phosphorus transfer functions and export coefficient models as tools for reconstructing lake nutrient histories. *Freshwater Biology* 10(50): 1651-1670.

Abstract: 1. We compared the baseline phosphorus (P) concentrations inferred by diatom-P transfer functions and export coefficient models at 62 lakes in Great Britain to assess whether the techniques produce similar estimates of historical nutrient status. 2. There was a strong linear relationship between the two sets of values over the whole total P (TP) gradient (2-200 $\mu\text{g TP L}^{-1}$). However, a systematic bias was observed with the diatom model producing the higher values in 46 lakes (of which values differed by more than 10 $\mu\text{g TP L}^{-1}$ in 21). The export coefficient model gave the higher values in 10 lakes (of which the values differed by more than 10 $\mu\text{g TP L}^{-1}$ in only 4). 3. The difference between baseline and present-day TP concentrations was calculated to compare the extent of eutrophication inferred by the two sets of model output. There was generally poor agreement between the amounts of change estimated by the two approaches. The discrepancy in both the baseline values and the degree of change inferred by the models was greatest in the shallow and more productive sites. 4. Both approaches were applied to two lakes in the English Lake District where long-term P data exist, to assess how well the models track measured P concentrations since approximately 1850. There was good agreement between the pre-enrichment TP concentrations generated by the models. The diatom model paralleled the steeper rise in maximum soluble reactive P (SRP) more closely than the gradual increase in annual mean TP in both lakes. The export coefficient model produced a closer fit to observed annual mean TP concentrations for both sites, tracking the changes in total external nutrient loading. 5. A combined approach is recommended, with the diatom model employed to reflect the nature and timing of the in-lake response to changes in nutrient loading, and the export coefficient model used to establish the origins and extent of changes in the external load and to assess potential reduction in load.

58: J. P. Benstead, L. A. Deegan, B. J. Peterson, A. D. Hurn, W. B. Bowden, K. Suberkropp, K. M. Buzby, A. C. Green and J. A. Vacca,. 2005. Responses of a beaded Arctic stream to short-term N and P fertilisation. *Freshwater Biology* 2(50): 277-290.

Abstract: 1. Oligotrophic Arctic streams are likely to be sensitive to changes in hydrology and nutrient inputs predicted to occur as a consequence of future climate and land use change. To investigate the potential consequences of nutrient enrichment for low-order Arctic streams, we added ammonium-N and phosphorous to a second-order beaded, tundra stream on Alaska's north slope. We measured responses in nutrient chemistry, chlorophyll a standing crop, and in the breakdown and macroinvertebrate colonisation of leaf litter over a 38-day summer period. 2. During the addition, nutrient concentrations immediately downstream of the dripper averaged 6.4 μM ammonium-N and 0.45 μM soluble reactive P. Concentrations upstream of the dripper averaged 0.54 μM ammonium-N and 0.03 μM soluble reactive P. Uptake of both nutrients was rapid. Concentrations were reduced on average to 28 % (ammonium-N) and 15 % (inorganic P) of maximum values within 1500 m. Standing crops of chlorophyll a on standardised samplers were significantly higher by the end of the experiment. Breakdown rates of senescent willow (*Salix* sp.) and sedge (*Carex* sp.) litter and associated fungal biomass were also significantly increased by nutrient addition. 3. Fertilisation resulted in four- to sevenfold higher macroinvertebrate abundance and two-to fourfold higher macroinvertebrate biomass in litter bags, as well as an increase in late-summer body mass of larval *Nemoura* stoneflies. 4. Our results are consistent with those of similar studies of larger streams in the high-Arctic region. Based on our short-term experiment, increased inputs of nutrients into these ecosystems, whether caused by climate change or more local disturbance, are likely to have profound ecological consequences. Longer-term effects of enrichment, and their interaction with other components of future change in climate or land use, are more difficult to assess.

59: N. Berenzen, T. Kumke, H. K. Schulz and R. Schulz,. 2005. Macroinvertebrate community structure in agricultural streams: impact of runoff-related pesticide contamination. *Ecotoxicology and Environmental Safety* 1(60): 37-46.

Abstract: This study aims to assess the runoff-related pesticide contamination, among other environmental factors, that contributes to differentiation in the macroinvertebrate communities inhabiting six streams in northern Germany (Braunschweig, Lower Saxony). A total of 91 macroinvertebrate taxa, were sampled three times (April, May and June 2000) during the main period of pesticide application to cereals and sugar beets in the catchment. Thirteen environmental variables (e.g., nutrients, discharge, in-stream structure), including runoff-related pesticide concentrations expressed as a sum parameter based on toxicity units (TUSUM), were analyzed using canonical correspondence analysis (CCA) and redundancy analysis. CCA based on species-level data and environmental variables explained 48% of the variance, with TUSUM, stream width, percentage of detritus in the stream bed, and temperature being the most important variables. The sampling dates were of minor importance for the classification. The community composition in three streams exposed to maximum total pesticide levels between 0.2 x and 0.01 x acute toxicity to *Daphnia* (48-h LC50) was clearly distinct from that at three control sites. Redundancy analysis using average values of the environmental variables and taxonomic orders explained 95% of the variance, with TUSUM being the only significant variable. The results show that the present pesticide levels affect the invertebrate community structure in the field. Furthermore, they underline the potential for effects in the field at pesticide concentrations greater than 0.01 x acute toxicity to *Daphnia* and are thus in agreement with the assumptions underlying the standards set by the European Union uniform principle. (C) 2003 Elsevier Inc. All rights reserved.

60: A. K. Bergstrom, P. Blomqvist and M. Jansson,. 2005. Effects of atmospheric nitrogen deposition on nutrient limitation and phytoplankton biomass in unproductive Swedish lakes. *Limnology and Oceanography* 3(50): 987-994.

Abstract: We used chemical data (3,907 lakes) and phytoplankton biomass (chlorophyll a) data (225 lakes) from Swedish lake monitoring programs to assess the effects of atmospheric nitrogen (N) deposition on nutrient limitation and phytoplankton biomass in unproductive Swedish lakes. There was a clear north-south gradient of increasing lake concentrations of dissolved inorganic nitrogen, which was related to the pattern of atmospheric N input. On the basis of positive relationships between total phosphorus (P) concentrations and phytoplankton biomass we conclude that lakes in areas of enhanced N deposition are mainly P limited during summer. This relationship was not detected in lakes in pristine areas with low N deposition, which, together with experimental evidence from the literature, suggest possible N limitation. During summer, lakes in high N-deposition areas had clearly higher phytoplankton biomass relative to the total phosphorus concentrations compared to lakes in low N-deposition areas. Thus, in Swedish unproductive lakes, high atmospheric N input is reflected by increased lake concentrations of dissolved inorganic nitrogen and, possibly, by a shift from natural N limitation of phytoplankton to P limitation. Our results also reveal that increased N input has caused a eutrophication with higher phytoplankton biomass as the result.

61: J. Berkowitz, M. A. Anderson and R. C. Graham,. 2005. Laboratory investigation of aluminum solubility and solid-phase properties following alum treatment of lake waters. Water Research 16(39): 3918-3928.

Abstract: Water samples from two southern California lakes adversely affected by internal nutrient loading were treated with a 20mg/L dose of Al^{3+} in laboratory studies to examine Al solubility and solid-phase speciation over time. Alum [$\text{Al}_2(\text{SO}_4)_3 \cdot 18 \text{H}_2\text{O}$] applications to water samples from Big Bear Lake and Lake Elsinore resulted in a rapid initial decrease in pH and alkalinity followed by a gradual recovery in pH over several weeks. Dissolved Al concentrations increased following treatment, reaching a maximum of 2.54mg/L after 17 days in Lake Elsinore water and 0.91 mg/L after 48 days in Big Bear Lake water; concentrations in both waters then decreased to $< 0.25 \text{ mg/L}$ after 150 days. The solid phase was periodically collected and analyzed using X-ray diffraction (XRD), differential scanning calorimetry-thermogravimetric analysis (DSC-TGA), scanning electron microscopy (SEM), and surface area analyses to investigate the nature of the reaction products and crystallinity development over time. Poorly ordered, X-ray amorphous solid phases transformed over time to relatively well-ordered gibbsite, with strong diffraction peaks at 4.8 and 4.3 Å. XRD also indicated the formation of a second (possibly aluminosilicate) crystalline phase after 150 days in Lake Elsinore water. Surface areas also decreased over time as crystals reordered to form gibbsite/microcrystalline gibbsite species. DSC-TGA results suggested that the initially formed amorphous $\text{Al}(\text{OH})_3$ underwent transformation to $> 45\%$ gibbsite. These results were supported by geochemical modeling using Visual MINTEQ with Al solubility putatively controlled by amorphous $\text{Al}(\text{OH})_3$ shortly after treatment and approaching that of microcrystalline gibbsite after about 150 days. These findings indicate that $\text{Al}(\text{OH})_3$ formed after alum treatment undergoes significant chemical and mineralogical changes that may alter its effectiveness as a reactive barrier to phosphorus release from lake sediments. (c) 2005 Elsevier Ltd. All rights reserved.

62: S. Bernal, A. Butturini and F. Sabater,. 2005. Seasonal variations of dissolved nitrogen and DOC : DON ratios in an intermittent Mediterranean stream. Biogeochemistry 2(75): 351-372.

Abstract: Seasonal variations of dissolved inorganic nitrogen (DIN) ($\text{NO}_3\text{-N}$ and $\text{NH}_4\text{-N}$) and dissolved organic nitrogen (DON) were determined in Fuirosos, an intermittent stream draining an unpolluted Mediterranean forested catchment (10.5 km²) in Catalonia (Spain). The influence of flow on streamwater concentrations and seasonal differences in quality and origin of dissolved organic matter, inferred from dissolved organic carbon to nitrogen ratios (DOC:DON ratios), were examined. During baseflow conditions, nitrate and ammonium had opposite behaviour, probably controlled by biological processes such as vegetation uptake and mineralization activity. DON concentrations did not have a seasonal trend. During storms, nitrate and DON increased by several times but discharge was not a good predictor of nutrient concentrations. DOC:DON ratios in streamwater were around 26, except during the months following drought when DOC:DON ratios ranged between 42 and 20 during baseflow and stormflow conditions, respectively. Annual N export during 2000-2001 was 70 kg km⁻¹ year⁻¹, of which 75% was delivered during stormflow. The relative contribution of nitrogen forms to the total annual export was 57, 35 and 8% as $\text{NO}_3\text{-N}$, DON and $\text{NH}_4\text{-N}$, respectively.

63: E. S. Bernhardt, G. E. Likens, R. O. Hall, D. C. Buso, S. G. Fisher, T. M. Burton, J. L. Meyer, M. H. McDowell, M. S. Mayer, W. B. Bowden, S. E. G. Findlay, K. H. Macneale, R. S. Stelzer and W. H. Lowe,. 2005. Can't see the forest for the stream? - In-stream processing and terrestrial nitrogen exports. *Bioscience* 3(55): 219-230.

Abstract: There has been a long-term decline in nitrate (NO₃⁻) concentration and export from several long-term monitoring watersheds in New England that cannot be explained by current terrestrial ecosystem models. A number of potential causes for this nitrogen (N) decline have been suggested, including changes in atmospheric chemistry, insect outbreaks, soil frost, and interannual climate fluctuations. In-stream removal of NO₃⁻ has not been included in current attempts to explain this regional decline in watershed NO₃⁻ export, yet streams may have high removal rates of NO₃⁻. We make use of 40 years of data on watershed N export and stream N biogeochemistry from the Hubbard Brook Experimental Forest (HBEF) to determine (a) whether there have been changes in HBEF stream N cycling over the last four decades and (b) whether these changes are of sufficient magnitude to help explain a substantial proportion of the unexplained regional decline in NO₃⁻ export. Examining how the tempos and modes of change are distinct for upland forest and stream ecosystems is a necessary step for improving predictions of watershed exports.

64: U. G. Berninger and S. A. Wickham,. 2005. Response of the microbial food web to manipulation of nutrients and grazers in the oligotrophic Gulf of Aqaba and northern Red Sea. *Marine Biology* 4(147): 1017-1032.

Abstract: The control mechanisms within the pelagic microbial food web of the oligotrophic Gulf of Aqaba and the northern Red Sea were investigated in the spring of 1999. Nutrient conditions and potential grazer impact were manipulated in a series of dilution experiments. Ambient nutrient concentrations and autotrophic biomass were very low (0.23-1.21 $\mu\text{mol NO}_3 \text{ l}^{-1}$, 0.06-0.98 $\mu\text{mol NH}_4 \text{ l}^{-1}$, 1.08-1.17 $\mu\text{mol Si l}^{-1}$, 0.08-0.12 $\mu\text{mol P l}^{-1}$, 0.15-0.36 $\mu\text{g chlorophyll a l}^{-1}$). The planktonic community was characterized by low abundances [$3.0\text{-}5.5 \times 10^5$ heterotrophic bacteria ml^{-1} , $0.58\text{-}7.2 \times 10^3$ ultraphytoplankton $< 8 \mu\text{m ml}^{-1}$ (small eukaryotic photoautotrophs and *Prochlorococcus* sp., excluding *Synechococcus* sp.), $0.45\text{-}4.4 \times 10^4$ *Synechococcus* sp. ml^{-1} , $0.32\text{-}1.2 \times 10^3$ heterotrophic nanoflagellates ml^{-1} , $1.3\text{-}3.8 \times 10^3$ phytoplankton $> 8 \mu\text{m l}^{-1}$, $0.93\text{-}5.4 \times 10^2$ microzooplankton l^{-1}] and dominated by small forms (0.2-8 μm). Dinoflagellates and oligotrichous ciliates were the most common groups in initial samples among the phytoplankton $> 8 \mu\text{m}$ and microzooplankton, respectively. Results show that bottom-up and top-down control mechanisms operated simultaneously. Small organisms were vulnerable to grazing, with maximum grazing rates of 1.1 day^{-1} on heterotrophic bacteria and 1.3 day^{-1} on ultraphytoplankton. In contrast, algae $> 8 \mu\text{m}$ showed stronger signs of nutrient limitation, especially when the final assemblages were dominated by diatoms. *Synechococcus* sp. were not grazed and only showed moderate to no response to nutrient additions. The high spatial and temporal variation of our results indicates that the composition of the planktonic community determines the prevailing control mechanisms. It further implies that, at this transitional time of the year (onset of summer stratification), the populations fluctuate about an equilibrium between growth and grazing.

65: M. J. Bernot and W. K. Dodds,. 2005. Nitrogen retention, removal, and saturation in lotic ecosystems. *Ecosystems* 4(8): 442-453.

Abstract: Increased nitrogen (N) loading to lotic ecosystems may cause fundamental changes in the ability of streams and rivers to retain or remove N due to the potential for N saturation. Lotic ecosystems will saturate with sustained increases in the N load, but it is unclear at what point saturation will occur. Rates of N transformation in lotic ecosystems will vary depending on the total N load and whether it is an acute or chronic N load. Nitrogen saturation may not occur with only pulsed or short-term increases in N. Overall, saturation of microbial uptake will occur prior to saturation of denitrification of N and denitrification will become saturated prior to nitrification, exacerbating increases in nitrate concentrations and in N export downstream. The rate of N export to downstream ecosystems will increase proportionally to the N load once saturation occurs. Long term data sets showed that smaller lotic ecosystems have a greater capacity to remove in-stream N loads, relative to larger systems. Thus, denitrification is likely to become less important as a N loss mechanism as the stream size increases. There is a great need for long-term studies of N additions in lotic ecosystems and clear distinctions need to be made between ecosystem responses to short-term or periodic increases in N loading and alterations in ecosystem functions due to chronic N loading.

66: A. Bertolo, R. Carignan, P. Magnan, B. Pinel-Alloul, D. Planas and E. Garcia,. 2005. Decoupling of pelagic and littoral food webs in oligotrophic Canadian Shield lakes. *Oikos* 3(111): 534-546.

Abstract: The importance of top-down effects of piscivorous fish on phytoplankton in natural oligotrophic lakes is still debated. In this study, we analyzed patterns in phytoplankton and zooplankton abundance in 37 oligotrophic Canadian Shield lakes in relation to variations in both piscivorous fish predation and resources (total phosphorus; TP). Zooplankton community structure (but not total biomass) was partially affected by the variation in fish predation while the phytoplankton community structure and total biomass showed no response. Carbon isotope analyses revealed that the lack of top-down effects is due to the uncoupling of the littoral and the pelagic food webs. We found that the fish community depends mostly on benthic resources, suggesting that only low planktivory occurred in our study lakes. Due to the absence of specialized zooplanktivorous fish, zooplankton is poorly exploited in these lakes and thus able to control phytoplankton by grazing. A comparison of our data with published studies on the TP-chlorophyll a relationships in both natural and manipulated systems shows that the phytoplankton biomass per unit of TP is relatively low in Canadian Shield lakes.

67: S. Bertrand, X. Boes, J. Castiaux, F. Charlet, R. Urrutia, C. Espinoza, G. Lepoint, B. Charlier and N. Fagel,. 2005. Temporal evolution of sediment supply in Lago Puyehue (Southern Chile) during the last 600 yr and its climatic significance. Quaternary Research 2(64): 163-175.

Abstract: Short-term climate changes in Southern Chile are investigated by a multi-proxy analysis of a 53-cm-long sedimentary sequence selected among eight short cores retrieved in Lago Puyehue (Chile, 40 degrees S). This core contains a 600-yr-long undisturbed record of paleo-precipitation changes. Two measurement methods for sediment density, organic matter and biogenic silica contents are compared and the most appropriate techniques are selected. Together with aluminium and titanium concentrations, grain size and geochemical properties of the organic matter, these proxies are used to demonstrate paleo-precipitation changes around 40 degrees S. Increase of terrigenous particle supply between A.D. 1490 and A.D. 1700 suggests a humid period. Contemporaneously, delta(13)C data show increasing lake productivity, in response to the high nutrient supply. The A.D. 1700-1900 interval is characterized by a decreasing terrigenous supply and increasing delta(13)C values, interpreted as a drying period. The magnetic susceptibility signal, reflecting the terrigenous/biogenic ratio, demonstrates that similar variations occur in all the undisturbed sedimentary environments of Lago Puyehue. The A.D. 1490-1700 wet period is associated with the onset of the European Little Ice Age (LIA) and interpreted as its local signature. This work supports the fact that the LIA was a global event, not only restricted to the Northern Hemisphere. (c) 2005 University of Washington. All rights reserved.

68: K. Besemer, M. M. Moeseneder, J. M. Arrieta, G. J. Herndl and P. Peduzzi,. 2005. Complexity of bacterial communities in a river-floodplain system (Danube, Austria). *Applied and Environmental Microbiology* 2(71): 609-620.

Abstract: Natural floodplains play an essential role in the processing and decomposition of organic matter and in the self-purification ability of rivers, largely due to the activity of bacteria. Knowledge about the composition of bacterial communities and its impact on organic-matter cycling is crucial for the understanding of ecological processes in river-floodplain systems. Particle-associated and free-living bacterial assemblages from the Danube River and various floodplain pools with different hydrological characteristics were investigated using terminal restriction fragment length polymorphism analysis. The particle-associated bacterial community exhibited a higher number of operational taxonomic units (OTUs) and was more heterogeneous in time and space than the free-living community. The temporal dynamics of the community structure were generally higher in isolated floodplain pools. The community structures of the river and the various floodplain pools, as well as those of the particle-associated and free-living bacteria, differed significantly. The compositional dynamics of the planktonic bacterial communities were related to changes in the algal biomass, temperature, and concentrations of organic and inorganic nutrients. The OTU richness of the free-living community was correlated with the concentration and origin of organic matter and the concentration of inorganic nutrients, while no correlation with the OTU richness of the particle-associated assemblage was found. Our results demonstrate the importance of the river-floodplain interactions and the influence of damming and regulation on the bacterial-community composition.

69: A. H. W. Beusen, A. L. M. Dekkers, A. F. Bouwman, W. Ludwig and J. Harrison,. 2005. Estimation of global river transport of sediments and associated particulate C, N, and P. *Global Biogeochemical Cycles* 4(19): .

Abstract: This paper presents a multiple linear regression model developed for describing global river export of sediments (suspended solids, TSS) to coastal seas, and approaches for estimating organic carbon, nitrogen, and phosphorous transported as particulate matter (POC, PN, and PP) associated with sediments. The model, with river-basin spatial scale and a 1-year temporal scale, is based on five factors with a significant influence on TSS yields (the extent of marginal grassland and wetland rice, Fournier precipitation, Fournier slope, and lithology), and accounts for sediment trapping in reservoirs. The model generates predictions within a factor of 4 for 80% of the 124 rivers in the data set. It is a robust model which was cross-validated by using training and validation sets of data, and validated against independent data. In addition, Monte Carlo simulations were used to deal with uncertainties in the model coefficients for the five model factors. The global river export of TSS calculated thus is 19 Pg yr⁻¹ with a 95% confidence interval of 11 - 27 Pg yr⁻¹ when accounting for sediment trapping in regulated rivers. Associated POC, PN, and PP export is 197 Tg yr⁻¹ (as C), 30 Tg yr⁻¹ (N), and 9 Tg yr⁻¹ (P), respectively. The global sediment trapping included in these estimates is 13%. Most particulate nutrients are transported by rivers to the Pacific (similar to 37% of global particulate nutrient export), Atlantic (28 - 29%), and Indian (similar to 20%) oceans, and the major source regions are Asia (similar to 50% of global particulate nutrient export), South America (similar to 20%), and Africa (12%).

70: M. T. Bidwell and R. D. Dawson,. 2005. Calcium availability limits reproductive output of tree swallows (*Tachycineta bicolor*) in a nonacidified landscape. *Auk* 1(122): 246-254.

Abstract: Breeding birds require high levels of energy and certain nutrients, such as calcium. The extent to which calcium limits reproduction in wild birds is unclear. We performed a supplementation experiment to determine whether calcium limits the reproductive output of free-ranging insectivorous Tree Swallows (*Tachycineta bicolor*), a species whose usual diet contains little calcium. Providing supplemental calcium in the form of crushed oyster shell did not affect clutch initiation date, but it caused birds that had not started constructing a nest when we first detected them on the study area to begin laying sooner, which suggests that calcium reduced the length of the prelaying period. Supplemented females produced larger eggs, and that effect was most pronounced among females in good body condition. There was a trend for supplemented birds to produce larger clutches, and their clutches had significantly greater total mass than those of control birds. Supplemented birds, in particular those breeding late in the season, also hatched significantly more eggs. Our results suggest that calcium availability may limit some aspects of avian reproduction, even in nonacidified landscapes like our study area, where levels of calcium in the soil are high.

71: V. J. Bierman, M. J. Erickson and S. C. Hinz,. 2005. The Lake Okeechobee Water Quality Model (LOWQM) enhancements, calibration, validation and analysis. Lake and Reservoir Management 3(21): 231-260.

Abstract: The Lake Okeechobee Water Quality Model (LOWQM) was enhanced to more accurately simulate sediment-water phosphorus (P) dynamics by separating the organic P (OP) into four classes (readily degradable, moderately degradable, non-degradable and dissolved), and to more accurately simulate algal dynamics by representing the phytoplankton community with the three distinct major algal groups (cyanobacteria, diatoms and green algae) observed in the lake. The model was calibrated and validated to observed water column nutrient data, sediment nutrient measurements and biovolume data for cyanobacteria, diatoms, and green algae. Model predictions were consistent with experimental observations and indicated that net sediment inorganic P (IP) loads were twice the external TP loads and net sediment inorganic nitrogen (IN) loads were 0.64 times the external total N loads. However, because of organic nutrient and algal settling the lake sediments are an overall nutrient sink. Sensitivity analysis indicated that total algal carbon, algal groups and chlorophyll a were very sensitive to changing algal parameters, parameters affecting light, temperature and supply of IP to the water column. Nutrients were less sensitive for two reasons: 1) algae represent a small fraction of the total nutrient mass, 2) the large pools of sediment nutrients, with long turnover times, buffer changes in the water column. Sensitivity analysis pointed to three potential management options to improve lake water quality: dredging, chemical treatment of sediments and external load reduction. These options were previously considered in a large sediment management feasibility study, which concluded that the last option-load reduction-was the most viable.

72: J. Biggs, P. Williams, M. Whitfield, P. Nicolet and A. Weatherby,. 2005. 15 years of pond assessment in Britain: results and lessons learned from the work of Pond Conservation. *Aquatic Conservation-Marine and Freshwater Ecosystems* 6(15): 693-714.

Abstract: 1. In 1986 work began which led to the foundation of Pond Conservation, the UK NGO which promotes the conservation of ponds and other freshwater habitats. In 1989 the organization initiated the UK National Pond Survey (NPS) to provide baseline data on the biota and physico-chemical characteristics of ponds. 2. Survey data have been used to demonstrate the importance of small water bodies for freshwater plants and animals, to establish techniques for assessing the ecological status of ponds and to provide the basis for a new national pond monitoring network in the UK. 3. Comparisons with extensive river and lake datasets show that, at a UK level, ponds support slightly more macro invertebrate species than rivers, and more uncommon species. They support similar numbers of wetland plants to lakes. Farmland ponds generally have lower site diversity than rivers; however, in terms of regional diversity they make a greater contribution than other aquatic habitats. 4. Although ponds are an important biodiversity resource, studies have shown that ponds outside nature reserves are significantly degraded: thus ponds in the lowlands supported only half the number of wetland plant species that would be expected in minimally impaired ponds. 5. The environmental factors most highly correlated with species number and rarity in minimally impaired ponds were area, isolation, PH (and the related chemical measures alkalinity, calcium, conductivity) and abundance of vegetation. 6. Studies of degraded ponds showed strong negative relationships between potentially damaging environmental factors (e.g. intensive land use, nutrient levels) and species richness and rarity. 7. Although considerable progress has been made in characterizing the plant and invertebrate assemblages of ponds, comparatively little is known about the way ponds function or how they are affected by management. Given the importance of ponds in maintaining aquatic biodiversity at the landscape scale, further research is

73: T. J. Blakely and J. S. Harding,. 2005. Longitudinal patterns in benthic communities in an urban stream under restoration. New Zealand Journal of Marine and Freshwater Research 1(39): 17-28.

Abstract: Okeover Stream, on the University of Canterbury campus in Christchurch, New Zealand, has been the subject of restoration efforts since 1998. Our study focused on quantifying the response of this urban stream to current restoration efforts. Initially, physico-chemical conditions and biological communities at three sites along the Okeover Stream were compared with three physically similar sites on each of nearby Waimairi Stream and Avon River. General physical and chemical parameters were similar in all streams with circum-neutral pH, specific conductivity ranging from 167 to 173 μ S/cm, dissolved oxygen ranging from 9.0 to 9.2 mg/litre, low turbidity, and similar hydrological conditions. However, analysis of heavy metals in the sediment showed mean lead (Pb) concentrations in Okeover and Waimairi Streams exceeded ANZECC ISQG-low trigger values (86.9 and 83.7 mg/kg, respectively), whereas Avon River sediment Pb levels (27.3 mg/ kg) were below trigger values. Benthic taxonomic richness did not differ significantly among the three streams. However, Okeover Stream community was dominated by the amphipod *Paracalliope fluviatilis*, whereas in Waimairi Stream and Avon River the gastropod snails *Potamopyrgus antipodarum* and *Physella acuta* were the dominant benthic fauna. A further assessment made at six sites along 1200 m of Okeover Stream showed no distinct longitudinal patterns in physical or chemical conditions, but there was a strong pattern in benthic macroinvertebrate communities. Taxonomic richness and caddisfly diversity increased downstream, with twice as many taxa at the most downstream site than the uppermost sampling site. In upper reaches, copper (Cu), Pb, and zinc (Zn) concentrations in sediments all exceeded ANZECC ISQG-low trigger values. Despite ongoing restoration efforts in Okeover Stream, sedimentation, the presence of high heavy metal concentrations, intermittent flows in headwaters, and possible barriers to adult recolonisation seem to be having a co

74: C. R. Blattel, K. W. J. Williard, S. G. Baer and J. J. Zaczek,. 2005. Abatement of ground water phosphate in giant cane and forest riparian buffers. Journal of the American Water Resources Association 2(41): 301-307.

Abstract: Forest and grass riparian buffers have been shown to be effective best management practices for controlling nonpoint source pollution. However, little research has been conducted on giant cane (*Arundinaria gigantea* (Walt. Muhl.)), a formerly common bamboo species, native to the lower midwestern and southeastern United States, and its ability to reduce nutrient loads to streams. From May 2002 through May 2003, orthophosphate or dissolved reactive phosphate (DRP) concentrations in ground water were measured at successive distances from the field edge through 12 m of riparian buffers of both giant cane and mixed hardwood forest along three streams draining agricultural land in the Cache River watershed in southern Illinois. Giant cane and mixed hardwood forest did not differ in their DRP sequestration abilities. Ground water DRP concentrations were significantly reduced (14 percent) in the first 1.5 m of the buffers, and there was an overall 28 percent reduction in DRP concentration by 12 m from the field edge. The relatively low DRP reductions compared to other studies could be attributed to high DRP input levels, narrow (12 m) buffer lengths, and/or mature (28 to 48 year old) riparian vegetation.

75: K. A. a. J. E. F. Blocksom,. 2005. COMPARISON OF MACROINVERTEBRATE SAMPLING METHODS. Environmental Monitoring and Assessment 102: 243-262.

Abstract: Bioassessment of nonwadeable streams in the United States is increasing, but methods for these systems are not as well-developed as for wadeable streams. In this study, we compared six macroinvertebrate field sampling methods for nonwadeable streams adapted from those used by three major programs: the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program-Surface Waters, the U.S. Geological Survey's National Water Quality Assessment Program, and the Ohio Environmental Protection Agency, Division of Surface Water Biocriteria Program. We performed all six methods at 60 sites across four rivers and measured water chemistry and physical habitat at each site to assess abiotic condition. Sites were divided into two groups: those influenced by navigational lock and dam structures (restricted flow, or RF) and those free-flowing or with lowhead dams (run-of-the-river, or ROR). Metrics based on passive Hester-Dendy artificial substrate samplers differed greatly from active sampling methods (i.e., using nets) but represented abiotic conditions well in both ROR and RF sites. Although metric values were similar across certain sampling methods, the metrics significantly correlated with abiotic variables varied among methods and between ROR and RF sites. These results emphasize that methods are not interchangeable, and the ability to detect certain stressors depends on sampling method.

76: G. Boedeltje, A. J. R. Smolders, L. P. M. Lamers and J. G. M. Roelofs,. 2005. Interactions between sediment propagule banks and sediment nutrient fluxes explain floating plant dominance in stagnant shallow waters. Archiv Fur Hydrobiologie 3(162): 349-362.

Abstract: Mats of floating plants are known to have detrimental effects on aquatic life as they reduce the penetration of light so that submerged species are unable to develop. These mats also prevent gaseous exchange between water and atmosphere resulting in anoxic conditions of the water layer. In shallow waters, nutrient fluxes from the sediment to the water layer are expected to play a key role in the shift to floating plant dominance. This study investigated the potential recruitment and development of duckweed mats from propagule banks in field enclosures containing either muddy or sandy sediment. It was observed that free-floating fronds of *Lemna minor* were derived from both sediment types, but that dense duckweed mats developed exclusively in enclosures with muddy sediment. The results can be explained by differences in nutrient release from the sediments to the overlying water during summer, when high fluxes, especially of phosphorus and nitrogen, were observed almost exclusively in enclosures with muddy sediment involving anoxia of the water layer. This study discusses the results in relation to free-floating plant dominance and the management of shallow waters.

77: I. Bogrekci and W. S. Lee,. 2005. Spectral soil signatures and sensing phosphorus. Biosystems Engineering 4(92): 527-533.

Abstract: Developing a phosphorus (P) sensing system using ultraviolet (UV), visible (VIS) and near infrared (NIR) provides a non-contact, cost and time effective, and less laborious measurement of phosphorus concentration in a soil sample. The determination of soil spectral signatures improves the prediction accuracy of calibration models for the determination of soil P concentration. This study aimed to obtain spectral signatures of soil samples and develop calibration models for sensing P concentrations in a soil sample. A total of 345 soil samples were collected from the drainage basin of the Lake Okeechobee to obtain a broad range of P concentrations from very low to very high (1-2709 mg/kg). Thirty-eight soil samples from different fields were sub-sampled and leached in order to remove their existing nutrient contents. The reflectance spectra of leached and unleached soil samples were measured using UV, VIS and NIR spectroscopy. Phosphorus concentrations of the samples were correlated with the absorbance of the same sample. Leached soil signatures were subtracted from those of unleached soil samples to obtain only constituent spectrum. Data analysis for P concentration determination was conducted with and without soil signature correction. For each set, two-thirds of the data was used for calibration while one-thirds of the data was for validation. Partial least squares analysis (PLS) was applied to the data set. Values for the coefficient of determination (R^2) increased from 0.87 to 0.93 when original soil and constituent spectra were used, respectively. Also, using constituent spectra rather than original soil absorbance spectra reduced the root mean square errors (RMSEs) from 222 to 172 in $\mu\text{g/g}$. (c) 2005 Silsoe Research Institute. All rights reserved
Published by Elsevier Ltd.

78: D. Boix, S. Gascon, J. Sala, M. Martinoy, J. Gifre and X. D. Quintana,. 2005. A new index of water quality assessment in Mediterranean wetlands based on crustacean and insect assemblages: the case of Catalunya (NE Iberian peninsula). *Aquatic Conservation-Marine and Freshwater Ecosystems* 6(15): 635-651.

Abstract: 1. According to the European Water Framework Directive (2000/60/CE) tools are required to evaluate wetland ecological quality. In this context, a biological index to evaluate water quality (QAELS) is proposed for Mediterranean wetlands in Catalunya (NE Iberian peninsula). 2. The study was carried out in 99 shallow lentic ecosystems, situated below 800 in a.s.l. and with a maximum depth of less than 6 m. At each sampling point, a range of water parameters was measured (temperature, conductivity, pH, dissolved oxygen, chlorophyll a, dissolved nutrients and total nutrients) and data were gathered on invertebrate taxon composition (collected with a dip-net of 250 µm mesh size). 3. A previous classification of wetlands in that area was required to obtain QAELS. The QAELS index is obtained by: (1) the relative abundance of each microcrustacean taxon (Cladocera, Copepoda and Ostracoda) weighted by an ecological quality requirement coefficient, which is obtained for each taxon by means of partial canonical correspondence analysis (ACCO index); and (2) the taxonomic richness of crustaceans and aquatic insects (RIC index). 4. Several taxonomic resolutions were also tested in order to determine the simplest identification level that gives acceptable results in further applications of the QAELS index. It is concluded that the composition of microcrustacean assemblages (ACCO index) is useful for assessing the water quality of Mediterranean wetlands. 5. The RIC index improves the relationship of the QAELS index to water quality variables, avoiding possible anomalous values that could be obtained when using the ACCO index alone. Copyright (c) 2005 John Wiley & Sons, Ltd.

79: S. Bonilla, V. Villeneuve and W. F. Vincent,. 2005. Benthic and planktonic algal communities in a High Arctic Lake: Pigment structure and contrasting responses to nutrient enrichment. *Journal of Phycology* 6(41): 1120-1130.

Abstract: We investigated the fine pigment structure and composition of phytoplankton and benthic cyanobacterial mats in Ward Hunt Lake at the northern limit of High Arctic Canada and the responses of these two communities to in situ nutrient enrichment. The HPLC analyses showed that more than 98% of the total pigment stocks occurred in the benthos. The phytoplankton contained Chrysophyceae, low concentrations of other protists and Cyanobacteria (notably picocyanobacteria), and the accessory pigments chl c(2), fucoxanthin, diadinoxanthin, violaxanthin, and zeaxanthin. The benthic community contained the accessory pigments chl b, chl c(2), and a set of carotenoids dominated by glycosidic xanthophylls, characteristic of filamentous cyanobacteria. The black surface layer of the mats was rich in the UV-screening compounds scytonemin, red scytonemin-like, and mycosporine-like amino acids, and the blue-green basal stratum contained high concentrations of light-harvesting pigments. In a first bioassay of the benthic mats, there was no significant photosynthetic or growth response to inorganic carbon or full nutrient enrichment over 15 days. This bioassay was repeated with increased replication and HPLC analysis in a subsequent season, and the results confirmed the lack of significant response to added nutrients. In contrast, the phytoplankton in samples from the overlying water column responded strongly to enrichment, and chl a biomass increased by a factor of 19.2 over 2 weeks. These results underscore the divergent ecophysiology of benthic versus planktonic communities in extreme latitudes and show that cold lake ecosystems can be dominated by benthic phototrophs that are nutrient sufficient despite their ultraoligotrophic overlying waters.

80: D. B. BOOTH,. 2005. Challenges and prospects for restoring urban streams: a perspective. Journal of the North American Benthological Society 24(3): 724-737.

Abstract: Undoing harm caused by catchment urbanization on stream channels and their resident biota is challenging because of the range of stressors in this environment. One primary way in which urbanization degrades biological conditions is by changing flow patterns; thus, reestablishing natural flow regimes in urban streams demands particular attention if restoration is to have a chance for success. Enhancement efforts in urban streams typically are limited to rehabilitating channel morphology and riparian habitat, but such physical improvements alone do not address all factors affecting biotic health. Some habitat-forming processes such as the delivery of woody debris or sediment may be amenable to partial restoration, even in highly disturbed streams, and they constitute obvious high-priority actions. There is no evidence to suggest, however, that improving nonhydrologic factors can fully mitigate hydrologic consequences of urban development. In the absence of effective hydrologic mitigation, appropriate short-term rehabilitation objectives for urban channels should be to 1) eliminate point sources of pollution, 2) reconstruct physical channel elements to resemble equivalent undisturbed channels, and 3) provide habitat for self-sustaining biotic communities, even if those communities depart significantly from predisturbance conditions. Long-term improvement of stream conditions is not feasible under typical urban constraints, so large sums of money should not be spent on unrealistic or unreachable targets for stream rehabilitation. However, such a strategy should not be an excuse to preclude potential future gains by taking irreversible present-day development or rehabilitative actions.

81: M. Bormans, P. W. Ford and L. Fabbro,. 2005. Spatial and temporal variability in cyanobacterial populations controlled by physical processes. Journal of Plankton Research 1(27): 61-70.

Abstract: ne Fitzroy impoundment is a long slender water body (10 in deep) formed by the regulation of the Fitzroy River in tropical Australia. Large, monsoonally driven discharges in late summer flush the impoundment repeatedly leaving, after 2 months, a longitudinally uniform, well-mixed water column, rich in dissolved nutrients and with high turbidity). For the rest of the year flows are negligible. Paradoxically, two sites with initially identical nutrient and stratification characteristics, and located only 30 km apart, develop quite different Patterns of cyanobacterial succession. The upstream site is initially dominated by *Anabaena circinalis* which appears in early spring and collapses within the month. A mixed population of *Anabaenopsis elenkinii* and *Aphanizomenon issatschenkoi* then develops at both sites. This is followed by a mixture of small cyanobacteria (consisting of *Cylindrospermopsis*, *Planktoyngbya* and *Limnothrix*) which develops mainly at the downstream site and persists for 3 months until flushed away by flood flows. We report on data covering an 8 month period of investigation of the stratification, light climate, temperature and nutrient dynamics at these two sites. We show that large-scale climatic conditions and the local weather pattern set the physical and chemical conditions which determine the cyanobacterial response.

82: J. L. Bouldin, J. L. Farris, M. T. Moore, S. Smith, W. W. Stephens and C. M. Cooper,. 2005. Evaluated fate and effects of atrazine and lambda-cyhalothrin in vegetated and unvegetated microcosms. Environmental Toxicology 5(20): 487-498.

Abstract: Contaminants such as nutrients, metals, and pesticides can interact with constructed wetlands and existing drainage ditches used as agricultural best-management practices. Our research has shown that the presence of macrophytes and a hydrologic regime aid in the transfer and transformation of pesticides associated with agricultural runoff. This study consisted of application of both atrazine (triazine herbicide) and lambda-cyhalothrin (pyrethroid insecticide) to vegetated and unvegetated microcosms in order to measure the fate and effects of pesticides applied at suggested field application rates. Exposures focused on monocultures of *Ludwigia peploides* (water primrose) and *Juncus effusus* (soft rush). Pesticide sorption was evident through concentrations of atrazine and lambda-cyhalothrin in plant tissue as high as 2461.4 and 86.50 $\mu\text{g/kg}$, respectively. Toxicity was measured in water from unvegetated microcosms for 28 days and in *Chironomus tentans* (midge larvae) exposed to sediment collected from 3 h to 56 days in microcosms receiving the pesticide combination. The comparative survival of test organisms in this study suggests that effective mitigation of pesticides from runoff can depend on the macrophyte contact and vegetative attributes associated with ditches. (C) 2005 Wiley Periodicals, Inc. Environ Toxicol 20: 487-499, 2005.

83: M. J. Bowes, W. A. House, R. A. Hodgkinson and D. V. Leach,. 2005. Phosphorus-discharge hysteresis during storm events along a river catchment: the River Swale, UK. Water Research 5(39): 751-762.

Abstract: Variations in the concentration of determinands in rivers during storms often result in a hysteresis effect with different concentration during the rising and falling limb of the hydrograph. This is investigated here by measuring total phosphorus, particulate phosphorus and soluble reactive phosphorus at 3-h intervals at three points along the River Swale. Phosphorus concentration-discharge hysteresis from 10 storm events were quantified using an empirical model. The size and direction of the hysteresis loops were described by a response factor, and the slope of the loop quantified by a gradient constant. The modelled loops produced acceptable agreement with the field measurements. Hysteresis patterns for all phosphorus fractions changed markedly downstream, with predominantly anticlockwise trajectories in the upland moors (indicating a slow diffuse phosphorus delivery to the river) and clockwise in the intensively farmed lowland (indicating mobilisation of within-channel and riverbank phosphorus, and rapid inputs from field drains). The size of the hysteresis loops increased downstream, indicating an increased capacity for phosphorus storage and mobilisation within the lower catchment. During a succession of storms, lowland hysteresis loops decreased in magnitude, tending towards anticlockwise behaviour, indicating a depletion of mobile phosphorus from the river channel and margins. The modelling of hysteresis trajectories offers a convenient method of determining the relative contributions of diffuse and within-channel phosphorus sources. (c) 2005 Elsevier Ltd. All rights reserved.

84: M. J. Bowes, D. V. Leach and W. A. House,. 2005. Seasonal nutrient dynamics in a chalk stream: the River Frome, Dorset, UK. Science of the Total Environment 1-3(336): 225-241.

Abstract: Chalk streams provide unique, environmentally important habitats, but are particularly susceptible to human activities, such as water abstraction, fish farming and intensive agricultural activity on their fertile flood-meadows, resulting in increased nutrient concentrations. Weekly phosphorus, nitrate, dissolved silicon, chloride and flow measurements were made at nine sites along a 32 km stretch of the River Frome and its tributaries, over a 15 month period. The stretch was divided into two sections (termed the middle and lower reach) and mass balances were calculated for each determinand by totalling the inputs from upstream, tributaries, sewage treatment works and an estimate of groundwater input, and subtracting this from the load exported from each reach. Phosphorus and nitrate were retained within the river channel during the summer months, due to bioaccumulation into river biota and adsorption of phosphorus to bed sediments. During the autumn to spring periods, there was a net export, attributed to increased diffuse inputs from the catchment during storms, decomposition of channel biomass and remobilisation of phosphorus from the bed sediment. This seasonality of retention and remobilisation was higher in the lower reach than the middle reach, which was attributed to downstream changes in land use and fine sediment availability. Silicon showed much less seasonality, but did have periods of rapid retention in spring, due to diatom uptake within the river channel, and a subsequent release from the bed sediments during storm events. Chloride did not produce a seasonal pattern, indicating that the observed phosphorus and nitrate seasonality was a product of annual variation in diffuse inputs and internal riverine processes, rather than an artefact of sampling, flow gauging and analytical errors. (C) 2004 Elsevier B.V. All rights reserved.

85: M. Bowles, L. Zettler, T. Bell and P. Kelsey,. 2005. Relationships between soil characteristics, distribution and restoration potential of the federal threatened eastern prairie fringed orchid, *Platanthera leucophaea* (Nutt.) Lindl. American Midland Naturalist 2(154): 273-285.

Abstract: The Federal threatened eastern prairie fringed orchid (*Platanthera leucophaea*) occupies prairies, sedge meadows, bogs and fens, primarily north of the Wisconsin glacial boundary. In the Midwest, where restoration is a recovery objective, its southern distribution is thought to be limited by the transition from nutrient-rich Wisconsin-aged soils to more acidic nutrient poor soils of Illinoian-aged glacial drift. To better understand edaphic factors affecting its distribution and potential for establishment of new populations, we analyzed soil characteristics across the range of habitats occupied by this species, as well as from unoccupied habitats on the Illinoian Till Plain. We found that *P. leucophaea* occupies a complex edaphic gradient in variation of % organic matter, base content and soil texture. On Wisconsin-aged substrates, it occurs in circum-neutral base-rich organic prairie soils in Illinois and Wisconsin and in less calcareous soils with slightly higher pH and lower organic matter content in Michigan lake plain prairies. Eastern sand prairie and sedge meadow habitats on Wisconsin-aged drift and on unglaciated soils are moderately acid and nutrient poor, while bog and fen habitats are more strongly acidic and highly organic, with no evidence for an underlying calcareous substrate. In comparison, unoccupied prairie soils on the Illinoian till plain have lower pH, % organic matter and base concentrations. These soils also have relatively high % silt content which results in comparatively low available soil moisture holding capacity. This combination of soil conditions may exceed the tolerance limits of *P. leucophaea* and prevent this species from occurring south of the Wisconsin glacial boundary in the Midwest. On the other extreme, calcareous fens have high pH levels as well as extremely high calcium concentrations, which may exceed the tolerance limits of this species. These findings have implications for guiding efforts to establish *P. leucophaea* i

86: M. F. Bowman, P. A. Chambers and D. W. Schindler,. 2005. Changes in stoichiometric constraints on epilithon and benthic macroinvertebrates in response to slight nutrient enrichment of mountain rivers. *Freshwater Biology* 11(50): 1836-1852.

Abstract: 1. To assess changes in stoichiometric constraints on stream benthos, we measured elemental composition of epilithon and benthic macroinvertebrates in intrinsically P-limited mountain rivers, upstream and downstream of low-level anthropogenic nutrient enrichment by effluents of municipal wastewater treatment plants. 2. While there was a broad range in the elemental composition of epilithon (C : P ratios of 200-16 500, C : N ratios of 8-280, N : P ratios of 8-535) and heptageniid mayfly scrapers (C : P ratios of 125-300, C : N ratios of 5.1-7.2, N : P ratios of 20-60), the average C : P ratio of epilithon was 10-fold lower and the average C : N ratio twofold lower at more nutrient-rich downstream sites. Nutrient ratios in benthic macroinvertebrates were lower than in epilithon and varied little between relatively nutrient-poor and nutrient-rich sites. 3. We modified the existing definition of producer-consumer elemental imbalance to allow for variation in consumer nutrient content. We defined this 'non-homeostatic' imbalance as the perpendicular distance between the producer and consumer C : P, C : N, or N : P ratios, and the 1 : 1 line. 4. At P-limited sites, the estimated mayfly N : P recycling ratio was higher than the N : P ratio in epilithon, suggesting nutrient recycling by consumers could accentuate P-limitation of epilithon. 5. Measuring the degree of producer-consumer nutrient imbalance may be important in predicting the magnitude of effects from nutrient enrichment and can help elucidate the causes and consequences of ecological patterns and processes in rivers.

87: M. F. Bowman, P. A. Chambers and D. W. Schindler,. 2005. Epilithic algal abundance in relation to anthropogenic changes in phosphorus bioavailability and limitation in mountain rivers. Canadian Journal of Fisheries and Aquatic Sciences 1(62): 174-184.

Abstract: Low-level cultural eutrophication (0.1-3.8 $\mu\text{g L}^{-1}$ increase in total phosphorus (TP)) of oligotrophic mountain rivers resulted in 4- to 30-fold increases in benthic algal abundance. Because anthropogenic P was more bioavailable than naturally occurring P, there were higher algal abundances downstream relative to upstream of nutrient point sources at a given P concentration. Neither TP nor soluble reactive P concentrations were indicative of P bioavailability. Of the measures studied, epilithic alkaline phosphatase activity was most strongly correlated with algal abundance, most indicative of P bioavailability and thus the most precise indicator of P limitation. Although changes in dissolved inorganic nitrogen (DIN) to P ratios in river water and carbon (C) to P ratios in epilithon were consistent with changes in algal abundance and nutrient limitation, published water DIN to TP and tissue C to P ratio thresholds did not always yield accurate predictions of the type or degree of nutrient limitation. Epilithic N to P ratios and algal growth on nutrient-diffusing substrates were also inexact measures of epilithic nutrient limitation but, unlike other measures, were not strongly correlated with algal abundance. Thus, the predictability of the benthic algal response to anthropogenic nutrient additions in oligotrophic rivers will be improved by using measures indicative of both nutrient limitation and bioavailability.

88: L. Boyd, R. Mac Nally and J. Read,. 2005. Does fallen timber on floodplains influence distributions of nutrients, plants and seeds?. *Plant Ecology* 2(177): 165-176.

Abstract: While much is conjectured about the ecological significance of fallen timber, there has been little work on the influence of logs on plants and nutrient distributions on periodically inundated floodplains. We compared distributions of seeds, germinated plants and a suite of soil properties around logs on (a) the floodplain proper, (b) in 'flood runners' (floodplain drainage channels) and (c) at randomly selected log-free locations on the floodplain. Sampling was conducted on logs oriented parallel to the river, so that we could compare the sides of logs closer to and further from the river. Numbers of exotic species germinating around flood-runner logs was much reduced compared with the other two locations. Native seeds accumulated to a greater extent on the river-side of floodplain logs compared to flood-runners logs. Densities of plants were lowest in the immediate proximity of logs, increasing up to two-fold 2 m away on both sides of logs. Gravel fraction was highest around flood-runner logs, while the fraction around floodplain logs was higher than at log-free locations. Extractable Na was higher around flood-runner logs (2.6%) than at log-free points (1.2%), but levels for floodplain logs were intermediate (2.1%). Soil samples taken near flood-runner logs were slightly more acidic than samples taken elsewhere. Our results generally were not consistent with expectations that floodplain logs would act as favourable areas for plant germination and survivorship. While certain sediment characteristics did appear to be influenced by the presence of logs (e.g., gravel fraction, pH and Na), effects were relatively small and most other measured characters were not affected by location.

89: E. G. Bradshaw, P. Rasmussen, H. Nielsen and N. J. Anderson,. 2005. Mid- to late-Holocene land-use change and lake development at Dallund So, Denmark: trends in lake primary production as reflected by algal and macrophyte remains. *Holocene* 8(15): 1130-1142.

Abstract: Diatom, macrofossil, pollen, *Pediastrum* and biogenic silica analyses were carried out on an 11-m sediment sequence from the Danish lake Dallund So, demonstrating major changes in the aquatic ecosystem over the last 7000 years. A diatom-phosphorus calibration model was applied to the fossil diatom record to reconstruct in-lake total phosphorus (TP) concentrations over this period. Prior to the introduction of agriculture to the region, c. 6000 years ago, the lake was relatively deep and had low diatom-inferred TP concentrations (c. 20 $\mu\text{g TP/L}$), with limited macrophyte growth. Moderate nutrient enrichment of the lake was inferred during the Bronze Age (1700-500 BC) and Iron Age (500 BC-AD 1050) periods and evidence for water-level lowering was observed. Marked eutrophication of the lake (reconstructed TP levels consistently $> 100 \mu\text{g/L}$) was associated with major changes in agriculture during the Mediaeval period (AD 1050-1536) and continued to the present day. These data document the long-term anthropogenic impact on Dallund So, a lake in an area with a long history of human activity.

90: B. C. Braskerud, K. S. Tonderski, B. Wedding, R. Bakke, A. G. B. Blankenberg, B. Ulen and J. Koskiahio,. 2005. Can constructed wetlands reduce the diffuse phosphorus loads to eutrophic water in cold temperate regions?. Journal of Environmental Quality 6(34): 2145-2155.

Abstract: Construction of wetlands is a possible supplement to best management practices (BMP) at the field level to mitigate phosphorus (P) pollution from agricultural areas. In this paper, annual results from 17 intensively studied wetlands in the cold temperate or boreal climatic zone are reported and analyzed. Surface areas varied from 0.007 to 8.7% of the catchment area. The average total phosphorus (TP) retention varied from 1 to 88%, and the dissolved reactive phosphorus (DRP) retention from -19 to 89%. Retention varied substantially from site to site, indicating the existence of site-specific factors in the catchment and wetlands that influenced the P removal. Factors important for P retention in wetlands were evaluated through multiple statistical analyses by dividing P into two fractions: particulate phosphorus (PP) and DRP. Both relative (%) PP and DRP retention increased with wetland surface area. However, PP retention was not as sensitive as DRP in terms of wetland size and retention: specific PP retention (gram P retention per m² and year) decreased as wetland area (A.) increased, suggesting the existence of a site-specific optimal wetland to catchment area (A.) ratio. Particulate P retention decreased with increasing DRP to TP ratio, while the opposite was found for DRP. Dissolved reactive P retention was higher in new than in old wetlands, while increasing age did not influence PP retention negatively. Effective BMP in the catchment is important to keep the P loss low, because the outlet concentration of P from wetlands is often positively correlated to the input concentration. However, wetlands act as the last buffer in a catchment, since the retention often increases as the P concentration in streams increases.

91: B. Breckling, F. Muller, H. Reuter, F. Holker and O. Franzle,. 2005. Emergent properties in individual-based ecological models - introducing case studies in an ecosystem research context. *Ecological Modelling* 4(186): 376-388.

Abstract: Individual-based models (IBM) extend the potential of ecological models to cope with spatial heterogeneity and complex ecological interaction networks with variable structures. This paper introduces a series of IBM-applications in the ecosystem research project 'Bornhoved Lakes District'. Here we outline the general theoretical implications of individual-based modelling related to self-organisation processes and emergent properties in different fields of ecological research and characterise the conceptual basis common to these applications. The case studies introduced are: spatial dispersal and colonisation processes of terrestrial arthropods community dynamics and trophic interaction in small mammals limnological application-spatially explicit fish energetic population model plant root system development and nutrient acquisition dynamics plant architecture and assimilation physiology We used the IBM-approach to analyse fundamental biocenotical interactions and investigate, how dispersal processes, behavioural characteristics and energetics at the level of individual organisms are linked with the population level and community processes as well as with ecosystem and landscape structures. The ecosystem based investigations are presented together with an overview of the employed modelling methodology. In addition, it is explained, how the conceptual background of emergent properties is involved in this approach. The individual-based modelling approach allows realistic descriptions and is highly adaptive to particular contexts and questions under investigation. Its main feature is that the characteristics of higher level ecological units like populations or communities can be determined as emergent properties from the lower ones. (c) 2004 Elsevier B.V All rights reserved.

92: M. T. Brett, G. B. Arhonditsis, S. E. Mueller, D. M. Hartley, J. D. Frodge and D. E. Funke,. 2005. Non-point-source impacts on stream nutrient concentrations along a forest to urban gradient. Environmental Management 3(35): 330-342.

Abstract: We conducted statistical analyses of a 10-year record of stream nutrient and sediment concentrations for 17 streams in the greater Seattle region to determine the impact of urban non-point-source pollutants on stream water quality. These catchments are dominated by either urban (22-87%) or forest (6-73%) land cover, with no major nutrient point sources, Stream water phosphorus concentrations were moderately strongly ($r^2 = 0,58$) correlated with catchment land-cover type, whereas nitrogen concentrations were weakly ($r^2 = 0,19$) and nonsignificantly (at $\alpha < 0.05$) correlated with land cover, The most urban streams had, on average, 95% higher total phosphorus (TP) and 122% higher soluble reactive phosphorus (SRP) and 71% higher turbidity than the most forested streams, Nitrate (NO_3), ammonium (NH_4), and total suspended solids (TSS) concentrations did not vary significantly with land cover, These results suggest that urbanization markedly increased stream phosphorus concentrations and modestly increased nitrogen concentrations. However, nutrient concentrations in Seattle region urban streams are significantly less than those previously reported for agricultural area streams.

93: M. T. Brett, S. E. Mueller and G. B. Arhonditsis,. 2005. A daily time series analysis of stream water phosphorus concentrations along an urban to forest gradient. Environmental Management 1(35): 56-71.

Abstract: During a 1-year period, we sampled stream water total phosphorus (TP) concentrations daily and soluble reactive phosphorus (SRP) concentrations weekly in four Seattle area streams spanning a gradient of forested to urban-dominated land cover. The objective of this study was to develop time series models describing stream water phosphorus concentration dependence on seasonal variation in stream base flows, short-term flow fluctuations, antecedent flow conditions, and rainfall. Stream water SRP concentrations varied on average by $\pm 18\%$ or $\pm 5.7 \mu\text{g/L}$ from one week to another, whereas TP varied $\pm 48\%$ or $\pm 32.5 \mu\text{g/L}$ from one week to another. On average, SRP constituted about 47% of TP. Stream water SRP concentrations followed a simple sine-wave annual cycle with high concentrations during the low-flow summer period and low concentrations during the high-flow winter period in three of the four study sites. These trends are probably due to seasonal variation in the relative contributions of groundwater and subsurface flows to stream flow. In forested Issaquah Creek, SRP concentrations were relatively constant throughout the year except during the fall, when a major salmon spawning run occurred in the stream and SRP concentrations increased markedly. Stream water SRP concentrations were statistically unrelated to short-term flow fluctuations, antecedent flow conditions, or rainfall in each of the study streams. Stream water TP concentrations are highly variable and strongly influenced by short-term flow fluctuations. Each of the processes assessed had statistically significant correlations with TP concentrations, with seasonal base flow being the strongest, followed by antecedent flow conditions, short-term flow fluctuations, and rainfall. Time series models for each individual stream were able to predict similar to 70% of the variability in the SRP annual cycle in three of the four streams ($r^2 = 0.57-0.81$), whereas individual TP models explained similar to 50% o

94: J. E. Brodie and A. W. Mitchell,. 2005. Nutrients in Australian tropical rivers: changes with agricultural development and implications for receiving environments. Marine and Freshwater Research 3(56): 279-302.

Abstract: In tropical Australia, intensive studies of river suspended sediment (SS) and nutrient dynamics have been restricted to streams on the north-east coast between the Fitzroy and Normanby Rivers (Queensland), Magela Creek/East Alligator River (Northern Territory) and the Ord River (Western Australia). Historical conditions in these rivers were probably characterised by low-moderate SS concentrations and low concentrations of dissolved inorganic nitrogen and phosphorus in flow events. Introduction of agriculture has transformed SS and nutrient dynamics. Grazing has led to soil erosion and increased SS and particulate nutrient concentrations and fluxes in event flows. Fertilised cropping has increased nutrient inputs to catchments, where it forms a substantial proportion of the catchment area. Consequently, both particulate and dissolved inorganic nutrient concentrations and fluxes have increased. Australian tropical rivers have episodic flows, with most material transport occurring during large flow events. The restricted period of these highly energetic flows means little trapping of materials in waterways occurs. Loads are transported efficiently downstream and processes such as denitrification and in-channel sedimentation may be of limited importance. Owing to excessive nutrient inputs associated with agriculture, a number of northern freshwater, estuarine and coastal ecosystems are now eutrophic. Continued development, especially fertilised cropping, without adequate management of nutrient losses is likely to exacerbate these problems.

95: J. D. Brookes, K. Aldridge, T. Wallace, L. Linden and G. G. Ganf,. 2005. Multiple interception pathways for resource utilisation and increased ecosystem resilience. *Hydrobiologia* (552): 135-146.

Abstract: Natural ecosystems consist of multiple pathways for resource capture and energy flow. As landscapes become impacted, the diversity of these pathways is reduced and ecosystem health suffers. Efficient resource processing is essential for successful ecosystem restoration and yet little information is available relating the two issues. Disturbances to terrestrial, marine, and freshwater environments have decreased the complexity of such ecosystems thus reducing their resilience to increases in resource loading from anthropogenic sources. The effects of a reduction in the number of pathways are observed in terminal water bodies where increased levels of nutrients are not successfully intercepted beforehand, and conditions often favour a single phytoplankton pathway, resulting in algal blooms. If a suitable number of pathways is restored, significant amounts of resources may be retained, reducing the impacts on downstream ecosystems. The restoration of functional diversity is likely to provide process redundancy and therefore improve ecosystem resilience to further disturbance. This concept provides a more holistic approach to management strategies that may enhance resource interception, while restoring habitat and biological diversity.

96: E. N. J. Brookshire, H. M. Valett, S. A. Thomas and J. R. Webster,. 2005. Coupled cycling of dissolved organic nitrogen and carbon in a forest stream. Ecology 9(86): 2487-2496.

Abstract: Dissolved organic nitrogen (DON) is an abundant but poorly understood pool of N in many ecosystems. We assessed DON cycling in a N-limited headwater forest stream via whole-ecosystem additions of dissolved inorganic nitrogen (DIN) and labile dissolved organic matter (DOM), hydrologic transport and biogeochemical modeling, and laboratory experiments with native sediments. We sampled surface and subsurface waters to understand how interaction among hydrologic exchange, DIN, DON, and dissolved organic carbon (DOC) influence stream N losses at summer baseflow. Added DON was taken up rapidly from the water column at rates exceeding DOC and DIN. A significant fraction of this DON was mineralized and nitrified. Combined DON and NO₃-N uptake lengths resulted in spiraling lengths of similar to 210 m, suggesting the potential for multiple. transformations of labile N loads within catchment boundaries. Simultaneous addition of DIN increased DOM uptake, but more so for C, resulting in an upward shift in the C:N ratio of uptake. Sediment incubations also showed a strong biotic influence on DOC and DON dynamics. Despite efficient uptake of added DOM, background DON and high molecular mass DOC concentrations increased downstream, resulting in higher DOM loads than could be accounted for by groundwater discharge and suggesting net release of less bioavailable forms from the channel/hyporheic zone. At the same time, subsurface DOM was characterized by very low C:N ratios and a disproportionately large DON pool despite rapid hydrologic mixing with dilute and high C:N ratio surface waters. Analysis of expected DON loads from conservative hyporheic fluxes indicated that watershed losses of DON would have been seven times greater in the absence of apparent benthic demand, suggesting tight internal cycling of subsurface DON. Our study further demonstrates the potential for significant transformation of N in headwater streams before export to downstream ecosystems.

97: J. A. Browder, R. Alleman, S. Markley, P. Ortner and P. A. Pitts,. 2005. Biscayne Bay conceptual ecological model. Wetlands 4(25): 854-869.

Abstract: Biscayne Bay is a naturally clear-water bay that spans the length of Miami-Dade County, Florida, USA. It is bordered on the east by barrier islands that include Miami Beach and is an almost completely urban bay in the north and a relatively natural bay in the south. Planned water management changes in the next few years may decrease freshwater flows to the bay from present sources, while offering reclaimed wastewater in return. In addition, a project is planned to restore the former diffuse freshwater flow to the bay through many small creeks crossing coastal wetlands by redistributing the water that now flows into the bay through several large canals. To guide a science-based, adaptive-management approach to water-management planning, a conceptual ecological model of Biscayne Bay was developed based upon a series of open workshops involving researchers familiar with Biscayne Bay. The CEM model relates ecological attributes of the bay to outside forcing functions, identified as water management, watershed development, and sea-level rise. The model depicts the effects of these forcing functions on the ecological attributes of the bay through four stressors. The hypothesized pathways of these effects include salinity patterns, water quality, sediment contaminant concentrations, and physical impacts. Major research questions were identified with regard to uncertainties explicit in the model. The issues addressed include, for example (1) the quantitative relationship between upstream water management, rainfall, and flow into Biscayne Bay; (2) the salinity gradient required to restore the historical estuarine fish community; (3) the potential effect of freshwater inputs on benthic habitats; (4) the effect of introduced nutrient and contaminant loads, including the effects of reclaimed wastewater.

98: M. T. a. M. B. V. Brown,. 2005. LANDSCAPE DEVELOPMENT INTENSITY INDEX. Environmental Monitoring and Assessment (101): 289-309.

Abstract: The condition of landscapes and the ecological communities within them is strongly related to levels of human activity. Human-dominated land uses and especially the intensity of the uses can affect adjacent ecological communities through direct, secondary, and cumulative impacts. Using land use data and a development-intensity measure derived from energy use per unit area, an index of Landscape Development Intensity (LDI) can be calculated for watersheds of varying sizes to estimate the potential impacts from human-dominated activities that are experienced by ecological systems within those watersheds. The intended use of the LDI is as an index of the human disturbance gradient (the level of human induced impacts on the biological, chemical, and physical processes of surrounding lands or waters). The LDI can be used at the scale of river, stream, or lake watersheds or at the smaller scale of individual isolated wetland watersheds. Based on land uses and land cover, the LDI can be applied using available GIS land use/land cover data, aerial photographs, or field surveys. A description of data needs and methods for calculating an LDI index and several applications of the index as a land use based ranking scheme of the human disturbance gradient for watersheds are given.

99: W. Browne and P. D. Jenssen,. 2005. Exceeding tertiary standards with a pond/reed bed system in Norway. Water Science and Technology 9(51): 299-306.

Abstract: At Vidarasen in Norway sewage from a community consisting of 160 people, including a dairy, a food processing workshop, a bakery and a laundry is treated using a pond/reed bed system. The system consists of sludge settlement, pre-treatment surface/vertical-flow constructed wetlands, a 5 m deep enhanced facultative pond, three stabilization ponds, a planted sand filter and finally two horizontal-flow constructed wetlands filled with lightweight aggregate (Filtralite-P). The enhanced facultative pond and the primary stabilization pond are equipped with Flowform-cascades, which provide year-round aeration, rhythmical treatment and mixing of wastewater in the ponds. Treatment performance during the first five years has been high and unaffected by harsh winter conditions. Average phosphorus discharge from the system is 0.25 mg/l with total nitrogen 4 mg/l, total organic carbon (TOC) 5 mg/l and thermo-tolerant coliforms < 100/100 ml. The system is ecologically diverse and supports abundant populations of higher aquatic life such as ducks, amphibians and carp.

100: S. Brucet, X. D. Quintana, R. Moreno-Amich and D. Boix,. 2005. Changes in the shape of zooplankton biomass-size spectra at ecological scaling in a fluctuating ecosystem (Emporda Wetlands, Ne Spain). *Vie Et Milieu-Life and Environment* 1(55): 31-40.

Abstract: The biomass-size spectrum, at ecological scaling of zooplankton community in a fluctuating basin of Emporda Wetlands was analysed by adjustment to a model based on the Pareto distribution. Different shapes of spectra have been related to the availability of resources. Under flooding conditions biomass-size spectra fit better a linear model (Pareto Type 1), whereas in confinement conditions curved shape biomass-size spectra (Pareto Type 11) were more frequent. Results suggest that under flooding conditions competitive and predatory interactions are low and size distributions reflect mainly population growth, especially of small-size organisms. The result is a linear spectrum. On the other hand, during confinement conditions interactions between species would acquire more relevance due to the lack of resources, favouring the displacement of biomass toward larger sizes. The result is a curved spectrum and a decrease of diversity. Thereby, the shape of the biomass-size spectrum is an indicator of the degree of ecological interactions within the zooplankton functional group.

101: T. Buchaca, M. Felip and J. Catalan,. 2005. A comparison of HPLC pigment analyses and biovolume estimates of phytoplankton groups in an oligotrophic lake. Journal of Plankton Research 1(27): 91-101.

Abstract: Assessment of the contribution of distinct algal groups to phytoplankton biomass in oligotrophic lakes by marker pigments is compared with assessment by cell-counting biovolume estimates. Seasonal samples from an oligotrophic alpine lake (Redon, Pyrenees) mostly included species of chrysophytes, dinoflagellates, cryptophytes and chlorophytes. The chlorophyll a (Chl a) corresponding to each algal group was estimated using HPLC pigment analyses and the CHEMTAX program. Chl a estimates and biovolume showed a significant correlation for all the groups during the ice-free season except for chlorophytes. However, some of the samples from the initial phase of the ice cover presented a clear departure from the relationship during the ice-free period in most groups. On the other hand, the ratios between a specific marker pigment and the biovolume of the marked algal group were significantly constant within the photic zone ($>1\%$ surface irradiance) for most of the pigments and groups, including chlorophytes. Nevertheless, the ratios increased and showed a large variability for samples below the photic depth or below the ice cover. The violaxanthin-chrysophyte biovolume ratio presented an opposed tendency to other pigment-biovolume ratios, which increased in inverse proportion to the depth of the sample. The results are discussed in terms of methodological limitations, acclimation responses and species composition.

102: M. H. Bundy, H. A. Vanderploeg, P. J. Lavrentyev and P. A. Kovalcik,. 2005. The importance of microzooplankton versus phytoplankton to copepod populations during late winter and early spring in Lake Michigan. Canadian Journal of Fisheries and Aquatic Sciences 10(62): 2371-2385.

Abstract: Feeding rates of the calanoid copepod *Leptodiaptomus sicilis* on natural assemblages of phytoplankton and microzooplankton were evaluated during late winter and early spring in Lake Michigan. Microzooplankton were the preferred food source for this copepod, and larger size fractions of phytoplankton were preferred to smaller size fractions. Ingestion rates of total chlorophyll a ranged from 2 to 14 ng center dot copepod(-1)center dot day(-1), while ingestion rates of micro zoo plank ton biomass ranged from 0.04 to 0.15 mu g C center dot copepod(-1 center dot)day(-1). In these experiments, microzooplankton carbon accounted for 22%-74% of the total carbon ingested. Clearance rates of microzooplankton carbon were positively related to the larger size fractions of chlorophyll a and to total suspended solids. Measured ingestion rates of microzooplankton and phyto plankton carbon suggest that calanoid copepod populations have the potential to control microzooplankton production in late winter and early spring, and even with an abundance of phytoplankton carbon, food availability may limit the reproduction of *L. sicilis*. Because microzooplankton contribute significantly to the diet of these copepods, stimulation of the microbial food web by terrigenous inputs of nutrients and carbon may be transmitted to higher trophic levels (i.e., mesozooplankton and their predators) through heterotrophic flagellates and protozoans.

103: D. B. Bunnell, T. B. Johnson and C. T. Knight,. 2005. The impact of introduced round gobies (*Neogobius melanostomus*) on phosphorus cycling in central Lake Erie. *Canadian Journal of Fisheries and Aquatic Sciences* 1(62): 15-29.

Abstract: We used an individual-based bioenergetic model to simulate the phosphorus flux of the round goby (*Neogobius melanostomus*) population in central Lake Erie during 1995 - 2002. Estimates of round goby diet composition, growth rates, and population abundance were derived from field sampling. As an abundant introduced fish, we predicted that round gobies would influence phosphorus cycling both directly, through excretion, and indirectly, through consumption of dreissenid mussels, whose high mass-specific phosphorus excretion enhances recycling. In 1999, when age- 1+ round gobies reached peak abundance near 350 million ($2.4 \text{ kg} \cdot \text{ha}^{-1}$), annual phosphorus excretion was estimated at $7 \text{ t} (1.4 \times 10^{-3} \text{ mg P.m}^{-2} \cdot \text{day}^{-1})$. From an ecosystem perspective, however, round gobies excreted only 0.4% of the phosphorus needed by the benthic community for primary production. Indirectly, round gobies consumed $< 0.2\%$ of dreissenid population biomass, indicating that round gobies did not reduce nutrient availability by consuming dreissenids. Compared with previous studies that have revealed introduced species to influence phosphorus cycling, round gobies likely did not attain a sufficiently high biomass density to influence phosphorus cycling in Lake Erie.

104: T. P. Burt and G. Pinay,. 2005. Linking hydrology and biogeochemistry in complex landscapes. Progress in Physical Geography 3(29): 297-316.

Abstract: This review seeks to examine connections between hydrology and biogeochemistry at the landscape scale. A review of research on landscape structure and organization provides a context for what follows, and seeks to integrate work at relevant scales in ecology and geomorphology; the degree of functional 'connectedness' between different landscape elements provides the key theme. Following a review of hillslope hydrology, links between hillslope runoff pathways and nutrient dynamics are then considered. We focus in particular on riparian zones, where nutrient dynamics has relevance for water-quality management in catchments. In conclusion, we argue that future studies need to focus on the critical near-stream zone, given its importance in coupling hillslope and channel systems.

105: T. A. Burton,. 2005. Fish and stream habitat risks from uncharacteristic wildfire: Observations from 17 years of fire-related disturbances on the Boise National Forest, Idaho. Forest Ecology and Management 1-2(211): 140-149.

Abstract: Several large, uncharacteristic wildfires occurred on the Boise National Forest in Southwest Idaho, from 1986 to 2003. From 1987 to 1994, severe wildfires burned almost 50% of the ponderosa pine forest types (about 200,000 ha). The intensity of the fires varied across the landscape, with a mix of low to moderate severity, and lesser amounts of high burn severity. After the fires, localized debris flows favored smaller order streams in watersheds less than 4000 ha in size, where there had been mostly high severity burning. Locally, areas experiencing high heat and post-fire debris flows had reduced fish numbers and altered fish habitats. Uncharacteristic wildfires on the managed portions of the Boise National Forest appeared to have more pronounced, short-term effects on fish habitats as compared with characteristic wildfires in the Central Idaho Wilderness. Even in the most severely impacted streams, habitat conditions and trout populations improved dramatically within 5-10 years. Post-fire floods apparently rejuvenated stream habitats by exporting fine sediments and by importing large amounts of gravel, cobble, woody debris, and nutrients, resulting in higher fish productivities than before the fire. These observations suggest that important elements of biodiversity and fish productivity may be influenced, or even created by fire-related disturbances. In some cases, habitats that were completely devoid of salmonid fishes just after the debris floods, were later re-colonized with migrants returning from downstream or nearby tributary rearing habitats. Re-population was likely enhanced by higher fecundity, homing instinct, and greater mobility of the larger migratory fish. Ecosystem restoration activities that reduce both short- and long-term threats of uncharacteristic wildfire on imperiled fishes could be emphasized in areas where local populations may be weak and/or isolated, but potentially recoverable. But forest ecosystem restoration alone may not reduce risks t

106: H. Butler, A. Atkinson and M. Gordon,. 2005. Omnivory and predation impact of the calanoid copepod *Boeckella poppei* in a maritime Antarctic lake. *Polar Biology* 11(28): 815-821.

Abstract: The copepod *Boeckella poppei* is a major species in high latitude lakes of the Southern Hemisphere. In such lakes the reduced diversity of metazoans contrasts with a rich microbial assemblage, making these systems amenable to the study of predation controls on the microbial food web. However, the diet of *B. poppei* is subject to conflicting reports, with little information on feeding rates. We incubated this species in water from Sombre Lake, a much-studied maritime Antarctic Lake on the South Orkney Islands, in order to quantify its feeding rates and potential impact on the microbial assemblage. Overall, clearance rates were similar across 4 experiments spanning November 1999-March 2000, but increased with prey size over the range of 2.7-18 μm equivalent spherical diameter (esd). *B. poppei* fed omnivorously, although small phototrophic flagellates comprised the bulk of the diet because of their overwhelming dominance in the incubation water. Larger motile preys-heterotrophic ciliates of similar to 18 μm esd-were cleared fastest (mean 555 ml mg^{-1} dry mass day^{-1}) and at equivalent rates to those found for freshwater and marine copepods of similar size and at similar temperatures. Estimated predation impact on the microbial food web varied with the abundance of copepods; these were similar to 30-fold greater in March than in December. In March even the relatively abundant *B. poppei* (1.7 adults l^{-1}) had a negligible impact on nanoflagellates, due to the low clearance rate on these small cells. However, in March, *B. poppei* adults were estimated to clear 24% of the lake water of ciliates daily. Given the generation time of ciliates (1.6 days measured in a previous summer study), and the fact that other larval stages of *B. poppei* were not assessed, this species has the potential to control this part of the microbial assemblage in Sombre Lake.

107: D. S. Byun, Y. K. Cho, I. A. Huh and D. E. Hart,. 2005. Runoff-induced vertical thermal dynamics in a canyon-shaped reservoir during the summer monsoon. Marine and Freshwater Research 7(56): 959-968.

Abstract: During the summer rainy season, double thermoclines were observed in a small canyon-shaped reservoir. The physical processes leading to thermocline evolution are examined from the vertical temperature profile observed along the reservoir before and after rain. Observations show that their evolution is related to the inflow of runoff, which is colder than the reservoir surface water and post-rain fair-weather conditions. Tongue-like distributions of turbidity, conductivity and nutrient concentrations downstream from the headwater clearly reveal the presence of runoff-induced intermediate inflows. In addition to supplying nutrients, the inflow provides the oxygen-deficient intermediate layer with a rich supply of dissolved oxygen. Concurrently, in the upper part of the reservoir runoff-induced inflows may drive the oxygen-deficient bottom water to shift downstream along the layer beneath the runoff-induced inflow. The water mass between the two thermoclines may operate as a source of nutrients for algal development in early autumn when the upper thermocline is destroyed by the convective overturn owing to the surface cooling.

108: V. G. Caccia and J. N. Boyer,. 2005. Spatial patterning of water quality in Biscayne Bay, Florida as a function of land use and water management. Marine Pollution Bulletin 11(50): 1416-1429.

Abstract: An objective classification analysis was performed on a water quality data set from 25 sites collected monthly during 1994-2003. The water quality parameters measured included: TN, TON, DIN, NH₄⁺, NO₃⁻, NO₂⁻, TP, SRP, TN:TP ratio, TOC, DO, CHL A, turbidity, salinity and temperature. Based on this spatial analysis, Biscayne Bay was divided into five zones having similar water quality characteristics. A robust nutrient gradient, driven mostly by dissolved inorganic nitrogen, from alongshore to offshore in the main Bay, was a large determinant in the spatial clustering. Two of these zones (Alongshore and Inshore) were heavily influenced by freshwater input from four canals which drain the South Dade agricultural area, Black Point Landfill, and sewage treatment plant. The North Bay zone, with high turbidity, phytoplankton biomass, total phosphorus, and low DO, was affected by runoff from five canals, the Munisport Landfill, and the urban landscape. The South Bay zone, an embayment surrounded by mangrove wetlands with little urban development, was high in dissolved organic constituents but low in inorganic nutrients. The Main Bay was the area most influenced by water exchange with the Atlantic Ocean and showed the lowest nutrient concentrations. The water quality in Biscayne Bay is therefore highly dependent of the land use and influence from the watershed. (c) 2005 Elsevier Ltd. All rights reserved.

109: J. A. Camargo, K. Alonso and M. de la Puente,. 2005. Eutrophication downstream from small reservoirs in mountain rivers of Central Spain. Water Research 14(39): 3376-3384.

Abstract: In this research we examined the hypothesis that upper reaches of rivers and streams can experience eutrophication as a consequence of deep releases from dams. Field studies were conducted in four mountain rivers (Tormes, Riaza, Eresma and Miraflores Rivers) of Central Spain. The watersheds of these rivers are underlain by siliceous rocks. A small deep-release storage reservoir is found in the upper reaches of each river. Two sampling sites, upstream and downstream from the reservoir, were established in stony riffles of each impounded river. Significant ($P < 0.01$) increases in conductivity and nutrient ($\text{NO}_3\text{-N}$, $\text{NH}_4\text{-N}$, $\text{PO}_4\text{-P}$) concentrations downstream from the reservoirs were measured. Significant ($P < 0.01$) increases in periphyton chlorophyll a and ash-free dry biomass were also quantified at downstream sites. Significant ($P < 0.01$) correlation coefficients indicated that phosphate would play a more important role as the limiting nutrient for periphyton. Relative abundances of macroinvertebrate scrapers and collector-gatherers increased downstream from the reservoirs. Furthermore, taxon dominance, total density and total biomass of macroinvertebrates tended to be higher at downstream sites than at upstream sites. In contrast, taxon diversity and relative abundance of macroinvertebrate shredders decreased downstream from the reservoirs. It is concluded that small deep-release storage reservoirs, located in upper reaches of siliceous rivers, can act as nutrient sources, causing eutrophication downstream. Nutrients would ultimately come from land/forest runoff. The fact that terrestrial vegetation was not completely removed before filling reservoirs could also contribute to the eutrophication process. (c) 2005 Elsevier Ltd. All rights reserved.

110: A. K. Canion and C. Ochs,. 2005. The population dynamics of freshwater armored dinoflagellates in a small lake in Mississippi. Journal of Freshwater Ecology 4(20): 617-626.

Abstract: We investigated the temporal and spatial changes in population density of five dinoflagellates in Boondoggle Lake, a shallow, nutrient-poor lake in northern Mississippi. Dinoflagellate density and physicochemical conditions were assessed at three depths over a period of 16 months. We identified five *Peridinium* species (*P. deflandrei*, *P. volzii*, *P. wisconsinense*, *P. limbatum* and *P. inconspicuum*) and one *Peridiniopsis* species (*P. polonicium*). With the exception of *P. inconspicuum*, none of these species has previously been reported in Mississippi. *P. deflandrei* dominated the summer bloom (90% of the total dinoflagellate population) and reached a maximum population density of 2.75×10^5 cells/L. *P. wisconsinense* and *P. polonicium* also had maximum densities in the summer. The increase of these species coincided with the onset of temperature and oxygen stratification, and their decrease coincided with lake mixing. *P. volzii* and *P. limbatum* reached maximum abundances in the spring and were less abundant than the summer species. Declines in these species were observed at the onset of stratification, with increases again after mixing.

111: A. E. Carey, W. B. Lyons and J. S. Owen,. 2005. Significance of landscape age, uplift, and weathering rates to ecosystem development. *Aquatic Geochemistry* 2(11): 215-239.

Abstract: The combined roles of chemical and physical weathering have profound effects on the development of terrestrial ecosystems. Landscapes which are tectonically active are rapidly denudated and continually produce nutrient solutes from fresh bedrock. The chemical weathering yields are related to climate, but also to geologic factors such as uplift rates. Long-term nutrient production and the phase of ecological development are closely related to geological setting. Until recently, this relationship has not been seriously considered by ecologists. Our analysis of existing information suggests, however, not only that the nature and type of geologic processes provide significant insights into landscape, but also to ecological development. In this paper, we describe the impact of geologic uplift on the long term generation of soluble nutrients from bedrock by evaluating long-term data from a number of forested sites and comparing it to newly collected data from Taiwan, an area undergoing rapid tectonic uplift.

112: M. V. Carle, P.N. Halpin, and C.A. Stow,. 2005. Patterns of watershed urbanization and impacts on water quality. Journal of the American Water Resources Association 3(41): 693-708.

There is no abstract for this article.

113: M. V. Carle, P. N. Halpin and C. A. Stow,. 2005. Patterns of watershed urbanization and impacts on water quality. Journal of the American Water Resources Association 3(41): 693-708.

Abstract: Urban runoff contributes to nonpoint source pollution, but there is little understanding of the way that pattern and extent of urbanization contributes to this problem. Indicators of type and density of urbanization and access to municipal services were examined in six urban watersheds in Durham, North Carolina. Principal components analysis (PCA) was used to identify patterns in the distribution of these variables across the urban landscape. While spatial variation in urban environments is not perfectly captured by any one variable, the results suggest that most of the variation can be explained using several variables related to the extent and distribution of urban development. Multiple linear regression models were fit to relate these urbanization indicators to total phosphorus, total kjeldahl nitrogen, total suspended solids, and fecal coliforms. Development density was correlated to decreased water quality in each of the models. Indicators of urbanization type such as the house age, amount of contiguous impervious surface, and stormwater connectivity explained additional variation. In the nutrient models, access to city services was also an important factor. The results indicate that while urbanization density is important in predicting water quality, indicators of urbanization type and access to city services help explain additional variation in the models.

114: R. E. Carlson and K. E. Havens,. 2005. Simple graphical methods for the interpretation of relationships between trophic state variables. Lake and Reservoir Management 1(21): 107-118.

Abstract: Graphical methods are presented that can identify relationships between the trophic state variables, total phosphorus, total nitrogen, chlorophyll, and Secchi depth. The graphical approach extends the use of empirical models beyond predictions based solely on local data. Instead, the authors suggest comparing the data against an established set of predictive equations. These equations serve as a "standard model" from which deviations can be observed and interpreted. The goal of the use of deviations from a standard model is to enhance our ability to understand relationships between important nutrient, transparency, and biological variables and to adjust our predictive models and management decisions accordingly. Examples are given of interpretations of deviations caused by nitrogen limitation, non-algal turbidity, zooplankton grazing, and dissolved water color.

115: S. R. Carpenter,. 2005. Eutrophication of aquatic ecosystems: Bistability and soil phosphorus. Proceedings of the National Academy of Sciences of the United States of America 29(102): 10002-10005.

Abstract: Eutrophication (the overenrichment of aquatic ecosystems with nutrients leading to algal blooms and anoxic events) is a persistent condition of surface waters and a widespread environmental problem. Some lakes have recovered after sources of nutrients were reduced. In others, recycling of phosphorus from sediments enriched by years of high nutrient inputs causes lakes to remain eutrophic even after external inputs of phosphorus are decreased. Slow flux of phosphorus from overfertilized soils may be even more important for maintaining eutrophication of lakes in agricultural regions. This type of eutrophication is not reversible unless there are substantial changes in soil management. Technologies for rapidly reducing phosphorus content of overenriched soils, or reducing erosion rates, are needed to improve water quality.

116: S. R. Carpenter, J. J. Cole, M. L. Pace, M. Van de Bogert, D. L. Bade, D. Bastviken, C. M. Gille, J. R. Hodgson, J. F. Kitchell and E. S. Kritzberg,. 2005. Ecosystem subsidies: Terrestrial support of aquatic food webs from C-13 addition to contrasting lakes. *Ecology* 10(86): 2737-2750.

Abstract: Whole-lake additions of dissolved inorganic C-13 were used to measure allochthony (the terrestrial contribution of organic carbon to aquatic consumers) in two unproductive lakes (Paul and Peter Lakes in 2001), a nutrient-enriched lake (Peter Lake in 2002), and a dystrophic lake (Tuesday Lake in 2002). Three kinds of dynamic models were used to estimate allochthony: a process-rich, dual-isotope flow model based on mass balances of two carbon isotopes in 12 carbon pools; simple univariate time-series models driven by observed time courses of $\delta(13)CO_2$; and multivariate autoregression models that combined information from time series of $\delta(13)C$ in several interacting carbon pools. All three models gave similar estimates of allochthony. In the three experiments without nutrient enrichment, flows of terrestrial carbon to dissolved and particulate organic carbon, zooplankton, Chaoborus, and fishes were substantial. For example, terrestrial sources accounted for more than half the carbon flow to juvenile and adult largemouth bass, pumpkinseed sunfish, golden shiners, brook sticklebacks, and fathead minnows in the unenriched experiments. Allochthony was highest in the dystrophic lake and lowest in the nutrient-enriched lake. Nutrient enrichment of Peter Lake decreased allochthony of zooplankton from 0.34-0.48 to 0-0.12, and of fishes from 0.51-0.80 to 0.25-0.55. These experiments show that lake ecosystem carbon cycles, including carbon flows to consumers, are heavily subsidized by organic carbon from the surrounding landscape.

117: G. M. Carr, P. A. Chambers and A. Morin,. 2005. Periphyton, water quality, and land use at multiple spatial scales in Alberta rivers. Canadian Journal of Fisheries and Aquatic Sciences 6(62): 1309-1319.

Abstract: The ability of land use to replace water quality variables in predictive models of periphyton chlorophyll a was tested with a 21-year data set for Alberta rivers. Nutrients (total dissolved P and NO₂ + NO₃) explained 23%-24% of the variability in seasonal chlorophyll a, whereas land use (human population density) explained 25%-28% of the variability. The best models included the combination of total dissolved P and population density, explaining 32%-34% of periphyton chlorophyll a variability. However, analysis of variance of chlorophyll a by ecoregions and ecozones explained about as much variability (28%-30%), and the inclusion of an ecoregion term into the regression models showed a diminished importance of land use as a predictor of chlorophyll a, with best models based on the combination of nutrients and ecoregion and explaining up to 43%-44% of periphyton chlorophyll a variability. Within ecoregions, land use was sometimes a good surrogate for nutrient data in predicting chlorophyll a concentrations. Overall, land use is a suitable surrogate for nutrients in regression models for chlorophyll a, but its inclusion in general models may reflect regional differences in nutrient-chlorophyll relationships rather than true land use effects on chlorophyll a.

118: G. M. Carr, A. Morin and P. A. Chambers,. 2005. Bacteria and algae in stream periphyton along a nutrient gradient. *Freshwater Biology* 8(50): 1337-1350.

Abstract: 1. Stream riffles in southern Ontario and western Quebec were sampled for biomass (58 stations from 51 streams) and production (22 stations from 21 streams) of algae and bacteria in periphyton to test the hypothesis that bacteria in benthic biofilms compete with algae for nutrients. 2. Algal and bacterial biomass were positively correlated, as were algal and bacterial production. Bacterial production was also positively correlated to algal and bacterial biomass, but the relationship was not significant. The ratio of algal to bacterial biomass did not vary with nutrients whereas algal production tended to increase with nutrients more rapidly than bacterial production. 3. Instream nitrogen concentrations explained 38-58% of the variability in algal biomass and production. Bacterial abundance explained an additional 9-29% of the residual variance in algal production and biomass. However, the relationship between bacterial abundance and algal production and biomass, once nutrients were taken into account, was positive, in contrast to the predicted effect of competition. 4. Hence, we reject our original hypothesis that bacteria in biofilms compete with algae for nutrients and instead suggest that bacteria and algae in biofilms coexist in an association that offers space and resources to sustain production of both groups of organisms.

119: B. B. Castro, S. C. Antunes, R. Pereira, A. Soare and F. Goncalves,. 2005. Rotifer community structure in three shallow lakes: seasonal fluctuations and explanatory factors. *Hydrobiologia* (543): 221-232.

Abstract: The present work aimed at studying the rotifer communities of three shallow eutrophic lakes in Portugal (lakes Mira, Vela and Linhos). At the time of the study, Mira and Vela faced large inputs of allochthonous nutrients, while Linhos was facing terrestrialsation, with cycles of dominance-senescence of macrophytes. The three lakes differed in terms of their abiotic features, with Linhos presenting very high nutrient levels and low pH, while Vela and Mira shared most of the characteristics. The rotifer communities of these two lakes were poorly diversified but highly abundant (max. > 2000 ind l(-1)), with a clear dominance of eurytopic euplanktonic species (mainly *Keratella cochlearis*). On the other hand, Linhos presented lower abundances (< 1000 ind l(-1)) but higher species richness, mainly due to macrophyte-associated taxa, such as the littoral genera *Lepadella*, *Testudinella* and *Squatinella*. In all lakes, summertime represented a peak in terms of abundance and diversity. Canonical correspondence analysis (CCA) identified two main environmental gradients that shape up the rotifer assemblages: a temporal gradient, mainly related to temperature, and a eutrophy gradient, associated with nitrogenous nutrients. The latter gradient is clearly dependent on between-lake variation, due to the high nutrient levels observed in lake Linhos. Variance partitioning using CCA revealed that the largest portion (27.5%) of the total variation explained (52.1%) was attributed to the interaction between lake and environmental variables.

120: H. Castro, S. Newman, K. R. Reddy and A. Ogram,. 2005. Distribution and stability of sulfate-reducing prokaryotic and hydrogenotrophic methanogenic assemblages in nutrient-impacted regions of the Florida everglades. Applied and Environmental Microbiology 5(71): 2695-2704.

Abstract: Although the influence of phosphorus loading on the Everglades ecosystem has received a great deal of attention, most research has targeted macro indicators, such as those based on vegetation or fauna, or chemical and physical parameters involved in biogeochemical cycles. Fewer studies have addressed the role of microorganisms, and these have mainly targeted gross informative parameters such as microbial biomass, enzymatic activities, and microbial enumerations. The objectives of this study were to characterize the dynamics of sulfate-reducing and methanogenic assemblages using terminal restriction fragment length polymorphism (T-RFLP) targeting the dissimilatory sulfite reductase (*dsrA*) and methyl coenzyme M reductase (*mcrA*) genes, respectively, and assess the impact of nutrient enrichment on microbial assemblages in the northern Everglades. T-RFLP combined with principal component analysis was a powerful technique to discriminate between soils from sites with eutrophic, transitional, and oligotrophic nutrient concentrations. *dsrA* T-RFLP provided a higher level of discrimination between the three sites. *mcrA* was a relatively weaker system to distinguish between sites, since it could not categorically discriminate between eutrophic and transition soil samples, but may be useful as an early indicator of phosphorus loading which is altering hydrogenotrophic methanogenic community in the transition zones, making them more similar to eutrophic zones. Clearly, targeting a combination of different microbial communities provides greater insight into the functioning of this ecosystem and provides useful information for understanding the relationship between eutrophication effects and microbial assemblages.

121: G. G. Cavalcanti and B. G. Lockaby,. 2005. Effects of sediment deposition on fine root dynamics in riparian forests. Soil Science Society of America Journal 3(69): 729-737.

Abstract: One of the most important functions of riparian zones is their ability to improve water quality by trapping sediment leaving agricultural fields and other disturbed areas. However, few data exist quantifying the impacts of sediment deposition from anthropogenic disturbance on belowground processes within these ecosystems. This study was conducted at Ft. Benning, GA, where disturbance caused by military training has generated a range of sedimentation levels in riparian forests near ephemeral streams. Nine ephemeral streams, exhibiting different levels of sediment deposition, were selected for study. Two paired treatment plots (upper and lower) were established along each catchment to represent potentially disturbed and control conditions, respectively. On highly and moderately disturbed catchments, upper plots had received varying rates of sediment from erosion along unpaved roads. Biomass, turnover, productivity, and nutrient contents of fine roots were compared within and across catchments. Temporal fluctuations in biomass of live and dead fine roots were observed for both treatments in the three disturbance categories, except for upper plots of highly disturbed catchments, where biomass remained fairly low and constant throughout the study. Fine root productivity declined sharply with sediment rates as low as 0.3 cm yr⁻¹. Nutrient contents of live and dead fine roots followed a similar trend to that of root biomass. These data suggest that fine root dynamics may be affected by sediment deposition rates commonly occurring in some wetland forests, and the water filtration function performed by these ecosystems may be at risk.

122: M. A. Cerqueira, F. N. Vieira, R. V. Ferreira and J. F. Silva,. 2005. The water quality of the Certima River basin (Central Portugal). Environmental Monitoring and Assessment 1-3(111): 297-306.

Abstract: The aim of this study was to evaluate the water quality of the Certima River basin (Central Portugal). For that purpose, surface water samples were collected in March, May and July 2003, at 10 selected sampling sites, and were analysed for physicochemical parameters, namely temperature, conductivity, pH, total suspended solids, dissolved oxygen, biochemical oxygen demand (BOD₅), Kjeldahl nitrogen and total phosphorus. Results revealed an acceptable water quality during the spring season. Maxima of 64 mg dm⁻³ for BOD₅, 39 mg dm⁻³ for Kjeldahl nitrogen, and 5.2 mg dm⁻³ for total phosphorus, were recorded during summer, indicating a significant degradation of the water quality in a river stretch located downstream of the town of Mealhada. These values, which did not comply with the objectives of minimum quality for surface waters prescribed by the Portuguese legislation, were related to domestic wastewater discharges and runoff waters from a cattle farm. Besides their effects on the middle stretch of the river, these pollution sources were the most likely cause of the high nutrient load in downstream waters, and thus may have a major impact on the trophic status of Pateira de Fermentelos, a sensitive wetland area located in the lower Certima basin.

123: M. A. Chadwick and A. D. Hury, 2005. Effects of atmospheric N deposition on coarse organic matter in a headwater stream. *Hydrobiologia* (532): 167-179.

Abstract: Input, storage, export potential, and system-level processing of coarse organic matter were investigated in the intermittent streams that drain the Bear Brook Watershed in Maine (BBWM). BBWM is a paired catchment study investigating ecosystem effects of atmospheric N and S deposition. We predicted that the increased N loading to the treatment catchment would elevate input of organic matter, result in higher levels of coarse organic matter biomass, and increase litter processing rates in the treatment stream relative to the reference stream. We found that the streams draining BBWM did not have statistically different coarse organic matter input, biomass, or processing rates and we found only modest differences in export potential. System-level processing rates for maple (*Acer* spp.) litter were similar to rates previously quantified using litterbag methods. However, system-level processing rates for American beech (*Fagus grandifolia*) litter were an order of magnitude faster than rates measured with litterbags. This difference was likely due to movements of these leaves from riffle/runs and pools into debris dams, rather than differences in measurements of leaf tissue processing rates between methods. Organic matter dynamics of the intermittent streams at BBWM were similar to other forested, headwater streams. Our results indicate that the long-term N manipulation experiment at BBWM has not altered input, storage or processing of coarse organic matter in the treatment stream. Physical characteristics of these stream ecosystems appear to regulate organic matter dynamics rather than differences in nutrient chemistry.

124: M. A. Chadwick and A. D. Hury, 2005. Response of stream macroinvertebrate production to atmospheric nitrogen deposition and channel drying. *Limnology and Oceanography* 1(50): 228-236.

Abstract: We assessed the effect of atmospheric nitrogen (N) deposition on secondary production in a first-order intermittent stream at the Bear Brook Watershed in Maine (BBWM). BBWM is a paired-catchment experiment designed to determine the effects of N deposition on a forested ecosystem. Nitrogen as $(\text{NH}_4)_2\text{SO}_4$ has been applied to the treatment catchment since 1989, with the adjacent catchment serving as a reference (both are drained by a first-order intermittent stream). Secondary production and detritus biomass were quantified for 2 yr. Production did not vary between streams (range = 1.7-2.3 g ash-free dry mass $\text{m}^{-2} \text{yr}^{-1}$) but was similar to 35% higher for both streams in the second year. The distribution of production among functional feeding groups varied little between streams but differed among taxa. Detritus biomass was similar between streams but was similar to 25% higher in the second year. The $(\text{NH}_4)_2\text{SO}_4$ treatment had no effect on production in the treatment stream. The statistically identical level of production between streams is presumably because of similar habitat, channel drying, and trophic resources. Difference in production between years was positively related to detritus biomass. Differences in the distribution of production among taxa between streams were likely the result of contrasts in the duration of flowing water, with the treatment stream having the longer duration. Our study indicates that patterns of litter input and channel drying, rather than N deposition, control levels of secondary production in these intermittent streams by altering both resource availability and community structure. These variables apparently override the effects of N deposition in regions where nitrogen is not a limiting nutrient.

125: W. C. Chan and Z. Y. Lin,. 2005. Prediction of microbial growth rate in biofilters by using the nutrient diffusion coefficient. Journal of Chemical Technology and Biotechnology 9(80): 1046-1053.

Abstract: In this study, an optimal process for preparing a synthetic filter material with nitrogen nutrient (PVA/peat/KNO₃ composite beads) was developed for biofiltration and the optimal initial nitrogen concentration of the boric acid and phosphate aqueous solutions was found to be 3.94 and 1.52 g nitrogen L⁻¹, respectively. The water-soluble nitrogen content in the prepared composite beads was higher than that of the compost. The mass transport process for the water-soluble nitrogen dissolving out of the composite beads occurred in two stages: external mass transport occurred in the early stage and an intraparticle diffusion process occurred in the long-term stage. The rate of water-soluble nitrogen dissolving out during the external mass transport process increased with increasing the concentration of KNO₃ aqueous solution and that during the intraparticle diffusion process had a maximum value for the composite beads that had been immersed in 0.384 M KNO₃. The path of water-soluble nitrogen dissolving out from the composite beads was that the water-soluble nitrogen dispersed in the peat phase firstly diffused into the outer poly(vinyl alcohol) (PVA) phase and then it diffused out of the bead surface. The percentage of volatile organic compounds (VOCs) removed by the biofilter from an air stream remained above 99% for 230 days for the composite beads that had been immersed in KNO₃ before packing. The microbial growth rate had a maximum value for the composite beads that had been immersed in 0.384 M KNO₃ and was higher than that of the compost by a factor of 1.49. The rate of nitrogen dissolving out during the intraparticle diffusion process could be used as an index to predict the microbial growth rate in the biofilter. (c) 2005 Society of Chemical Industry.

126: W. C. Chan and R. X. Zheng,. 2005. Poly(vinyl alcohol)/compost composites for biofiltration of swine waste volatiles. Journal of Polymers and the Environment 3(13): 267-277.

Abstract: In this study, a Poly(vinyl alcohol)(PVA)/compost composite bead is prepared and is indicated suitable as a filter material for biofiltration. The optimal preparation process is with the compost size of 16-35 mesh, the ratio of water to compost of 40 g/15 g compost, and the immersion time in the phosphate solution of 60 min. The composite bead prepared by this process is a porous spherical particle with a diameter between 2.4 and 6.0 mm and a density of 0.96 g/cm³. It contains 9.43 mg P/g dry solid and 12.1 mg N/g dry solid. The equilibrium moisture content of the composite bead bed from adsorption and holding experiments is 50.5 and 54.6% on a wet basis respectively, which is about 1.74 times higher than that of swine manure compost bed. It corresponds to the optimal filter material required and is sufficient to sustain biological activity as the composite bead adsorbs equilibrium moisture. The bulk compressive strength of the composite bead bed is about 1.15 times larger than that of swine manure compost bed to ensure even distribution of air flow and reduce the head loss as the air flow stream passed through. The pH value of the filter bed could maintain in the 6.9-7.2 range during the operation period due to the composite bead has the phosphate buffer capacity. The percentage of ethyl acetate removal could remain at over 99% for 40 days operation while the composite beads adsorbed inorganic nitrate nutrients. The pressure drop of two kind composite beads and pig manure compost filter beds are 0 and 2 mm H₂O, respectively, after operating for 40 days.

127: V. Chaplot, A. Saleh and D. B. Jaynes,. 2005. Effect of the accuracy of spatial rainfall information on the modeling of water, sediment, and NO₃-N loads at the watershed level. Journal of Hydrology 1-4(312): 223-234.

Abstract: In a given watershed, the accuracy of models in predicting the hydrologic and erosion behavior depends, to a large extent, on the quality of the knowledge in respect of the spatial rainfall. The hydrologic and erosion aspects of rainfall are often discussed without due regard to any resulting improvement in watershed modeling. Thus, there is a real need for streamlining raingauge networks in order to reflect rainfall variability and its effect on the prediction of water, sediment and nutrient fluxes at the watershed scale. In this study, such an impact was analyzed using 9-year data collected at the outlets of two watersheds encompassing a range of climates, surface areas and environmental conditions. The Soil and Water Assessment Tool (SWAT) was applied using as input data that collected from 1 to 15 precipitation gauges per watershed. At both sites the highest densities of raingauges were used for SWAT calibration. The differences between the highest gauge concentration and lower concentrations used for the estimation of sediment loads led to the conclusion that a high gauge concentration is necessary. At both watersheds, predictions using rainfall records from the national service stations produced inaccurate estimations. This was probably because the gauge concentration was too sparse. Finally, the general applicability of these results is proposed by displaying the possibilities of extrapolation to other watersheds or models. © 2005 Elsevier B.V.. All rights reserved.

128: C. T. A. Chen,. 2005. Tracing tropical and intermediate waters from the South China Sea to the Okinawa Trough and beyond. Journal of Geophysical Research-Oceans C5(110): .

Abstract: Intermediate waters with a salinity minimum from 350 to 1350 m depths have been reported to flow out of the South China Sea (SCS) through the Luzon Strait. This eastward flowing SCS Intermediate Water (SCSIW) is blocked by the northward flowing Black Stream (Kuroshio) southeast of Taiwan and is forced to turn to the north. The SCSIW subsequently enters and occupies the western half of the Okinawa Trough. Because of strong upwelling in the SCS basin, the SCSIW contains more nutrients than does the Kuroshio Intermediate Water in the Philippine Sea. One of the major purposes of this note is to reconfirm that the SCSIW actually does upwell onto the East China Sea (ECS) shelf and to show that the South China Sea Tropical Water (SCSTW), with a salinity maximum of 50-150 m in depth, follows the same pathway as the SCSIW and similarly occupies the western half of the Okinawa Trough. Part of these relatively nutrient-rich subsurface waters upwell, thereby supplying nutrients to the ECS shelves. The remaining SCSIW and SCSTW flow along with the Kuroshio and can be traced as far east as 140&DEG; E, south of Japan. This is just around the region where the Oyashio joins the Kuroshio to form the North Pacific Intermediate Water.

129: F. Z. Chen, P. Xie, H. J. Tang and H. Liu,. 2005. Negative effects of Microcystis blooms on the crustacean plankton in an enclosure experiment in the subtropical China. Journal of Environmental Sciences-China 5(17): 775-781.

Abstract: Effects of Microcystis blooms on the crustacean plankton were studied using enclosure experiments during July-September, 2000. Eight enclosures were set in the hypereutrophic Donghu Lake. Different nutrient concentrations through additional nutrient and sediment in enclosures were expected to result in different abundance of Microcystis. From July to early August, the phytoplankton community was dominated by Chlorophyta, Cryptophyta, Bacillariophyta and Cyanophyta other than Microcystis aeruginosa. M. aeruginosa showed a rapid increase during early August in all enclosures and predominated. Crustacean plankton was dominated by the herbivorous Moina micrura, Diaphanosoma brachyurum and Ceriodaphnia cornuta, and the predaceous Mesocyclops sp. and Thermocyclops taihokuensis. During the pre-bloom period, the dynamics of M. micrura population appeared to be mainly affected by the predaceous cyclopoids. With the development of Microcystis blooms, such interaction between M. micrura and cyclopoids seemed weakened, especially when the Microcystis biomass was high. But there was no apparent influence on the interaction between Leptodora kindti and its zooplanktonic prey. The density of two cyclopoids decreased with the enhancement of Microcystis. The density decline of M. micrura was caused by both predation and inhibition by Microcystis. The low food availability of other edible phytoplankton during the blooms led to low densities of both C. cornuta and D. brachyurum by late August. It appears that dense Microcystis blooms exert strong negative effects on the herbivorous cladocerans and the predaceous cyclopoids.

130: H. J. Chen, R. G. Qualls and R. R. Blank,. 2005. Effect of soil flooding on photosynthesis, carbohydrate partitioning and nutrient uptake in the invasive exotic *Lepidium latifolium*. *Aquatic Botany* 4(82): 250-268.

Abstract: *Lepidium latifolium* L. is an invasive exotic crucifer that has spread explosively in wetlands and riparian areas of the western United States. To understand the ecophysiological characteristics of *L. latifolium* that affect its ability to invade riparian areas and wetlands, we examined photosynthesis, chlorophyll concentration, carbohydrate partitioning and nutrient uptake in *L. latifolium* in response to soil flooding. Photosynthesis of flooded plants was about 60-70% of the rate of unflooded controls. Chlorophyll concentrations of flooded plants were about 60-70% of the unflooded plants during 1550 days of flooding. Flooding resulted in an increase in leaf starch concentration, but root starch concentration was not significantly affected. However, concentrations of soluble sugar were significantly higher in both leaves and roots of flooded plants than unflooded controls. On day 50 after initial flooding, the concentrations of N, P, K and Zn in leaves of flooded plants were lower than in control plants. The concentrations of Mn and Fe in leaves of flooded plants were eight and two times those of control plants, respectively. In contrast, N, P, K and Zn concentrations of roots of flooded plants were slightly higher than in unflooded plants. The concentrations of Fe and Mn in roots of flooded plants were 15 and 150 times those of the control plants, respectively. The transport of P, K, and Zn to shoots decreased and that of Mn increased under flooding. The accumulation of N, K and Zn in roots decreased and that of Mn increased in response to flooding. The results suggested that the maintenance of relatively high photosynthesis and the accumulation of soluble sugar in roots of flooded plants are important adaptations for this species in flooded environments. Despite a reduction in photosynthesis and disruption in nutrient and photosynthate allocation in response to flooding, *L. latifolium* was able to survive 50 days of flooding stress. Overall, *L. latifolium* performed l

131: X. J. Chen and Y. P. Sheng,. 2005. Three-dimensional modeling of sediment and phosphorus dynamics in Lake Okeechobee, Florida: Spring 1989 simulation. Journal of Environmental Engineering-Asce 3(131): 359-374.

Abstract: Lake Okeechobee is a large and shallow freshwater body in south Florida. Due to the shallowness of Lake Okeechobee, the nutrient dynamics are strongly influenced by hydrodynamic processes (circulation and wind-induced waves) and sediment transport processes. To study water quality and the effects of hydrodynamic and sediment transport processes on nutrient dynamics in the lake, a three-dimensional simulation system that closely couples hydrodynamic and sediment transport processes with nutrient dynamics was developed and used. In this paper, we present, a three-dimensional, coupled hydrodynamics-sediment-nutrient model for Lake Okeechobee. The coupled model was used to simulate a four-week survey conducted in spring 1989 in Lake Okeechobee. By comparing model results to measured field data, it is shown that the coupled model system is able to simulate weekly sediment and phosphorus dynamics in Lake Okeechobee. Model applications demonstrated that the resuspension flux of phosphorus from the lake bottom is significantly higher than the molecular flux during resuspension events and can cause increases of phosphorus concentrations in the water column. Sensitivity runs of the model show that both the advective/diffusive transport and the algal uptake promote the release of phosphorus from suspended sediments and thus affect the phosphorus budget in the lake and the net resuspension flux of phosphorus from the lake bottom.

132: X. Y. Chen, X. H. Wei and R. Scherer,. 2005. Influence of wildfire and harvest on biomass, carbon pool, and decomposition of large woody debris in forested streams of southern interior British Columbia. *Forest Ecology and Management* 1-3(208): 101-114.

Abstract: Large woody debris (LWD) is an important component in the biogeochemistry cycle of carbon and nutrients in forested stream ecosystems. In-stream LWD volume, biomass and carbon pool were investigated in 19 forested streams in the south central interior of British Columbia. The stream channels were classified into four disturbance categories based upon condition of the adjacent riparian forest. The categories are: (1) riparian forest harvested approximately 10 years ago (HT10), (2) riparian forest harvested approximately 30 years ago (HT30), (3) riparian forest burned by a wildfire approximately 40 years ago (WF), and (4) undisturbed old-growth riparian forest (OF). Streams with riparian forests that were affected by wildfire or were recently harvested were observed to have significantly higher LWD volumes, biomass, and carbon pool as compared to streams flowing through old-growth riparian forests. LWD stocks averaged 376 m⁽⁻³⁾ ha⁽⁻¹⁾ (volume), 112 Mg ha⁽⁻¹⁾ (biomass), 52 Mg C ha⁽⁻¹⁾ (carbon) in WF, 258 m⁽⁻³⁾ ha⁽⁻¹⁾, 78 Mg ha⁽⁻¹⁾ and 36 Mg C ha⁽⁻¹⁾ in HT10, 180 m⁽⁻³⁾ ha⁽⁻¹⁾, 52 Mg ha⁽⁻¹⁾ and 23 Mg C ha⁽⁻¹⁾ in HT30, and 114 m⁽⁻³⁾ ha⁽⁻¹⁾, 37 Mg ha⁽⁻¹⁾ and 17 Mg C ha⁽⁻¹⁾ in OF. Volume, biomass, and carbon stock were 2.3, 2.0, 2.1, and 1.3, 1.1 and 1.1 times higher in WF and HT10 than in OF, respectively, but LWD loading did not differ significantly between HT30 and OF. Major differences were also observed in the state of decay of LWD between the four disturbance categories based upon three decomposition classes. Our study supports the conclusion that harvesting creates a short-term increase in LWD stocks. However, harvesting may greatly reduce LWD loadings over the long-term due to relatively rapid decomposition of LWD due to increased rate of decay, transport, and reduced recruitment from the adjacent riparian forest. In the study streams, the wood density of LWD ranged from 0.273 to 0.427 g cm⁽⁻³⁾ depending upon the species and decomposition level. An average decay rate

133: T. H. Chrzanowski and J. P. Grover,. 2005. Temporal coherence in limnological features of two southwestern reservoirs. *Lake and Reservoir Management* 1(21): 39-48.

Abstract: Properties of aquatic ecosystems have recently been considered in a landscape context where lakes in a geographic area are examined to identify common and long-term behavior patterns for one or more variables. Identifying such temporally coherent features should permit generalizations about lake behavior in specific regions and therefore, predictive models based upon such information should have broad applicability within a regional landscape. We considered the temporal coherence of a number of physical, chemical, and biological features of two southwestern reservoirs that differed in age, watersheds, and trophic status to identify common landscape-level predictors of behavior. We found synchronous behavior (temporal coherence) associated with particulate nutrient dynamics (organic carbon, nitrogen and phosphate (PP)), dissolved factors that force plankton dynamics (total dissolved phosphate, reactive phosphate and reactive silicate (SRSi), and with nutrient ratios used as indices of nutrient limitation in the plankton (TDN:TDP, C:P, and N:P). Algal parameters related to biomass (chlorophyll and Simpson's diversity index) did not vary coherently but algal genus richness and bacterial abundance did. Temperature was identified as a forcing function explaining synchronous variability in all cases except SRSi, PP, C:P, N:P, bacteria, and richness. The two systems, although managed for different purposes, behaved similarly with respect to several commonly measured limnological features, most notably, those involving phosphorus. We conclude that it may be possible to use such analysis to establish reference conditions for reservoirs in a given geographic region.

134: G. Q. Chu, J. Q. Liu, G. Schettler, J. Y. Li, Q. Sun, Z. Y. Gu, H. Y. Lu, Q. Liu and T. S. Liu,. 2005. Sediment fluxes and varve formation in Sihailongwan, a maar lake from northeastern China. *Journal of Paleolimnology* 3(34): 311-324.

Abstract: Data derived from monthly sediment traps in Sihailongwan, a maar lake in northeastern China, yielded a detailed record of seasonal sediment fluxes. Sediment fluxes correspond to seasonal climatic variations. The diatom flux shows two distinct peaks in September and November, whereas the flux of chrysophyte stomatocysts shows a maximum in May. The blooms of diatoms may be related to the subsequent deepening of the thermocline in September and lake overturn in spring and November, and in flux of nutrient-rich groundwater sometime after the onset of the summer monsoon. The fluxes of organic matter and siliciclastics show a distinct seasonal pattern. They are varying between 0.03 and 0.56 g m⁽⁻²⁾ d⁽⁻¹⁾ and reach a maximum in May. Quartz in the trap samples indicates that the siliciclastic matter may originate from distant aeolian sources. Sediment trap data and thin section investigations confirm the seasonality of Lake Sihailongwan sediments. Dark-colored layer, which mainly consists of valves of *Cyclotella comta*, might be deposited during autumn, and then is followed by a light-colored mixed layer starting with siliciclastics deposited after ice-out. The varved sediments in the U-shaped Lake Sihailongwan represent a sensitive siliciclastic and geochemical archive of paleoenvironmental variability in this data-sparse area. Detailed investigations of varved sediments should provide decadal to annual records of seasonal sediment flux and its relation to climatic parameters. Especially the diatomaceous layer is regarded to indicate summer climatic fluctuations, while the thick siliciclastic layer could be an indicator of dust events.

135: G. Q. Chu, Q. Sun, S. Q. Li, M. P. Zheng, X. X. Jia, C. F. Lu, J. Q. Liu and T. S. Liu,. 2005. Long-chain alkenone distributions and temperature dependence in lacustrine surface sediments from China. *Geochimica Et Cosmochimica Acta* 21(69): 4985-5003.

Abstract: Long-chain alkenones (LCK) of lacustrine surface sediments were analyzed in 37 lakes from China. The results obtained were complemented by published data from 13 other Chinese lakes. These lakes are located across large temperature and precipitation gradients, therefore allowing for an assessment of the distribution pattern of LCK and their temperature dependency. Different distribution patterns of LCK (C-37 predominant pattern and C-38 predominant pattern) were detected in the surface sediment samples. The ratio of C-37:4 methyl ketone to the sum of C-37 alkenones observed in the different lakes is highly variable (5%-96%, with mean value of 55%), and more than that seen in marine systems. The finding that some of the ocean LCK precursor algae (*Gephyrocapsa oceanica*, *Coccolithus pelagicus*) were also present in the limnic systems suggested that both systems might have similar biosynthetic sources. Empirical relationships between the alkenone unsaturation index U-37(k') and different temperature sets (mean annual air temperature, mean annual air temperature in different seasons, and lake surface water temperature of July) were tested. The best correlation between U-37(k') and temperature was obtained using mean annual air temperature. A general linear regression of U-37(k') and MAAT can be expressed as $U-37(k') = 0.0328 \times T + 0.126$ ($n = 38$, $r^2 = 0.83$). Although questions such as species-uncertainty and other unknown factors for U-37(k') temperature dependence still remain, the equation might be representative of the average contribution of LCK to sediments for these data over a wide range of surface temperatures, water chemistry and different alkenones-producer algal populations. The general relationship of U-37(k'), and mean annual air temperature is consistent with that in marine systems. It supports the suggestion that the biosynthetic pathway of alkenones and the mechanism of their temperature signal may be similar in both marine and limnic systems. LCK might b

136: I. Ciglenecki, M. Caric, F. Krsinic, D. Vilicic and B. Cosovic,. 2005. The extinction by sulfide-turnover and recovery of a naturally eutrophic, meromictic seawater lake. *Journal of Marine Systems* 1-2(56): 29-44.

Abstract: Since 1994 seasonal variations of temperature, salinity and vertical distribution of dissolved oxygen, nutrients, dissolved organic carbon (DOC), surface-active substances (SAS), reduced sulfur species (RSS), phyto- and zooplankton have been investigated in water column of the Rogoznica Lake. During the thermohaline stratification (spring and summer), the surface water is well-oxygenated while anoxia is occurring in the bottom layer. Anoxic deep water is characterized by high concentrations of RSS (up to 10^{-3} M, mainly in the form of sulfide); nutrients (NH_4^+ , up to 150 μM ; PO_4^{3-} , up to 22 μM ; SiO_4^{4-} , up to 400 μM) and DOC (up to 6 mg/l) as a result of the pronounced remineralization of allochthonous organic matter produced in the surface water. The depth position of anoxic water layer changes seasonally and is greatly influenced by rainfall, the influence of which is visible from decreased salinity in deeper layers as well. As a result of autumn/winter mixing, bottom water rich with nutrients is coming to the surface, supporting new phytoplankton and oxygen productions. Natural eutrophication of the lake is strongly influenced by nutrient recycling under anaerobic conditions. Turnover of lake water layers in September 1997 occurred so quickly that it resulted in the appearance of total anoxia and sulfide presence throughout the water column. The aerobic flora and fauna died and added to the oxygen demand and the production of nutrients. Those long-term datasets help in recognizing the general trend from unique cases, such as the anoxic event in 1997, which was related to anthropogenic eutrophication. (c) 2004 Elsevier B.V. All rights reserved.

137: M. P. Ciria, M. L. Solano and P. Soriano,. 2005. Role of macrophyte *Typha latifolia* in a constructed wetland for wastewater treatment and assessment of its potential as a biomass fuel. *Biosystems Engineering* 4(92): 535-544.

Abstract: In the last decade, constructed wetlands have been gaining in popularity as a reduced cost and low maintenance technology for treating wastewater from small urbanised areas. In these wetlands at the same time that pollutant removal from wastewater occurs, great quantities of biomass are produced. As according to some authors, plants must be harvested for the most effective removal of pollutants, large amount of biomass would be available for different uses. Although different solutions have been proposed (to transform it into compost or feed supplements for animals), the biomass potential for fuel production has been neglected. Therefore, the objectives of this work were focused to the study of the suitability of the macrophyte *Typha latifolia* produced in a wetland as a fuel. Main goals were: (1) to assess the role of the macrophyte, in the removal of biological oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), nitrogen, phosphorous and pathogens from raw municipal wastewater; and (2) to determine the thermochemical characterisation of the biomass produced in order to examine the suitability of the biomass as a fuel. The constructed wetland consisted of two beds, of 40 m² each with gravel as the supporting medium. The hydraulic application rate was 50 mm day⁻¹. One of the beds was planted with cattail (*Typha latifolia*) and the other one was used as an unplanted control bed. With regard to wastewater treatment efficacy, the results obtained agree with the important role of macrophytes for maintaining the wetlands treatment capability, particularly for systems with high organic matter and ammonia-N content. Due to the high biomass yields obtained in the planted bed, and to the thermal behaviour of both cattail biomass and their ash, the utilisation of cattail biomass as fuel in thermochemical processes could be recommended. (c) 2005 Silsoe Research Institute. All rights reserved Published by Elsevier Ltd.

138: G. Clarke, M. Kernan, A. Marchetto, S. Sorvari and J. Catalan,. 2005. Using diatoms to assess geographical patterns of change in high-altitude European lakes from pre-industrial times to the present day. *Aquatic Sciences* 3(67): 224-236.

Abstract: Baseline and historical environmental data are sparse in high-altitude regions. Diatom assemblages preserved in lake sediment records can, however, provide proxy data of past environmental and biological conditions. Sediment cores were retrieved from 209 high altitude lakes from 11 countries in Europe. Diatoms were extracted and counted from surface-sediment samples and sediments representing pre-industrial conditions. Regional changes in diatom assemblages covering at least the last c. 150 years are discussed and quantified using ordination techniques and dissimilarity indices. Distinct changes in diatom composition are identified and regional patterns highlighted, with two lake regions showing particularly large changes in diatom composition (Central Swiss Alps and the Pyrenees). Several driving mechanisms that might have caused the changes in the diatom community are discussed. Pre-industrial and present-day lake-water pH are inferred from the diatom assemblages and their prediction accuracy compared to contemporary water-chemistry measurements for each lake. Regional pH changes are minimal with no lake region exceeding 0.27 pH units of change in the period covering the last c. 150 years. The majority of lakes studied show an increase in planktonic diatom species over the period covering the past c. 150 years. We hypothesise that changes in the ratio of planktonic to non-planktonic diatoms within the study lake-regions are related to changes in climate and to associated changes in nutrients, ice-cover and erosion caused by climate warming.

139: C. Claudia Pahl-Wostl,. 2005. Information, public empowerment, and the management of urban watersheds..
Environmental Modelling & Software (20): 457-467.

There is no abstract for this article.

140: J. M. Clemente, N. Mazzeo, J. Gorga and M. Meerhoff,. 2005. Succession and collapse of macrozoobenthos in a subtropical hypertrophic lake under restoration (Lake Rodo, Uruguay). *Aquatic Ecology* 4(39): 455-464.

Abstract: We studied the succession patterns of the benthic community following a whole-lake restoration experiment in a subtropical hypertrophic lake (Lake Rodo, 34 degrees 55' S 56 degrees 10' W, Montevideo, Uruguay). The restoration measures involved diversion of the main inlet and removal of upper 1-m sediment and biomanipulation of the fish community. Between January 1997 and November 1999, we sampled sediments seasonally to analyse changes in benthos in relation to other abiotic and biotic characteristics of the system. The benthic community of the lake was composed of three families and nine genera. The maximum density (646 ind m⁻²), as well as the maximum taxonomic richness (six), were observed 1 month after the lake was refilled. Since 1998, the benthic abundance decreased considerably and continuously and a total absence of benthic organisms was registered by the end of the year. The low abundance of macroinvertebrates during 1997 could be explained by the food preferences of the dominant fish species, and the high fish biomass at the beginning of the biomanipulation process. However, the most relevant physico-chemical temporal patterns were the increase of organic matter and nutrients in the sediment and the fluctuations of oxygen and nitrate in the deepest layer of the water column. The disappearance of benthos was related to these temporal changes. These results stress the importance of the increase of organic matter for the changes in the physicochemical environment, and its importance in the benthic succession and possible collapse. We suggest that in hypertrophic lakes, the effects of organic matter enrichment in the sediment can be even more relevant than fish predation in shaping the zoobenthos.

141: J. M. Cohen, T. M. Samocha, J. M. Fox, R. L. Gandy and A. L. Lawrence,. 2005. Characterization of water quality factors during intensive raceway production of juvenile *Litopenaeus vannamei* using limited discharge and biosecure management tools. *Aquacultural Engineering* 3-4(32): 425-442.

Abstract: Disease epizootics have negatively affected production and expansion of the shrimp culture industry. This, along with environmental concerns regarding limited water resources and contamination of receiving streams, has caused the industry to investigate more sustainable and biosecure management practices. A study was conducted to evaluate the effect of limited water exchange on water quality, growth and survival of the Pacific white shrimp *Litopenaeus vannamei* postlarvae (PL) in greenhouse-enclosed raceways. Concentrations of $\text{NH}_4\text{-N}$ did not exceed 2.0 mg l^{-1} during this period; whereas, $\text{NO}_2\text{-N}$ exceeded 26.4 mg l^{-1} , indicating assimilation of primary amines by primary productivity. Periodic removal of suspended solids by a common pressurized sand filter and injection of oxygen into culture water resulted in high-survival rates for both raceways (97.5 and 106.0%) with an average biomass yield of $4.29 \pm 0.06 \text{ kg m}^{-3}$. Shrimp samples collected during the nursery trial and at harvest showed no signs of bacterial or viral pathogen infections. (c) 2004 Elsevier B.V. All rights reserved.

142: E. Conde, M. Cardenas, A. Ponce-Mendoza, M. L. Luna-Guido, C. Cruz-Mondragon and L. Dendooven,. 2005. The impacts of inorganic nitrogen application on mineralization of C-14-labelled maize and glucose, and on priming effect in saline alkaline soil. *Soil Biology & Biochemistry* 4(37): 681-691.

Abstract: Organic matter dynamics and nutrient availability in saline alkaline soil of the former lake Texcoco will determine the success of a planned reforestation program. Uniformly labelled C-14-maize (MAI-treatment) and glucose (GLU-treatment) with or without 200 mg NH_4^+ - N kg^{-1} soil (MAI-N treatment and GLU-N treatment, respectively) were added to soils with electrolytic conductivity (EC) 56 dS m^{-1} (soil A) and 12 dS m^{-1} (soil B) to investigate the importance of N availability on decomposition of organic material. Production of CO_2 and $(\text{CO}_2)\text{-C-14}$ and inorganic N dynamics were monitored. The amount of C-14-glucose mineralized increased 1.8-times in the soil A, but had no effect in the soil B when 200 mg NH_4^+ - N kg^{-1} soil was added, while the amount of C-14-maize mineralized increased 1.7 and 1.3-times when 200 NH_4^+ - N kg^{-1} soil was added in the soils A and B, respectively. Application of NH_4^+ increased priming effect 3.7-times in the MAI-treatment of the soil A and 3.4-times in the GLU-treatment, while in the soil B the increase of priming effect was 4.1-times in the MAI-treatment and 3.7-times in the GLU-treatment. Of the 200 mg NH_4^+ - N kg^{-1} added to both soils less than 10 mg $\text{NH}_3\text{-N}$ kg^{-1} was volatilized within one day, while 22 and 44 mg NH_4^+ - N kg^{-1} soil was fixed on the soil matrix in the soil A and the soil B, respectively. Therefore more than 100 mg NH_4^+ - N kg^{-1} was immobilized into the microbial biomass within the first day. Concentration of nitrite (NO_2^-) increased sharply in all the treatments of soil A at the onset of the incubation followed by a decrease. A similar pattern was observed in the GLU-N and MAI-N treatments of the soil B, but not in the other treatments. A decrease in concentration of NO_3^- was observed in both soils followed by an increase in the MAI-N and GLU-N treatments of the soil B. It was found that application of NH_4^+ had a stimulating effect on the decomposition of maize and glucose, and on the priming effect, while as

143: J. D. Conroy and D. A. Culver,. 2005. Do dreissenid mussels affect Lake Erie ecosystem stability processes?. American Midland Naturalist 1(153): 20-32.

Abstract: Ecosystem stability processes such as constancy, resilience and persistence are important, but often neglected, topics of invasive species research. Here we consider how invasive dreissenid mussels affect ecosystem stability processes in Lake Erie through both consumptive and excretory processes rising the stability landscape heuristic (Gunderson, 2000). Consumption of phytoplankton by dreissenid mussels adds complexity to the system and potentially slows energy transfer from lower to higher trophic levels decreasing system constancy and lowering system resiliency. Excreting soluble waste products at low nitrogen to phosphorus ratios exacerbates these impacts on stability processes because low nutrient ratios favor growth of cyanobacterial blooms, less preferred Food of zooplankton, further decreasing the transfer of energy from lower to higher trophic levels. We also provide evidence for recent changes in Lake Erie's stability landscape including a return towards eutrophy.

144: J. D. Conroy, W. J. Edwards, R. A. Pontius, D. D. Kane, H. Y. Zhang, J. F. Shea, J. N. Richey and D. A. Culver,. 2005. Soluble nitrogen and phosphorus excretion of exotic freshwater mussels (*Dreissena* spp.): potential impacts for nutrient remineralisation in western Lake Erie. *Freshwater Biology* 7(50): 1146-1162.

Abstract: 1. Recent increases in phytoplankton biomass and the recurrence of cyanobacterial blooms in western Lake Erie, concomitant with a shift from a community dominated by zebra mussels (*Dreissena polymorpha*) to one dominated by quagga mussels (*D. bugensis*), led us to test for differences in ammonia-nitrogen and phosphate-phosphorus excretion rates of these two species of invasive molluscs. 2. We found significant differences in excretion rate both between size classes within a taxon and between taxa, with zebra mussels generally having greater nutrient excretion rates than quagga mussels. Combining measured excretion rates with measurements of mussel soft-tissue dry weight and shell length, we developed nutrient excretion equations allowing estimation of nutrient excretion by dreissenids. 3. Comparing dreissenid ammonia and phosphate excretion with that of the crustacean zooplankton, we demonstrated that the mussels add to nitrogen and phosphorus remineralisation, shortening nitrogen and phosphorus turnover times, and, importantly, modify the nitrogen and phosphorus cycles in Lake Erie. The increased nutrient flux from dreissenids may facilitate phytoplankton growth and cyanobacterial blooms in well-mixed and/or shallow areas of western Lake Erie.

145: D. L. Correll,. 2005. Principles of planning and establishment of buffer zones. Ecological Engineering 5(24): 433-439.

Abstract: Good management of the uplands is essential and effective buffer zones along the streams draining the basin will complete the task of water quality protection. Most basin drainage moves through the riparian zones of first- and second-order headwaters streams. It is important to have continuous buffers on both sides of these streams. For larger streams, protect the flood plains. Several zones of buffer vegetation are most effective. A narrow grass strip at the upland edge traps suspended particulates and phosphorus. A wider zone of woody vegetation traps nitrate, and both cools and provides natural organic matter to the receiving waters. Contour the buffer surface to avoid concentrated storm flows and periodically remove sediment berms that develop. For a completely degraded riparian zone, it is essential to provide soils of the right porosity and organic carbon content. Sub-soils need to be permeable and to have a reasonable groundwater retention time. High organic carbon is required to develop a low redox potential. Provide short-term protection from erosion. Only add native species. Sometimes, exotic plants get established and must be eradicated. Fence livestock out. Control excessive activity by wild ungulates, voles, and beaver. (c) 2005 Published by Elsevier B.V.

146: J. F. Costelloe, J. Powling, J. R. W. Reid, R. J. Shiel and P. Hudson,. 2005. Algal diversity and assemblages in arid zone rivers of the Lake Eyre Basin, Australia. *River Research and Applications* 2-3(21): 337-349.

Abstract: The responses of algal assemblages in and zone rivers to flow events, drying and water quality changes are fundamental to our understanding of these unregulated rivers. We studied planktonic and other algae, identified to genus, in three rivers in the Lake Eyre Basin. where summer-autumn floods typically occur on an annual basis. A moderately diverse algal flora was discovered with a total of 118 genera, containing at least 237 taxa, in seven phyla. Algal diversity was found to be highest during, or soon after flood events of varying sizes and in the summer following a large flood in the previous flood season. We suggest that the combination of germination of algae from channel and floodplain sediments and the transport of algae from aquatic refuges during flood events resulted in the observed increases in diversity. In addition, nutrient influxes associated with previous large floods, interact with the increase in temperature in the subsequent summer to provide optimum conditions for high algal production and, in some sites, high diversity. Multivariate analyses found that salinity was a significant driver of assemblage composition but only explained a small portion of the variance in generic richness. Within phyla, assemblage richness within the Chlorophyta and Euglenophyta showed a weak, but significant, negative correlation with increasing salinity, while in the Cyanophyta and Bacillariophyta richness was not significantly correlated because both latter groups contained salt-tolerant taxa. Copyright (c) 2005 John Wiley T Sons, Ltd.

147: M. F. Coveney, E. F. Lowe, L. E. Battoe, E. R. Marzolf and R. Conrow,. 2005. Response of a eutrophic, shallow subtropical lake to reduced nutrient loading. *Freshwater Biology* 10(50): 1718-1730.

Abstract: 1. Lake Apopka (FL, U.S.A.) was subjected to decades of high nutrient loading from farms developed in the 1940s on converted riparian wetlands. Consequences included perennially high densities of cyanobacteria, low water transparency, elimination of submerged vegetation, modified fish community, and deposition of nutrient-rich, flocculent sediments. 2. Initial steps were taken to reduce phosphorus (P) loading. Through strengthened regulation and purchase of farms for restoration, external P loading was reduced on average from 0.56 to 0.25 g P m⁻² year⁻¹ (55%) starting in 1993. The P loading target for the lake is 0.13 g P m⁻² year⁻¹. 3. For the first 6 years of P loading reduction the annual sedimentation coefficient (sigma) averaged 13% less than the prior long-term value (0.97 versus 1.11 year⁻¹). The sedimentation coefficient, sigma, was lower in the last 3 years of the study, but this period included extreme low-water conditions and may not be representative. Annual sigma was negative (net P flux to the water column) only 1 year. 4. Wind velocity explained 43% of the variation in sigma during the period before reductions in total phosphorus (TP) concentration of lake water, but this proportion dropped to 6% after TP reductions. 5. Annual mean TP concentrations differed considerably from values predicted from external loading and hydraulic retention time using the Vollenweider-Organization for Economic Co-operation and Development relationship. Reductions in lake water TP concentration fit model predictions better when multiyear (3-year) mean values were used. 6. Evidence available to date indicates that this shallow, eutrophic lake responded to the decrease in external P loading. Neither recycling of sediment P nor wind-driven resuspension of sediments prevented improvements in water quality. Reductions in TP concentration were evident about two TP-resident times (2 x 0.9 year) after programmes began to reduce P loading. Improvements in concentrations

148: M. F. Coveney, E. F. Lowe, L. E. Battoe, E. R. Marzolf and R. Conrow,. 2005. Response of a eutrophic, shallow subtropical lake to reduced nutrient loading. (vol 50, pg 1718, 2005). Freshwater Biology 12(50): 2167-2167.

There is no abstract for this article.

149: D. K. Crigger, G. A. Graves and D. L. Fike,. 2005. Lake Worth Lagoon conceptual ecological model. Wetlands 4(25): 943-954.

Abstract: The Lake Worth Lagoon is a major estuarine water body located in Palm Beach County, Florida whose remaining natural resources need to be protected. The lagoonal ecosystem has been stressed through the past one hundred years due to many anthropogenic influences. Altered hydrology of the system allows massive freshwater discharges into the lagoon, which exit via two ocean inlets and influence continental reef systems. These discharges carry large influxes of nutrients, suspended and dissolved organic matter, contaminants, and toxins into the lagoon, affecting the flora and fauna. Additional pressures in this urbanized coastal area include boating and fishing pressures, as well as loss of natural habitat through physical alterations to the system. A conceptual ecological model of the cause-and-effect relationships of flora and fauna to human-induced and natural conditions within the system was developed. The model consists of ecosystem external drivers and ecological stressors, ecological attributes, and ecological effects, and presents research hypotheses, including the effects of altered volume, timing and distribution of fresh water relative to seagrasses, macroinvertebrates, salinity, fishes, nutrients, toxins, suspended solids, and dissolved organic loads that will assist in the development of a quantitative hydrodynamic model for this system.

150: W. F. Cross, J. P. Benstead, P. C. Frost and S. A. Thomas,. 2005. Ecological stoichiometry in freshwater benthic systems: recent progress and perspectives. *Freshwater Biology* 11(50): 1895-1912.

Abstract: 1. Ecological stoichiometry deals with the mass balance of multiple key elements [e.g. carbon (C), nitrogen (N), phosphorus (P)] in ecological systems. This conceptual framework, largely developed in the pelagic zone of lakes, has been successfully applied to topics ranging from population dynamics to biogeochemical cycling. More recently, an explicit stoichiometric approach has also been used in many other environments, including freshwater benthic ecosystems. 2. Description of elemental patterns among benthic resources and consumers provides a useful starting point for understanding causes of variation and stoichiometric imbalance in feeding interactions. Although there is considerable overlap among categories, terrestrially-derived resources, such as wood, leaf litter and green leaves have substantially higher C : nutrient ratios than other resources of both terrestrial and aquatic origin, such as periphyton and fine particulate organic matter. The elemental composition of these resources for benthic consumers is modulated by a range of factors and processes, including nutrient availability and ratios, particle size and microbial colonisation. 3. Among consumers in benthic systems, bacteria are the most nutrient-rich, followed (in descending order) by fishes, invertebrate predators, invertebrate primary consumers, and fungi. Differences in consumer C : nutrient ratios appear to be related to broad-scale phylogenetic differences which determine body size, growth rate and resource allocation to structural body constituents (e.g. P-rich bone). 4. Benthic consumers can influence the stoichiometry of dissolved nutrients and basal resources in multiple ways. Direct consumption alters the stoichiometry of food resources by increasing nutrient availability (e.g. reduced boundary layer thickness on substrata) or through removal of nutrient-rich patches (e.g. selective feeding on fungal patches within leaf litter). In addition, consumers alter the stoichiometry of resource

151: W. F. Cross, B. R. Johnson, J. B. Wallace and A. D. Rosemond,. 2005. Contrasting response of stream detritivores to long-term nutrient enrichment. *Limnology and Oceanography* 6(50): 1730-1739.

Abstract: We examined growth and production responses of two dominant stream detritivores (chironomids and *Tallaperla* spp. stoneflies) at opposite ends of the "slow-fast" life-history continuum and with distinct feeding characteristics (i.e., consumption of fine particulate organic matter vs. leaf litter) to a 2-yr experimental nutrient enrichment of a headwater stream. Enrichment had large positive effects (similar to 50% increase) on chironomid growth rates but no effects on those of *Tallaperla* spp. On an areal basis, enrichment had a large positive effect on chironomid production (similar to 183% increase) but no detectable effect on the production of *Tallaperla* spp. When production data were examined on a per gram food basis, enrichment had an apparent positive effect on the production of both chironomids and *Tallaperla* spp. Together, these results suggest that nutrient-induced changes to organic matter quality had consistent and substantial positive effects on short-lived chironomids, but effects were limited for longer-lived stoneflies. The lack of a system-wide effect on *Tallaperla* spp. may have been due to nutrient-induced reductions in leaf litter quantity, despite increases in litter quality. Our results indicate that species-specific characteristics such as life span and dominant food type may be important in determining population- and community-level responses of consumers to nutrient enrichment of detritus-based aquatic ecosystems.

152: L. O. Crossetti and C. E. D. Bicudo,. 2005. Structural and functional phytoplankton responses to nutrient impoverishment in mesocosms placed in a shallow eutrophic reservoir (Garcas Pond), Sao Paulo, Brazil. *Hydrobiologia* (541): 71-85.

Abstract: Experiments were performed in mesocosms placed in a shallow eutrophic reservoir for the purpose of testing a nutrient removal technique as an eutrophication reduction method. Garcas Pond is in the Parque Estadual das Fontes do Ipiranga Biological Reserve, located in the southeastern part of the Municipality of Sao Paulo (Sao Paulo State). Three different treatments were designed and each was conducted within two enclosures (closed systems) containing 360 l of water. Mesocosms built with polyethylene bags and PVC pipes were attached to the reservoir bottom. Treatment dilutions were made by using different proportions of pond and oligotrophic tributary water, following Carlson's trophic state index modified by Toledo and collaborators. Dilutions constituted the oligo-, meso-, and eutrophic treatments. Ten abiotic and nine biological variables were simultaneously studied over 31 days. Species richness, diversity, evenness, and dominance are discussed. Dissolved oxygen concentration decrease was observed in all treatments during the entire study period, whereas ammonium and free CO₂ values increased, indicating decomposition process presence in all treatments. Nutrient impoverishment induced P limitation in all treatments during most of the study period, a fact that, considered together with the free CO₂ concentration increase, low alkalinity values, and pH reduction throughout the period clearly indicated a photosynthetic activity decrease. Confinement and nutrient dilution led to changes in floristic composition as well as in phytoplankton biomass in all treatments. The initial community mainly represented by R- and S-strategists (*Planktothrix*, *Cylindroperniopsis* and *Microcystis*) was gradually replaced by C-strategists (*Cryptomonas* spp., *Chlorococcales* in general). Characteristics of the initial succession phases were observed in all treatments. Thus, the community was first inhabited by fast growing species but no important biomass contribution of size fractions was

153: D. J. Crossman, J. H. Choat and K. D. Clements,. 2005. Nutritional ecology of nominally herbivorous fishes on coral reefs. *Marine Ecology-Progress Series* (296): 129-142.

Abstract: Nominally herbivorous acanthurids (surgeonfishes) and scarids (parrotfishes) have often been considered a 'homogeneous' functional group that consumes and digests algae. Recent work demonstrates that many of these fishes consume detritus. The objective of this study was to investigate the composition of dietary nutrients targeted by these and other fishes in terms of feeding behaviour, diet and short chain fatty acids (SCFA). We undertook a nutritional analysis of a range of species including detritivores, algivores, omnivores and planktivores from north eastern Australia. We calculated assimilation efficiencies for total protein amino acids (TAA), carbohydrate and lipid, and measured TAA in gut fluid along the intestine. Nutrients were assimilated similarly to their dietary proportions, with planktivores assimilating a high proportion of TAA, a moderate proportion of lipid and little carbohydrate. Omnivores assimilated moderate proportions of TAA and carbohydrate, and a low proportion of lipid. Algivores assimilated a low proportion of TAA and lipid, but a high proportion of carbohydrate. Detritivorous scarids and acanthurids differed significantly from algivores, assimilating a high proportion of TAA, a low proportion of carbohydrate and a moderate proportion of lipid. TAA levels in gut fluid of all species were highest in the anterior and lowest in the posterior intestine. Gut segments with highest TAA values were compared between dietary groups and followed a similar trend to TAA assimilation. Planktivores had high concentrations of TAA, while omnivores had intermediate, and algivores the lowest, concentrations. The highest gut fluid TAA concentrations were found in detritivorous scarids and acanthurids, and were significantly higher than in algivores. A significant negative correlation was found between anterior intestinal fluid TAA and posterior intestinal SCFA values. Detritivores had the highest levels of TAA but the lowest levels of SCFA. Planktivorous spec

154: B. C. Crump and J. E. Hobbie,. 2005. Synchrony and seasonality in bacterioplankton communities of two temperate rivers. *Limnology and Oceanography* 6(50): 1718-1729.

Abstract: The bacterioplankton community composition (measured with denaturing gradient gel electrophoresis of 16S ribosomal DNA [rDNA]) of two nonintersecting temperate rivers was nearly identical and changed synchronously over 2.5 yr, suggesting that intrinsic controls on bacteria were similar in the two rivers and that seasonal changes were driven by extrinsic factors such as climate. Most potential controls on community composition also exhibited synchrony; these included bacterial production rate (leucine incorporation), water temperature, river flow rate, and a suite of chemical measurements. Temperature and river flow rate were the best predictors of temporal patterns in diversity. However, diversity patterns also correlated with bacterial production and concentrations of dissolved organic nitrogen and nitrate, suggesting that diversity is directly or indirectly influenced by complex seasonal shifts in environmental conditions. Winter and summer communities were somewhat predictable over 3 yr, although these communities were not identical. Two polymerase chain reaction (PCR)-amplified clone libraries of 16S rDNA, constructed with summer samples from each river, were not significantly different and contained typical freshwater bacterioplankton of the beta-Proteobacteria, Bacteroidetes, and Actinobacteria, including members of five new freshwater bacterioplankton clusters. However, libraries also included several phylotypes related to bacteria from soil and sediment, indicating the potential importance of allochthonous organisms in river diversity.

155: C. A. da Silva, S. Train and L. C. Rodrigues,. 2005. Phytoplankton assemblages in a Brazilian subtropical cascading reservoir system. *Hydrobiologia* (537): 99-109.

Abstract: Variations in the structure and dynamics of a phytoplankton community were determined during two periods in 2001, along five cascading reservoirs of the Iguacu River, Parana State (Brazil). The vertical dynamics of the phytoplankton was related to underwater light availability and the water column-mixing regime. Correlations between physical and chemical variables and phytoplankton abundance were evaluated by Canonical Correspondence Analysis (CCA). No significant cascading effect throughout the serial reservoirs was obtained. Thus, the main factor affecting the structure of the phytoplankton assemblages of each reservoir was the hydrodynamic pattern. The instability of the water column during the winter favored the development of R-strategist species such as *Aulacoseira granulata*, *Urosolenia longiseta* and *U. eriensis* in most reservoirs. In the period of the highest hydraulic stability and temperature, the greatest contribution to biomass came from Cyanophyceae S-strategists such as *Aphanocapsa* sp.l, *Anabaena planctonica* and *A. crassa*. The phytoplanktonic associations recorded were important indicators of the environmental conditions of these reservoirs.

156: E. M. D'Angelo,. 2005. Phosphorus sorption capacity and exchange by soils from mitigated and late successional bottomland forest wetlands. *Wetlands* 2(25): 297-305.

Abstract: A central tenet of wetland mitigation is that replacement wetlands can sequester nutrients and perform other functions at the same level as natural wetlands. This study evaluated phosphorus (P) sorption capacity and P exchange in flooded soil microcosms obtained from eight early successional (ES) mitigated and eight late successional (LS) bottomland forest wetlands in western Kentucky, USA. The LS soils had three times greater capacity to remove and retain soluble inorganic P than ES soils, which was mostly due to higher amounts of amorphous aluminum (A1) oxides (oxalate extractable), organically-bound A1 (CuCl₂ extractable), and organic carbon in LS soils. Phosphorus exchange rates between the soil and water column were not significantly different in LS and ES microcosms, but rates in both systems were strongly related to the molar ratio of Mehlich III extractable P to A1 + Fe in the soil ($r^2=0.64$). Relationships between P sorption/exchange and organic C, Mehlich III- and oxalate-extractable forms of P, Al, and Fe determined in this study could be useful for (i) identifying suitable mitigation sites that would be P sinks rather than P sources to the water column and (ii) determining replacement ratios that would fairly compensate for P retention capacity losses caused by destruction/alteration of Kentucky bottomland hardwood forest wetlands.

157: F. Darchambeau, I. Thys, B. Leporcq, L. Hoffmann and J. P. Descy,. 2005. Influence of zooplankton stoichiometry on nutrient sedimentation in a lake system. *Limnology and Oceanography* 3(50): 905-913.

Abstract: We explored rates and stoichiometry (C: N: P ratios) of sinking particles in a temperate reservoir during a 2-yr period. Plankton was sampled weekly, and a sediment trap placed below the metalimnion collected sinking particles. There were no significant relationships between the stoichiometry of entrapped material and seston or zooplankton stoichiometry. However the differences in the entrapped C: P and N: P ratios between consecutive trap samplings were negatively correlated with the time variations of the zooplankton C: P and N: P ratios. Zooplankton C: P and N: P ratios were positively correlated with the percentage of copepod biomass in total zooplankton biomass > 250 μ m and negatively correlated with the percentage of cladocerans. Zooplankton biomass > 250 μ m reduced the fraction of N and P primary production lost to sinking (export ratio). The residuals of the N export ratio versus zooplankton biomass relationship were negatively correlated with the zooplankton N: P ratio, whereas there was a positive relationship with the residuals of the P export ratio relationship. These observations support the hypothesis that the regulation of elemental homeostasis in the herbivorous zooplankton consumers occurs at least partly at the assimilation/egestion level. Elements ingested in excess-P for the herbivorous copepods and N for many cladocerans-are concentrated into sinking feces, whereas the deficient elements are captured into biomass.

158: A. Darracq and G. Destouni,. 2005. In-stream nitrogen attenuation: Model-aggregation effects and implications for coastal nitrogen impacts. Environmental Science & Technology 10(39): 3716-3722.

Abstract: Eutrophication problems in coastal and marine waters worldwide emphasize the significance, for the Scientific community as well as the whole society, of relevant quantification of catchment-scale nitrogen transport from land to coast. Different catchment-scale nitrogen budget models use, and base management recommendations on, quite different process representations of and spatial resolution approaches to in-stream nitrogen attenuation. We compare three different spatial resolution approaches to modeling nitrogen loss rates in streams of the same drainage basin. Results show that commonly used spatial model aggregation may lead to artificial decrease of calibrated nitrogen loss rates with increasing stream depth (or flow), in addition to any such dependences that may prevail in independently measurable reality. Coastal nitrogen impact predictions and practical management implications of large-scale model aggregation of nitrogen attenuation rates may further differ considerably from those based on rates from finer resolution modeling or independent measurements.

159: A. Darracq, F. Greffe, F. Hannerz, G. Destouni and V. Cvetkovic,. 2005. Nutrient transport scenarios in a changing Stockholm and Malaren valley region, Sweden. Water Science and Technology 3-4(51): 31-38.

Abstract: Norrstrom catchment, west of Stockholm, covers most of the Malaren valley. Provision of drinking water from Lake Malaren is an absolute precondition for continued growth in the region. Stockholm County's population is expected to increase by 600,000 people before 2030. Current climate change predictions anticipate significant temperature and precipitation increases. We implement the PolFlow model embedded in PCRaster for quantifying water and substances fluxes on the catchment scale over a 30-year time horizon. We formulate scenarios for changes in water quality and quantity due to climate change and population development. Results indicate a mild impact from climate change on surface flow rates but substantial effects on sub-surface residence times. Population development slightly affects nutrients loads. Using source apportionment and sensitivity analysis, we identify a number of critical parameters/processes to be further studied, in order for future results to be more reliable and usable in a water resources management context.

160: B. Das, R. D. Vinebrooke, A. Sanchez-Azofeifa, B. Rivard and A. P. Wolfe,. 2005. Inferring sedimentary chlorophyll concentrations with reflectance spectroscopy: a novel approach to reconstructing historical changes in the trophic status of mountain lakes. *Canadian Journal of Fisheries and Aquatic Sciences* 5(62): 1067-1078.

Abstract: Reflectance spectroscopy has made it possible to rapidly and nondestructively assess the chlorophyll content of plants and natural waters. However, to date this approach has not been applied to chlorophyll and chlorophyll derivatives preserved in lake sediments. Here, we explore the relationships between visible-near-infrared spectral properties of lake sediments and measured pigment concentrations for lakes that have been exposed recently to anthropogenic nitrogen deposition. Down-core decreases in pigment concentrations and changes in reflectance properties effectively chronicle increases in whole-lake primary production since 1950. Specifically, reflectance spectra of sediments from four alpine lakes in Rocky Mountain National Park (Colorado Front Range, USA) preserve salient troughs near 675 nm that covary in magnitude with concentrations of chlorophyll a and associated pheopigments. The area of the trough in reflectance between 600 and 760 nm best explains the sum of total chlorophyll a and its derivatives ($r^2 = 0.82$, $n = 23$, $P < 0.01$). This result suggests that chlorophyll a preserved in lake sediments can be remotely sensed using a simple index derived from reflectance spectroscopy, thus providing a new paleolimnological strategy for rapid exploratory assessments of changing lake trophic status.

161: M. Dasey, N. Ryan, J. Wilson, G. McGregor, L. Fabbro, B. A. Neilan, B. P. Burns, H. Kankaanpaa, L. F. Morrison, G. A. Codd, D. Rissik and L. Bowling,. 2005. Investigations into the taxonomy, toxicity and ecology of benthic cyanobacterial accumulations in Myall Lake, Australia. *Marine and Freshwater Research* 1(56): 45-55.

Abstract: Large benthic accumulations of cyanobacteria occur in sheltered embayments within Myall Lake, New South Wales, Australia. The lake is shallow, with the entire bottom within the euphotic zone, and it is generally considered pristine, having low nutrient concentrations. The accumulations are highly organic and contain a mix of species mainly from the order Chroococcales, with two forms of Aphanothece being dominant. However polymerase chain reaction (PCR) analysis indicates a close similarity to *Microcystis flos-aquae*. The cells appear to lack aerotopes and form sticky mucilaginous amalgamations, which may enhance their benthic habit. Although Chroococcales also dominate the planktonic cyanobacterial community, the benthic species are seldom, if ever, found entrained within the water column. Some hepatotoxicity was indicated by mouse bioassay, protein phosphatase inhibition assay, enzyme-linked immunosorbent assay (ELISA) for microcystins, PCR and by chromatographic evidence for a microcystin. Ecological aspects of the distribution, gross morphology of the organisms and management implications for recreational water-users are discussed.

162: C. A. Davis, L. M. Smith and W. C. Conway,. 2005. Lipid reserves of migrant shorebirds during spring in Playas of the Southern Great Plains. Condor 2(107): 457-462.

Abstract: Inland-migrating shorebirds rely on wetlands as stopover sites to replenish nutrient reserves. Because wetlands are spatially and temporally dynamic, shorebirds may accumulate highly variable lipid reserves. We compared lipid reserves among four shore-bird species (American Avocets [*Recurvirostra americana*], Long-billed Dowitchers [*Limnodromus scolopaceus*], Least Sandpipers [*Calidris minutilla*], and Western Sandpipers [*C. mauri*]) collected from playa wetlands in the southern Great Plains during spring 1993 and 1994. Because playas are ephemeral, we had the opportunity to examine the influence of a variable environment (a wet year and a dry year) on lipid reserves. Additionally, we examined the influence of different migration distances and strategies, and body sizes on lipid reserves. Western Sandpipers had the highest lipid reserves (41%-50%) and Dowitchers had the lowest reserves (18%). Least and Western Sandpipers had 7%-9% higher lipid reserves in the wet year than dry year. Thus, small-bodied shorebirds may be more affected by variable habitat conditions than large-bodied shorebirds because of their higher mass-specific metabolic rates.

163: S. M. Davis, D. L. Childers, J. J. Lorenz, H. R. Wanless and T. E. Hopkins,. 2005. A conceptual model of ecological interactions in the mangrove estuaries of the Florida Everglades. *Wetlands* 4(25): 832-842.

Abstract: A brackish water ecotone of coastal bays and lakes, mangrove forests, salt marshes, tidal creeks, and upland hammocks separates Florida Bay, Biscayne Bay, and the Gulf of Mexico from the freshwater Everglades. The Everglades mangrove estuaries are characterized by salinity gradients that vary spatially with topography and vary seasonally and inter-annually with rainfall, tide, and freshwater flow from the Everglades. Because of their location at the lower end of the Everglades drainage basin, Everglades mangrove estuaries have been affected by upstream water management practices that have altered the freshwater heads and flows and that affect salinity gradients. Additionally, interannual variation in precipitation patterns, particularly those caused to El Nino events, control freshwater inputs and salinity dynamics in these estuaries. Two major external drivers on this system are water management activities and global climate change. These drivers lead to two major ecosystem stressors: reduced freshwater flow volume and duration, and sea-level rise. Major ecological attributes include mangrove forest production, soil accretion, and resilience; coastal lake submerged aquatic vegetation; resident mangrove fish populations; wood stork (*Mycteria americana*) and roseate spoonbill (*Platylea ajaja*) nesting colonies; and estuarine crocodilian populations. Causal linkages between stressors and attributes include coastal transgression, hydroperiods, salinity gradients, and the "white zone" freshwater/estuarine interface. The functional estuary and its ecological attributes, as influenced by sea level and freshwater flow, must be viewed as spatially dynamic, with a possible near-term balancing of transgression but ultimately a long-term continuation of inland movement. Regardless of the spatio-temporal timing of this transgression, a salinity gradient supportive of ecologically functional Everglades mangrove estuaries will be required to maintain the integrity of the South Flor

164: S. M. Davis, E. E. Gaiser, W. F. Loftus and A. E. Huffman,. 2005. Southern marl prairies conceptual ecological model. Wetlands 4(25): 821-831.

Abstract: About 190,000 ha of higher-elevation marl prairies flank either side of Shark River Slough in the southern Everglades. Water levels typically drop below the ground surface each year in this landscape. Consequently, peat soil accretion is inhibited, and substrates consist either of calcitic marl produced by algal periphyton mats or exposed limestone bedrock. The southern marl prairies support complex mosaics of wet prairie, sawgrass (Cladium jamaicense), tree islands, and tropical hammock communities and a high diversity of plant species. However, relatively short hydroperiods and annual dry downs provide stressful conditions for aquatic fauna, affecting survival in the dry season when surface water is absent. Here, we present a conceptual ecological model developed for this landscape through scientific consensus, use of empirical data, and modeling. The two major societal drivers affecting the southern marl prairies are water management practices and agricultural and urban development. These drivers lead to five groups of ecosystem stressors: loss of spatial extent and connectivity, shortened hydroperiod and increased drought severity, extended hydroperiod and drying pattern reversals, introduction and spread of non-native trees, and introduction and spread of non-native fishes. Major ecological attributes include periphyton mats, plant species diversity and community mosaic, Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*), marsh fishes and associated aquatic fauna prey base, American alligator (*Alligator mississippiensis*), and wading bird early dry season foraging. Water management and development are hypothesized to have a negative effect on the ecological attributes of the southern marl prairies in the following ways. Periphyton mats have decreased in cover in areas where hydroperiod has been significantly reduced and changed in community composition due to inverse responses to increased nutrient availability. Plant species diversity and comm

165: J. W. Day, J. Barras, E. Clairain, J. Johnston, D. Justic, G. P. Kemp, J. Y. Ko, R. Lane, W. J. Mitsch, G. Steyer, P. Templet and A. Yanez-Arancibia,. 2005. Implications of global climatic change and energy cost and availability for the restoration of the Mississippi delta. Ecological Engineering 4(24): 253-265.

Abstract: Over the past several thousand years, inputs from the Mississippi River formed the Mississippi delta, an area of about 25,000 km². Over the past century, however, there has been a high loss of coastal wetlands of about 4800 km². The main causes of this loss are the near complete isolation of the river from the delta, mostly due to the construction of flood control levees, and pervasive hydrological disruption of the deltaic plain. There is presently a large-scale State-Federal program to restore the delta that includes construction of water control structures in the flood control levees to divert river water into deteriorating wetlands and pumping of dredged sediment, often for long distances, for marsh creation. Global climate change and decreasing availability and increasing cost of energy are likely to have important implications for delta restoration. Coastal restoration efforts will have to be more intensive to offset the impacts of climate change including accelerated sea level rise and changes in precipitation patterns. Future coastal restoration efforts should also focus on less energy-intensive, ecologically engineered management techniques that use the energies of nature as much as possible. Diversions may be as important for controlling salinity as for providing sediments and nutrients for restoring coastal wetlands. Energy-intensive pumping-dredged sediments for coastal restoration will likely become much more expensive in the future. (c) 2005 Elsevier B.V. All rights reserved.

166: P. De Clercq, Y. Arijs, T. Van Meir, G. Van Stappen, P. Sorgeloos, K. Dewettinck, M. Rey, S. Grenier and G. Febvay,. 2005. Nutritional value of brine shrimp cysts as a factitious food for *Orius laevigatus* (Heteroptera : Anthocoridae). *Biocontrol Science and Technology* 5(15): 467-479.

Abstract: Decapsulated cysts of the brine shrimp *Artemia franciscana* were assessed as a factitious food for rearing the anthocorid predator *Orius laevigatus*. Developmental and reproductive traits of *O. laevigatus* reared for a single generation on *A. franciscana* from three geographical locations or on gamma- irradiated eggs of the Mediterranean flour moth *Ephestia kuehniella* were compared. There was no effect of diet on nymphal survival but nymphal period on *E. kuehniella* eggs (12.2 days) was 0.7 - 1.6 days shorter than on the *Artemia* diets. The predator developed 0.5 - 1 day faster on cysts from San Francisco Bay (USA) than on cysts from Great Salt Lake (USA) or Macau (Brazil). Fecundity on brine shrimp cysts from different locations was similar to that on flour moth eggs (142 - 187 eggs/ female). The biochemical composition of decapsulated cysts from San Francisco Bay was compared with that of *E. kuehniella* eggs. Depending on the type of analysis, *Artemia* cysts contained higher or similar amounts of protein as compared with *E. kuehniella* eggs, but amino acid patterns were generally similar. Flour moth eggs were almost three times richer in fatty acids than brine shrimp cysts, with some marked differences in fatty acid profiles. Because nutrient imbalances in a diet may be expressed only after several generations of rearing, the predator was cultured for three consecutive generations on *A. franciscana* cysts from San Francisco Bay. In the third generation on brine shrimp cysts, nymphs took 18% longer to develop, and adults were shorted- lived and about 60% less fecund than those maintained on *E. kuehniella* eggs. Brine shrimp cysts may be used as a supplement in the mass production of *O. laevigatus* but may not be a suitable food for long- term culturing of the predator.

167: E. M. De Haas, M. H. S. Kraak, A. A. Koelmans and W. Admiraal,. 2005. The impact of sediment reworking by opportunistic chironomids on specialised mayflies. *Freshwater Biology* 5(50): 770-780.

Abstract: 1. Bioturbation, by definition, changes the structure and properties of sediments, thereby altering the environment of the bioturbator and other benthic species. In addition to the indirect effects of sediment reworking (e.g. changes in water quality), bioturbating species may also directly interfere with other species via competition. This study aims, therefore, to examine both the direct and indirect effects of sediment reworking by an opportunistic detritivore on survival and growth of a specialised mayfly species. 2. Bioturbation was imposed by adding different densities of the midge *Chironomus riparius* to clean and polluted sediments. Changes in water quality and sediment properties, and survival and growth of the mayfly *Ephoron virgo* were assessed. 3. Chironomid density had a strong negative effect on the concentrations of metals, nutrients and particles in the overlying water, but increased the penetration of oxygen into the sediment. Survival and growth of *E. virgo* were strongly reduced in the presence of chironomids. In the polluted sediment, the activity of chironomids enhanced the negative effects of pollution on *E. virgo*. In the clean sediment, inhibition of the mayfly was even more pronounced. 4. This suggests that direct disturbance by *C. riparius* was more important than indirect changes in water quality, and over-ruled the potential positive effects of improved oxygen penetration. The results indicated that the distribution of small insects, such as *E. virgo*, can be limited by bioturbating benthic invertebrates.

168: E. M. De Haas, N. Roessink, B. Verbree, A. A. Koelmans, M. H. S. Kraak and W. Admiraal,. 2005. Influence of sediment quality on the responses of benthic invertebrates after treatment with the fungicide triphenyltin acetate. *Environmental Toxicology and Chemistry* 5(24): 1133-1139.

Abstract: After decades of pollution, benthic communities in floodplain lake ecosystems are likely to be exposed to a diverse assortment of sediment-bound historical toxicants and nutrients as well as pulses of newly discharged or deposited toxicants. The aim of this study was therefore to analyze the effects of background sediment pollution on the responses of benthic invertebrates to an experimental toxic shock in a laboratory setting. Sediment from a relatively clean and a historically polluted floodplain lake located along the River Waal, a branch of the River Rhine, The Netherlands, was selected, and the fungicide triphenyltin acetate (TPT) was used as the acute stressor. Juvenile stages of the mayfly *Ephoron virgo* and the midge *Chironomus riparius* were chosen as test organisms because of their different response to sediment-bound toxicants and food quantity and quality. Our results demonstrated that the type of sediment had no effect on survival and growth of *C. riparius* when exposed to sediment-associated TPT and that *E. virgo* was more affected by sediment-associated TPT on clean sediment than on polluted sediment. For the mayfly, no cumulative response of the historical pollution and the recent toxic shock was observed. This observation is discussed in view of the variable content of organic matter, acting both as food and as sorbent, and leads to the hypothesis that a very strong sequestering of TPT in historically polluted sediment prevents expression of toxic effects.

169: I. de Vicente, V. Amores, C. Escot, A. Basanta and L. Cruz-Pizarro,. 2005. Temporal and spatial trends in the sedimentation process in a canyon-type reservoir (El Gergal, Seville, Spain). Archiv Fur Hydrobiologie 2(163): 241-257.

Abstract: The seasonal and spatial (vertical and horizontal) variations in the magnitude of sestonic fluxes and the chemical composition (C, N, P and organic matter concentrations) of entrapped material have been studied over a year on a monthly basis in El Gergal, a mesotrophic canyon-type reservoir in the south of Spain. The chemical composition of settled particles and of surficial sediment was compared in trying to elucidate the role of some relevant processes like mineralization and resuspension of unconsolidated sediment. A very clear increasing tendency in the magnitude of settling fluxes from the down-reservoir to the up-reservoir zone as a consequence of the prevailing wind direction and of water level fluctuations has been found. Vertical gradients in sestonic rates can mainly be explained by the different contribution of resuspension processes that can be ultimately related to the thermal and hydrologic regime. A comparison of the chemical composition of the total settled matter and of the surficial sediment revealed a predominantly inorganic matrix, which reflects the dominating role of inorganic allochthonous material input.

170: A. De Wever, K. Muylaert, K. Van der Gucht, S. Pirlot, C. Cocquyt, J. P. Descy, P. D. Plisnier and W. Vyverman,. 2005. Bacterial community composition in Lake Tanganyika: Vertical and horizontal heterogeneity. *Applied and Environmental Microbiology* 9(71): 5029-5037.

Abstract: Vertical and latitudinal differences in bacterial community composition (BCC) in Lake Tanganyika were studied during the dry season of 2002 by means of denaturing gradient gel electrophoresis analysis of PCR-amplified 16S RNA fragments. Dominant bands were sequenced and identified as members of the Cyanobacteria, Actinobacteria, Nitrospirae, green nonsulfur bacteria, and Firmicutes divisions and the Gamma- and Deltaproteobacteria subdivisions. The BCC in the lake displayed both vertical and latitudinal variation. Vertical changes in BCC were related to the thermal water column stratification, which influences oxygen and nutrient concentrations. Latitudinal variation was related to upwelling of deep water and increased primary production in the south of the lake. The number of bands per sample increased with bacterial production in the epilimnion of the lake, suggesting a positive diversity-productivity relationship.

171: W. F. Debusk and K. R. Reddy,. 2005. Litter decomposition and nutrient dynamics in a phosphorus enriched everglades marsh. *Biogeochemistry* 2(75): 217-240.

Abstract: A field study was conducted in a nutrient-impacted marsh in Water Conservation Area 2A (WCA-2A) of the Everglades in southern Florida, USA, to evaluate early stages of plant litter (detritus) decomposition along a well-documented trophic gradient, and to determine the relative importance of environmental factors and substrate composition in governing decomposition rate. Vertically stratified decomposition chambers containing native plant litter (cattail and sawgrass leaves) were placed in the soil and water column along a 10-km transect coinciding with a gradient of soil phosphorus (P) enrichment. Decomposition rate varied significantly along the vertical water-soil profile, with rates typically higher in the water column and litter layer than below the soil surface, presumably in response to vertical gradients of such environmental factors as O₂ and nutrient availability. An overall decrease in decomposition rate occurred along the soil P gradient (from high- to low-impact). First-order rate constant (k) values for decomposition ranged from 1.0 to 9.2 x 10⁻³ day⁻¹ (mean = 2.8 x 10⁻³ day⁻¹) for cattails, and from 6.7 x 10⁻⁴ to 3.0 x 10⁻³ day⁻¹ (mean = 1.7 x 10⁻³ day⁻¹) for sawgrass. Substantial N and P immobilization occurred within the litter layer, being most pronounced at nutrient-impacted sites. Nutrient content of the decomposing plant tissue was more strongly correlated to decomposition rate than was the nutrient content of the surrounding soil and water. Our experimental results suggest that, although decomposition rate was significantly affected by initial substrate composition, the external supply or availability of nutrients probably played a greater role in controlling decomposition rate. It was also evident that nutrient availability for litter decomposition was not accurately reflected by ambient nutrient concentration, e.g., water and soil porewater nutrient concentration.

172: U. Deil,. 2005. A review on habitats, plant traits and vegetation of ephemeral wetlands - a global perspective. *Phytocoenologia* 2-3(35): 533-705.

Abstract: Based upon a world-wide literature review and a database, which refers to 250 publications and documents about 8500 phytosociological releves, the following questions are discussed: What are the common ecological parameters for temporary wetlands and which environmental conditions offer a niche for dwarf ephemerals? Which taxa have evolved and speciated within ephemeral wetland habitats? How do the relations between relief features, local hydrology and climatic conditions change in different parts of the world? Which global patterns in flora and vegetation do occur? The review is restricted to ephemeral freshwater ecosystems with the following two properties: Above-ground plant cover is seasonal, and the habitats are water-saturated or submerged only part of the year. For a better understanding of large-scale patterns, the results of studies about small-scale zonation, variability in time (phenology and year-to-year dynamics), ecophysiology and life strategies are briefly reported. Fin

173: R. D. DeLaune, S. R. Pezeshki and A. Jugsujinda,. 2005. Impact of Mississippi River freshwater reintroduction on *Spartina patens* marshes: Responses to nutrient input and lowering of salinity. *Wetlands* 1(25): 155-161.

Abstract: Greenhouse studies using soil-plant plugs extracted from a *Spartina patens* marsh receiving diverted Mississippi River water shows that lowering of salinity and increased nutrient input associated with freshwater reintroduction into Louisiana estuaries will enhance nutrient uptake and biomass production of wiregrass (*Spartina patens*). Biomass production doubled in response to the addition of 10g N m^{-2} . A salinity-nutrient interaction was shown. Plants grown in fertilized treatments at 0 ppt had significantly greater biomass production than plants grown under fertilized treatment and 8 ppt salinity. However, a significantly greater amount of biomass was measured in both fertilized treatments (0 and 8 ppt) as compared to control. Lowering of salinity alone also stimulated plant growth. Results demonstrated that proposed reintroduction of Mississippi River water into *Spartina patens* marshes of Breton Sound should enhance plant growth and improve marsh stability.

174: B. Demirel, O. Yenigun and T. T. Onay,. 2005. Anaerobic treatment of dairy wastewaters: a review. Process Biochemistry 8(40): 2583-2595.

Abstract: Anaerobic treatment is often reported to be an effective method for treating dairy effluents. The objective of this paper is to summarize recent research efforts and case studies in anaerobic treatment of dairy wastewaters. The main characteristics of industrial dairy waste streams are identified and the anaerobic degradation mechanisms of the primary constituents in dairy wastewaters, namely carbohydrates (mainly lactose), proteins and lipids are described. Primary attention is then focused on bench-pilot-full-scale anaerobic treatment efforts for dairy waste effluents. Combined (anaerobic-aerobic) treatment methods are also discussed. Finally, areas where further research and attention are required are identified. 2005 Elsevier Ltd. All rights reserved.

175: P. J. Depetris, D. M. Gaiero, J. L. Probst, J. Hartmann and S. Kempe,. 2005. Biogeochemical output and typology of rivers draining Patagonia's Atlantic seaboard. *Journal of Coastal Research* 4(21): 835-844.

Abstract: Between June 1995 and November 1998, eight Patagonian rivers were sampled for the suspended and dissolved loads delivered to the SW Atlantic. The most important rivers (Negro and Santa Cruz) jointly deliver similar to 90% of the total Patagonian freshwater budget (similar to $60 \text{ km}^3 \text{ y}^{-1}$). Of the total sediment load (similar to $1.7 \cdot 10^{12} \text{ g y}^{-1}$), 2.8% was accounted for by particulate organic carbon (POC), 0.9% by inorganic particulate carbon (PC), 0.7% by particulate nitrogen (PN), and 0.7% by particulate phosphorus (PP). The mean dissolved organic carbon (DOC) yield was similar to $0.50 \text{ g m}^{-2} \text{ y}^{-1}$, and POC similar to $0.3 \text{ g m}^{-2} \text{ y}^{-1}$. Nitrogen is the limiting nutrient in all rivers; the mean molecular C:N:P ratio is 371:1. POC:PN ratios (4.4-10) indicate an autochthonous origin for the organic matter in suspended particulate matter (TSS). Many factors, such as proglacial oligotrophic lakes, coal-bearing strata, wetlands, aridity, as well as various human impacts, suggest a complex typology. The analysis (Euclidean distance cluster analysis) of biogeochemical variables [SiO_2 , NO_3^- , PO_4^{3-} , DOC, POC, PC, PP, PN, C:N, DOC:POC, PC:POC, POC (%)] indicates that runoff, superimposed on biogeochemical variables, plays an important role in Patagonian riverine typology: a) Low runoff rivers ($<100 \text{ mm y}^{-1}$): the Chubut, Chico, Deseado are characterized by low yields and POC:PN ratios; the Coyle River, by high DOC:POC; b) Medium discharge rivers ($100\text{-}300 \text{ mm y}^{-1}$): the Negro River has high dissolved yields and high POC(%TSS); the Colorado is distinguished by high PP and PC specific yields, and POC:PN ratio; c) High runoff rivers ($>1000 \text{ mm y}^{-1}$): Santa Cruz and Gallegos rivers, are both characterized by above-average specific yields; the Gallegos has high POC(%TSS), POC:PN and DOC:POC.

176: L. A. Derry, A. C. Kurtz, K. Ziegler and O. A. Chadwick,. 2005. Biological control of terrestrial silica cycling and export fluxes to watersheds. *Nature* 7027(433): 728-731.

Abstract: Silicon has a crucial role in many biogeochemical processes - for example, as a nutrient for marine and terrestrial biota, in buffering soil acidification and in the regulation of atmospheric carbon dioxide. Traditionally, silica fluxes to soil solutions and stream waters are thought to be controlled by the weathering and subsequent dissolution of silicate minerals(1,2). Rates of mineral dissolution can be enhanced by biological processes(3). But plants also take up considerable quantities of silica from soil solution, which is recycled into the soil from falling litter in a separate soil - plant silica cycle that can be significant in comparison with weathering input and hydrologic output(4-8). Here we analyse soil water in basaltic soils across the Hawaiian islands to assess the relative contributions of weathering and biogenic silica cycling by using the distinct signatures of the two processes in germanium/silicon ratios. Our data imply that most of the silica released to Hawaiian stream water has passed through the biogenic silica pool, whereas direct mineral - water reactions account for a smaller fraction of the stream silica flux. We expect that other systems exhibiting strong Si depletion of the mineral soils and/or high Si uptake rates by biomass will also have strong biological control on silica cycling and export.

177: J. S. Deschenes, A. Desbiens, M. Perrier and A. Kamen,. 2005. On simultaneous control of biomass and metabolite concentration in perfusion bioreactors. Dynamics of Continuous Discrete and Impulsive Systems-Series B-Applications & Algorithms (2): 663-667.

Abstract: A main problem in controlling bioprocesses is the lack of manipulated variables. Batch and fed-batch processes do not allow the bioreactor to be drained of the (often) toxic waste substances produced by the biomass. A chemostat (CSTR) only has the dilution rate as the manipulated variable, which allows a certain control over the biomass concentration with a risk, however, of instability if the dilution rate gets higher than the maximum growth rate. Perfusion processes with full biomass retention are somewhat similar to batches, as no steady-state is really obtained until biomass growth is stopped by nutrient limitations. Cell bleed is often used in perfusion processes to improve viability and prevent accumulation of dead cells. However, the idea of using the cell bleed stream as a manipulated variable for control has not previously been studied for perfusion systems. We propose here a control strategy with three degrees of freedom that can be used to control the reactor level, biomass concentration, and a metabolite concentration. We will show that maintaining these concentrations reverts to controlling the input metabolic flux of this metabolite.

178: J. P. Descy, M. A. Hardy, S. Stenuite, S. Pirlot, B. Leporcq, I. Kimirei, B. Sekadende, S. R. Mwaitega and D. Sinyenza,. 2005. Phytoplankton pigments and community composition in Lake Tanganyika. *Freshwater Biology* 4(50): 668-684.

Abstract: 1. A 2-year (2002-2003) survey of chlorophyll and carotenoid pigments is reported for two off-shore stations of Lake Tanganyika, Kigoma (Tanzania) and Mpulungu (Zambia), and from three cruises between those sites. Chlorophyll a concentrations were low (0.3-3.4 mg m⁻³) and average chlorophyll a integrated through the 100 m water column were similar for both stations and years (36.4-41.3 mg m⁻²). Most pigments were located in the 0-60 m layer and decreased sharply downward. Chlorophyll a degradation products (phaeophytins and phaeophorbides) were detected at 100 m depth, whereas carotenoids became undetectable. Temporal and seasonal variation of the vertical distribution of pigments was high. 2. The biomass of phytoplankton groups was calculated from marker pigment concentrations over the 0-100 m water column using the CHEMTAX software. On average for the study period, chlorophytes dominated in the northern station, followed by cyanobacteria T1 (type 1, or *Synechococcus* pigment type), whereas cyanobacteria T1 dominated in the south. Cyanobacteria T2 (type 2, containing echinenone), presumably corresponding to filamentous taxa, were detected in the rainy season. Diatoms (and chrysophytes) developed better in the dry season conditions, with a deep mixed layer and increased nutrient availability. Very large variation in the vertical distribution of algal groups was observed. 3. Our observations on phytoplankton composition are broadly consistent with those from previous studies. Our pigment data provide evidence for the lake-wide importance of picocyanobacteria and high interannual variation and spatial heterogeneity of phytoplankton in Lake Tanganyika, which may render difficult assessment of long-term changes in phytoplankton driven by climate change.

179: T. C. E. Dessouki, J. J. Hudson, B. R. Neal and M. J. Bogard,. 2005. The effects of phosphorus additions on the sedimentation of contaminants in a uranium mine pit-lake. Water Research 13(39): 3055-3061.

Abstract: We investigated the usefulness of phytoplankton for the removal of surface water contaminants. Nine large mesocosms (92.2 m³) were suspended in the flooded DJX uranium pit at Cluff Lake (Saskatchewan, Canada), and filled with highly contaminated mine water. Each mesocosm was fertilized with a different amount of phosphorus throughout the 35 day experiment to stimulate phytoplankton growth, and to create a range in phosphorus load (g) to examine how contaminants may be affected by different nutrient regimes. Algal growth was rapid in fertilized mesocosms (as demonstrated by chlorophyll a profiles). As phosphorus loads increased there were significant declines ($p < 0.05$) in the surface water concentrations of As, Co, Cu, Mn, Ni, and Zn. This decline was near significant for uranium ($p = 0.065$). The surface water concentrations of Ra-226, Mo, and Se showed no relationship to phosphorus load. Contaminant concentrations in sediment traps suspended at the bottom of each mesocosm generally showed the opposite trend to that observed in the surface water, with most contaminants (As, Co, Cu, Mn, Ni, Ra-226, U, and Zn) exhibiting a significant positive relationship ($p < 0.05$) with phosphorus load. Selenium and Mo did not respond to nutrient treatments. Our results suggest that phytoremediation has the potential to lower many surface water contaminants through the sedimentation of phytoplankton. Based on our results, we estimate that the Saskatchewan Surface Water Quality Objectives (SSWQO) for DJX pit would be met in approximately 45 weeks for Co, 65 weeks for Ni, 15 weeks for U, and 5 weeks for Zn. (c) 2005 Elsevier Ltd. All rights reserved.

180: I. Diadovski, M. Petrov, T. Ilkova and I. Ivanov,. 2005. A model for the Mesta River pollution assessment based on the integral indices. Chemical and Biochemical Engineering Quarterly 3(19): 291-296.

Abstract: A new conceptual model for integrated river pollution assessment is proposed. The pollution dynamics at the end of Bulgarian section of the Mesta River is investigated for estimation of the anthropogenic impact. A model for the dynamics of the integral index for the level of the stream water trophic pollution is proposed. The integral index is based on the oxygen balance, organic and nutrients loading, suspended and dissolved substances. This index was applied for assessment of the level of the trophic pollution of the Mesta River in point Hadjidimovo at the end of Bulgarian section. A modified method of time series analysis is applied.

181: M. D. Dickman, M. R. Peart and W. W. S. Yim,. 2005. Benthic diatoms as indicators of stream sediment concentration in Hong Kong. *International Review of Hydrobiology* 4(90): 412-421.

Abstract: Diatoms are photosynthetic unicellular, eukaryotic, microorganisms (algae) that are distinguished by their silicified ($\text{SiO}_2\text{-nH}_2\text{O}$) cell walls. They have often been employed to assess salinity, pH, and nutrient conditions. Our data suggest that, they may also be used to assess suspended solid levels in streams. The ratio of motile to attached benthic diatoms from five different stream sites in Hong Kong was correlated with the level of suspended solids for each of these sites. Sites with high concentrations of suspended solids had a high percentage of motile diatoms on their rocks while sites with low concentrations of suspended solids had a high percentage of attached (non-motile) diatoms on their rocks. When water carried by a stream has a high concentration of suspended solids, benthic diatoms in the stream are often covered in a layer of silt. Those diatoms that are motile are able to get on top of this silt layer while attached diatoms cannot. If the silt layer is not washed away, the attached diatoms perish and the percentage of motile diatoms increases. Thus, streams with high concentrations of suspended solids display a higher proportion of motile diatoms than do clear water streams with low concentrations of suspended solids.

182: S. Diehl, S. Berger and R. Wohrl,. 2005. Flexible nutrient stoichiometry mediates environmental influences, on phytoplankton and its resources. Ecology 11(86): 2931-2945.

Abstract: The elemental composition of plants, which affects ecosystem processes such as energy transfer to consumers and nutrient recycling, varies with the supply of nutrients and light. In contrast to most terrestrial systems, aquatic plants "compete" with abiotic light absorbents. Light supply to pelagic producers and, consequently, algal carbon to nutrient stoichiometry are therefore affected by background turbidity (light absorption by non-algal components, K-bg) and mixing depth (vertical extension of the mixed water column, z). Still, light as a dynamic variable has been neglected in models exploring the ecological consequences of flexible algal stoichiometry. In addition, there are hardly any field experiments exploring effects of light supply on planktonic systems. We present a dynamical model that accounts for the simultaneous dependence of algal production on light supply and internal algal nutrient stores and derive predictions on how a suite of state variables (algal biomass, light climate, algal nutrient stoichiometry, dissolved nutrient concentration, and nutrients in sediment) should be affected by z and K-bg. We compare these predictions with results of an enclosure experiment in a phosphorus-deficient lake, in which we manipulated z and K-bg. Algal biomass decreased at higher K-bg and showed a unimodal response to z (being limited by sinking losses at shallow z and by light at deep z). The biomass peak shifted toward lower z with increased K-bg. The seston carbon: phosphorus ratio decreased with increasing z and K-bg. Dissolved mineral phosphorus was undetectable in all treatments. Total water column phosphorus and sedimented phosphorus increased with increasing z but were unaffected by K-bg. These data are in almost complete qualitative congruence with model predictions over the examined range of mixing depths (1-15 m). The model thus provides a useful framework for the continued mechanistic exploration of how environmental drivers influence producer stoic

183: N. E. Dobiesz, D. A. McLeish, R. L. Eshenroder, J. R. Bence, L. C. Mohr, M. P. Ebener, T. F. Nalepa, A. P. Woldt, J. E. Johnson, R. L. Argyle and J. C. Makarewicz,. 2005. Ecology of the Lake Huron fish community, 1970-1999. Canadian Journal of Fisheries and Aquatic Sciences 6(62): 1432-1451.

Abstract: We review the status of the Lake Huron fish community between 1970 and 1999 and explore the effects of key stressors. Offshore waters changed little in terms of nutrient enrichment, while phosphorus levels declined in inner Saginaw Bay. Introduced mussels (*Dreissena* spp.) proliferated and may have caused a decline in *Diporeia* spp. This introduction could have caused a decline in lake whitefish (*Coregonus clupeaformis*) growth and condition, with serious repercussions for commercial fisheries. *Bythotrephes*, an exotic predatory cladoceran, and other new exotics may be influencing the fish community. Sea lampreys (*Petromyzon marinus*) remained prevalent, but intensive control efforts on the St. Mary's River may reduce their predation on salmonines. Overfishing was less of a problem than in the past, although fishing continued to reduce the amount of lake trout (*Salvelinus namaycush*) spawning biomass resulting from hatchery-reared fish planted to rehabilitate this species. Massive stocking programs have increased the abundance of top predators, but lake trout were rehabilitated in only one area. Successful lake trout rehabilitation may require lower densities of introduced pelagic prey fish than were seen in the 1990s, along with continued stocking of hatchery-reared lake trout and control of sea lamprey. Such reductions in prey fish could limit Pacific salmon (*Oncorhynchus* spp.) fisheries.

184: M. T. Dokulil and K. Teubner,. 2005. Do phytoplankton communities correctly track trophic changes? An assessment using directly measured and palaeolimnological data. *Freshwater Biology* 10(50): 1594-1604.

Abstract: 1. Measurements of total phosphorus (TP) concentrations since 1975 and a 50-year time series of phytoplankton biovolume and species composition from Lake Mondsee (Austria) were combined with palaeolimnological information on diatom composition and reconstructed TP-levels to describe the response of phytoplankton communities to changing nutrient conditions. 2. Four phases were identified in the long-term record. Phase I was the pre-eutrophication period characterised by TP-levels of about 6 $\mu\text{g L}^{-1}$ and diatom dominance. Phase II began in 1966 with an increase in TP concentration followed by the invasion of *Planktothrix rubescens* in 1968, characterising mesotrophic conditions. Phase III, from 1976 to 1979, had the highest annual mean TP concentrations (up to 36 $\mu\text{g L}^{-1}$) and phytoplankton biovolumes (3.57 $\text{mm}^3 \text{L}^{-1}$), although reductions in external nutrient loading started in 1974. Phases II and III saw an expansion of species characteristic of higher nutrient levels as reflected in the diatom stratigraphy. Oligotrophication (phase IV) began in 1980 when annual average TP concentration, Secchi depth and algal biovolume began to decline, accompanied by increasing concentrations of soluble reactive silica. 3. The period from 1981 to 1986 was characterised by asynchronous trends. Annual mean and maximum total phytoplankton biovolume initially continued to increase after TP concentration began to decline. Reductions in phytoplankton biovolume were delayed by about 5 years. Several phytoplankton species differed in the timing of their responses to changing nutrient conditions. For example, while *P. rubescens* declined concomitantly with the decline in TP concentration, other species indicative of higher phosphorus concentrations, such as *Tabellaria flocculosa* var. *asterionelloides*, tended to increase further. 4. These data therefore do not support the hypotheses that a reduction in TP concentration is accompanied by (i) an immediate decline in total phytoplankton biovolume

185: E. Donali, P. Brettum, O. Kaste, J. Lovik, A. Lyche-Solheim and T. Andersen,. 2005. Pelagic response of a humic lake to three years of phosphorus addition. Canadian Journal of Fisheries and Aquatic Sciences 2(62): 322-332.

Abstract: Three years of whole-lake phosphorus (P) fertilization, conducted in a 12-ha boreal forest lake, revealed significant changes in epilimnion nutrients, biomasses, and primary production. As a time average for all three treatment years, primary production increased 257% relative to the reference basin value of 16.5 mg center dot m⁻³center dot day⁻¹, whereas the carbon masses of both nanoalgae (> 2 mu m) and zooplankton increased roughly 130% from their initial values of 15 mg center dot m⁻³ and 17 mg center dot m⁻³, respectively. Calculated from a difference, the absolute increase in the sum of ciliates and picoplankton (heterotrophic bacteria and picoalgae) was more than six times as large as for algae larger than 2 mu m, indicating that most added P ended in this compartment. Moreover, fertilization did not change the species inventory among nanoalgae and zooplankton, although the biomass composition changed somewhat. Only the former dominant species, the chrysophytes *Dinobryon crenulatum*, *D. sociale* v. *americanum*, *Mallomonas allorgei*, and *Ochromonas* sp. and the calanoid copepod *Eudiaptomus gracilis* increased substantially in biomass owing to the added P. Surprisingly, we observed a substantial delay in the food web response to fertilization, where most variables increased monotonously in size from year to year during the fertilization period. The underlying mechanisms for these delayed increases remains to be explained.

186: M. W. Doyle, E. H. Stanley, C. H. Orr, A. R. Selle, S. A. Sethi and J. M. Harbor,. 2005. Stream ecosystem response to small dam removal: Lessons from the Heartland. *Geomorphology* 1-2(71): 227-244.

Abstract: In this paper, we synthesize a series of small dam removal Studies to examine how changes in channel form can affect riparian vegetation, fish, macroinvertebrates, mussels, and nutrient dynamics. Each of the ecosystem attributes responded to the disturbance of darn removal in different ways and recovered at very different rates, ranging from months to decades. Riparian vegetation appeared to require the greatest time for recovery, while macroinvertebrates had the least, Mussel communities were the most adversely affected group of species and showed no signs of recovery during the time period of the study. Based oil these and other Studies, we suggest that ecosystems may follow two trajectories of recovery following darn removal. First, ecosystem,; may fully recover to pre-dam conditions, although this may be unlikely in many cases. Even if full recovery occurs, the timescales over which different attributes recover will vary greatly and may be perceived by the public or management agencies as not recovering at all. Second, ecosystems may only partially recover to pre-dam conditions as the legacy of environmental damage of long-term darn presence may not be reversible or because other watershed changes inhibit full recovery. The potential for full or partial recovery is likely driven by the sensitivity of particular organisms, the characteristics of the dam removed, and the local geomorphic conditions of the watershed. Scientists and management agencies should assess the potential for full or partial recovery prior to dam removal and, in particular, should identify those species or groups of species that are likely to not recover to pre-dam conditions. Such information is critical in the decision of whether, or how, to remove a dam. (c) 2005 Elsevier B.V. All rights reserved.

187: M. W. Doyle, E. H. Stanley, D. L. Strayer, R. B. Jacobson and J. C. Schmidt,. 2005. Effective discharge analysis of ecological processes in streams. Water Resources Research 11(41): .

Abstract: Discharge is a master variable that controls many processes in stream ecosystems. However, there is uncertainty of which discharges are most important for driving particular ecological processes and thus how flow regime may influence entire stream ecosystems. Here the analytical method of effective discharge from fluvial geomorphology is used to analyze the interaction between frequency and magnitude of discharge events that drive organic matter transport, algal growth, nutrient retention, macroinvertebrate disturbance, and habitat availability. We quantify the ecological effective discharge using a synthesis of previously published studies and modeling from a range of study sites. An analytical expression is then developed for a particular case of ecological effective discharge and is used to explore how effective discharge varies within variable hydrologic regimes. Our results suggest that a range of discharges is important for different ecological processes in an individual stream. Discharges are not equally important; instead, effective discharge values exist that correspond to near modal flows and moderate floods for the variable sets examined. We suggest four types of ecological response to discharge variability: discharge as a transport mechanism, regulator of habitat, process modulator, and disturbance. Effective discharge analysis will perform well when there is a unique, essentially instantaneous relationship between discharge and an ecological process and poorly when effects of discharge are delayed or confounded by legacy effects. Despite some limitations the conceptual and analytical utility of the effective discharge analysis allows exploring general questions about how hydrologic variability influences various ecological processes in streams.

188: S. A. Doyle, J. E. Saros and C. E. Williamson,. 2005. Interactive effects of temperature and nutrient limitation on the response of alpine phytoplankton growth to ultraviolet radiation. *Limnology and Oceanography* 5(50): 1362-1367.

Abstract: We performed bag-enclosure experiments for 7 d in a lake in the Beartooth Mountains (in Montana and Wyoming) using natural phytoplankton assemblages. Ultraviolet radiation (UVR) (exposed or blocked), temperature (6 degrees C and 14 degrees C), and nutrients (nitrogen, phosphorus, and nitrogen plus phosphorus) were manipulated in a factorial design to determine how these factors interact to affect phytoplankton growth. Four major phytoplankton taxa (two diatoms, one chrysophyte, and one dinoflagellate) were found in the water samples across all treatments. Greater growth rates were observed at the higher temperature for all taxa, except the chrysophyte. UVR depressed the growth rates of all phytoplankton at 6 degrees C regardless of nutrient conditions. In contrast, at 14 degrees C, a negative effect of UVR was not observed for any species in the absence of nutrient additions; only with the addition of nutrients did UVR exposure depress the growth of one diatom species and the dinoflagellate. Our results suggest that in alpine lakes, the effects of UVR exposure on phytoplankton depend on temperature and nutrient availability, indicating that climate change and enhanced atmospheric nitrogen deposition are likely to alter UV-temperature-nutrient relationships of plankton in high-UV systems.

189: D. C. Drake, J. V. Smith and R. J. Naiman,. 2005. Salmon decay and nutrient contributions to riparian forest soils. Northwest Science 1(79): 61-71.

Abstract: Empirical evidence links salmon-derived nutrients to riparian vegetation production and quality, but mechanisms regulating transformation of salmon tissues into plant tissues are still largely unknown. We measured salmon carcass nutrient contributions to riparian soils of Kennedy Creek, WA, a coastal rainforest system. We used ion exchange resins to estimate cumulative bioavailability of major ions in soils, and soil extracts to examine timing and lateral movement of ammonium (NH_4^+) and nitrate (NO_3^-) from carcasses. Over the period of skeletonization (76 days), bioavailability of NH_4^+ was similar to 250x, soluble P (primarily PO_4^{2-}) was similar to 2x, and sulfur (SO_x) was similar to 5.5x higher than baseline within 20 cm of carcasses, while availability of other ions was not affected. Maximum NH_4^+ and NO_3^- within 10 cm of carcasses occurred at similar to 240 degree days (dd; 56 days). NO_3^- and NH_4^+ maxima 20 and 50 cm from carcasses occurred between 300 dd (70 days) and 600 dd (150 days). When Protected from large scavengers. an average minimum of 49.3% of total carcass N was contributed to soils, and NH_4^+ and NO_3^- moved through soils laterally at least 50 cm. Approximately 97% of salmon N is in quickly decaying soft tissues, while 88% of Ca and 50% of P is in the slowly decaying skeleton. Different lag-times in bioavailability of nutrients result; NH_4^+ becomes bioavailable within weeks, NO_3^- within months, and P and Ca^{2+} over months to years. These findings provide a potential timing mechanism for feedbacks between salmon and riparian vegetation in the context of local conditions.

190: P. D. Driver, G. P. Closs and T. Koen,. 2005. The effects of size and density of carp (*Cyprinus carpio* L.) on water quality in an experimental pond. *Archiv Fur Hydrobiologie* 1(163): 117-131.

Abstract: A field experiment was used to quantify the effects of carp (*Cyprinus carpio*) biomass density and size-structure on dissolved oxygen, conductivity, turbidity, pH, temperature, nutrient concentrations and algal biomass in replicated enclosures. The treatments in this field experiment comprised different combinations of large (2 kg) and small (0.7 kg) carp, and low (330 kg/ha), intermediate (570 kg/ha) and high (650 kg/ha) biomass densities. The impacts of carp were more size-dependent than described in previous studies. In particular, carp size was more important than carp biomass density in determining the concentration of total phosphorus and algal biomass. On the other hand, a more even mix of carp sizes increased total nitrogen. These results were compared to other studies of carp impacts. Although carp size tends to be poorly and inconsistently reported, and focused on small carp if mechanisms of nutrient mobilization are tested, there is evidence that differences in carp size explain some of the conflicting results among carp studies. We argue that there is a continuum of effects where larger carp tend to mobilise phosphorus through sediment suspension and smaller carp tend to mobilise phosphorus through excretion. Additionally, we suggest that there is little evidence for a carp size effect on nitrogen among various studies, regeneration of nitrogen by carp is mostly from excretion and, consequently nitrogen regeneration is likely to be proportional to the biomass of carp.

191: M. J. Duever,. 2005. Big Cypress regional ecosystem conceptual ecological model. Wetlands 4(25): 843-853.

Abstract: The Big Cypress region of southwest Florida is a diverse mosaic of upland pine flatwoods and hardwood hammocks, herbaceous wet prairies and marshes, and forested wetlands. Besides large natural landscapes, it includes extensive areas of residential and agricultural development. Dominant natural controlling factors are hydrology on the low relief land surface and fire in a subtropical environment with a strong wet-dry seasonal cycle of rainfall. Human influences on the Big Cypress ecosystem are all associated with extensive residential and agricultural development. Lowered water levels and shortened hydroperiods cause shifts to drier communities, which leads to habitat loss and more intense fires. Higher nutrient concentrations associated with agriculture and more mineralized ground-water inputs from a variety of sources favor nuisance and exotic plant species. Fragmentation of the plant community mosaic interferes with seasonal expansion and contraction of wetland water bodies and associated seasonal movements of animal populations. Fragmentation also interferes with wildlife movements and the natural spread of fire across the landscape. Disturbed environments along edges created by fragmentation facilitate invasion of natural plant and animal communities by exotic species. Efforts to eradicate fire have eliminated large areas of early successional communities, while creating high fuel loads that ultimately result in very destructive fires. The spread of exotic plants is resulting in the replacement of large areas of native plant communities, but the effects of exotic animal invasions on native animal populations are poorly known. The objective of this paper is to present a conceptual model of the major human influences on the Big Cypress region, and how they affect natural processes and selected components of the ecosystem.

192: E. J. Dunne, N. Culleton, G. O'Donovan, R. Harrington and A. E. Olsen,. 2005. An integrated constructed wetland to treat contaminants and nutrients from dairy farmyard dirty water. Ecological Engineering 3(24): 221-234.

Abstract: Water pollution by agriculture can include inappropriately managed dairy farmyard dirty water. In Ireland, dairy farmyard dirty water includes farmyard runoff, parlour washings, and silage/farmyard manure effluents. The objectives of this study were to determine (i) the quality and quantity of dirty water generated at a farm-scale and (ii) the seasonal effectiveness of a constructed wetland to treat farmyard dirty water. The wetland system was 4800 m² in area and treated dirty water from a 42-cow organic dairy unit with an open yard area of 2031 m². Monthly dirty water inflow rate to the wetland ranged between 3.6 and 18.5 m³ d⁻¹. Farmyard dirty water accounted for 27% of hydrological inputs to the wetland, whereas rainfall on wetland, along with wetland bank inflows accounted for 45 and 28%, respectively. Farmyard dirty water quality and quantity did not vary with season. Yearly mass loads discharged to the wetland were 47 +/- 10 kg yr⁻¹ of soluble reactive phosphorus (SRP), 128 +/- 35 kg yr⁻¹ of NH₄⁺, 5484 +/- 1433 kg yr⁻¹ of organic material as measured by five-day biological oxygen demand (BOD₅), and 1570 +/- 465 kg yr⁻¹ of total suspended solids (TSS). Phosphorus retention by the wetland varied with season (5-84%) with least amounts being retained during winter. (c) 2004 Elsevier B.V. All rights reserved.

193: A. H. Dye,. 2005. Meiobenthos in intermittently open/closed coastal lakes in New South Wales: spatial and temporal patterns in densities of major taxa. Marine and Freshwater Research 8(56): 1055-1067.

Abstract: Intermittently open/closed coastal lakes and lagoons (ICOLs) are common in Australia. Isolation from the sea makes them susceptible to nutrient enrichment and pollution and many are considered degraded. Understanding of their ecology and the effects of anthropogenic activity is limited. Many lakes are kept open artificially to improve water quality and mitigate the effects of floods. The present study examined the relationship between multivariate and univariate patterns in higher taxa of meiobenthos and compared their densities and distributions in naturally open and closed lakes with those in managed lakes. The degree of correspondence between multivariate and univariate patterns was taxon and locality dependent. Differences in densities between types of lakes was not related to physical factors. Within lakes, meiobenthos generally correlated negatively with salinity and organic content, but positively with silt. Densities reflected the degree of isolation from the sea, but the influence of this factor varied among lakes within categories and between taxa. Most taxa were less abundant in isolated localities, such as the inner reaches of lakes and in closed lakes. Meiobenthos were more spatially variable in closed and in managed lakes. The influence of frequency and duration of closure on the ecology of coastal lakes is discussed.

194: A. R. Dzialowski, S. H. Wang, N. C. Lim, W. W. Spotts and D. G. Huggins,. 2005. Nutrient limitation of phytoplankton growth in central plains reservoirs, USA. Journal of Plankton Research 6(27): 587-595.

Abstract: Historically, phosphorus has been considered to be the primary nutrient limiting phytoplankton growth in freshwater ecosystems. We tested this hypothesis in 19 Kansas reservoirs located within the Central Plains region, USA. Bioassay experiments were conducted to assess growth-rate limitation by nitrogen (N), phosphorus (P) and nitrogen and phosphorus (N and P). The addition of P alone rarely increased phytoplankton growth with only 8% of the total bioassay experiments indicating P-limitation. In contrast, limitation by N (16%) and co-limitation by N and P (63%) were more commonly observed. Results from the bioassay experiments were also used to test the hypothesis that nutrient limitation could be inferred from the water column total nitrogen : total phosphorus (TN : TP) ratio. We found that there was a classification range of TN : TP ratios that correctly predicted nutrient limitation in the majority of reservoirs. Generally, reservoirs that were N limited had water column TN : TP ratios < 18 (molar); reservoirs that were co-limited by N and P had water column TN : TP ratios between 20 and 46; and reservoirs that were P limited had water column TN : TP ratios > 65. Overall, these results suggest that management efforts should focus on both N and P decreases to control phytoplankton growth. Furthermore, the water column TN : TP ratio can be an effective tool for assessing potential nutrient limitation in the Central Plains region using the TN : TP classification values provided above.

195: A. N. Dzyuban,. 2005. Butyric acid bacteria of the genus Clostridium in the bottom sediments of inland basins of different types. Microbiology 1(74): 104-110.

Abstract: The cell numbers and ecological characteristics of the distribution of certain species of butyric acid bacteria (BABs) of the genus Clostridium in the bottom sediments of inland basins of different types were studied using the optimal nutrient media. The seasonal dynamics of clostridial vegetative cells and spores in sediments with different ecological conditions were revealed. The cell numbers of the dominant BAB species were shown to depend on the redox potential of the sediments, the amount and composition of C-org, and the trophic state of the basin in general. *C. pasteurianum* was found to predominate in eutrophic lakes and reservoirs ($5-11 \times 10^6$ cells/Cm-3), *C. butyricum* and *C. felsineum* predominated in mesotrophic ones ($2-11 \times 10^6$ cells/Cm-3), and *C. acetobutylicum* was predominant in acidic chthonioeutrophic lakes and reservoirs ($0.1-0.5 \times 10^6$ cells/Cm-3). The lowest cell numbers of BAB s were found in river sediments, whereas the highest numbers were recorded in the sediments of polysaprobic zones ($0.1-1.0 \times 10^3$ and $0.5-2.0 \times 10^7$ cells/Cm-3 respectively).

196: M. C. Eimers, J. G. Winter, W. A. Scheider, S. A. Watmough and K. H. Nicholls,. 2005. Recent changes and patterns in the water chemistry of Lake Simcoe. Journal of Great Lakes Research 3(31): 322-332.

Abstract: After the Great Lakes, Lake Simcoe is the largest lake in southern Ontario. Located within a 1 hour drive of half the population of Ontario, there is currently major concern over the impact of rapid urbanization on the nutrient status of the lake. However, despite a more than doubling of the human population in the Lake Simcoe watershed over the past two decades, average total phosphorus (TP) levels were lower in 2000-2003 compared with 1980-1983 at six of eight lake stations, and declines were significant at the most nutrient-enriched near-shore sites located in Kempenfelt Bay (0.29 $\mu\text{g/L/year}$) and Cook ' s Bay (0.31-0.41 $\mu\text{g/L/year}$). Total P concentrations varied two-fold across the lake, and phytoplankton bio-volume followed a similar pattern, with greatest phytoplankton abundance occurring at high TP sites, particularly in Cook's Bay. Nevertheless, steep declines in bio-volume occurred at all sites beginning in the mid-1990s, and water clarity (Secchi disk depth) improved concurrently such that Secchi depths were 40-80% greater in 2000-2003 compared with 1980-1983. Zebra mussels, which became established in Lake Simcoe around 1995, likely contributed to decreased phytoplankton bio-volume and related improvements in water clarity, which began during the mid-1990s. Despite major reductions in phytoplankton bio-volume, average rates of dissolved oxygen (DO) depletion (18 m-bottom zone; normalized to 4 degrees C) did not change substantially over time, and were similar in 2000-2003 (average 1.25 +/- 0.21 g O-2/m(3)/month) compared with 1980-1983 (average 1.26 +/- 0.19 g O-2/m(3)/month). In contrast, minimum, end-of-summer DO levels (18 m-bottom) increased slightly over the period of record. Although there has been some improvement in end-of-summer DO availability, DO concentrations continue to decline to levels that are limiting to many fish species (e.g., 3.8 mg O-2/L in 2001) by the end of the summer stratified period.

197: W. R. Eisner, J. G. Bockheim, K. M. Hinkel, T. A. Brown, F. E. Nelson, K. M. Peterson and B. M. Jones,. 2005. Paleoenvironmental analyses of an organic deposit from an erosional landscape remnant, Arctic Coastal Plain of Alaska. *Palaeogeography Palaeoclimatology Palaeoecology* 3-4(217): 187-204.

Abstract: The dominant landscape process on the Arctic Coastal Plain of northern Alaska is the formation and drainage of thaw lakes. Lakes and drained thaw-lake basins account for approximately 75% of the modern surface expression of the Barrow Peninsula. The thaw-lake cycle usually obliterates lacustrine or peat sediments from previous cycles, which could otherwise be used for paleoecological reconstruction of long-term landscape and vegetation changes. Several possible erosional remnants of a former topographic surface that predates the formation of the thaw lakes have been tentatively identified. These remnants are characterized by a higher elevation, a thick organic layer with very high ground ice content in the upper permafrost and a plant community somewhat atypical of the region. Ten soil cores were collected from one site, and one core was intensively sampled for soil organic carbon content, pollen analysis and C-14 dating. The lowest level of the organic sediments represents the earliest phase of plant growth and dates to ca. 9000 cal BP. Palynological, evidence indicates the presence of mesic shrub tundra (including sedge, birch, willow and heath vegetation), and microfossil indicators point to wetter eutrophic conditions during this period. Carbon accumulation was rapid due to high net primary productivity in a relatively nutrient-rich environment. These results are interpreted as the local response to ameliorating climate during the early Holocene. The middle Holocene portion of the record contains an unconformity, indicating that between 8200 and 4200 cal BP sediments were eroded from the site, presumably in response to wind activity during a drier period centered around 4500 cal BP. The modern vegetation community of the erosional remnant was established after 4200 cal BP and peat growth resumed. During the late Holocene, carbon accumulation rates (CARs) were greatly reduced in response to the combined effects of declining productivity associated with climatic cooling.

198: P. Ekholm, E. Turtola, J. Gronroos, P. Seuri and K. Ylivainio,. 2005. Phosphorus loss from different farming systems estimated from soil surface phosphorus balance. *Agriculture Ecosystems & Environment* 3-4(110): 266-278.

Abstract: The phosphorus load originating from crop production and animal husbandry is a major contributor to the eutrophication of lakes, rivers and coastal waters. The P losses to surface waters may, however, differ drastically due to the diversity of agricultural production systems practised under contrasting environmental conditions. To assess the most problematic types of agriculture, we need information on the P load from different alternative farming practices. Such information cannot, however, be obtained solely from field runoff experiments, as the number of treatment combinations required to account for all relevant farming systems and environmental conditions far exceeds our research capabilities. To facilitate the comparison of P loads, we therefore need reasonably simple models. A key factor controlling the P load from agriculture is the past and present use of nutrients in fertilizers and manure in relation to a crop's uptake, i.e. the soil-surface balance of P. Here, we present a simple empirical model that relates the P surplus (or deficit) in a farm to the edge-of-field losses of algal-available P. Based on long-term fertilizer trials, the model first estimates the change in soil-test P of top soil with the aid of the soil-surface balance of P. Soil-test P is then used to approximate the concentration of dissolved reactive P in surface runoff and drainage flow, as adjusted for different P application types. The loss of particulate P is obtained from typical erosion rates. The model can be applied in life-cycle analyses and in assessing future developments. We illustrate use of the model by calculating the loss of algal-available P from conventional and organic crop and dairy farms located on clay and fine sand soils. (c) 2005 Elsevier B.V. All rights reserved.

199: H. Elhatip and O. Gullu,. 2005. Influences of wastewater discharges on the water quality of Mamasin dam watershed in Aksaray, Central Anatolian part of Turkey. Environmental Geology 7(48): 829-834.

Abstract: Sustaining the human ecological benefits of surface water requires carefully planned strategies for reducing the cumulative risks posed by diverse human activities. Municipal governments in Aksaray City play a key role in developing solutions to surface water management and protection problems. The responsibility to provide drinking water and sewage works, regulate the use of private land, and protect public health provides the mandate and authority to take action. A large part of Aksaray City uses Mamasin dam water as its primary source for drinking water. Several point sources of contamination may result from direct wastewater discharges from Melendiz and Karasu rivers, which recharge the Mamasin dam watershed. Relevant studies were carried out for monitoring the eutrophication process, which usually occurs in the static water mass of the Mamasin dam lake. This process may be caused by the continual increase in nutrients and decrease Of O₂ levels, causing anaerobic conditions. Stimulated algae growth in these water bodies consequently reduces water quality. Hydrochemical parameters were evaluated to estimate the types of pollution sources, the level of pollution, and its environmental impacts on the Mamasin dam drinking water reservoir.

200: J. A. Elliott, S. J. Thackeray, C. Huntingford and R. G. Jones,. 2005. Combining a regional climate model with a phytoplankton community model to predict future changes in phytoplankton in lakes. *Freshwater Biology* 8(50): 1404-1411.

Abstract: 1. Linking a regional climate model (RCM) configured for contemporary atmospheric greenhouse gas concentrations, with a phytoplankton community model (PROTECH) produced realistic simulations of 20 years of recent phytoplankton data from Bassenthwaite Lake, in the North-West of England. 2. Meteorological drivers were derived from the RCM to represent a future climate scenario involving a 1% per annum compound increase in atmospheric CO₂ concentrations until 2100. Using these drivers, PROTECH was run for another 20 year period representing the last two decades of the 21st century. 3. Comparison of these present and future simulations revealed likely impacts on the current seasonal phytoplankton development. Under future climate conditions, the simulated spring bloom showed an increase in cyanobacteria dominance caused by greater success of *Planktothrix*. Also, the summer cyanobacteria bloom declined earlier because of nutrient limitation caused by the increased spring growth. Overall productivity in the lake did not change. 4. Analysis showed that these predicted changes were driven by changes in water temperature, which were in turn triggered by the higher air temperatures predicted by the RCM.

201: K. J. Elliott and J. M. Vose,. 2005. Initial effects of prescribed fire on quality of soil solution and streamwater in the southern Appalachian mountains. Southern Journal of Applied Forestry 1(29): 5-15.

Abstract: Prescribed burning is being used in the Conasauga River Watershed in southeastern Tennessee and northern Georgia by National Forest managers to restore degraded pine/oak communities. The purpose of these burns is to restore shortleaf pine (*Pinus echinata* Miller)/mixed-oak forests with more diverse understories, which include native bluestem grasses (*Andropogon gyrans* Ashe and *Schizachyrium scoparium* (Michx.) Nash). Although burning might be an effective tool for restoring these stands to a shortleaf pine/mixed-oak/bluestem grass community type, it is not known whether these restoration burns will have a negative impact on water quality. Six subwatersheds (similar in vegetation, soil type, stream size and location, and disturbance history) were located within the Conasauga River Watershed. Four of the sites were burned in Mar. 2001, and two sites were designated as controls. To evaluate initial effects of prescribed burning on water quality, we measured soil solution and streamwater nutrient concentrations and streamwater sediment concentration (TSS; total suspended solids) weekly over a 10-month period. Consistent with goals of the land managers, all the prescribed fires resulted in low- to moderate-intensity and low-severity fires. Soil solution and streamwater $\text{NO}_3\text{--N}$ and $\text{NH}_4\text{+--N}$ did not increase after burning on any of the sites. We found no differences in TSS between burn and control streams in any of the sample periods. In addition, we found no detectable differences between control and burned sites for concentrations of PO_4^{3-} , SO_4^{2-} , Ca^{2+} , Mg^{2+} , K^+ , or pH in soil solution or streamwater. Thus, these prescribed restoration fires did not have a significant effect on soil solution and stream chemistry or stream sediment (TSS) concentrations. Our results suggest that low-intensity, low-severity fires, such as those in this study, could be used as a tool to restore vegetation structure and composition in these mixed pine-hardwood ecosystems without negatively impactin

202: J. C. Ellis,. 2005. Marine birds on land: a review of plant biomass, species richness, and community composition in seabird colonies. *Plant Ecology* 2(181): 227-241.

Abstract: Seabirds are chemical and physical engineers that are capable of transforming terrestrial vegetation by altering edaphic conditions, generating physical disturbance, and affecting seed dispersal. Substantial changes in seabird populations are occurring worldwide and are likely to have important consequences for plant community composition on islands and coastal areas. This review focuses on the impact of seabirds on plant biomass, species richness and community composition. A total of 57 publications (42 studies) were selected for review. Of the 42 studies represented in the publications, 55% were descriptive. Most studies took place in Australia, New Zealand, the British Isles, Japan, North America, and sub-Antarctic islands. A few studies showed that aboveground plant biomass in seabird colonies increased with sufficient rainfall and moderate temperatures. The majority of studies on plant species richness showed a decrease in seabird colonies compared to areas unaffected by birds. However, species richness was higher in areas of intermediate seabird disturbance, compared to undisturbed areas. Moreover, the effects of seabirds on species richness varied with respect to island size. Most studies of plant community composition indicated that annuals, "ruderals", and cosmopolitan species increased in abundance in seabird colonies. Changes in plant communities in seabird colonies appear to result mainly from altered soil nutrient concentrations and pH, increased physical disturbance, and seed dispersal by seabirds and humans. However, few studies have rigorously studied the relative importance of these alterations. Both the direction and magnitude of seabird effects are modified by: (1) density of birds, (2) temperature and precipitation, and (3) proximity to human habitation. A reduction in seabird populations is likely to have negative consequences for native plant species that rely on seabird disturbance for their persistence. However, seed dispersal by nesting sea

203: M. A. Elrashidi, M. D. Mays, A. Fares, C. A. Seybold, J. L. Harder, S. D. Peaslee and P. VanNeste,. 2005. Loss of nitrate-nitrogen by runoff and leaching for agricultural watersheds. Soil Science 12(170): 969-984.

Abstract: The loss of nutrients in runoff and leaching water from agricultural land is a major cause of poor water quality in the United States. Scientists (NRCS) developed a technique to estimate the impact of agricultural watersheds on natural water resources. The objectives were to apply the technique on Wagon Train (WT) watershed in Nebraska to predict: (i) loss of water by surface runoff and subsurface leaching, (ii) loss of nitrate-N from soils by runoff and leaching, and (iii) nitrate-N loading for WT reservoir. The annual loss of water was estimated at 4.32 million m(3) for runoff and 0.98 million m(3) for leaching. The observed annual inflow for WT reservoir was 4.25 million m(3). The predicted annual nitrate-N loss by runoff was about 7.0 Mg and could be considered the annual loading for the reservoir. The predicted nitrate-N loss by leaching was 7.73 Mg, however, the fate was not clear. The estimated average nitrate-N concentration in runoff and leaching water at field sites was 1.63 and 7.88 mg/L, respectively. The observed nitrate-N concentration in water samples taken from 12 major streams ranged between 0.37 and 1.56 mg/L with an average of 0.90 mg/L. Nitrogen uptake by algae, weeds, and aquatic plants and emission of gaseous nitrogen oxides from fresh water under reducing conditions might explain the lower nitrate-N concentration. No attempt was made to monitor the nitrate-N concentration in soil leachate or groundwater. When factors affecting N concentration in streams are considered, the technique could provide a reasonable estimation of N concentration in stream water. We concluded that the technique could be applied to estimate the loss of nitrate-N by runoff and leaching from soils and the impact on surface waters.

204: M. A. Elrashidi, M. D. Mays, J. Harder, D. Schroeder, P. Brakhage, S. Peaslee, C. Seybold and C. Schaecher,. 2005. Loss of phosphorus by runoff for agricultural watersheds. Soil Science 7(170): 543-558.

Abstract: The loss of nutrients in runoff from agricultural land is a major cause of poor surface water quality in the United State. Scientists (NRCS) developed a technique to estimate the impact of agricultural watersheds on natural water resources. The objectives of this study were to apply this technique on the Wagon Train (WT) watershed to predict (1) loss of water by surface runoff, (2) loss of phosphorus (P) from soils by runoff and P loading for WT reservoir. The annual loss of water by runoff was estimated at 4.32 million m(3). The USGS data for a 50-year period (1951 to 2000) indicated that the average annual inflow for WT reservoir was 4.25 million m(3). The predicted annual P loss by runoff was 844 kg and could be considered as the annual loading for WT reservoir. The predicted P concentration in the runoff water at field sites was 196 mu g/L. Phosphorus concentration observed in major streams at the beginning of spring (March) ranged from 99 mu g/L to 240 mu g/L with an average of 162 mu g/L (S.D. = 40 mu g/L), and the average P concentration in water samples taken from different locations in the reservoir was 140 mu g/L. Phosphorus uptake by algae, weeds and aquatic plants, as well as high pH in the reservoir and streams might explain the slight drop of P concentration in waters. Further, the average P concentration observed in the main stream samples for the entire rainy season (March through October), ranged between 157 and 346 mu g/L with an average of 267 mu g/L (S.D. = 65 mu g/L). Application of P fertilizers (April/May) for summer crops might explain the increase in P concentration. When factors affecting P concentration in streams are considered, the technique could provide a reasonable estimation of P concentration in stream water.

205: J. J. Elser, J. H. Schampel, F. Garcia-Pichel, B. D. Wade, V. Souza, L. Eguiarte, A. Escalante and J. D. Farmer,. 2005. Effects of phosphorus enrichment and grazing snails on modern stromatolitic microbial communities. *Freshwater Biology* 11(50): 1808-1825.

Abstract: 1. The effects of phosphorus enrichment and grazing snails on a benthic microbial community that builds stromatolitic oncolites were examined in an experiment at Rio Mesquites, Cuatro Cienegas, Mexico. Chemical analyses of stream water samples indicated that overall atomic ratios of total nitrogen (N) to total phosphorus (P) were approximately 110, indicating a strong potential for P-limitation of microbial growth. 2. Phosphorus enrichment involved addition of 5 $\mu\text{mol Na}_2\text{HPO}_4 \text{ L}^{-1}$ to streamside microcosms receiving intermittent inputs of stream water while grazer manipulation involved removal of the dominant grazer, the snail *Mexithauma quadripaludium*. After 7 weeks, we examined responses in organic matter content, C : N : P ratios, metabolism (P removal, primary production, dark respiration, and calcification), and microbial community structure using molecular fingerprinting of 16S rRNA genes. 3. Manipulation of snails did not affect response variables measured in these treatments (organic matter, C : P ratio, P removal rate). However, P enrichment significantly decreased the C : P and N : P ratios of surficial materials in the oncolites (organic matter content was unchanged), increased net and gross photosynthesis (oxygen consumption in the dark was unchanged), increased rates of calcification, and increased diatoms relative to cyanobacteria. Heterotrophic Eubacteria and Archaea were only modestly affected. Thus, our results indicate weak grazing effects but strong impacts of P in this benthic system. 4. We hypothesise that a state of severe P-limitation is imposed on autotrophic production in this food web due, at least in part, to co-precipitation of phosphate during calcite deposition. This produces severe P-limitation of the benthic algae and cyanobacteria, resulting in high C : P ratio of microbial mats relative to the biomass of photoautotrophs (phytoplankton, terrestrial foliage) in other ecosystems. In turn, this high C : P ratio is likely to generate severe

206: A. Elshorbagy, R. S. V. Teegavarapu and L. Ormsbee,. 2005. Total maximum daily load (TMDL) approach to surface water quality management: concepts, issues, and applications. Canadian Journal of Civil Engineering 2(32): 442-448.

Abstract: The total maximum daily load (TMDL) approach is an emerging paradigm in surface water quality management and has been adopted and applied in many states in the US. The paper explains the conceptual development of the general TMDL process for surface water quality management of three water quality impairment constituents, namely, nutrients, pathogens, and acid load. The application of the TMDL approach to a stream impaired due to high acidic concentrations from mine drainage in southeastern Kentucky is explained and used to demonstrate the complete development of the TMDL process. The paper highlights a number of issues, ranging from assessment of pollution-causing sources to development of practical methods for implementation of TMDLs.

207: S. H. Ensign and M. W. Doyle,. 2005. In-channel transient storage and associated nutrient retention: Evidence from experimental manipulations. *Limnology and Oceanography* 6(50): 1740-1751.

Abstract: We examined the effect of in-channel flow obstructions such as vegetation and coarse woody debris (CWD) on transient storage and nutrient uptake by using experimental channel manipulations. Transient storage and nutrient uptake were measured under existing conditions in a vegetated agricultural stream and a shaded blackwater stream, and measurements were repeated after removal of vegetation and CWD. Removal of vegetation and CWD decreased transient storage area ($A(s)$) by 61% and 43% in the agricultural and blackwater streams, respectively, and decreased the portion of median travel time owing to transient storage ($F-med$) by 45% and 56%, respectively. Flow baffles were then added to create in-channel transient storage in both streams. Baffles increased $A(s)$ 227% and 119% for the agricultural and blackwater streams, respectively, and increased $F-med$ 309% and 132%, respectively. Ammonium and PO_4 uptake for the blackwater stream, determined by using nutrient addition experiments and expressed as the mass transfer coefficient (V_f), decreased after CWD removal by 88% and 38%, respectively. Ammonium V_f in the blackwater stream increased 143-fold after baffles were installed, and PO_4 V_f increased from -1.7 to 53 $mm\ min^{-1}$. Nutrient uptake rates were not calculated for the agricultural stream because sediment disturbance inadvertently altered the sediment-water column nutrient equilibrium. Results from both streams demonstrate that in-channel transient storage, rather than hyporheic storage, can be a substantial portion of overall transient storage in streams. In-channel transient storage influenced nutrient uptake in a blackwater stream, although these results could not be corroborated with data from the agricultural stream.

208: A. Ernst, M. Deicher, P. M. J. Herman and U. I. A. Wollenzien,. 2005. Nitrate and phosphate affect cultivability of cyanobacteria from environments with low nutrient levels. Applied and Environmental Microbiology 6(71): 3379-3383.

Abstract: Nitrate and phosphate concentrations higher than those found in the natural environment slowed down growth of two strains of non-bloom-forming, phycoerythrin-rich *Synechococcus* spp. isolated from mesotrophic subalpine lakes. The results make clear why isolation of these picocyanobacteria in standard cultivation media was difficult. At low concentrations, closely related strains exhibited distinct growth characteristics with respect to these two nutrients, possibly explaining differences in their seasonal appearance in the natural environment.

209: M. A. Evans-White and G. A. Lamberti,. 2005. Grazer species effects on epilithon nutrient composition. *Freshwater Biology* 11(50): 1853-1863.

Abstract: 1. Field and laboratory experiments were conducted to investigate the excretion stoichiometry of nitrogen (N) and phosphorus (P) of two benthic macroinvertebrate grazers, the crayfish *Orconectes propinquus* and the snail *Elimia livescens*, that differ in body stoichiometry (mean body molar N : P 18 and 28, respectively). Crayfish excretion had a significantly higher ammonium : soluble reactive phosphorus (SRP) ratio in the laboratory and in three natural streams than did snails, as predicted by ecological stoichiometry theory. 2. In greenhouse recirculating artificial streams, treatments consisting of crayfish, snails, or no grazers were used to examine responses in dissolved nutrient concentrations and epilithon nutrient composition and limitation. SRP concentrations depended upon the grazer species, with the snail treatment having a higher SRP concentration than other treatments ($P < 0.05$). Dissolved inorganic N was not affected by grazers, but appeared to be rapidly incorporated in epilithon. 3. Epilithon N content was dependent upon the grazer species present, with the crayfish treatment having a significantly higher N content than other treatments ($P = 0.001$). No grazer species effects on epilithon P content were found. However, both grazer treatments had significantly lower epilithon P content than the no-grazer treatment. 4. Traditionally, studies have focused on how grazer-induced structural changes to epilithon can alter epilithon nutrient dynamics, but this structural mechanism could not solely explain differences in epilithon nutrient contents and ratios in the present study. Our results rather suggest that benthic grazers can alter epilithon nutrient composition and limitation via nutrient excretion. Consequently, macroinvertebrate grazers may serve as 'nutrient pumps' that partly regulate the availability of nutrients to algae in stream ecosystems.

210: M. A. Evans-White, R. S. Stelzer and G. A. Lamberti,. 2005. Taxonomic and regional patterns in benthic macroinvertebrate elemental composition in streams. *Freshwater Biology* 11(50): 1786-1799.

Abstract: 1. Ecological stoichiometry has been used to better understand dynamics in consumer growth and the role of consumer-recycled nutrients because it focuses on more than one element. Most research has focused on pelagic rather than benthic consumers. Variation in elemental composition among benthic consumer taxa would suggest that taxa differ in their susceptibility to nutrient limitation or in their role in recycling nutrients. 2. We collected benthic macroinvertebrates from streams in two regions (Indiana-Michigan and Wisconsin, U.S.A.) to examine taxonomic and regional variation in benthic macroinvertebrate body carbon (C), nitrogen (N), and phosphorus (P) concentrations and ratios. 3. Elemental composition varied little within taxa common to both regions. In contrast, elemental composition differed greatly among taxa and appeared to be related to phylogeny. The elemental composition of macroinvertebrates clustered into three distinct groups: insects, mollusks, and crustaceans. To a lesser extent, insects and mollusks also differed in elemental composition among genera. 4. Functional feeding groups (FFGs) differed in elemental composition, with predators having a higher N content than other groups. Substantial elemental imbalances between C and N were found between most primary consumers and their likely food sources, and the magnitude of the imbalance depended in part on the FFG. 5. Our results support an assumption of most ecological stoichiometry models that, within a species, the elemental composition of aquatic invertebrates is relatively constant. Variation in elemental composition among taxa at various higher taxonomic levels suggests that susceptibility of stream invertebrates to nutrient limitation and their role in nutrient cycling will strongly depend on phylogeny.

211: T. J. Fahey, T. G. Siccama, C. T. Driscoll, G. E. Likens, J. Campbell, C. E. Johnson, J. J. Battles, J. D. Aber, J. J. Cole, M. C. Fisk, P. M. Groffman, S. P. Hamburg, R. T. Holmes, P. A. Schwarz and R. D. Yanai,. 2005. The biogeochemistry of carbon at Hubbard Brook. *Biogeochemistry* 1(75): 109-176.

Abstract: The biogeochemical behavior of carbon in the forested watersheds of the Hubbard Brook Experimental Forest (HBEF) was analyzed in long-term studies. The largest pools of C in the reference watershed (W6) reside in mineral soil organic matter (43% of total ecosystem C) and living biomass (40.5%), with the remainder in surface detritus (14.5%). Repeated sampling indicated that none of these pools was changing significantly in the late-1990s, although high spatial variability precluded the detection of small changes in the soil organic matter pools, which are large; hence, net ecosystem productivity (NEP) in this 2nd growth forest was near zero (+/- about 20 g C/m²-yr) and probably similar in magnitude to fluvial export of organic C. Aboveground net primary productivity (ANPP) of the forest declined by 24% between the late-1950s (462 g C/m²-yr) and the late-1990s (354 g C/m²-yr), illustrating age-related decline in forest NPP, effects of multiple stresses and unusual tree mortality,

212: G. W. Fairchild, J. N. Anderson and D. J. Velinsky,. 2005. The trophic state 'chain of relationships' in ponds: does size matter?. *Hydrobiologia* (539): 35-46.

Abstract: In contrast to shallow lakes, factors affecting trophic state in ponds are not well described, and may include unique effects related to pond size. We examined the interdependence of ambient N and P, phytoplankton biomass, light penetration and stratification in 13 ponds of varying area and mean depth in Chester County, PA (USA) during March, May and July of 2002. Seven of the ponds had primarily residential watersheds, and six were farm ponds. The ponds were all eutrophic or hypereutrophic based on Carlson's Trophic State Index, but varied widely in nutrient content (from 20 to 179 μg total P/L and from 683 to 3895 μg total N/L) and size (surface areas from 0.1 to 1.7 ha, mean depths from 0.6 to 1.8 m). Although total N (TN) typically declined while total P (TP) rose from March to July, the ratio TN/TP remained sufficiently high that algal growth was probably limited by P during the study period. Phytoplankton biomass (as chlorophyll-a) was positively correlated with TP and negatively correlated with Secchi depth on all three sampling dates. Despite their shallow nature, the ponds were frequently stratified with near-anoxic hypolimnia later in the study period; mixing depth was greater in ponds with greater light penetration. Residual variation in chlorophyll-a unexplained by TP, and in Secchi depth unexplained by chlorophyll-a, was related to either mean depth or surface area, suggesting that trophic state in ponds may be controlled differently than in much larger, shallow lakes.

213: J. Faithful and W. Finlayson,. 2005. Water quality assessment for sustainable agriculture in the Wet Tropics - A community-assisted approach. Marine Pollution Bulletin 1-4(51): 99-112.

Abstract: A number of studies in north Queensland over the past two decades have concluded that large amounts of nutrients and sediments are exported from agricultural watersheds, particularly during wet season rainfall events. With the co-operation of a number of growers, runoff from Queensland Wet Tropics banana and cane farm paddocks in two distinct tropical river catchments was examined to provide an estimate of nutrient and sediment concentrations and export, with comparison to water quality of flow through a small urban lakes system. Median total nitrogen concentrations in cane drainage runoff (3110 $\mu\text{g N/L}$) were higher than for banana paddock drainage (2580 $\mu\text{g N/L}$), although the maximum concentration was recorded from a banana paddock (20,900 $\mu\text{g N/L}$). Nitrogen losses during post-event drainage flow were supplemented by high proportions of NO_x (nitrate + nitrite) sourced from groundwater inputs. Banana paddocks had the highest maximum and median total phosphorus and TSS concentrations (5120 and 286 $\mu\text{g P/L}$, and 7250 and 75 mg/L respectively) compared to the cane farms (1430 and 50 $\mu\text{g P/L}$, and 1840 and 14 mg/L respectively). The higher phosphorus and TSS concentrations in the banana runoff were attributed to higher paddock slopes and a greater proportion of exposed ground surface during the wet season. Highest nutrient and TSS concentrations corresponded with samples collected near the peak discharge periods; however, the rising stage of the drainage flows, where the highest nutrient and TSS concentrations are often reported, were difficult to target because of the manual sampling strategy used. This study shows that high concentrations of nutrients and TSS occur in the runoff from cane and banana paddocks. Median total nitrogen, total phosphorus and TSS concentrations in flow through the urban lakes were 369 $\mu\text{g N/L}$, 16 $\mu\text{g P/L}$ and 11 mg/L , respectively. Flux estimates of 9.2 kgN, 0.8 kgP and 126 kgTSS/ha were determined for drainage runoff from a banana paddock

214: L. M. Farmer, S. R. Pezeshki and D. Larsen,. 2005. Effects of hydroperiod and iron on *Typha latifolia* grown in a phosphorus-enhanced medium. *Journal of Plant Nutrition* 7(28): 1175-1190.

Abstract: This study was designed to mimic a phosphorus-(P)-enhanced environment and focused on the effects of hydroperiod and dissolved iron (Fe) concentrations on *Typha latifolia*. The physiological responses and nutrient uptake capabilities of plants were quantified. The research was conducted in a greenhouse utilizing a factorial design with three soil-moisture treatments (permanently flooded, periodically flooded, drained) and three Fe levels (0 mg Fe L⁻¹, control; 1 mg Fe L⁻¹; 10 mg Fe L⁻¹). All treatments also received P at 0.2 mg l⁻¹. Plant gas exchange, growth, biomass, and tissue Fe and P concentrations were measured. Permanent flooding enhanced height growth, shoot weight, and root weight, and led to high Fe concentrations in the roots. Plants receiving the 10 mg Fe L⁻¹ treatment had taller shoot heights compared with those receiving the control and 1 mg Fe L⁻¹ treatments. It appeared that a concentration of 10 mg Fe L⁻¹ did not significantly affect *T. latifolia* under moderately reduced soil conditions. However, low soil-redox potential levels below +70 mV and iron levels of 10 mg L⁻¹ may eventually lead to a photosynthetic decline in *T. latifolia*. Results highlighted two important findings: (1) Fe treatment and moisture regimes, as tested, did not affect tissue P concentrations and thus the ability to uptake and sequester P, and (2) a treatment of 10 mg Fe L⁻¹ may have led to some initial beneficial effects in *T. latifolia*, such as producing the greatest shoot growth, but a photosynthetic decline was noted in the last week as redox potential levels fell below +100 mV This effect potentially hinders the use of Fe to aid P retention in wetlands, due to the possibility of inducing physiological dysfunction in some species, such as noted in *T. latifolia*.

215: M. Farnworth and R. J. Petrell,. 2005. Analysis of pond seepage for application in fisheries and aquaculture. Journal of the American Water Resources Association 3(41): 581-590.

Abstract: The purpose of this research was to examine through modeling and experimentation if seepage out of a pond through stratified soil can be predicted, and effectively collected and managed to augment streamflow during a low precipitation period extending three months or more. The 55 m² experimental pond with sandy/loamy banks was excavated to hardpan, and its bottom was approximately 0.7 above the water table. Output from a mathematical model containing both bottom and bank seepage elements agreed with experimental data, and showed that as compared to bottom seepage, the bank seepage contributed approximately 25 percent of the total seepage. Seepage collection (as measured from a circumscribing ditch) linearly varied with stage ($r^2 > 0.99$). There was an 8 to 22 percent over-collection at the lower pond stages, and a 9 to 45 percent under-collection at the highest stage. As an example of its utility, the model was applied to estimate the pond size and shape needed to supply a hypothetical stream and maintain fish stocks during a three-month low-precipitation period. Future work will focus on nutrient transport and removal.

216: A. A. Fathi and R. J. Flower,. 2005. Water quality and phytoplankton communities in Lake Qarun (Egypt). Aquatic Sciences 3(67): 350-362.

Abstract: Lake Qarun is a closed saline lake in the northern part of El-Fayoum Depression (Middle Egypt) at the margin of the Great Western Desert. It is almost entirely sustained by inflow from the Nile River and, during the 20th century, lake water salinity has increased strongly. Physico-chemical characteristics and phytoplankton periodicity in the lake were monitored during 2001. All the water quality variables measured showed considerable seasonal variation, and quantitative and qualitative differences in phytoplankton communities were recorded. The maximum crop density was in August, whereas lowest values occurred in December. Highest crop densities coincided with a high abundance of Bacillariophyceae. The Bacillariophyceae were most diverse with 23 species, then Chlorophyceae with 16, Cyanophyceae with 8, and Chrysophyceae and Dinophyceae with one species each. Despite being a saline inland lake, the open-water phytoplankton communities were composed of some marine/brackish forms but mainly of freshwater communities tolerant to high salinity. The identified phytoplankton species indicate a tendency towards eutrophy but total crop densities were relatively low compared with eutrophic lakes elsewhere. Light limitation by suspended solids as well as hydrological related factors are believed responsible for the relatively low phytoplankton abundance. The lake appears to be ecologically unstable and careful limnological monitoring is recommended.

217: K. Feeley,. 2005. The role of clumped defecation in the spatial distribution of soil nutrients and the availability of nutrients for plant uptake. Journal of Tropical Ecology (21): 99-102.

There is no abstract for this article.

218: M. C. Feller,. 2005. Forest harvesting and streamwater inorganic chemistry in western North America: A review. Journal of the American Water Resources Association 4(41): 785-811.

Abstract: The solution chemistry of forested streams primarily in western North America is explained by considering the major factors that influence this chemistry-geological weathering; atmospheric precipitation and climate; precipitation acidity; terrestrial biological processes; physical/chemical reactions in the soil; and physical, chemical, and biological processes within streams. Due to the complexity of all these processes and their varying importance for different chemicals, stream water chemistry has exhibited considerable geographic and temporal variation and is difficult to model accurately. The impacts of forest harvesting on stream water chemistry were reviewed by considering the effects of harvesting on each of the important factors controlling this chemistry, as well as other factors influencing these impacts - extent of the watershed harvested, presence of buffer strips between streams and harvested areas, nature of post-harvesting site preparation, revegetation rate following harvesting, pre-harvesting soil fertility, and soil buffering capacity. These effects have sometimes reinforced one another but have sometimes been counterbalancing or slight so that harvesting impacts on stream water chemistry have been highly variable. Eight major knowledge gaps were identified, two of which - a scarcity of detailed stream chemical budgets and knowledge of longitudinal variation in stream chemistry - relate to undisturbed streams, while the remainder relate to forest harvesting effects.

219: J. W. Feminella and C. J. Walsh,. 2005. Urbanization and stream ecology: an introduction to the series. Journal of the North American Benthological Society 3(24): 585-587.

There is no abstract for this article.

220: G. P. Fernandez, G. M. Chescheir, R. W. Skaggs and D. M. Amatya,. 2005. Development and testing of watershed-scale models for poorly drained soils. Transactions of the Asae 2(48): 639-652.

Abstract: Two watershed-scale hydrology and water quality models were used to evaluate the cumulative impacts of land use and management practices on downstream hydrology and nitrogen loading of poorly drained watersheds. Field-scale hydrology and nutrient dynamics are predicted by DRAINMOD in both models. In the first model (DRAINMOD-DUFLOW), field-scale predictions are coupled to the canal/stream routing and in-stream water quality model DUFLOW, which handles flow routing and nutrient transport and transformation in the drainage canal/stream network. In the second model (DRAINMOD-W), DRAINMOD was integrated with a new one-dimensional canal and water quality model. The hydrology and hydraulic routing components of the models were tested using data from a 2950 ha drained managed forest watershed in the coastal plain of eastern North Carolina. Both models simulated the hydrology and nitrate-nitrogen (NO₃-N) loading of the watershed acceptably. Simulated outflows and NO₃-N loads at the outlet of the watershed were in good agreement with the temporal trend for five years of observed data. Over a five-year period, total outflow was within 1% of the measured value. Similarly, NO₃-N load predictions were within 1% of the measured load. Predictions of the two models were not statistically different at the 5% level of significance.

221: J. M. Fernandez, M. A. E. Selma, F. R. Aymerich, M. T. P. Saez and M. F. C. Fructuoso,. 2005. Aquatic birds as bioindicators of trophic changes and ecosystem deterioration in the Mar Menor lagoon (SE Spain). *Hydrobiologia* (550): 221-235.

Abstract: The Mar Menor is the largest coastal lagoon in the Western Mediterranean and it is an important site for wintering and breeding waterfowl. During recent decades several hydrological and land-use changes in the watershed have increasingly threatened the conservation of the lagoon due to the development of urban areas, tourism and agriculture. A dynamic system model has been developed at the watershed scale to estimate the annual load of nutrients reaching the Mar Menor-associated wetlands. At present, mean annual loadings of approximately 2000 tonnes of nitrogen and 60 tonnes of phosphorus are delivered to the lagoon. The simulation results emphasize the role of heavy rainfall events and floods in the formation of the total nutrient load. The composition of aquatic bird communities has been used to assess the nutrient impact on the lagoon food-web. The Great Crested Grebe is apparently the species most closely dependant on local trophic conditions. The related Black-necked Grebe, that dominates the waterbird plays a similar role, but its more opportunistic response to changes in food community of the lagoon resources, reduces its indicator value. The abundance of the two species of grebes seems to closely track the nitrogen load curve, especially during the first phase of enrichment, suggesting the existence of a direct trophic relationship. In the following phase, jellyfish blooms coincide with the bird decline. Jellyfishes seem to have a buffering effect towards nutrients, determining a bottom up limitation to other trophic compartments. In recent years, this buffering capacity has probably been overloaded, favouring the growth of new food resources available to the grebes. Unlike grebes, *Mergus serrator*, a typical piscivorous bird, does not seem to be affected positively by eutrophication since it shows a long-term stability in numbers or even a slight decline. Since this suspected decline would parallel a long-term reduction of fish catches, the species could be

222: A. D. Ferrao, W. R. Demott and A. J. Tessier,. 2005. Responses of tropical cladocerans to a gradient of resource quality. *Freshwater Biology* 6(50): 954-964.

Abstract: 1. The response of three tropical cladocerans to a gradient of resource quality was compared in a series of growth bioassays using seston collected from five lakes of different depth and trophic structure in Michigan, U.S.A. To assess the food quality in terms of digestibility, assimilation experiments were performed with P-32-labelled seston from the same lakes. Animals were also analysed for P-content in their tissues at the end of these assays. 2. In general, assimilation efficiency was higher when animals fed on seston from shallow compared to deep lakes, and was significantly correlated with growth rates, suggesting that shallow lakes have the best food resources in terms of digestibility and P availability. 3. Results also showed that all cladoceran species responded similarly to the resource gradient, with lower growth rates in deep lakes and higher growth rates in shallow lakes, although the strength of response (sensitivity) was different among the species tested. 4. The cladoceran *Moina micrura* was the most sensitive species, and also displayed the highest P-content and maximal growth rate, a pattern consistent with the growth rate hypothesis. 5. However, seston C : P ratio and growth rates in the different resources did not correlate with the animals' P-contents, showing an uncoupling between RNA-phosphorus demands for growth and seston food quality. 6. In conclusion, our results support the idea that digestion resistance in algae is a major constraint to cladocerans in natural plankton communities.

223: J. P. Field, K. W. Farrish, B. P. Oswald, M. T. Romig and E. A. Carter,. 2005. Forest site preparation effects on soil and nutrient losses in east Texas. Transactions of the Asae 2(48): 861-869.

Abstract: Site preparation practices are frequently utilized in Southern pine ecosystems to facilitate planting and seedling establishment. Soil and nutrient losses were monitored in 12 bordered erosion plots following four site preparation treatments in a clearcut harvested loblolly pine (*Pinus taeda* L) forest in east Texas. Three replications of four site preparation treatments were used: (1) chemical herbicide followed by prescribed fire and mechanical tillage, (2) chemical herbicide followed by prescribed fire, (3) chemical herbicide only, and (4) unprepared control. Annual soil loss from the mechanical tillage and prescribed fire treatments (1273 kg ha⁻¹) and 885 kg ha⁻¹, respectively) was significantly greater than annual soil loss from the chemical herbicide and control treatments (240 kg ha⁻¹) and 219 kg ha⁻¹, respectively). During the first post-treatment year sediment concentration and overland flow increased significantly in the mechanical tillage and prescribed fire treatments with respect to control. Nutrient (N, P, K, Ca, Mg, and S) concentrations and losses in sediment and overland flow temporarily increased after the mechanical tillage and prescribed fire treatments, but not after the chemical herbicide and control treatments. Nutrient concentrations and losses for all site preparation treatments were relatively small and should have little or no effects on water quality and long-term site productivity.

224: C. C. Figueredo and A. Giani,. 2005. Ecological interactions between Nile tilapia (*Oreochromis niloticus*, L.) and the phytoplanktonic community of the Furnas Reservoir (Brazil). *Freshwater Biology* 8(50): 1391-1403.

Abstract: 1. Exotic invasive species modify natural food webs in a way frequently hard to predict. In several aquatic environments in Brazil the introduction of *Oreochromis niloticus* (tilapia) was followed by changes in water quality. Yet, because of its rapid and easy growth, this fish has been used in many aquaculture programmes around the country. 2. To measure the effects of tilapia on the phytoplankton community and on water conditions of a large tropical reservoir in south-eastern Brazil (Furnas Reservoir), we performed two in situ experiments using three controls (no fish) and three tilapia enclosures (high fish density). Abiotic and biotic parameters were measured at 4 day intervals for 28 days. 3. Fish presence increased nitrogen (N) and phosphorus (P) availability (ammonium 260 and 70% mean increase - first and second experiment; and total phosphorus 540 and 270% mean increase) via excretion. Nutrient recycling by fish can thus be significant in the nutrient dynamics of the reservoir. The higher chlorophyll a concentration in the experimental fish tanks (86 and 34 $\mu\text{g L}^{-1}$, first and second experiment, respectively) was the result of a positive bottom-up effect on the phytoplankton community (approximately 2 $\mu\text{g L}^{-1}$ in the reservoir and control tank). 4. Because tilapia feed selectively on large algae (mainly cyanobacteria and diatoms), several small-sized or mucilaginous colonial chlorophytes proliferated at the end of the experiments. Thus, the trophic cascade revealed strong influences on algal composition as well as on biomass. 5. Tilapia can contribute to the eutrophication of a waterbody by both top-down and bottom-up forces. In particular, by supplying considerable amount of nutrients it promotes the increase of fast growing algae. Tilapia must be used cautiously in aquaculture to avoid unexpected environmental degradation.

225: M. L. Filippi and M. R. Talbot,. 2005. The palaeolimnology of northern Lake Malawi over the last 25 ka based upon the elemental and stable isotopic composition of sedimentary organic matter. Quaternary Science Reviews 10-11(24): 1303-1328.

Abstract: Sediments accumulating in offshore areas of northern Lake Malawi typically contain 1-4% organic carbon. This organic matter (OM) is of mainly phytoplankton origin with varying mixtures of terrestrial and degraded, reworked material. High-resolution, stable carbon and nitrogen isotopic, elemental and Rock-Eval pyrolysis analyses of the bulk OM contained in three cores have been used to characterise the OM and provide detailed insights into the palaeolimnology and palaeoclimatology of northern Lake Malawi over the last 25 ka. Preservation of the OM as reflected by its Rock-Eval hydrogen index (HI) is highly variable. Periods characterised by notably low HI (< 250) indicate a lowered lake level when oxic conditions episodically reached the deep lake floor. Particularly well-defined lowstands occurred between ca 11.8 and 10 cal ka and around 700 years ago. Isotopic and other evidence also suggest lowstand conditions before and during the Last Glacial Maximum (LGM) lasting until ca 17 ka. However, the OM that accumulated at that time has relatively high HI. Generally high HI values persisted until ca 11.8 ka, when there was a rapid decline leading in to the terminal Pleistocene-early Holocene lowstand. This abrupt change divides the OM record into two distinct phases, one preceding and the other following the decrease in HI. Higher HI values in the earlier period, even during times of low lake level, reflect high rates of primary production stimulated by vigorous vertical mixing of the water column that was driven by a greater incidence of northerly winds. After ca 11.8 ka the wind regime changed to one similar to today's, with mixing and nutrient cycling largely controlled by the southerly trade wind system, and the locus of high primary production at the south end of the lake. Periods Of low $\delta(15)\text{N}$ during the mid- and late Holocene suggest intervals of stable stratification due to significantly reduced wind-driven mixing in the northern part of the lake, when N-fix

226: D. L. Findlay, M. Paterson, L. L. Hendzel and H. Kling,. 2005. Factors influencing *Gonyostomum* semen blooms in a small boreal reservoir lake. *Hydrobiologia* (533): 243-252.

Abstract: Blooms of the nuisance alga *Gonyostomum* semen occurred in Lake 979 (Experimental Lakes Area), a small brown-water lake, that was subjected to several years of an experimental flooding regime. During periods of flooding, blooms of *G. semen* developed when light decreased below $100 \mu\text{mol m}^{-2} \text{s}^{-1}$ and total phosphorous concentrations increased to $>30 \mu\text{g l}^{-1}$. *Gonyostomum* semen biomass was significantly correlated with total P and DOC concentrations. In addition, *G. semen* abundance increased at times when *Daphnia rosea* had rapidly declined to <10 animals l^{-1} . *Daphnia* egg ratios suggest that declines in *Daphnia* abundance were the result of shifts in mortality and not causally linked to changes in *G. semen* densities. The results observed in Lake 979 were supported by a laboratory experiment where the appearance of *G. semen* from Lake 979 sediment was stimulated by altering chemical and biological variables. The stimulation of *G. semen* blooms appears to be dependant on multiple variables rather than a single variable.

227: D. L. Findlay, M. J. Vanni, M. Paterson, K. H. Mills, S. E. M. Kasian, W. J. Findlay and A. G. Salki,. 2005. Dynamics of a boreal lake ecosystem during a long-term manipulation of top predators. *Ecosystems* 6(8): 603-618.

Abstract: We assessed the long-term (16 years) effects of introducing piscivores (northern pike) into a small, boreal lake (Lake 221, Experimental Lakes Area) containing abundant populations of two planktivorous fish species. After the introduction, pearl dace were extirpated and yellow perch abundance was greatly reduced. *Daphnia* species shifted from *D. galeata mendota* to larger bodied *Daphnia catawba*, but the total zooplankton biomass did not increase, nor did the biomass of large grazers such as *Daphnia*. Phytoplankton biomass decreased after the northern pike introduction, but increased when northern pike were partially removed from the lake. Phosphorus (P) excretion by fish was similar to 0.18 mg P m⁻² d⁻¹ before pike addition, declined rapidly to approximately 0.03-0.10 as planktivorous perch and dace populations were reduced by pike, and increased back to premanipulation levels after the pike were partially removed and the perch population recovered. When perch were abundant, P excretion by fish supported about 30% of the P demand by primary producers, decreasing to 6-14% when pike were abundant. Changes in phytoplankton abundance in Lake 221 appear to be driven by changes in P cycling by yellow perch, whose abundance was controlled by the addition and removal of pike. These results confirm the role of nutrient cycling in mediating trophic cascades and are consistent with previous enclosure experiments conducted in the same lake.

228: M. M. Fisher, K. R. Reddy and R. T. James,. 2005. Internal nutrient loads from sediments in a shallow, subtropical lake. Lake and Reservoir Management 3(21): 338-349.

Abstract: Fluxes of dissolved inorganic nitrogen, DIN, (as ammonia, $\text{NH}_4\text{-N}$) and phosphorus (as dissolved reactive phosphorus, DRP) from the sediments to the water column of Lake Okeechobee were determined from two separate techniques: increases in nutrient concentration in the water column above intact cores and concentration gradients determined with pore water equilibrators. These fluxes were estimated from different sediment types within the lake (sand, peat, mud) and at two major inflows (Kissimmee River and Taylor Creek). DRP release from peat sediments was highest. Measurements in other sediments were not significantly different from each other. DRP flux to the lake was estimated as 326 $\text{Mt}(\cdot)\text{yr}^{-1}$ in 1989 and had increased to 472 $\text{Mt}(\cdot)\text{yr}^{-1}$ in 1999. Because of measurement variation, this increase was not statistically different. These estimates of internal DRP loads are greater than estimated external surface DRP loads that averaged 316 $\text{Mt}(\cdot)\text{yr}^{-1}$ from 1979-1988 and 258 $\text{Mt}(\cdot)\text{yr}^{-1}$ from 1989-1999. DIN flux was highest near Taylor Creek. There was no consistent pattern between sediment type and DIN flux. Internal loads of DIN were estimated in 1999 as 4,500 $\text{Mt}(\cdot)\text{yr}^{-1}$, which is greater than the external surface loads of DIN estimated for the period of 1989-1998, of 896 $\text{Mt}(\cdot)\text{yr}^{-1}$. Sediment oxygen demand measured in the cores was strongly correlated to DRP and DIN flux, indicating that these fluxes are largely a result of mineralization of organic material. This study indicates that sediment diffusive fluxes are a significant source of DRP and DIN to the lake water column.

229: K. M. Flinn, M. Vellend and P. L. Marks,. 2005. Environmental causes and consequences of forest clearance and agricultural abandonment in central New York, USA. *Journal of Biogeography* 3(32): 439-452.

Abstract: Aim Climate, topography and soils drive many patterns of plant distribution and abundance across landscapes, but current plant communities may also reflect a legacy of past disturbance such as agricultural land use. To assess the relative influences of environmental conditions and disturbance history on vegetation, it is important to understand how these forces interact. This study relates the geographical distribution of land uses to variation in topography and soils; evaluates the consequences of land-use decisions for current forests; and examines the effects of agricultural land use on the chemical properties of forest soils. Location Tompkins County occupies 1250 km² in central New York's Finger Lakes region. Like much of eastern North America, this area underwent forest clearance for agriculture during the 1800s and widespread field abandonment and forest recovery during the 1900s. The current landscape consists of a patchwork of forests that were never cleared, forests that developed on old fields and active agricultural lands. Methods We investigated relationships among topography, soils and land-use decisions by gathering information about land-use history, slope, aspect, elevation, soil lime content, soil drainage and accessibility in a geographic information system (GIS). To assess the effects of agriculture on forest soil chemistry, we measured pH, organic matter content and extractable nutrient concentrations in field-collected soil samples from 47 post-agricultural and uncleared forests. Results Steeper slopes, less accessible lands and lower-lime soils tended to remain forested, and farmers were more likely to abandon fields that were steeper, farther from roads, lower in lime and more poorly drained. Slope had by far the greatest impact on patterns of clearance and abandonment, and accessibility had a surprisingly strong influence on the distribution of land uses. The effects of other factors varied more, depending for example on location within th

230: M. G. Forbes, K. L. Dickson, F. Saleh, W. T. Waller, R. D. Doyle and P. Hudak,. 2005. Recovery and fractionation of phosphorus retained by lightweight expanded shale and masonry sand used as media in subsurface flow treatment wetlands. *Environmental Science & Technology* 12(39): 4621-4627.

Abstract: Most subsurface flow treatment wetlands, also known as reed bed or root zone systems, use sand or gravel substrates to reduce organics, solids, and nutrients in septic tank effluents. Phosphorus (P) retention in these systems is highly variable and few studies have identified the fate of retained P. In this study, two substrates, expanded shale and masonry sand, were used as filter media in five subsurface flow pilot-scale wetlands (2.7 m³). After 1 year of operation, we estimated the annual rate of P sorption by taking the difference between total P (TP) of substrate in the pilot cells and TP of substrate not exposed to wastewater (control). Means and standard deviations of TP retained by expanded shale were 349 +/- 171 mg kg⁻¹, respectively. For a substrate depth of 0.9 m, aerial P retention by shale was 201 +/- 98.6 g of P m⁻² year⁻¹, respectively. Masonry sand retained an insignificant quantity of wastewater P (111.9 +/- 21.8 mg kg⁻¹) and on occasion exported P. Substrate samples were also sequentially fractionated into labile P, microbial P, (Fe + Al) P, humic P, (Ca + Mg) P, and residual P. In expanded shale samples, the greatest increase in P was in the relatively permanent form of (Fe + Al) P (108 mg kg⁻¹), followed by labile P (46.7 mg kg⁻¹) and humic P (39.8 mg kg⁻¹). In masonry sand, there was an increase in labile P (9.71 mg kg⁻¹). Results suggest that sand is a poor candidate for long-term P storage, but its efficiency is similar to that reported for many sand, gravel, and rock systems. By contrast, expanded shale and similar products with high hydraulic conductivity and P sorption capacity could greatly improve performance of P retention in constructed wetlands.

231: K. J. Forshay and E. H. Stanley,. 2005. Rapid nitrate loss and denitrification in a temperate river floodplain. Biogeochemistry 1(75): 43-64.

Abstract: Nitrogen (N) pollution is a problem in many large temperate zone rivers, and N retention in river channels is often small in these systems. To determine the potential for floodplains to act as N sinks during overbank flooding, we combined monitoring, denitrification assays, and experimental nitrate ($\text{NO}_3\text{--N}$) additions to determine how the amount and form of N changed during flooding and the processes responsible for these changes in the Wisconsin River floodplain (USA). Spring flooding increased N concentrations in the floodplain to levels equal to the river. As discharge declined and connectivity between the river and floodplain was disrupted, total dissolved N decreased over 75% from 1.41 mg l⁻¹, equivalent to source water in the Wisconsin River on 14 April 2001, to 0.34 mg l⁻¹ on 22 April 2001. Simultaneously $\text{NO}_3\text{--N}$ was attenuated almost 100% from 1.09 to < 0.002 mg l⁻¹. Unamended sediment denitrification rates were moderate (0-483 $\mu\text{g m}^{-2} \text{h}^{-1}$) and seasonally variable, and activity was limited by the availability of $\text{NO}_3\text{--N}$ on all dates. Two experimental $\text{NO}_3\text{--N}$ pulse additions to floodplain water bodies confirmed rapid $\text{NO}_3\text{--N}$ depletion. Over 80% of the observed $\text{NO}_3\text{--N}$ decline was caused by hydrologic export for addition #1 but only 22% in addition #2. During the second addition, a significant fraction (> 60%) of $\text{NO}_3\text{--N}$ mass loss was not attributable to hydrologic losses or conversion to other forms of N, suggesting that denitrification was likely responsible for most of the $\text{NO}_3\text{--N}$ disappearance. Floodplain capacity to decrease the dominant fraction of river borne N within days of inundation demonstrates that the Wisconsin River floodplain was an active N sink, that denitrification often drives N losses, and that enhancing connections between rivers and their floodplains may enhance overall retention and reduce N exports from large basins.

232: L. Forsstrom, S. Sorvari, A. Korhola and M. Rautio,. 2005. Seasonality of phytoplankton in subarctic Lake Saanajarvi in NW Finnish Lapland. Polar Biology 11(28): 846-861.

Abstract: We studied the phytoplankton seasonality in the subarctic Lake Saanajarvi, Finnish Lapland, in two successive years with slightly different weather conditions. The total number of taxa studied during the period was 148. Characteristic phytoplankton species were chrysophytes *Uroglena* sp., *Chrysococcus* spp., *Dinobryon* spp and diatoms *Cyclotella* spp. The results were analysed in relation to weather patterns and physico-chemical variables measured from the lake during the 2 years. The seasonal dynamics of phytoplankton were characterized by (1) maxima in total densities during autumn and minima in winter; (2) different species reaching maximum and minimum densities during different seasons; (3) close to equilibrium state during strong thermal stratification in 1997 with dominance of only a few taxa; and (4) two annual maxima in species diversity at the beginning of the thermal stratification and during the autumn overturn. According to canonical ordinations, calcium buffer capacity, nutrients and temperature all play a role in regulating algal biomass and species compositions. With regard to physical factors, the length of the mixing cycle, thermal stability of the water column and water temperature seem to have a major control over the plankton dynamics. The length of the ice-free season seems to be more decisive for biomass production than the thermal stability during this period, which, in turn, appears to affect the algal biodiversity.

233: A. Fortuna, P. E. Rieke, L. W. Jacobs, B. Leinauer and D. E. Karcher,. 2005. Kentucky bluegrass response to use of aquatic plants as a soil amendment. Hortscience 1(40): 237-241.

Abstract: Rapid aquatic plant growth in Michigan's smaller lakes has reduced their navigability and recreational use. Harvested aquatic weeds have posed a new waste disposal issue for municipalities. Application of lake weeds as a soil amendment on area farms was viewed as a possible waste management option that might benefit local sod producers. The objectives of this study were to 1) estimate the amount of plant-available N (PAN) released from lake weed material, 2) determine the chemical composition of aquatic plant tissues and their effect on plant-available moisture, and 3) study turfgrass response to lake weed applications using the criteria of turfgrass quality, growth, and N uptake. Rates of lake weed refuse applied to field plots were 96, 161, and 206 Mg.ha⁻¹. Two 47-day laboratory incubations were conducted with the same rates of refuse. Relative to biosolids, the metal content of the lake weeds was low and the nutrient content high. One megagram of lake weeds contained 0.37 kg of P and 2.5 kg of K. The decay constant for the C fraction in lake weeds was 8 to 10 days and 16 days for the N fraction. Estimates of the N supplied by lake weeds (570, 960, and 1200 kg PAN/ha) were based on data from C and N incubations. Application of lake weeds significantly increased plant-available soil moisture and significantly enhanced sod establishment and turf density, resulting in decreased weed pressure. However, excess N was present at higher application rates. Management concerns during the application of lake weeds should focus on nutrient loading and the timing of plant-available N release. Depending on methods of weed harvesting, we observed that large amounts of unwanted trash present in the plant biomass could discourage use by growers. Land application of lake weed refuse could ease waste disposal problems, reduce fertilizer inputs for sod growers, and improve the moisture status of sands. Further, this information can be of value to environmental regulatory agencies i

234: N. W. Foster, F. D. Beall and D. P. Kreutzweiser,. 2005. The role of forests in regulating water: The Turkey Lakes Watershed case study. Forestry Chronicle 1(81): 142-148.

Abstract: Long-term experimental catchment studies, applied to relatively undisturbed ecosystems, provide reliable hydrologic data that are highly relevant to forest management decisions on water Supply and quality. A number of large-scale, longterm catchment studies have been conducted in North America to examine these linkages and processes in support of watershed management decisions. Among these the Turkey Lakes Watershed (TLW), a rare example of a long-term fully integrated examination of the biology and chemistry of the atmosphere, forests, soils, streams, and lakes, is presented as a case study. Multi-agency, interdisciplinary research at the TLW, which has strong links nationally and internationally, has included hydrological studies, examination of landscape influences on nutrient export to surface waters, and impacts of catchment disturbance on water yield, nutrient flux, carbon cycling, and sedimentation streams. Application of partial cut harvest systems in the TLW tolerant hardwood forest resulted in reduced runoff and improved water quality (sediment, nitrate and calcium concentrations) relative to clear cut harvest. Twenty years after the initiation of reductions in atmospheric S emissions losses of SO₄²⁻ from some headwater basins remain high and there is little evidence of acidification recovery in TLW surface waters. The TLW research approach can be used globally to scientifically assess how natural and human actions affect the important services provided by forested watersheds. I-or example, TLW results have contributed to international policy on acid rain reductions and air quality agreements.

235: A. D. Fox, J. Madsen, H. Boyd, E. Kuijken, D. W. Norriss, I. M. Tombre and D. A. Stroud,. 2005. Effects of agricultural change on abundance, fitness components and distribution of two arctic-nesting goose populations. *Global Change Biology* 6(11): 881-893.

Abstract: Intensification of agriculture since the 1950s has enhanced the availability, competitive ability, crude protein content, digestibility and extended growing seasons of forage grasses. Spilled cereal grain also provides a rich food source in autumn and in winter. Long-distance migratory herbivorous geese have rapidly exploited these feeding opportunities and most species have shown expansions in range and population size in the last 50 years. Results of long-term studies are presented from two Arctic-breeding populations, the Svalbard pink-footed goose and the Greenland white-fronted goose (GWFG). GWFGs have shown major habitat shifts since the 1950s from winter use of plant storage organs in natural wetlands to feeding on intensively managed farmland. Declines in local density on, and abandonment of, unmodified traditional wintering habitat and increased reproductive success among those birds wintering on farmland suggest that density-dependent processes were not the cause of the shift in this wintersitefaithful population. Based on enhanced nutrient and energy intake rates, we argue that observed shifts in both species from traditionally used natural habitats to intensively managed farmland on spring staging and wintering areas have not necessarily been the result of habitat destruction. Increased food intake rates and potential demographic benefits resulting from shifts to highly profitable foraging opportunities on increasingly intensively managed farmland, more likely explain increases in goose numbers in these populations. The geographically exploratory behaviour of subdominant individuals enables the discovery and exploitation of new winter feeding opportunities and hence range expansion. Recent destruction of traditional habitats and declines in farming at northern latitudes present fresh challenges to the well being of both populations. More urgently, Canada geese colonizing breeding and moulting habitats of white-fronted geese in Greenland are further affec

236: L. H. Fraser and L. M. Feinstein,. 2005. Effects of mycorrhizal inoculant, N : P supply ratio, and water depth on the growth and biomass allocation of three wetland plant species. Canadian Journal of Botany-Revue Canadienne De Botanique 9(83): 1117-1125.

Abstract: In the greenhouse, we investigated the growth and biomass allocation of three juvenile wetland species (*Carex tribuloides* Wahl., *Phalaris arundinacea* L., and *Rumex orbiculatus* Gray) under three different water depths (-4, 0, and +2 cm relative to the soil surface), three N:P supply ratios (1:30, 1:1, 30:1), and two mycorrhizal inoculant treatments (arbuscular mycorrhizal (AM) fungi present, absent). After 6 weeks, the plants were harvested, separated to above- and below-ground parts, oven-dried, and weighed. The mycorrhizal inoculant significantly increased plant growth and reduced root:shoot ratios. At an N:P supply ratio of 30:1, plants with AM fungi had significantly greater biomass than those plants without AM fungi. However, at 1:1 N:P supply ratio, plants without AM fungi had greater biomass. Plants without AM fungi had higher root:shoot ratios at 0 and -4 cm water depth than plants with AM fungi. In general, *C. tribuloides* had the lowest growth, and unlike *P. arundinacea* and *R. orbiculatus*, was not affected by the water depth treatment. Growth of the wetland plants was limited more by nitrogen than by phosphorus. Our results suggest that at high N:P nutrient supply ratios and non-flooded conditions the growth of wetland seedlings can benefit by being inoculated with AM fungi.

237: L. H. Fraser and P. A. Keddy,. 2005. Can competitive ability predict structure in experimental plant communities?.
Journal of Vegetation Science 5(16): 571-578.

Abstract: Question: Two questions were posed: 1. Can an independent measure of relative competitive ability be used to predict the abundance of species in mixtures? 2. Is the success of those predictions affected by low fertility (stress simulation) or clipping (disturbance simulation)? Location: Greenhouse at Carleton University, Ottawa, Canada. Methods: We collected adult plant ramets of 11 species from the field and transplanted one ramet of each species into 56 containers of 60 L. We applied a 4 x 2 factorial combination of fertilization (none, full nutrients except N, full nutrients except P, full nutrients) and clipping (no clipping, clipping to 10 cm above soil) with seven replicates of each treatment. After two growing seasons the above- and below-ground biomass of each species was determined. Results: Regression analyses uncovered a significant positive relationship between plant biomass (measured in this study) and relative competitive ability (as measured in an independent study) under all experimental conditions. Both the mean slope and mean R^2 were lowest in treatments with low nutrients and highest in the full nutrient treatment (irrespective of clipping). Conclusions: Our results show that (1) at high fertility, relative competitive ability can generally predict the abundance of species in experimental plant communities, and (2) the intensity of competition (inferred from the magnitude of the slope or R^2) increased with increasing nutrient supply, particularly nitrogen.

238: A. M. Freyria, Y. Yang, H. Chajra, C. F. Rousseau, M. C. Ronziere, D. Herbage and A. J. El Haj,. 2005. Optimization of dynamic culture conditions: Effects on biosynthetic activities of chondrocytes grown in collagen sponges. Tissue Engineering 5-6(11): 674-684.

Abstract: Application of mechanical stimulation, using dynamic bioreactors, is considered an effective strategy to enhance cellular behavior in load-bearing tissues. In this study, two types of perfusion mode (direct and free flow) are investigated in terms of the biosynthetic activities of chondrocytes grown in collagen sponges by assessment of cell proliferation rate, matrix production, and tissue morphology. Effects of the duration of preculture and dynamic conditioning are further determined. Our results have demonstrated that both bovine and human-derived chondrocytes demonstrate a dose-dependent response to flow rate (0-1 mL/min) in terms of cell number and glycosaminoglycan (GAG) content. This may reflect the weak adhesion of cells to the sponge scaffolds and the immature state of the constructs even after 3 weeks of proliferative culture. Our studies define an optimal flow rate between 0.1 and 0.3 mL/min for direct perfusion and free flow bioreactors. Using fresh bovine chondrocytes and a lower flow rate of 0.1 mL/min, a comparison was made between free flow system and direct perfusion system. In the free flow bioreactor, no cell loss was observed and higher GAG production was measured compared with static cultured controls. However, as with direct perfusion, the enhancement effect of free flow perfusion was strongly dependent on the maturation and organization of the constructs before the stimulation. To address the maturation of the matrix, preculture periods were varied before mechanical conditioning. An increase in culture duration of 18 days before mechanical conditioning resulted in enhanced GAG production compared with controls. Interestingly, additional enhancement was found in specimens that were further subjected to a prolonged duration of perfusion (63% increase after an additional 4 days of perfusion) after prematuration. The free flow system has an advantage over the direct perfusion system, especially when using sponge scaffolds, which have lower mechani

239: N. Friberg, A. Baattrup-Pedersen, M. Pedersen and J. Skriver,. 2005. The new Danish stream monitoring programme (NOVANA) - Preparing monitoring activities for the water framework directive era. Environmental Monitoring and Assessment 1-3(111): 27-42.

Abstract: Denmark has a long tradition of monitoring the aquatic environment. Previous monitoring has mainly focused on loss of nutrients and subsequent impacts on the biological structure in lakes and coastal areas. However, as part of the third Action Plan for the Aquatic Environment more emphasis has been put on stream ecology. The present paper describes background, strategy and content of the new NOVANA stream programme, which will run for the period 2004-2009. The new programme will encompass more than 800 stations covering all stream types in Denmark and monitoring will include three biological quality elements (macrophytes, macroinvertebrates and fish) as well as physico-chemical features and hydromorphological elements. In addition, the new programme integrates monitoring of elements both in the stream itself and in the riparian zone. Compliance with important European Commission Directives such as the Water Framework Directive and the Habitat Directive is discussed.

240: P. C. Frost, W. F. Cross and J. P. Benstead,. 2005. Ecological stoichiometry in freshwater benthic ecosystems: an introduction. *Freshwater Biology* 11(50): 1781-1785.

Abstract: 1. Ecological stoichiometry is a conceptual framework that considers how the balance of energy and elements affects and is affected by organisms in the environment. This perspective has seen recent development primarily in marine and freshwater pelagic ecosystems but its widescale application to freshwater benthic ecosystems remains limited. 2. This paper briefly introduces the concept of ecological stoichiometry, its potential application to freshwater benthic ecosystems, and it provides an overview of a series of papers that use a stoichiometric approach to illustrate the utility of this concept for studying a range of central questions about benthic ecosystems. 3. Papers in this issue include a detailed description of the elemental composition of stream benthic invertebrates, an analysis of the algal content of and its effects on C : P stoichiometry of periphyton, two reports exploring the stoichiometry of stromatolites and their snail consumers in a stream fed by thermal springs, an examination of the stoichiometric effects on stream periphyton and macroinvertebrates of slight nutrient enrichment resulting from treated sewage effluents, a study of nutrient release ratios and their control from crayfish and snails, a paper addressing the stoichiometric effects on fish and plankton that result from benthic food subsidies to fish, a study of the stoichiometry of tree leaves and litter and floodplain arthropods in the riparian zone of the Rio Grande, and a synthesis examining the current state and future potential of benthic stoichiometry. 4. The insights from these and other studies suggest that ecological stoichiometry has great potential to guide scientific thought and resolve long-standing problems in ecology. Increasing use of this stoichiometric perspective should thus lead to a deeper understanding of important ecological processes in freshwater benthic ecosystems.

241: P. C. Frost, H. Hillebrand and M. Kahlert,. 2005. Low algal carbon content and its effect on the C : P stoichiometry of periphyton. *Freshwater Biology* 11(50): 1800-1807.

Abstract: 1. We examined the contribution of algal cells to periphytic organic carbon and assessed the effects of variable biomass composition on the carbon : phosphorus (C : P) ratio of periphyton. We compiled more than 5000 published and unpublished observations of periphytic carbon : chlorophyll a (C : Chl) ratios, an index of algal prevalence, from a variety of substrata collected from lake and low-salinity coastal habitats. In addition, we converted estimates of algal biovolume into algal C to obtain an independent measure of cellular algal carbon in periphyton. This information was used in a model relating periphyton C : P ratio to algal cellular carbon, the algal C : P ratio, and the C : P ratio of non-algal organic matter in periphyton. 2. The mean C : Chl ratio of periphyton (405) was relatively high with values in > 25% of the samples exceeding 500. On average, 8.4% of total periphyton C was accounted for by C in algal cells. Only 15% of samples were found to have more than 15% periphyton C in cellular algal carbon. Our model showed a nonlinear relationship between periphytic C : P ratios and the C : P ratio of algal cells in the periphyton when non-algal organic matter was present. However, even at relatively low cellular algal C (< 10% of total C), algal C : P ratios can strongly affect the C : P ratio of periphyton as a whole (i.e. algal cells plus other organic matter). 3. The high C : Chl ratios and the low biovolume-derived algal C of periphyton samples in our data set indicate that algal cells are typically a minor component of organic carbon in periphyton, However, this minor contribution would not preclude algal cellular stoichiometry from notably influencing periphyton C : P ratios.

242: P. C. Frost and N. C. Tuchman,. 2005. Nutrient release rates and ratios by two stream detritivores fed leaf litter grown under elevated atmospheric CO₂. Archiv Fur Hydrobiologie 4(163): 463-477.

Abstract: We examined how nutrient release by two common stream detritivores, Asellus and Gammarus, was affected by the consumption of aspen leaf litter from trees grown under elevated CO₂. We measured excretory release of dissolved organic carbon (DOC), ammonia (NH₄), and soluble reactive phosphorus (SRP) from consumers fed senesced leaves of Populus tremuloides (trembling aspen) trees grown under elevated (720 ppm) and ambient (360 ppm) CO₂. Contrary to predictions based on ecological stoichiometry, elevated CO₂ leaves caused greater NH₄ and SRP release from both animals but did not affect the release of DOC. Elevated CO₂ leaves reduced DOC: NH₄ and DOC: SRP ratios released from Asellus but did not affect these ratios from Gammarus. Both animals showed lower NH₄:SRP release ratios after eating elevated CO₂ leaves. A mass balance model of consumer N and P release demonstrated that increased excretion rates likely resulted from reduced absorption efficiencies (and unchanged or higher digestive efficiencies) in these aquatic detritivores. Our results indicate that changes in leaf biochemistry resulting from elevated atmospheric CO₂ Will strongly affect the ability of stream consumers to retain important biogenic elements. Increased release rates of NH₄ and SRP are another indication, along with reduced growth and reproduction, that litter produced under elevated CO₂ has strong effects on key physiological processes in detritivores with potentially strong consequences for nutrient cycling in streams of forested regions.

243: R. Fujinuma, J. Bockheim and N. Balster,. 2005. Base-cation cycling by individual tree species in old-growth forests of Upper Michigan, USA. *Biogeochemistry* 3(74): 357-376.

Abstract: The influence of individual tree species on base-cation (Ca, Mg, K, Na) distribution and cycling was examined in sugar maple (*Acer saccharum* Marsh.), basswood (*Tilia americana* L.), and hemlock (*Tsuga canadensis* L.) in old-growth northern hardwood - hemlock forests on a sandy, mixed, frigid, Typic Haplorthod over two growing seasons in northwestern Michigan. Base cations in biomass, forest floor, and mineral soil (0-15 cm and 15-40 cm) pools were estimated for five replicated trees of each species; measured fluxes included bulk precipitation, throughfall, stemflow, litterfall, forest-floor leachate, mineralization + weathering, shallow-soil leachate, and deep-soil leachate. The three species differed in where base cations had accumulated within the single-tree ecosystems. Within these three single-tree ecosystems, the greatest quantity of base cations in woody biomass was found in sugar maple, whereas hemlock and basswood displayed the greatest amount in the upper 40 cm of mineral soil. Base-cation pools were ranked: sugar maple > basswood, hemlock in woody biomass; sugar maple, basswood > hemlock in foliage; hemlock > sugar maple, basswood in the forest floor, and basswood > sugar maple, hemlock in the mineral soil. Base-cation fluxes in throughfall, stemflow, the forest-floor leachate, and the deep-soil leachate (2000 only) were ranked: basswood > sugar maple > hemlock. Our measurements suggest that species-related differences in nutrient cycling are sufficient to produce significant differences in base-cation contents of the soil over short time intervals (< 65 years). Moreover, these species-mediated differences may be important controls over the spatial pattern and edaphic processes of northern hardwood-hemlock ecosystems in the upper Great Lakes region.

244: R. W. Fulweiler and S. W. Nixon,. 2005. Terrestrial vegetation and the seasonal cycle of dissolved silica in a southern New England coastal river. *Biogeochemistry* 1(74): 115-130.

Abstract: The Pawcatuck river watershed (797 km²) is located in southern Rhode Island and northeastern Connecticut. The predominant lithology of the area is granite, and over 60% of the watershed remains forested with mixed hardwoods (primarily oak) and eastern white pine. As part of a larger study of nutrient and sediment exports from the watershed to Little Narragansett Bay, we measured dissolved silica (SiO₂) (DSi) concentrations at the river mouth over 70 times between January 14, 2002 and November 29, 2002. Annual export of DSi during our study was 40x10⁶ mol or 50 kmol km⁻¹. The United States Geological Survey (USGS) obtained DSi concentrations at this site, at varying frequencies, from 1978 to the present, which allowed for a historical comparison of this study with previous years. River DSi concentrations exhibited a strong seasonal signal that did not vary in a regular way with water discharge or water temperature. DSi and dissolved inorganic nitrogen (DIN) concentrations were significantly related over the annual cycle ($p < 0.0001$) and both decreased substantially during the spring. Dissolved inorganic phosphorus (DIP) did not covary at any time with silica or nitrogen, suggesting that in-stream biological uptake was not responsible for the seasonal decline in silica. The spring decline in river silica concentrations may be due to silica uptake by terrestrial vegetation. We estimate a net forest silica accretion rate of 41 kmol km⁻² y⁻¹, a value that is stoichiometrically consistent with other measurements of net carbon accretion in nearby forests.

245: J. Gago, X. A. Alvarez-Salgado, M. Nieto-Cid, S. Brea and S. Piedracoba,. 2005. Continental inputs of C, N, P and Si species to the Ria de Vigo (NW Spain). *Estuarine Coastal and Shelf Science* 1-2(65): 74-82.

Abstract: C, N, P and Si in dissolved, particulate, organic and inorganic forms, determined from 12 surveys in the river Oitaben-Verdugo during 2002, allowed quantification of the chemical composition, phase partitioning and fluxes of continental materials to the inner Ria de Vigo (NW Spain). Despite the large fluxes normalised to the drainage basin of the river Oitaben-Verdugo (280 mmol C m⁽⁻²⁾ y⁽⁻¹⁾, 56.5 mmol N m⁽⁻²⁾ y⁽⁻¹⁾, 1.35 mmol p m⁽⁻²⁾ y⁽⁻¹⁾, and 61.3 mmol Si m⁽⁻²⁾ y⁽⁻¹⁾), its reduced dimensions (350 km⁽²⁾) yielded relatively low concentrations of these species. Organic C, N and P represented 62%, 43% and 48% of the total C, N and P fluxes, respectively. About 90% of the organic C and N and 60% of the organic P was in the dissolved form. The chemical composition of the organic materials was compatible with detrital organic matter derived from aquatic plants, phytoplankton and soil leaching but not with unprocessed terrestrial plants. Significant temporal changes were observed in the chemical composition, related to the seasonal cycle of the biological activity in stream waters and soils, as well as the chemical weathering reactions. Spatial differences were due to the contrasting dynamic regime and, likely, the origin of the materials. (c) 2005 Elsevier Ltd. All rights reserved.

246: E. E. Gaiser, J. C. Trexler, J. H. Richards, D. L. Childers, D. Lee, A. L. Edwards, L. J. Scinto, K. Jayachandran, G. B. Noe and R. D. Jones,. 2005. Cascading ecological effects of low-level phosphorus enrichment in the Florida everglades. *Journal of Environmental Quality* 2(34): 717-723.

Abstract: Few studies have examined long-term ecological effects of sustained low-level nutrient enhancement on wetland biota. To determine sustained effects of phosphorus (P) addition on Everglades marshes we added P at low levels (5,15, and 30 $\mu\text{g L}^{-1}$ above ambient) for 5 yr to triplicate 100-m flow-through channels in pristine marsh. A cascade of ecological responses occurred in similar sequence among treatments. Although the rate of change increased with dosing level, treatments converged to similar enriched endpoints, characterized most notably by a doubling of plant biomass and elimination of native, calcareous periphyton mats. The full sequence of biological changes occurred without an increase in water total P concentration, which remained near ambient levels until Year 5. This study indicates that Everglades marshes have a near-zero assimilative capacity for P without a state change, that ecosystem responses to enrichment accumulate over time, and that downstream P transport mainly occurs through biota rather than the water column.

247: K. Gajewski, G. Bouchard, S. E. Wilson, J. Kurek and L. C. Cwynar,. 2005. Distribution of Chironomidae (Insecta : Diptera) head capsules in recent sediments of Canadian Arctic lakes. *Hydrobiologia* (549): 131-143.

Abstract: Thirty-two taxa of chironomid larvae were collected from the sediments of 50 lakes from across the Canadian Arctic Islands. Most chironomid taxa living in the Arctic have wide distributions, with only one taxon, *Abiskomyia*, showing a clear geographic limitation in this region. Many of these taxa have habitat preferences, among which lake morphometry, pH, nutrients and temperature are important. Due to the complex environmental patterns in the Arctic, lakes in both the northern and southern portion of the Canadian Arctic Archipelago have warmer temperatures and the chironomid assemblages of these two regions resemble each other more than those of the intervening central islands. Chironomid diversity is lowest in the central arctic islands, primarily Devon and Cornwallis Island, where the combination of low nutrients and cold temperatures provide the most. severe environment for chironomid survival.

248: N. P. D. Gamage and T. Asaeda,. 2005. Decomposition and mineralization of *Eichhornia crassipes* litter under aerobic conditions with and without bacteria. *Hydrobiologia* (541): 13-27.

Abstract: The water hyacinth (*Eichhornia crassipes* (Mart.) Solms.) plants in lakes and reservoirs have gained considerable attention in tropical and sub-tropical parts of the world due to its rapid growth. The amount of nutrients released from the dead plant materials is of particular interest. Thus, decomposition of water hyacinth plant parts under aerobic conditions was studied in the laboratory. Roots, petioles, and leaves of water hyacinth were enclosed separately in one litre polypropylene bottles which contained 500 ml of lake water. To study the influence of bacteria on the decomposition, antibiotics were added to half of the bottles. We observed that decomposition of leaves and petioles without antibiotics were relatively rapid through day 61, with almost 92.7 and 97.3% of the dry mass removed, respectively. Weight loss due to bacterial activities during 94 days decomposition was 22.6, 3.9, and 30.5% from leaf, petiole, and root litter. Decomposition of litter in lake water indicated that after 94 days 0.6, 0, and 0.6 g m⁻² of leaf, petiole, and root N was dissolved in leachate, while 23.1, 14.4, and 6.0 g m⁻² of leaf, petiole, and root N was either volatilized or remained as particulate organic N. Moreover, 0.2, 0, and 0.1 g m⁻² of leaf, petiole, and root P remained dissolved in the leachate, while 3.1, 3.4, and 1.1 g m⁻² of leaf, petiole, and root P was either precipitated or remained as particulate organic P. The carbon dynamics during the decomposition indicated that 7.4, 28.8, and 3.7 g m⁻² of leaf, petiole, and root C remained dissolved in the leachate after 94 days while 228.0, 197.6, and 107.4 g m⁻² of leaf, petiole, and root C was either diffused or remained as particulate organic C. These findings are useful for quantifying the nutrient cycles of very shallow lakes with water hyacinth under aerobic water environment. Further examination of the fate of the plant litter as it moves down in deep anaerobic water environment, is necessary to understand

249: J. Gan, S. J. Lee, W. P. Liu, D. L. Haver and J. N. Kabashima,. 2005. Distribution and persistence of pyrethroids in runoff sediments. *Journal of Environmental Quality* 3(34): 836-841.

Abstract: Pyrethroids are commonly used insecticides in both agricultural and urban environments. Recent studies showed that surface runoff facilitated transport of pyrethroids to surface streams, probably by sediment movement. Sediment contamination by pyrethroids is of concern due to their wide-spectrum aquatic toxicity. In this study, we characterized the spatial distribution and persistence of bifenthrin [BF; (2-methyl(1,1'-biphenyl)-3-yl)methyl 3-(2-chloro-3,3,3-trifluoropropenyl)-2,2-dimethylcyclopropanecarboxylate] and permethrin [PM; 3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylic acid (3-phenoxyphenyl)methyl ester] in the sediment along a 260-m runoff path. Residues of BF and PM were significantly enriched in the eroded sediment, and the magnitude of enrichment was proportional to the downstream distance. At 145 m from the sedimentation pond, BF was enriched by > 25 times, while PM isomers were enriched by > 3.5 times. Pesticide enrichment along the runoff path coincided with enrichment of organic carbon and clay fractions in the sediment, as well as increases in adsorption coefficient K_d , suggesting that the runoff flow caused selective transport of organic matter and chemical-rich fine particles. Long persistence was observed for BF under both aerobic and anaerobic conditions, and the half-life ranged from 8 to 17 mo at 20 degrees C. The long persistence was probably caused by the strong pesticide adsorption to the solid phase. The significant enrichment, along with the prolonged persistence, suggests that movement of pyrethroids to the surface water may be caused predominantly by the chemically rich fine particles. It is therefore important to understand the fate of sediment-borne pyrethroids and devise mitigation strategies to reduce offsite movement of fine sediment.

250: P. Gantes, A. S. Caro, F. Momo, M. A. Casset and A. Torremorel,. 2005. An approximation to the nitrogen and phosphorus budgets in floating soils of a subtropical peatland (Ibera, Argentina). *Ecological Modelling* 1(186): 77-83.

Abstract: The N and P budgets in littoral floating soils - embalsados - of Ibera (Argentina) are here presented. The budgets were estimated from the differences in the total amounts of N and P in the aboveground biomass in February (summer) and August (winter), and the total amount of N and P in the floating soils sediments. Samples of vegetation - for aboveground biomass estimation - and of sediments were collected. The sediment samples were picked with a corer, and included roots, rhizomes, detritus and inorganic material. The total P and total N concentrations were determined for the vegetation samples and the bioavailable P and total N concentrations were determined in the sediments. The results show that the aboveground biomass production gets less than 10% of the N content of the sediments. There is a decrease in the total amount of N in the sediments during the growing period. This observation can be partly explained by lacking data from non-estimated compartments, like the grazed aboveground biomass and the increment of the belowground biomass. Other possible fates for N would be losses by denitrification and lixiviation to the lagoon. The N:P ratio in the biomass indicates a deficiency of N, which is consistent with the negative N balance estimated for the embalsado. With respect to bioavailable P, a negative balance between winter and summer was also found. This was not the case for total P. The significant decrease of bioavailable P in depth in the embalsado suggests a net flow towards the lagoon along the growing season. (c) 2005 Elsevier B.V. All rights reserved.

251: P. J. Garrison and S. A. Fitzgerald,. 2005. The role of shoreland development and commercial cranberry farming in a lake in Wisconsin, USA. *Journal of Paleolimnology* 2(33): 169-188.

Abstract: Musky Bay in Lac Courte Oreilles, Wisconsin, USA, is currently eutrophic. This large, shallow bay of an oligotrophic lake possesses the densest aquatic plant growth and a floating algal mat. Paleoecological reconstructions encompassing the last 130 years, were based on multiproxy analyses of sediment cores from three coring sites, two within the bay and one in the lake itself. These data were compared to historical records of the construction and expansion of two commercial cranberry bogs and shoreline residential homes to identify temporal and causal relations of eutrophication. The proxies investigated included: minor and trace elements; biogenic silica; and the diatom community. Post-depositional diagenesis of organic carbon, nitrogen, and phosphorus in the upper 30 cm of the core obscured records of historical ambient nutrient concentrations in the bay obviating their usefulness for this purpose. In contrast, calcium, magnesium, and potassium concentration profiles appeared to reflect runoff soil amendments applied to the cranberry bogs and aerial fertilizer spraying over the eastern bog adjacent to Musky Bay. The increase in aluminum content since about 1930 coincided with the historical trend in shoreland development and construction of the original commercial cranberry farm. The biogenic silica profile recorded a steady increase of nutrients to Musky Bay over the last several decades. Stratigraphic changes in the diatom community indicated that nutrient input began to increase in the 1940s and accelerated in the mid-1990s with the onset of a noxious floating algal mat. The diatom community indicates the bay has possessed a significant macrophyte community for at least the last 200 years, but increased nutrient input was manifested by a change in the composition, and an increase in the density of the epiphytic diatom community. Cranberry farming appeared to be the major source of nutrients because the diatom community changes occurred prior to the significant

252: S. Gascon, D. Boix, J. Sala and X. D. Quintana,. 2005. Variability of benthic assemblages in relation to the hydrological pattern in Mediterranean salt marshes (Emporda wetlands, NE Iberian Peninsula). Archiv Fur Hydrobiologie 2(163): 163-181.

Abstract: The structure and composition of benthic assemblages (organisms > 100 μ m) and the main factors which control them were studied in the coastal basins of the Emporda wetlands (NE Iberian Peninsula). Five coastal basins were sampled in three different conditions during one hydroperiod (1997-1998): (1) one month after the main autumnal inundation when the water level was high; (2) in the middle of the hydroperiod; and (3) when the basins were close to desiccation. Based on the hydrological pattern, three types of basins were distinguished: non-disturbed permanent waters (type 1), non-disturbed temporary waters (type 2), and disturbed temporary waters (type 3). These three types are in agreement with the classification result from the benthic assemblage composition. The type I basins, where more stable environmental conditions were found, had an assemblage characterised by a high density of individuals, total biomass and diversity. The assemblage of type 2 basins had lower richness and diversity values with little temporal variability. The high frequency of freshwater inputs in type 3 basins causes a high taxonomic singularity and high temporal variability of species richness and diversity. The main environmental parameters (salinity, sand percentage, total phosphorus from the sediment, and total organic carbon from the water) related to the structure of benthic assemblages, also discriminating three groups, were coincident with the three types derived from distinct hydrological patterns. Thus, water regime summarises the physical factors which ultimately determine benthic fauna.

253: V. Gasiunas, Z. Strusevicius and M. S. Struseviciene,. 2005. Pollutant removal by horizontal subsurface flow constructed wetlands in Lithuania. Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering 6-7(40): 1467-1478.

Abstract: Horizontal subsurface flow constructed wetlands recently have been developed in Lithuania. They ensure the efficient removal of nutrients and organic matter. This article analyses BOD₅ and N and P removal efficiency with respect to filter loads. To achieve a normative wastewater treatment level according to BOD₅ (25 mg O₂ l⁻¹), loads of filters should not exceed 5.8 g m⁻² day⁻¹, that is, the treatment of wastewater produced by population equivalent requires a filter area of 10.5 m². After treatment in filters total N of wastewater contains 55-85% of mineral N. Nitrite-N and nitrate-N make up 0.1% and 3.0% on average; the other part is composed of ammonia-N. Increasing total N concentrations contained in water outflow predetermine higher ammonia-N amounts. If water outflow contains 10 mg l⁻¹ of total N, ammonia-N makes up 51.5%; if it contains 40 mg l⁻¹, then ammonia-N makes up 81.0%. The average total nitrogen removal efficiency is 37-44%. P removal is affected by the physico-chemical characteristics of sand and qualitative composition of phosphorus contained in wastewater. P removal up to 2 mg l⁻¹ from domestic and other wastewater of similar composition requires no higher than 0.15 g m⁻²/day⁻¹ load of filters according to total P.

254: S. M. Gathumbi, P. J. Bohlen and D. A. Graetz,. 2005. Nutrient enrichment of wetland vegetation and sediments in subtropical pastures. Soil Science Society of America Journal 2(69): 539-548.

Abstract: Land use practices exert a major influence on plant productivity, soil and plant nutrient content, and within-stand nutrient cycling in wetlands in agricultural landscapes. We examined differences between improved and seminative pastures in plant and soil nutrient characteristics in seasonally flooded wetlands in subtropical grazing land of south central Florida. The wetlands were embedded within either grazed improved pastures with a long-term history of fertilizer application or seminative pastures with no history of previous fertilizer application. Soil nutrient concentrations decreased with soil depth for both land use types. Total C, N, and P were significantly greater ($P < 0.05$) in the 0- to 15-cm mineral layer compared with the deeper layers (15-30, 30-45 cm) for both improved and seminative pasture wetland soils. Improved pasture wetlands had greater amounts of total P (22.3 kg P ha⁻¹) in the upper 0- to 15-cm soil layer than did the seminative pasture wetlands (15.7 kg P ha⁻¹). Plant and soil (0-15 cm) N/P and CIP ratios were lower in improved pasture wetlands compared with seminative pasture wetlands, suggesting greater P enrichment in improved pasture wetlands. Microbial biomass C and N decreased with soil depth in both pasture types. Soil microbial biomass C/total C ratios decreased with soil depth and were similar for both improved and seminative pasture wetlands. Our results suggest that plant and soil nutrient enrichment and storage in temporary wetlands may be impacted by adjacent land use practices, which potentially leads to the alteration of the structure and functions of these wetland ecosystems.

255: P. Gell, J. Tibby, J. Fluin, P. Leahy, M. Reid, K. Adamson, S. Bulpin, A. MacGregor, P. Wallbrink, G. Hancock and B. Walsh,. 2005. Accessing limnological change and variability using fossil diatom assemblages, south-east Australia. *River Research and Applications* 2-3(21): 257-269.

Abstract: Floodplain wetlands accumulate river-borne sediments that include mixed assemblages of allochthonous and autochthonous diatoms as fossils. These assemblages have been used in river floodplain wetlands and reservoirs to quantitatively reconstruct salinity, pH and nutrients and to qualitatively infer connectivity and turbidity over periods spanning decades to millennia. High sedimentation rates in some sites have permitted sub-annual temporal resolution; however, annual to decadal resolution is more usual. The establishment of chronologies for these sequences is often difficult owing to the substantial input of fluvially borne Pb-210. the high spatial variability in the earliest detection of exotic pollen markers and the inaccuracy of radiocarbon approaches in dating sediments younger than 500 years. Other complexities arise from the difficulty of differentiating the influence of co-variables in accord with the river continuum concept and identifying shifts driven by hydrosere influences independent of changes to the fluvial system. Caution is also needed in inferring lotic change from a record accumulating in lentic systems. Nevertheless, substantial increases in salinity (lower Snowy, lower and middle Murray), pH (mid-Goulburn), turbidity (upper and lower Murray and Yarra), nutrients (lower Murray and Yarra), and sedimentation rate (widespread), as well as clear shifts in trophic structure (upper Murray), have been documented for the post-European period from regulated river wetlands across southeast Australia. A site in the lower Murray records river connectivity and water quality changes consistent with the regional Holocene climate record. Reductions in effective precipitation documented in closed lake systems are not evident in riverine plain wetlands, possibly owing to their relative complexity. The refinement of chronologies and data-bases will allow the determination of the pre-impact nature and variability of sites, the rates of limnological change and biol

256: D. P. Genereux, M. T. Jordan and D. Carbonell,. 2005. A paired-watershed budget study to quantify interbasin groundwater flow in a lowland rain forest, Costa Rica. Water Resources Research 4(41): .

Abstract: A paired-watershed budget study was used to quantify the annual water and major ion (sodium, potassium, magnesium, calcium, chloride, and sulfate) budgets of two adjacent lowland rain forest watersheds in Costa Rica. Interbasin groundwater flow (IGF) accounted for about two thirds of the water input and about 97% of the solute input (an average over the six major ions) to one watershed but little or none of the inputs to the adjacent watershed in which IGF was at most marginally distinguishable from zero. Results underscore the significance of IGF as a potential control on the hydrology and water quality of lowland watersheds, the spatial complexity of its occurrence in lowlands (where its influence may range from dominating to negligible on adjacent watersheds), and the importance of accounting for IGF in the design and execution of watershed studies and in water management.

257: S. E. Gergel,. 2005. Spatial and non-spatial factors: When do they affect landscape indicators of watershed loading?. Landscape Ecology 2(20): 177-189.

Abstract: The percentage of a watershed occupied by agricultural areas is widely used to predict nutrient loadings and in-stream water chemistry because water quality is often linked to non-point sources in a watershed. Measures of the spatial location of source areas have generally not been incorporated into such landscape indicators although empirical evidence and watershed loading models suggest that spatially explicit information is useful for predicting loadings. I created a heuristic grid-based surface-flow model to address the discrepancies between spatially explicit and non-spatial approaches to understanding watershed loading. The mean and variance in loading were compared among thousands of simulated watersheds with varying percentages of randomly located source and sinks. The variability in loading among replicate landscapes was greatest for those landscapes with similar to 65% source areas. This variance peak suggests that considering the spatial arrangement of cover types is most important for watersheds with intermediate relative abundances of sources and sinks as the wide variety of different spatial configurations can lead to either very high or very low loading. Increasing the output from source pixels (relative to the amount absorbed by sink pixels) among different landscapes moved the peak in variance to landscapes with lower percentages of sources. A final scenario examined both broad- and fine-scale heterogeneity in source output to disentangle the relative contributions of spatial configuration, percentage of source covers, and heterogeneity of sources in governing variability in loading. In landscapes with high percentages of source pixels, fine-scale heterogeneity in source output was responsible for a greater portion of the total variability in loading among different watersheds than was spatial arrangement. These results provide several testable hypotheses for when spatial and non-spatial approaches might be most useful in relating land cover to water

258: A. E. Ghaly, A. Kamal and N. S. Mahmoud,. 2005. Phytoremediation of aquaculture wastewater for water recycling and production of fish feed. Environment International 1(31): 1-13.

Abstract: Five plants were examined for their ability to remove nutrients from aquaculture wastewater and suitability as fish feed: alfalfa, white clover, oat, fall rye, barley. The seeds were first germinated in water in a hydroponic system, and the plants were fed wastewater from Tilapia production facility. Clover and alfalfa seeds were infected with fungus shortly after germination, and their roots were completely destroyed by day 14. Oat, rye and barley had the fastest growth and showed greater tolerance to fungal disease compared with alfalfa and clover. Although substantial amounts of soluble and insoluble substances were released by the seeds during the germination period, the plants were able to remove all the pollutants in wastewater and significant portions of those released substances. The total reductions in total solids, COD, NO₃-N, NO₂-N, phosphate and potassium ranged from 54.7% to 91.0%, 56.0% to 91.5%, 82.9% to 98.1%, 95.9% to 99.5%, 54.5% to 93.6% and 99.6% to 99.8%, respectively. Oat, barley and rye grow well in this type of hydroponic system and can be used as a fish feed after being supplemented with fat, Ca, Na, Mn and Fe. Oil seeds and the chlorides of these elements could be added to these plants when formulating the fish feed. For a continuous operation, a two-unit system could be configured to allow for one week germination and one week cleaning and startup in one unit while the other unit is in operation. (C) 2004 Elsevier Ltd. All rights reserved.

259: J. W. Gichuki, L. Triest and F. Dehairs,. 2005. The fate of organic matter in a papyrus (*Cyperus papyrus* L.) dominated tropical wetland ecosystem in Nyanza Gulf (Lake Victoria, Kenya) inferred from delta C-13 and delta N-15 analysis. *Isotopes in Environmental and Health Studies* 4(41): 379-390.

Abstract: Papyrus swamps usually form at the interface between river inlet and open lake. From one such wetland ecosystem (the Kibos system located in the Nyanza Gulf, Lake Victoria, Kenya), three sediment cores were recovered using piston corer in order to determine the fate of organic matter derived from papyrus and possible nutrient pathways in this system. The coring represented a transect from the river through the floating papyrus mat to the lake. Two short cores were retrieved from the lake and river. One long core (2 m) was recovered on a floating papyrus mat. The C:N ratio showed similar trends down core from the three locations. This may possibly be due to diagenic processes such as autolysis, dissolution and microbial mineralisation occurring in the sediments. Statistical analysis through one-way ANOVA revealed no significant differences in the C:N ratios between stations. Results of the stable carbon isotope ratios revealed that the delta(13)C of the river and lake samples were persistently more negative than -20 parts per thousand over the whole profile indicating possible contribution from terrestrial derived carbon. Regarding the floating mat core, the delta(13)C values ranged from -18.99 parts per thousand on the top of the floating mat but gradually increased to -16.82 parts per thousand towards the bottom of the core indicating possible contribution of carbon from *Cyperus papyrus* that has a delta(13)C value of -13.450.62 parts per thousand. Statistical analysis through one-way ANOVA revealed significant differences in the delta(13)C values between stations. The stable nitrogen isotope values were highly positive both in the river and in the lake station (delta(15) N > 10 parts per thousand), indicating possible contamination from sewage wastes. Values in the swamp were less positive suggesting first, the formation of ammonium depleted in N-15 from intense organic matter mineralisation, secondly indicating the delta(15)N signal of papyrus and, finally that nitrogen

260: P. Gikuma-Njuru and R. E. Hecky,. 2005. Nutrient concentrations in Nyanza Gulf, Lake Victoria, Kenya: light limits algal demand and abundance. *Hydrobiologia* 1-3(534): 131-140.

Abstract: Nyanza Gulf is a large shallow embayment connected to Lake Victoria by the deep narrow Rusinga Channel. Between December 2000 and May 2002 the gradient of nutrients along the axis of Nyanza gulf into the main lake was determined. Nutrient concentrations in the gulf were found to be different from those in the main lake with phosphorus fractions, SRP and TP being significantly higher in the main lake than in the gulf. Well oxygenated conditions in the gulf keep the PO₄-P strongly bound to mineral particles whereas in the main lake, where deeper depths allows for development of anoxia, it is released into solution. The low TN:TP molar ratio in the gulf and in the main lake indicates many algae may be N-limited and heterocystous N-fixing cyanobacteria may be favored. However, the high mineral turbidity in the gulf reduces light availability and hence limits algal abundance resulting in easily measure concentrations of mineral nutrients and in particular high levels of dissolved reactive silica. The gulf is a net source of dissolved silica and total nitrogen to the main lake while the main lake is potentially a source of P to the gulf depending on interchange through Rusinga Channel.

261: A. Giorgi, C. Feijoo and G. Tell,. 2005. Primary producers in a Pampean stream: temporal variation and structuring role. *Biodiversity and Conservation* 7(14): 1699-1718.

Abstract: Low current velocities, high nutrient levels, the lack of riparian forest vegetation, and the development of dense and rich macrophyte communities characterize Pampean streams. The objective of this study was to describe the main physical, chemical, and biological characteristics of a headwater Pampean stream as well as to analyze the role of macrophytes and phytobenthos. The study was conducted in a stream considered to be not much disturbed by human activities. Samples of water and organisms (macrophytes, benthic algae and invertebrates) were taken monthly for 14 months in two sampling stations, in fast. flow and slow. flow sites. Macrophyte biomass and diversity increased in spring and summer, and they decreased in autumn, when the plant community was greatly a. affected by an important. flood. Phytobenthos biomass was lower in late summer, possibly due to the establishment of a dense cover of the. floating macrophyte *Lemna gibba* L. Density of amphipods and gastropods greatly increases in spring and summer, jointly with the macrophyte development. Analysis of correlation showed that current velocity is the most important factor influencing macrophyte biomass and phytobenthos structure, while depth, nutrients, and herbivores are linked factors. Pampean streams could be considered systems dynamically fragile, because habitat heterogeneity is generated by aquatic vegetation, a substratum that varies along time.

262: S. P. Glaholt and M. J. Vanni,. 2005. Ecological responses to simulated benthic-derived nutrient subsidies mediated by omnivorous fish. *Freshwater Biology* 11(50): 1864-1881.

Abstract: 1. Fish can play an important role in coupling benthic and pelagic habitats by consuming benthic prey and providing essential nutrients to algae in dissolved form. However, little is known about the factors affecting the magnitude of this nutrient subsidy. 2. Using laboratory and mesocosm experiments we evaluated how varying ingestion rates of bluegill sunfish (*Lepomis macrochirus*) affects fish excretion rates of both nitrogen (N) and phosphorus (P). During the 10-week mesocosm experiment, we also evaluated how varying ingestion rates may affect plankton community dynamics, and nutrient flux between pelagic and benthic habitats. Lastly, bioenergetic/mass balance models were used to examine the nutrient stoichiometry of fish body composition and excretion products. 3. Under laboratory conditions, both N and P excretion rates increased with increased ingestion of benthic prey surrogates (earthworms). This effect was more pronounced for N than P. Furthermore, under the more realistic conditions of the mesocosm experiment ingestion rate had no significant effect on P excretion rate. 4. Increased fish ingestion rate in the mesocosm experiment increased total algal biomass and the flux of nutrients from the water column to sediments. Effects of variable ingestion were much stronger on periphyton biomass and algal sedimentation rates than on phytoplankton or zooplankton biomass or composition. 5. Fish body nutrient composition was greatly affected by ingestion rate. N content increased and P content decreased with ingestion rate. As a result, the N : P ratio of fish bodies also increased with ingestion rate. The N : P ratio of nutrients excreted by fish also increased with ingestion rate, counter to predictions of stoichiometric theory, which predicts that excreted N : P ratio is negatively correlated to body N : P. However, this finding can be explained by relaxing the assumption of constant nutrient assimilation rates, and our mass balance data suggest that assimilation

263: R. Goldyn and E. Szlag-Wasielewska,. 2005. The effects of two shallow reservoirs on the phyto- and bacterioplankton of lowland river. Polish Journal of Environmental Studies 4(14): 437-444.

Abstract: The effect of two different reservoirs on some parameters of river water quality has been studied. The Antoninek Reservoir (wetland-type, mean depth 0.4 m, area 7.2 ha, mean residence time 0.5 day) and the Maltanski Reservoir (also not stratified but plankton-type, mean depth 3.1 m, area 64 ha, mean residence time 34 days) are situated on the same river (mean discharge 0.67 m³ s⁻¹). Water of this river, which leaves the hypertrophic Swarzedzkie Lake upstream from the reservoirs, is rich in nutrients and plankton. As it flows through the Antoninek Reservoir it loses most of the phytoplanktonic organisms, measured as chlorophyll-a (70%), mostly due to the shading effect of emergent vegetation. The fraction autotrophic picoplankton (APP) also decreased considerably, both in numbers and biomass (about 68% and 54% on average, respectively). A similar reduction was recorded for the numbers of bacterioplankton (39% on average) and suspended solids (66%). Phytoplankton growth was observed again in the Maltanski Reservoir, due to the longer residence time of water and lack of macrophytes. Chlorophyll-a increased by 37%, APP numbers by 120%, their biomass by 154%, while the numbers of bacterioplankton only by 31%. Changes in plankton abundance and biomass as a result of retention of water in a shallow reservoir influenced the quality of outflowing water. Their range strongly depended on the presence of macrophytes within the reservoir.

264: M. A. Gonzalez Sagrario, E. Jeppesen, J. Goma, M. Sondergaard, J. P. Jensen, T. Lauridsen and F. Landkildehus,. 2005. Does high nitrogen loading prevent clear-water conditions in shallow lakes at moderately high phosphorus concentrations?. *Freshwater Biology* 1(50): 27-41.

Abstract: 1. The effect of total nitrogen (TN) and phosphorus (TP) loading on trophic structure and water clarity was studied during summer in 24 field enclosures fixed in, and kept open to, the sediment in a shallow lake. The experiment involved a control treatment and five treatments to which nutrients were added: (i) high phosphorus, (ii) moderate nitrogen, (iii) high nitrogen, (iv) high phosphorus and moderate nitrogen and (v) high phosphorus and high nitrogen. To reduce zooplankton grazers, 1(+) fish (*Perca fluviatilis* L.) were stocked in all enclosures at a density of 3.7 individuals m⁻². 2. With the addition of phosphorus, chlorophyll a and the total biovolume of phytoplankton rose significantly at moderate and high nitrogen. Cyanobacteria or chlorophytes dominated in all enclosures to which we added phosphorus as well as in the high nitrogen treatment, while cryptophytes dominated in the moderate nitrogen enclosures and the controls. 3. At the end of the experiment, the biomass of the submerged macrophytes *Elodea canadensis* and *Potamogeton* sp. was significantly lower in the dual treatments (TN, TP) than in single nutrient treatments and controls and the water clarity declined. The shift to a turbid state with low plant coverage occurred at TN >2 mg N L⁻¹ and TP >0.13-0.2 mg P L⁻¹. These results concur with a survey of Danish shallow lakes, showing that high macrophyte coverage occurred only when summer mean TN was below 2 mg N L⁻¹, irrespective of the concentration of TP, which ranged between 0.03 and 1.2 mg P L⁻¹. 4. Zooplankton biomass and the zooplankton : phytoplankton biomass ratio, and probably also the grazing pressure on phytoplankton, remained overall low in all treatments, reflecting the high fish abundance chosen for the experiment. We saw no response to nutrition addition in total zooplankton biomass, indicating that the loss of plants and a shift to the turbid state did not result from changes in zooplankton grazing. Shading by phytoplankton and periphy

265: A. Goonetilleke, E. Thomas, S. Ginn, D. Gilbert,. 2005. Understanding the role of land use in urban stormwater. Journal of Environmental Management 74: 31-42.

Abstract: Urbanisation significantly impacts water environments with increased runoff and the degradation of water quality. The management of quantity impacts are straight forward, but quality impacts are far more complex. Current approaches to safeguard water quality are largely ineffective and guided by entrenched misconceptions with a primary focus on `end-of-pipe' solutions. The outcomes of a research study presented in the paper, which investigated relationships between water quality and six different land uses offer practical guidance in the planning of future urban developments. In terms of safeguarding water quality, high-density residential development which results in a relatively smaller footprint would be the preferred option. The research study outcomes bring into question a number of fundamental concepts and misconceptions routinely accepted in stormwater quality management. The research findings confirmed the need to move beyond customary structural measures and identified the key role that urban planning can play in safeguarding urban water environments. q 2004 Elsevier Ltd. All rights reserved.

266: A. Gopinath, N. C. Kumar, K. V. Jayalakshmi, D. Padmalal and S. M. Nair,. 2005. A predictive regression model for the geochemical variability of iron and manganese in a coral reef ecosystem. Environmental Forensics 3(6): 301-310.

Abstract: This article focuses on the influence of nutrient forms (nitrogen/phosphorous forms) and parameters like pH and organic carbon in the distributional characteristics of two important trace metals, viz. iron and manganese, in different sedimentary microenvironments of coral reef ecosystem of Lakshadweep Archipelago. Positive correlations of Fe/Mn with nutrient forms attributes to a similar pattern of remineralization and depositional characteristics involved in their accumulation. Negative correlations indicates selective removal of Fe/Mn or some other mechanisms operating with microbial assistance or both which may act in opposition to one another. In the first stage, in order to formulate a predictive regression model to assess the geochemical variability of Fe/Mn, the influence of sedimentological characteristics as well as their first-order interaction effects in all the islands irrespective of there differences (n = 57) is taken into account. On the basis of this regression model, influencing factors are categorized as limiting factors, which by their mere occurrence reduce the concentration of Fe/Mn, and as controlling factors, which are enhancing their concentrations. In the second stage, the sample observations are divided into two subsamples of 30 samples and 27 samples each. For the first subsample, a model using only the highly significant nutrients ($|r| > 0.2616$), if any, and the highly significantly correlated nutrients ($|r| > 0.2616$) is incorporated. The model is developed as above and determined so that it is validated using the second subsample. The model has been found to be validated with 43% efficiency. A good understanding and prediction of manganese and iron concentrations and distribution in sediments (as a result of different influencing factors) may help in forensic studies dealing with various natural and anthropogenic sources of these metals.

267: A. Gottlieb, J. Richards and E. Gaiser,. 2005. Effects of desiccation duration on the community structure and nutrient retention of short and long-hydroperiod Everglades periphyton mats. Aquatic Botany 2(82): 99-112.

Abstract: Responses of periphyton communities to different relevant durations of dry down were assessed. Long-hydroperiod sites within Everglades National Park remain wet for greater than 8 months of the year while short-hydroperiod mats are wet for fewer than 4 months of the year. Dry down duration of long and short-hydroperiod Everglades periphyton was manipulated from 0 to 1, 3, or 8 months after which periphyton was rewetted 1 month and examined for algal species composition. The effects of desiccation and rewetting on periphyton nutrient retention were also assessed. Relative abundance of diatoms declined from an average of 47% in the long-hydroperiod community at the start of the experiment to 24% after 1 month of desiccation and only 12% after 8 months of desiccation. Short-hydroperiod periphyton contained a lower proportion of diatoms at the outset (3%), which declined to less than 1% after the 8-month desiccation treatment. A significant increase in the filamentous cyanobacteria *Schizothrix calcicola* occurred in long-hydroperiod periphyton mats during this same period, but not in short-hydroperiod mats. Long-hydroperiod periphyton communities had a greater response to desiccation overall, but short-hydroperiod community structure responded to desiccation more rapidly. Because short-hydroperiod communities dry frequently, they appear to cope better to desiccating conditions than long-hydroperiod periphyton communities. This is indicated by the dominance of desiccation resistant algal taxa such as the cyanobacterial filaments *S. calcicola* and *Scytonema hofmanni*. Long-hydroperiod periphyton mat communities converge compositionally to short-hydroperiod periphyton communities after prolonged desiccation. Desiccation and rewetting caused long-hydroperiod periphyton to flux greater concentrations of nutrients than short-hydroperiod periphyton. Significant increases in efflux occurred from 1 to 8 months for total phosphorus (TP) and from 1 to 3 and 8 months for total nitrogen

268: C. Gourley and A. Ridley,. 2005. Controlling non-point source pollution in Australian agricultural systems. *Pedosphere* 6(15): 768-777.

Abstract: The Australian farming sector is continuing to intensify, particularly within 300 km of the east and southern coastlines. In the future there will be fewer and larger farms, which will use more fertilizer, support more stock, grow more monoculture crops, and utilise more marginal soils. This is likely to increase the major environmental impacts of soil degradation, salt, nutrient and sediment contamination of waterways, and greenhouse gas emissions. Australian national water policy continues to focus on land, stream and groundwater salinity issues, although there is now a greater recognition of the importance of nitrogen and phosphorus losses from agriculture. The general philosophy of policy for dealing with nonpoint source pollution has been towards a voluntary rather than regulatory approach, with state and national governments supporting a range of programs to encourage sustainable agricultural practices. A catchment (watershed) based approach, through the use of integrated catchment management plans, is the primary way that non-point source pollution is addressed at the farm and local level. At an industry level, cotton, grains, meat, sugarcane and dairy amongst others, as well as the Australian fertilizer industry, have responded to non-point source issues by investing in research and development, and developing codes of practice aimed at abating these environmental impacts. Understanding the economic, social, political and cultural contexts of farming as well as the environmental impacts of agriculture are very important in determining the appropriateness of policy responses for Australian farming systems.

269: C. D. Graff, A. M. Sadeghi, R. R. Lowrance and R. G. Williams,. 2005. Quantifying the sensitivity of the riparian ecosystem management model (REMM) to changes in climate and buffer characteristics common to conservation practices. Transactions of the Asae 4(48): 1377-1387.

Abstract: Conservation practices, such as buffers, are often installed to mitigate the effects of nutrients and sediment runoff from agricultural practices. The Riparian Ecosystem Management Model (REMM) was developed as process-based model to evaluate the fate of nutrients and sediment through a riparian buffer up to the edge of a stream. A one-at-a-time sensitivity analysis was performed on REMM to evaluate the effects that changing herbaceous buffer scenarios have on N, P, and sediment in surface and ground water. Vegetation characteristics such as rooting depth, LAI, and plant height, along with some physical buffer characteristics were varied within their "typical" range and compared to a "base case" scenario. Model outputs were not sensitive to plant height or LAI, but moderately sensitive to changes in SLA. Model outputs were only sensitive to rooting depth as roots became shallower in the soil profile. Sediment yield and dissolved nitrate in surface water were the most sensitive to changes in Manning's n, while other soil physical characteristics such as surface roughness, surface condition, and % bare soil had little to no effect on model outcomes. Dissolved surface nitrate, organic P, and dissolved subsurface nitrate were all moderately sensitive to changes in saturated hydraulic conductivity and the slope of the buffer. Results indicate that within the model, many vegetation characteristics do not directly play a role in the physical transport of nutrients and sediment in surface and subsurface water; therefore, utilizing REMM to evaluate effects of specific herbaceous plant types may have limited value unless specific leaf area or rooting depth are considered. It would be possible to model and perhaps achieve specific load reductions by modifying slope and other physical characteristics or by considering forest versus grass buffers.

270: S. A. Graham, C. B. Craft, P. V. McCormick and A. Aldous,. 2005. Forms and accumulation of soil P in natural and recently restored peatlands - Upper Klamath Lake, Oregon, USA. *Wetlands* 3(25): 594-606.

Abstract: Forms, amounts, and accumulation of soil phosphorus (P) were measured in natural and recently restored marshes surrounding Upper Klamath Lake located in south-central Oregon, USA to determine rates of P accumulation in natural marshes and to assess changes in P pools caused by long-term drainage in recently restored marshes. Soil cores were collected from three natural marshes and radiometrically dated to determine recent (Cs-137-based) and long-term (Pb-210-based) rates of peat accretion and P accumulation. A second set of soil cores collected from the three natural marshes and from three recently restored marshes was analyzed using a modification of the Hedley procedure to determine the forms and amounts of soil P. Total P in the recently restored marshes (222 to 311 $\mu\text{g cm}^{-3}$) was 2-3 times greater than in the natural marshes (103 to 117 $\mu\text{g cm}^{-3}$), primarily due to greater bulk density caused by soil subsidence, a consequence of long-term marsh drainage. Occluded Fe- and Al-bound P-i, calcium-bound P-i and residual P were 4 times, 22 times, and 5 times greater, respectively, in the recently restored marshes. More than 67% of the P pool in both the natural and recently restored marshes was present in recalcitrant forms (humic-acid P-o and residual P) that provide long-term P storage in peat. Phosphorus accumulation in the natural marshes averaged 0.45 $\text{g m}^{-2} \text{yr}^{-1}$ (Cs-137) and 0.40 $\text{g m}^{-2} \text{yr}^{-1}$ (Pb-210), providing a benchmark for optimizing P sequestration in the recently restored marshes. Effective P sequestration in the recently restored marshes, however, will depend on re-establishing equilibrium between the P-enriched soils and the P concentration of floodwaters and a hydrologic regime similar to the natural marshes.

271: K. Granlund, A. Raike, P. Ekholm, K. Rankinen and S. Rekolainen,. 2005. Assessment of water protection targets for agricultural nutrient loading in Finland. Journal of Hydrology 1-4(304): 251-260.

Abstract: Temporal changes in observed P and N losses were studied in agricultural catchments in order to evaluate the achievement of water protection targets in Finland. Agriculture comprises the largest single source of nutrients into surface waters in Finland. Today, the main goal of water protection policy is controlling agricultural nutrient losses. In 1998, the Finnish Council of State issued a Decision-in-Principle on the water protection targets to 2005. By the year 2005, P and N loads from field cultivation should be reduced by 50% from the estimated loads at the beginning of the 1990s. The Finnish Agri-Environmental Programme (FAEP) forms the most important policy measure. It was implemented when Finland joined the European Union in 1995. The implementation of the Water Framework Directive will be reflected in the future environmental support scheme. The aim of this study was to investigate whether the water protection measures have decreased P and N losses in two small, intensively monitored agricultural catchments and in four coastal river basins in southern Finland. Due to high annual variability in observed losses, long-term monitoring data (years 1981-2000) of water quality were used in the analysis. Five year mean values of annual total P and total N loads were calculated for each of the catchments. The results showed that little or no reduction of loads was achieved during the first period (years 1995-1999) of the FAEP in the studied catchments. The results suggest that water protection measures for agricultural production need to be further intensified if the eutrophication tendency of Finnish lakes, rivers and coastal waters is soon to be reversed. The delayed response of water quality must be taken into account in the implementation of the Water Framework Directive. (c) 2004 Elsevier B.V. All rights reserved.

272: W. Green and G. Ho,. 2005. Small scale sanitation technologies. Water Science and Technology 10(51): 29-38.

Abstract: Small scale systems can improve the sustainability of sanitation systems as they more easily close the water and nutrient loops. They also provide alternate solutions to centrally managed large scale infrastructures. Appropriate sanitation provision can improve the lives of people with inadequate sanitation through health benefits, reuse products as well as reduce ecological impacts. In the literature there seems to be no compilation of a wide range of available onsite sanitation systems around the world that encompasses black and greywater treatment plus stand-alone dry and urine separation toilet systems. Seventy technologies have been identified and classified according to the different waste source streams. Sub-classification based on major treatment methods included aerobic digestion, composting and vermicomposting, anaerobic digestion, sand/soil/peat filtration and constructed wetlands. Potential users or suppliers of sanitation systems can choose from wide range of technologies available and examine the different treatment principles used in the technologies. Sanitation systems need to be selected according to the local social, economic and environmental conditions and should aim to be sustainable.

273: W. J. Green, B. R. Stage, A. Preston, S. Wagers, J. Shacat and S. Newell,. 2005. Geochemical processes in the Onyx River, Wright Valley, Antarctica: Major ions, nutrients, trace. *Geochimica Et Cosmochimica Acta* 4(69): 839-850.

Abstract: We present data on major ions, nutrients and trace metals in an Antarctic stream. The Onyx River is located in Wright Valley (77-32 S; 161-34 E), one of a group of ancient river and glacier-carved landforms that comprise the McMurdo Dry Valleys of Antarctica. The river is more than 30 km long and is the largest of the glacial meltwater streams that characterize this relatively ice-free region near the Ross Sea. The complete absence of rainfall in the region and the usually small contributions of glacially derived tributaries to the main channel make this a comparatively simple system for geochemical investigation. Moreover, the lack of human impacts, past or present, provides an increasingly rare window onto a pristine aquatic system. For all major ions and silica, we observe increasing concentrations with distance from Lake Brownworth down to the recording weir near Lake Vanda. Chemical weathering rates are unexpectedly high and may be related to the rapid dissolution of ancient carbonate deposits and to the severe physical weathering associated with the harsh Antarctic winter. Of the nutrients, nitrate and dissolved reactive phosphate appear to have quite different sources. Nitrate is enriched in waters near the Lower Wright Glacier and may ultimately be derived from stratospheric sources; while phosphate is likely to be the product of chemical weathering of valley rocks and soils. We confirm the work of earlier investigations regarding the importance of the Boulder Pavement as a nutrient sink. Dissolved Mn, Fe, Ni, Cu, and Cd are present at nanomolar levels and, in all cases, the concentrations of these metals are lower than in average world river water. We hypothesize that metal uptake and exchange with particulate phases along the course of the river may serve as a buffer for the dissolved load. Concurrent study of these three solute classes points out significant differences in the mechanisms and sites of their removal from the Onyx River. Copyright (C) 2005 E

274: M. Greenway,. 2005. The role of constructed wetlands in secondary effluent treatment and water reuse in subtropical and and Australia. Ecological Engineering 5(25): 501-509.

Abstract: Water reclamation and reuse is being actively promoted in Australia. In Queensland, surface-flow constructed wetlands with a diversity of macrophyte types offer the greatest potential for effluent polishing. Constructed wetlands in subtropical climates in coastal regions and and climates in inland western regions are conducive to high macrophyte growth rates and nutrient removal, in particular nitrogen, producing an effluent suitable for irrigation, restoration of wetlands and/or release into natural waterways. Faecal-coliform removal is also high, producing effluent with < 1000 cfu/100 mL and as low as 100 cfu/100 mL, acceptable for agricultural irrigation. Constructed wetlands can be designed to maximise the removal of both nutrients and pathogens by enhancing macrophyte diversity and natural disinfection processes by incorporating lagoons, shallow-water wetlands and subsurface-flow wetlands into the treatment train. Surface-flow wetlands can also be designed to minimise mosquito breeding by increasing macro-invertebrate predators, thereby alleviating community concerns about potential health risks. This paper addresses the role of constructed wetlands in nutrient and pathogen removal in Queensland's wetlands, and presents three case studies with respect to effluent reuse. (c) 2005 Elsevier B.V. All rights reserved.

275: J. L. Greenwood and A. D. Rosemond,. 2005. Periphyton response to long-term nutrient enrichment in a shaded headwater stream. Canadian Journal of Fisheries and Aquatic Sciences 9(62): 2033-2045.

Abstract: We maintained elevated but moderate concentrations of nitrogen and phosphorus continuously for 2 years in a heavily shaded headwater stream and compared effects on stream periphyton with a reference stream. Both streams were sampled for 1 year before treatment. Some measures of periphyton biomass (ash-free dry mass and chlorophyll a) responded positively to enrichment. Increased chlorophyll a was likely a result of higher chlorophyll per cell, as total algal biovolume did not change with enrichment. These differences were greatest during high-light months (November-May), when cellular growth rates (a proxy for production) were also highest with enrichment. Algal assemblages were dominated by diatoms and remained similar between the treatment and reference streams throughout the enrichment period. Although nutrients stimulated algal growth rates, the long-term effects of nutrient addition on periphyton biomass were small in magnitude compared with other published values and were potentially suppressed by light availability and invertebrate consumption. These and other factors may have also been important in limiting the algal species pool and thus a taxonomic response to enrichment. Our results indicate that in headwater streams with intact tree canopies, chronic nutrient enrichment at moderate concentrations may have little detectable effect on benthic algal composition or periphyton biomass. Although nutrients stimulated algal growth rates, the long-term effects of nutrient addition on periphyton biomass were small in magnitude compared with other published values and were potentially suppressed by light availability and invertebrate consumption. These and other factors may have also been important in limiting the algal species pool and thus a taxonomic response to enrichment. Our results indicate that in headwater streams with intact tree canopies, chronic nutrient enrichment at moderate concentrations may have little detectable effect on benthic algal composition

276: B. Gribsholt, H. T. S. Boschker, E. Struyf, M. Andersson, A. Tramper, L. De Brabandere, S. van Damme, N. Brion, P. Meire, F. Dehairs, J. J. Middelburg and C. H. R. Heip,. 2005. Nitrogen processing in a tidal freshwater marsh: A whole-ecosystem N-15 labeling study. *Limnology and Oceanography* 6(50): 1945-1959.

Abstract: We quantified the fate and transport of watershed-derived ammonium in a tidal freshwater marsh fringing the nutrient-rich Scheldt River in a whole-ecosystem N-15 labeling experiment. N-15-NH₄⁺ was added to the floodwater entering a 3,477 m² tidal marsh area, and marsh ammonium processing and retention were traced in six subsequent tide cycles. We present data for the water phase components of the marsh system, in which changes in concentration and isotopic enrichment of NO₃⁻, NO₂⁻, N₂O, N₂, NH₄⁺, and suspended particulate nitrogen (SPN) were measured in concert with a mass balance study. Simultaneous addition of a conservative tracer (NaBr) confirmed that tracer was evenly distributed, and the Br- budget was almost closed (115% recovery). All analyzed dissolved and suspended N pools were labeled, and 31% of added N-15-NH₄⁺ was retained or transformed. Nitrate was the most important pool for N-15, with nitrification accounting for 30% of N-15-transformation. In situ whole-ecosystem nitrification rates were four to nine times higher than those in the water column alone, implying a crucial role for the large reactive marsh surface area in N-transformation. Under conditions of low oxygen concentrations and high ammonium availability, nitrifiers produced N₂O. Our results show that tidal freshwater marshes function not only as nutrient sinks but also as nutrient transformers.

277: I. A. Grigorovich, E. L. Mills, C. B. Richards, D. Breneman and J. J. H. Ciborowski,. 2005. European valve snail *Valvata piscinalis* (Muller) in the Laurentian Great Lakes basin. *Journal of Great Lakes Research* 2(31): 135-143.

Abstract: Previously reported from the lower Great Lakes basin and St. Lawrence and Hudson rivers, the nonindigenous gastropod *Valvata piscinalis* was found for the first time in Superior Bay (Minnesota) of Lake Superior, Lake Michigan (Wisconsin), and Oneida Lake (New York) of the Lake Ontario basin. This snail was not abundant in Lakes Superior and Michigan, whereas in eutrophic Oneida Lake it reached a maximum density of 1,690 individuals/m² (mean density = 216 individuals/m²). Human-mediated disturbances could facilitate the range extension of this snail by providing dispersal opportunities (e.g., canals, shipping traffic) or increasing nutrients (e.g., eutrophication). A native of the Palaearctic region, *V. piscinalis* has colonized sites across the Great Lakes basin, suggesting that it will likely become common in disturbed Great Lakes areas.

278: N. B. GRIMM, RICHARD W. SHEIBLEY, CHELSEA L. CRENSHAW, CLIFFORD N. DAHM, W. JOHN ROACH, and LYDIA H. ZEGLIN,. 2005. N retention and transformation in urban streams. *Journal of the North American Benthological Society* 3(24): 626-642.

Abstract: Nutrient spiraling in theory and application provides a framework for comparing nutrient retention efficiency of urban streams to relatively unaltered streams. Previous research indicated that streams of the southwestern USA deserts are highly retentive of N because of N limitation, high productivity, and high channel complexity (in particular, extensive transient storage associated with the hyporheic zone). Most southwestern urban streams have extensively modified channels and experience N loading from urban runoff and inputs of NO₃⁻-contaminated groundwater. Therefore, we predicted southwestern urban streams are neither N-limited nor retentive. For some urban streams, however, restoration efforts reestablish flow in long-dry channels, create nonstructural flood-management solutions, and design riparian areas as a public recreation amenity. These human modifications may, in part, restore N retention functions if channel complexity and heterogeneity are as important to N retention efficiency as believed. We conducted experimental tracer studies using NO₃⁻, as part of the Lotic Intersite Nitrogen eXperiment (LINX) project, and several separate nutrient-addition experiments (using slight increases in NO₃⁻ concentration), to evaluate N retention in southwestern urban streams. We present preliminary results of those experiments, comparing results to similar experiments in unaltered streams to test our predictions. Our results allow an evaluation of the use of nutrient spiraling metrics as a tool for assessing the status of stream ecosystem services in urban restoration projects.

279: N. B. Grimm, R. W. Sheibley, C. L. Crenshaw, C. N. Dahm, W. J. Roach and L. H. Zeglin,. 2005. N retention and transformation in urban streams. *Journal of the North American Benthological Society* 3(24): 626-642.

Abstract: Nutrient spiraling in theory and application provides a framework for comparing nutrient retention efficiency of urban streams to relatively unaltered streams. Previous research indicated that streams of the southwestern USA deserts are highly retentive of N because of N limitation, high productivity, and high channel complexity (in particular, extensive transient storage associated with the hyporheic zone). Most southwestern urban streams have extensively modified channels and experience N loading from urban runoff and inputs of NO₃--contaminated groundwater. Therefore, we predicted southwestern urban streams are neither N-limited nor retentive. For some urban streams, however, restoration efforts reestablish flow in long-dry channels, create nonstructural flood-management solutions, and design riparian areas as a public recreation amenity. These human modifications may, in part, restore N retention functions if channel complexity and heterogeneity are as important to N retention efficiency as believed. We conducted experimental tracer studies using NO₃⁻, as part of the Lotic Intersite Nitrogen eXperiment (LINX) project, and several separate nutrient-addition experiments (using slight increases in NO₃⁻ concentration), to evaluate N retention in southwestern urban streams. We present preliminary results of those experiments, comparing results to similar experiments in unaltered streams to test our predictions. Our results allow an evaluation of the use of nutrient spiraling metrics as a tool for assessing the status of stream ecosystem services in urban restoration projects.

280: P. M. Groffman, A. M. Dorsey and P. M. Mayer,. 2005. N processing within geomorphic structures in urban streams. *Journal of the North American Benthological Society* 3(24): 613-625.

Abstract: Stream water often diverges from the main channel into sediments below the stream surface, gravel bars next to the stream, or organic debris dams in the middle of the stream. These geomorphic structures have the potential to support processes that produce or consume inorganic N (NH_4^+ , NO_3^-) and thus affect streamwater quality. We measured production (potential net mineralization and nitrification) and consumption (denitrification potential, net immobilization) of inorganic N, respiration, and organic-matter content in sediments from geomorphic structures in 4 streams in and around Baltimore, Maryland, USA. We sampled sediments from stream pools, riffles, gravel bars (vegetated and nonvegetated), and organic debris dams in forested reference and suburban catchments, and also sampled degraded (incised channel) and restored reaches of one stream. Denitrification potential was highest in organic debris dams and organic-rich gravel bars-structures with high organic matter content. Organic debris dams in suburban streams had higher denitrification than debris dams in the forested reference stream, likely because of higher NO_3^- concentrations in suburban streams. These results suggest that denitrification in debris dams increases in response to high NO_3^- levels and that denitrification may be an important sink for NO_3^- in urban or suburban streams. However, such denitrifying structures as organic debris dams may be difficult to maintain in urban streams because of high storm flows and downstream displacement. Geomorphic structures in N-rich streams also supported higher rates of nitrification than structures in a forested reference stream, suggesting that these structures can become sources of NO_3^- . The ultimate effect of different structures on NO_3^- concentrations in urban streams will depend on the balance of these production and consumption processes, which is a complex function of a stream's ability to retain organic matter and resist hydrologic changes associated with

281: D. L. Guelda, R. W. Koch, J. D. Jack and P. A. Bukaveckas,. 2005. Experimental evidence for density-dependent effects and the importance of algal production in determining population growth rates of riverine zooplankton. River Research and Applications 6(21): 595-608.

Abstract: Food limitation effects on life history traits of lake zooplankton have been well documented but few studies have examined linkages between population growth rates and food resources in riverine environments. In rivers, allochthonous inputs of particulate organic matter may mitigate food limitation effects allowing density-independent mechanisms associated with washout (discharge) and feeding interference (turbidity) to assume greater importance. We experimentally manipulated densities of commonly occurring riverine zooplankton (*Bosmina longirostris* and cyclopoid copepods) within 20001 mesocosms containing ambient or algal-enriched food resources. The experiment was repeated through time (July, August, September) to represent the range of zooplankton densities and food resource levels observed in the Ohio River during warm-water, low-flow conditions. High growth rates and low sensitivity to density-dependent effects were observed during July when particulate organic carbon (POC) and chlorophyll concentrations were highest. Lower growth rates and stronger response to density-dependent effects were observed during August and September experiments when POC and chlorophyll concentrations were lower. Direct manipulations of algal abundance resulted in higher growth rates when gains in chlorophyll were accompanied by increases in the edible size fraction (September experiment). Algal C concentrations were found to be a significant predictor of variation in population growth rates for *Bosmina* but not cyclopoids. Algal C concentrations in the Ohio River rarely fell below experimentally derived minimum food thresholds but were often below saturation thresholds suggesting that population growth rates were constrained by autochthonous food resources despite the prevalence of allochthonous carbon. Copyright (c) 2005 John Wiley & Sons, Ltd.

282: S. Gusewell,. 2005. High nitrogen: phosphorus ratios reduce nutrient retention and second-year growth of wetland sedges. New Phytologist 2(166): 537-550.

Abstract: Shifts from nitrogen (N)- to phosphorus (P)-limited growth due to high N deposition may alter the functioning of wetland vegetation. This experiment tested how N vs P deficiency affects the growth and nutrient use of wetland sedges. Five wetland Carex species were grown at nine N : P supply ratios (0.6-405) with two absolute levels of N and P. Biomass and nutrient concentrations were determined after one and two growing seasons. Shoot biomass was maximal at N : P supply ratios of 15-26 after one season but 5-15 after two seasons. Photosynthesis after the first season, second-year growth, leaf longevity, and the fraction of nutrient supply retained by plants over two seasons were all negatively related to N : P supply ratios, with small effects of absolute supply. The five Carex species responded similarly to N : P ratios but differed in nutrient resorption efficiency and biomass allocation. Plants treated with high N : P ratios appeared to lose nutrients below ground. Such losses may reduce plant performance in P-limited wetlands affected by high N deposition.

283: S. Gusewell,. 2005. Nutrient resorption of wetland graminoids is related to the type of nutrient limitation. Functional Ecology 2(19): 344-354.

Abstract: 1. Nitrogen or phosphorus limits plant growth in many wetlands. If specific mechanisms reducing losses of the growth-limiting nutrient have been favoured by selection, the N and P resorption efficiency (RE) during leaf senescence (NRE, PRE: the fraction of N or P resorbed) might depend on the type of nutrient limitation. 2. The size, mass, and N and P concentrations of green and senesced leaves were determined for 10 graminoid species at Dutch and Swiss wetland sites, with N : P ratios in leaves (6-27 by mass) indicating N or P limitation. 3. During senescence, leaf area decreased by 8-19%, and leaf mass by 8-38%; NRE ranged from 0 to 87%, and PRE from 30 to 96%. PRE correlated strongly with NRE ($r = 0.91$) but was, on average, 17% higher. Within the Swiss or Dutch sites, NRE and PRE did not correlate with foliar N : P ratios, indicating that RE was not directly adjusted to the type of nutrient limitation. 4. NRE and PRE were, on average, higher at the P-limited Swiss sites than at the N-limited Dutch sites. Because PRE exceeded NRE, high RE would be most beneficial when P limits plant growth. This may have contributed to the dominance of graminoids with high RE in P-limited wetlands.

284: S. Gusewell,. 2005. Responses of wetland graminoids to the relative supply of nitrogen and phosphorus. Plant Ecology 1(176): 35-55.

Abstract: The biomass production of wetland vegetation can be limited by nitrogen or phosphorus. Some species are most abundant in N-limited vegetation, and others in P-limited vegetation, possibly because growth-related traits of these species respond differently to N versus P supply. Two growth experiments were carried out to examine how various morphological and physiological traits respond to the relative supply of N and P, and whether species from sites with contrasting nutrient availability respond differently. In experiment 1, four *Carex* species were grown in nutrient solutions at five N:P supply ratios (1.7, 5, 15, 45, 135) combined with two levels of supply (geometric means of N and P supply). In experiment 2, two *Carex* and two grass species were grown in sand at the same five N:P supply ratios combined with three levels of supply and two light intensities (45% or 5% daylight). After 12-13 weeks of growth, plant biomass, allocation, leaf area, tissue nutrient concentrations and rates and nutrient uptake depended significantly on the N:P supply ratio, but the type and strength of the responses differed among these traits. The P concentration and the N:P ratio of shoots and roots as well as the rates of N and P uptake were mainly determined by the N:P supply ratio; they showed little or no dependence on the supply level and relatively small interspecific variation. By contrast, the N concentration, root mass ratio, leaf dry matter content and specific leaf area were only weakly related to the N:P supply ratio; they mainly depended on plant species and light, and partly on overall nutrient supply. Plant biomass was determined by all factors together. Within a level of light and nutrient supply, biomass was generally maximal (i.e. co-limited by N and P) at a N:P supply ratio of 15 or 45. All species responded in a similar way to the N:P supply ratio. In particular, the grass species *Phalaris arundinacea* and *Molinia caerulea* showed no differences in response that could cl

285: S. Gusewell, K. M. Bailey, W. J. Roem and B. L. Bedford,. 2005. Nutrient limitation and botanical diversity in wetlands: Can fertilisation raise species richness?. *Oikos* 1(109): 71-80.

Abstract: The 'resource balance hypothesis' proposes that the species richness of grassland vegetation is potentially highest when the N:P ratio of plant tissues is 10-15 (co-limitation), so that species richness could be raised by fertilisation with N or P at sites with lower or higher N: P ratios, respectively. Here we use data from field surveys in Swiss, Dutch and American fens or wet grasslands to analyse what changes in N: P ratios might produce noticeable changes in species richness. Plant species numbers, above-ground biomass, tissue N and P concentrations and soil pH were recorded in plots of 0.06-4m². In each data set, plots with intermediate tissue N: P ratios (6-20) were on average most species-rich, but N: P ratios explained only 5-37% of the variation in species richness. Moreover, these effects were partially confounded with those of vegetation biomass and/or soil pH. The unique effects of N: P ratios (excluding those shared with biomass and pH) explained 11-17% of variation in species richness. The relationship between species richness and N: P ratios was asymmetric: plots with high N: P ratios were more species-poor than those with low N: P ratios. This was paralleled by a smaller species pool size at high N:P ratios (estimated from species numbers in multiple records), suggesting that fewer species are adapted to P-limited conditions than to N-limited conditions. According to these data, species richness in wetlands may possibly be raised by P-fertilisation when the initial N: P ratio of the vegetation is well above 20, but this option is not recommended for nature conservation as it might promote common species at the expense of rare ones.

286: S. Gusewell and C. Freeman,. 2005. Nutrient limitation and enzyme activities during litter decomposition of nine wetland species in relation to litter N : P ratios. *Functional Ecology* 4(19): 582-593.

Abstract: 1. Litter decomposition can be limited by nitrogen or phosphorus, but conditions under which either nutrient is limiting remain uncertain. We investigated whether this depends on nutrient limitation during plant growth, on N : P ratios of the litter, or on activities of C-, N- and P-mineralizing enzymes. 2. Nine herbaceous species were grown at N : P supply ratios (N : P-s) of 5-160 (mass-based). Fresh leaf litter was incubated in the laboratory for 5-10 weeks, partly with N or P fertilization, to determine mass loss and activities of extracellular enzymes. 3. Both plant growth and litter decomposition were N-limited for plants grown at N : P-s < 20, and P-limited for those grown at N : P-s \geq 40. Litter N : P ratios varied widely among species and did not predict which nutrient limited decomposition, except that litter with N : P > 22 always had P-limited decomposition. 4. The activities of beta-glucosidase, chitinase and phosphatase differed widely among species but were poorly related to litter nutrient concentrations and mass loss. Within some species, phosphatase activity increased towards high litter N : P ratios, suggesting P limitation of decomposers. 5. We conclude that there is no unique critical N : P ratio discriminating between N- and P-limited decomposition because this critical N : P ratio is species-dependent and may also depend on the physical conditions under which plants were grown.

287: S. Gusewell, N. Zuberbuhler and C. Clerc,. 2005. Distribution and functional traits of *Solidago gigantea* in a Swiss lakeshore wetland. *Botanica Helvetica* 1(115): 63-75.

Abstract: Alien plant species are of particular ecological concern when they invade native vegetation of high conservation value and alter its functioning. We mapped the area and cover of stands of invasive alien species in the lakeshore wetland "Grande Caricaie" (CH) and examined whether the main invader, *Solidago gigantea* Ait., differs functionally from the resident vegetation. Seven alien species considered to be invasive in Switzerland occurred with a total area of 22.2 ha. The most frequent invaders were *S. gigantea* (60 stands) and *Robinia pseudoacacia* (42 stands, mostly in forest). Less than 1 % of the non-forested wetland area was colonised by alien species, mostly *S. gigantea*. Dense stands of *S. gigantea* (> 50% cover) occurred in mesotrophic, non-flooded vegetation, suggesting that its spread is limited by high water level rather than by low nutrient availability. *S. gigantea* appeared functionally similar to the invaded wetland vegetation: its shoot size, specific leaf area, and biomass N and P concentrations were similar to or lower than those of co-occurring native species. Total soil N and P concentrations under *S. gigantea* stands did not differ from those under non-invaded vegetation. Thus, the impact of invasive alien species on the non-forested wetlands of the Grande Caricaie currently seems rather low but possible changes in soil processes as well as effects on other biota remain to be investigated.

288: M. Gyllstrom, L. A. Hansson, E. Jeppesen, F. Garcia-Criado, E. Gross, K. Irvine, T. Kairesalo, R. Kornijow, M. R. Miracle, M. Nykanen, T. Noges, S. Romo, D. Stephen, E. Van Donk and B. Moss,. 2005. The role of climate in shaping zooplankton communities of shallow lakes. *Limnology and Oceanography* 6(50): 2008-2021.

Abstract: We analyzed data from 81 shallow European lakes, which were sampled with standardized methods, for combined effects of climatic, physical, and chemical features of food-web interactions, with a specific focus on zooplankton biomass and community structure. Multiple-regression analysis showed that total phosphorus (TP) generally was the most important predictor of zooplankton biomass and community structure. Climate was the next most important predictor and acted mainly through its effect on pelagic zooplankton taxa. Benthic and plant-associated taxa (typically almost half the total zooplankton biomass) were, however, affected mainly by macrophyte coverage. Neither climate nor TP affected the relation between small and large taxa, and we found only a weak trend with increasing TP of increasing mean crustacean body mass. Dividing the data set into three climate zones revealed a pronounced difference in response to lake productivity between cold lakes, with long periods of ice cover, and the two warmer lake types. These "ice" lakes differed from the others with respect to the effect of TP on chlorophyll a, the zooplankton: chlorophyll a ratio, the chlorophyll a: TP ratio, and the proportion of cyclopoids in the copepod community. Our data suggest that bottom-up forces, such as nutrient concentration, are the most important predictors of zooplankton biomass. In addition, climate contributes significantly-possibly by affecting top-down regulation by fish-and may interact with productivity in determining the zooplankton standing biomass and community composition. Hence, the present study suggests that food-web dynamics are closely linked to climatic features.

289: W. L. Hadwen and S. E. Bunn,. 2005. Food web responses to low-level nutrient and N-15-tracer additions in the littoral zone of an oligotrophic dune lake. *Limnology and Oceanography* 4(50): 1096-1105.

Abstract: We used natural abundance stable isotopes to establish the structure of the littoral zone food web of an oligotrophic, perched dune lake on Fraser Island, Australia. Mixing model analyses incorporating riparian vegetation, seston, and periphyton sources indicated that periphyton carbon was the most significant food resource for aquatic consumers, despite the abundance of allochthonous carbon sources. In order to examine the consequences of nutrient inputs from tourists visiting this remote lake, repeated additions of low levels of phosphate and N-15-enriched ammonium nitrate were made to three littoral zone sites. Additions led to significant increases in periphyton chlorophyll a (Chl a) concentrations in enriched sites but had no measurable effect on phytoplankton Chl a concentrations. Periphyton collected 5 h after the first nutrient addition had substantially enriched $\delta(15)\text{N}$ signatures, suggesting that periphyton rapidly assimilated the added nutrients (and N-15-tracer). After 10 d of additions, all other primary food sources for consumers also became N-15-enriched, indicating that ongoing nutrient inputs are likely to lead to increased primary production and detrital processing. Substantially enriched consumer $\delta(15)\text{N}$ signatures were also measured, indicating that the added nutrients were assimilated and passed through multiple trophic levels. Our results indicate that ongoing low-level nutrient additions by tourists to oligotrophic lakes could lead to increased primary (periphyton) and secondary (consumer) production. However, increases in periphyton production and biomass accrual could eventually escape control by grazers, leading to adverse ecological and aesthetic effects.

290: S. D. Hafner, P. M. Groffman and M. J. Mitchell,. 2005. Leaching of dissolved organic carbon, dissolved organic nitrogen, and other solutes from coarse woody debris and litter in a mixed forest in New York State. *Biogeochemistry* 2(74): 257-282.

Abstract: Coarse woody debris (CWD) may play a role in nutrient cycling in temperate forests through the leaching of solutes, including dissolved organic carbon (DOC) and dissolved organic nitrogen (DON), to the underlying soil. These fluxes need to be considered in element budget calculations, and have the potential to influence microbial activity, soil development, and other processes in the underlying soil, but studies on leaching from CWD are rare. In this study, we collected throughfall, litter leachate, and CWD leachate in situ at a young mixed lowland forest in NY State, USA over one year. We measured the concentrations of DOC, DON, NH_4^+ , NO_3^- , dissolved organic sulfur, SO_4^{2-} , Cl^- , Al, Ca, K, Mg, Na, and P, estimated the flux of these solutes in throughfall, and measured the cover of CWD to gain some insight into possible fluxes from CWD. Concentrations of DOC were much higher in CWD leachate than in throughfall or litter leachate (15 vs. 0.7 and 1.6 mM, respectively), and greater than reported values for other leachates from within forested ecosystems. Other solutes showed a similar pattern, with inorganic N being an exception. Our results suggest that microsite scale fluxes of DOC from CWD may be high relative to throughfall and litter leaching fluxes, but since CWD covered a relatively small fraction (2%) of the forest floor in our study, ecosystem scale fluxes from CWD may be negligible for this site. Soil directly beneath CWD may be influenced by CWD leaching, in terms of soil organic matter, microbial activity, and N availability. Concentrations of some metals showed correlations to DOC concentrations, highlighting the possibility of complexation by DOM. Several solute concentrations in throughfall, including DOC, showed positive correlations to mean air temperature, and fewer showed positive correlations in litter leachate, while negative correlations were observed to precipitation, suggesting both biological and hydrologic control of solute concentrations.

291: S. E. Hagerthey and W. C. Kerfoot,. 2005. Spatial variation in groundwater-related resource supply influences freshwater benthic algal assemblage composition. *Journal of the North American Benthological Society* 4(24): 807-819.

Abstract: The landscape position of a lake relative to local and regional groundwater flow patterns has important ecosystem consequences. The local hydraulic gradient sets up seepage regimes, influences hydrologic and nutrient budgets, and alters site stoichiometry (molar N:P). However, little is known about the biotic (ecological) consequences of groundwater-lake coupling. We investigated the relationship between groundwater flux (resource supply rates), resource supply ratios, and species patterns of benthic algae in Sparkling Lake, Wisconsin, USA, a north-temperate flow-through seepage lake. Nutrient fluxes of seepage waters influenced both local benthic algal biomass and species composition. Sites of high groundwater discharge (HGD) were characterized by low N:P flux, high algal biovolume, and low species richness and diversity. In contrast, low groundwater discharge (LGD) and low groundwater recharge (LGR) sites had high N:P, low algal biovolume, and high richness and diversity. HGD sites were dominated by diatoms and cyanobacteria characteristic of high P, whereas LGD and LGR sites were characterized by taxa associated with low F. Many species were unique to the local flow regimes, increasing overall benthic algal species richness in Sparkling Lake.

292: B. E. Haggard, E. H. Stanley and D. E. Storm,. 2005. Nutrient retention in a point-source-enriched stream. Journal of the North American Benthological Society 1(24): 29-47.

Abstract: The capacity of a 3(rd)-order Ozark Plateau stream (Arkansas, USA) to take up (or remove) nutrient inputs from a rural wastewater treatment plant (WWTP) was examined using nutrient spiraling methods. Short-term nutrient additions of ten are used to assess nutrient uptake length, where an exponential decline in the concentration of the added nutrient reflects gross nutrient uptake. We applied this quantitative framework using WWTP effluent as a stream nutrient addition, and estimated net nutrient uptake length (S-net), mass transfer coefficient ($v(f_{net})$), and uptake rate (U-net) in Columbia Hollow, Arkansas. Water samples were collected at a reference site upstream of the WWTP input and at 6 sites downstream of the WWTP (0.3-2.7 km). Input from the WWTP significantly increased discharge, temperature, conductivity, soluble reactive P (SRP), and NH_4-N , and decreased pH and NO_3-N 0.3 km downstream from the point source. When P additions from the WWTP were low, stored SRP was released from the stream reach to maintain high water-column concentrations. Dissolved inorganic N was not retained in Columbia Hollow Most or all of the NH_4-N added from the point source was converted to NO_3-N , resulting in net nitrification rates of 7 to 31 g $NO_3-N m^{-2} d^{-1}$. The relationship between dilution-corrected concentrations and distance from the WWTP input indicated no significant nutrient retention, or that several stream kilometers were required before N and P were taken up. U-net typically was >7- to 10-fold higher and $v(f_{net})$ estimates were 10- to 100-fold lower than values reported for undisturbed streams, indicating low relative nutrient demand. Rather than acting as a nutrient sink, Columbia Hollow appeared to be acting as a short-term storage zone for P and a transformer of N. Thus, the effect of this rural WWTP on the stream was profound, distorting N and P cycling in Columbia Hollow.

293: A. L. Haglund and H. Hillebrand,. 2005. The effect of grazing and nutrient supply on periphyton associated bacteria. Fems Microbiology Ecology 1(52): 31-41.

Abstract: The effects of nutrient additions and grazing by macro-invertebrates on periphyton-associated algae and bacteria were studied by performing an enclosure experiment on three occasions from early spring to summer at mesotrophic Lake Erken and Vaddo, at the Swedish Baltic coast. There were significant interactions between nutrient additions and grazing on bacterial biomass and specific activity in Lake Erken. Thus, the importance of either bottom-up or top-down effects could not be singled out. Bacterial biomass increased with enrichment only in the absence of grazers. Grazer presence tended to increase bacterial biomass in ambient nutrient conditions, but to decrease bacterial biomass under enrichment. For specific activity the positive response to enrichment was restricted to grazer presence. Hence, grazing by macro-invertebrates may have an indirect positive effect on bacterial activity by enhancing nutrient conditions through their feeding activities and/or fecal pellets production. In addition, we found a significant relationship between bacterial production and chlorophyll a at both sites. This relationship weakened in the presence of macro-invertebrates. Thus, the importance of internal nutrient regeneration by bacteria and algae decreased, possibly due to increased nutrient availability, in the presence of macro-invertebrate grazers. (c) 2004 Federation of European Microbiological Societies. Published by Elsevier B.V. All rights reserved.

294: N. G. Hairston, C. M. Kearns, L. P. Demma and S. W. Effler,. 2005. Species-specific *Daphnia* phenotypes: A history of industrial pollution and pelagic ecosystem response. *Ecology* 7(86): 1669-1678.

Abstract: Phenotypic differences among species, even closely related species, may translate into distinct effects on ecosystem dynamics. In lakes, the generalist grazer genus *Daphnia* often has marked effects on the abundance of primary producers, the rate of primary production, and rates of nutrient cycling. The effects are particularly distinct during the clear-water phase (CWP) when algal biomass is driven to extremely low values as *Daphnia* densities undergo an annual population increase. Here we show that the timing of the CWP in Onondaga Lake, New York, USA, has depended upon which *Daphnia* species were present in the water column. An analysis of the ephippia and diapausing eggs from the sediments reveals that long-term changes in the zooplankton species assemblage tracks a history of chemical (especially salt waste) pollution. Prior to 1930 the assemblage was dominated by native *D. pulicaria* and *D. ambigua*. From 1930 to 1980, these species were replaced by *D. exilis* and *D. curvirostris*, two salinity-tolerant exotic species native to shallow salt pools of the southwestern United States and coastal brackish ponds of Europe, respectively. As industry was progressively shut down by government action over the period from the 1970s to the 1980s, the exotic species disappeared, and the two native taxa returned (plus *D. galeata mendotae*, which is also native to the region). As we have shown previously, the exotic species were identified either by hatching and rearing diapausing eggs (*D. exilis*) or by analysis of eggs using mtDNA (*D. curvirostris*). We interpret their role in seasonal algal dynamics in Onondaga Lake retrospectively using data collected in prior studies of the lake. The native *Daphnia* currently cause a typical spring CWP in late May and early June, whereas the exotic species caused an unusual late-summer (August-October) CWP during the period of maximum cyanobacterial density.

295: L. Hakanson,. 2005. The importance of lake morphometry for the structure and function of lakes. International Review of Hydrobiology 4(90): 433-461.

Abstract: This work demonstrates quantitatively and in a comprehensive way that the size and form of lakes regulate many general transport processes, such as sedimentation, resuspension, diffusion, mixing, burial and outflow, which in turn regulate many abiotic state variables, such as concentrations of phosphorus, suspended particulate matter, many water chemical variables and water clarity, which in turn regulate primary production, which regulate secondary production, for example of zooplankton and fish. Such relationships are discussed not qualitatively but quantitatively using a new generation of validated dynamic ecosystem models (LakeWeb and LakeMab) based on mechanistic principles. It has been shown by critical model tests (including blind tests using data covering wide limnological ranges) that these models give predictions that agree well with empirical data. This should lend credibility to the results presented in this work, which would have been very difficult to obtain using traditional methods with extensive field studies in a few lakes. Simulations have been carried out where the inflow of phosphorus is held constant and the consequences simulated for small, large, shallow and deep lakes. There are striking differences in total phosphorus (TP) concentrations and trophic state (from 10 to 100 $\mu\text{g TP/l}$) and hence also in changes in many variables characterizing lake structure and function, such as Secchi depth, suspended particulate matter, pH, water temperature, chlorophyll, algal volume, macrophyte cover; as well as production and biomasses of benthic algae, bacterioplankton, macrophytes, herbivorous zooplankton, predatory zooplankton, zoobenthos, prey fish and predatory fish. These changes have been quantified in a comprehensive manner in this work and the approach to calculate such changes are basic for an understanding of how different lakes react to changes in nutrient loading (eutrophication).

296: L. Hakanson and A. Gyllenhammar,. 2005. Setting fish quotas based on holistic ecosystem modelling including environmental factors and foodweb interactions - a new approach. Aquatic Ecology 3(39): 325-351.

Abstract: We present a new approach to set fish quotas from holistic aquatic foodweb modelling (the LakeWeb-approach). This modelling includes changes in environmental conditions (nutrients, salinity, temperature, oxygen), process-based mass-balance calculations of nutrient concentrations from inflow, internal processes and outflow, calculations of how changes in nutrient concentrations affect primary production, how such changes influence secondary production and how this influence fish production and biomass. This approach gives dynamic, quantitative responses to alterations in driving variables and abiotic/biotic feedbacks. We have applied this approach for preliminary simulations of the cod biomass in the Baltic. We also show that this approach adds a new dimension in setting fish quotas, which in the future could complement, rather than compete with, the more established methods used today based on fish catch statistics and models based on other presuppositions. Our preliminary results indicate that under present environmental conditions (2003), the cod is likely to be extinct if the annual catch is between 95 and 100 kt. The present fish quota is 75 kt/yr in the Baltic, but the over fishing may be 35 kt/yr. We discuss cause-effect relationships regulating fish production, key factors influencing thresholds and points of no return connected to overfishing and changes in environmental conditions, factors regulating recovery and methods for setting optimal fish quotas using this modelling approach.

297: L. Hakanson, M. Mikrenska, K. Petrov and I. Foster,. 2005. Suspended particulate matter (SPM) in rivers: empirical data and models. Ecological Modelling 2-3(183): 251-267.

Abstract: This work uses three data-bases to derive the first (as far as we know) operational empirical model to predict concentrations of suspended particulate matter (SPM) in rivers. SPM is a variable of fundamental importance in aquatic sciences. This empirical model is meant to be used as a sub-model in models where the main aim is to predict concentrations of radionuclides, nutrients or metals in river water and biota. It is well known that SPM influences the transport of most types of pollutants in most systems and governs both primary phytoplankton and bacterioplankton production and hence also secondary production (e.g., of zooplankton and fish). An important feature of the requested model is that all variables needed to run the model should be readily accessible from standard monitoring programmes and/or maps. The UK data-base includes data on SPM, water discharge (Q) and many water quality variables for 79 river sites, and it covers a wide range in these variables and includes data from several years. This data-base has been used to address the within-site variability of SPM, and hence also the predictive power of the developed model for SPM. The characteristic coefficient of variation ($CV = S.D./MV$; S.D. = standard deviation; MV = mean value) for SPM in these rivers sites is very high indeed, 1.71. The factors influencing the variability of characteristic (median) SPM-values among sites in different rivers have been quantified and ranked using the other two data-bases, a European data-base including data on SPM, water discharge, latitude, longitude, continentality, and altitude, and a Swedish data-base, which includes a comprehensive set of data on catchment-area characteristics. The new empirical model is derived from the two latter data-bases. The measured river-characteristic SPM-values can be predicted from the following variables: (1) latitude (as a measure of mean temperature, primary production and weathering), (2) mean water discharge, (3) continentality (S

298: S. R. Hall, V. H. Smith, D. A. Lytle and M. A. Leibold,. 2005. Constraints on primary producer N : P stoichiometry along N : P supply ratio gradients. Ecology 7(86): 1894-1904.

Abstract: A current principle of ecological stoichiometry states that the nitrogen to phosphorus ratio (N:P) of primary producers should closely match that from environmental nutrient supplies. This hypothesis was tested using data from ponds in Michigan, USA, a freshwater mesocosm experiment, a synthesis of studies from diverse systems (cultures, lakes, streams, and marine and terrestrial environments), and simple dynamic models of producer growth and nutrient content. Unlike prior laboratory studies, the N:P stoichiometry of phytoplankton in Michigan ponds clustered around and below the Redfield ratio (7.2:1 by mass), despite wide variation in N:P supply ratios (2:1-63:1 by mass) and the presence of grazers. In a mesocosm experiment, the N:P stoichiometry of phytoplankton cells again deviated from a nearly 1:1 relationship with N:P supply. Phytoplankton seston exhibited lower N:P content than expected at high N:P supply ratios, and often higher N:P content than anticipated at low N:P supply ratios, regardless of herbivore presence. Similar deviations consistently occur in the N:P stoichiometry of algae and plants in the other diverse systems. The models predicted that both high loss rates (sinking, grazing) and physiological limits to nutrient storage capacity could attenuate producer stoichiometry. In the future, research should evaluate how limits to elemental plasticity of producers can influence the role of stoichiometry in structuring communities and ecosystem processes.

299: P. B. Hamilton, L. M. Ley, S. Dean and F. R. Pick,. 2005. The occurrence of the cyanobacterium *Cylindrospermopsis raciborskii* in Constance Lake: an exotic cyanoprokaryote new to Canada. *Phycologia* 1(44): 17-25.

Abstract: The tropical and subtropical toxin-producing cyanobacterium, *Cylindrospermopsis raciborskii*, is reported for the first time in Canada. The species is of particular concern because it appears to be spreading throughout temperate North America and produces toxins that can have serious effects on human health. *Cylindrospermopsis raciborskii* was found in Constance Lake, Ottawa, Ontario, a shallow mesotrophic to eutrophic hardwater lake (Summer average total phosphorus 28-48 $\mu\text{g l}^{-1}$) where bottom waters can reach sufficiently high temperatures to promote germination of resting stages in the sediments. Peak abundance and biomass occurred in July and August when Surface water temperatures were at their maximum. Year to year differences in abundance and dominance over four years of sampling (1998-2001) appeared to be due principally to differences in water temperature rather than nutrients. In the summer of 1998 when biomass was highest over the four years, *C. raciborskii* contributed 63 % of the total phytoplankton biomass and 60 % of the cyanobacterial biomass. A warming trend linked to climate change is likely to accelerate the spread and abundance of this potentially toxic species.

300: S. K. Hamilton and P. C. Gehrke,. 2005. Australia's tropical river systems: current scientific understanding and critical knowledge gaps for sustainable management. Marine and Freshwater Research 3(56): 243-252.

Abstract: Australia's tropical river systems are poorly understood in comparison with Australia's temperate freshwater and tropical marine systems. Tropical rivers convey similar to 70% of the continent's freshwater runoff, and are increasingly being targeted for development. However, existing knowledge is inadequate to support policy for tropical regions that avoids repeating the environmental problems of water use in southern Australia. This paper summarises existing knowledge on the hydrogeomorphic drivers of tropical catchments, fluxes of sediments and nutrients, flow requirements and wetlands. Key research issues include improved quantification of available water resources, hydrological, biogeochemical and ecological linkages at systems scales, understanding and valuing ecosystem processes and services, and projecting the effects of long-term climate change. Two special considerations for tropical Australia are the location of major centres of government and research capacity outside the tropical region, and the legal title of much of tropical Australia vesting in Aboriginal communities with different cultural values for rivers. Both issues will need to be addressed if tropical research is to be effective in supporting resource management needs into the future. Systems-scale thinking is needed to identify links between system components and coastal enterprises, and to protect the environmental, social, and economic values of Australia's tropical river systems.

301: W. P. Hamilton, M. Kim and E. L. Thackston,. 2005. Comparison of commercially available Escherichia coli enumeration tests: Implications for attaining water quality standards. Water Research 20(39): 4869-4878.

Abstract: Many states are replacing microbiological water quality standards based on "fecal" or thermotolerant coliforms (ThCs) with new standards that employ Escherichia coli as the indicator organism. Implicit in these new standards are assumptions about the equivalence of E coli enumeration tests and the E. coli levels that will provide protection equivalent to former ThC standards. To investigate these assumptions, E coli levels in split samples (tests conducted on portions of the same grab sample) collected from small urban streams were determined using enzyme-specific media (Colilert (R), m-ColiBlue24 (R), and nutrient agar with MUG) and compared to levels determined with conventional culture media (m-FC and m-TEC). Although levels observed with all tests were highly correlated, significantly fewer E coli were enumerated with m-TEC than with enzyme-specific media (paired Student's t-test, $p > 99\%$). In addition, E. coli were found to comprise a larger fraction (84-104%, depending on the test) of the total presumptive ThC concentration than that suggested by the United States Environmental Protection Agency (63%). Both of these observations (1) the improvement in E. coli yields observed with enzyme-specific media, and (2) the greater proportion of ThC organisms that are E. coli, indicate that more water quality violations will occur when enzyme-specific media are used for testing than if conventional culture media are used. (c) 2005 Published by Elsevier Ltd.

302: S. E. Hampton,. 2005. Increased niche differentiation between two *Conochilus* species over 33 years of climate change and food web alteration. *Limnology and Oceanography* 2(50): 421-426.

Abstract: Long-term data from Lake Washington are used to ask whether zooplankton population dynamics can be predicted on the basis of abiotic gradients and potential food resources. I used Dynamic Linear Models to examine effects of fluctuations in temperature and five algal groups on population dynamics of two rotifer species over a 33-yr period in which climate has warmed, anthropogenic nutrient loading has changed dramatically, and *Daphnia* has become established. Dynamics of the colonial rotifers *Conochilus hippocrepis* and *Conochilus unicornis* were both best predicted by temperature and the density of single-celled bacterio- and phytoplankton smaller than 10 μm , but their seasonal peaks have become dramatically offset toward fall and spring, respectively, in recent years. Both species have been extirpated from the summer months in which they once flourished, seemingly because of midsummer declines in their food resources, which have been depressed by *Daphnia* since its establishment. However, climate warming has increased the length of the plankton growing season in Lake Washington, such that spring and fall offer greater abundance of food resources for *Conochilus*, offsetting modern exclusion of *Conochilus* from midsummer months. Additionally, greater distinction in temporal niches presumably has reduced possibilities for intrageneric competition, and both *Conochilus* species have achieved higher mean annual abundances in recent years.

303: G. E. Hannon, R. H. W. Bradshaw, E. G. Bradshaw, I. Snowball and S. Wastegard,. 2005. Climate change and human settlement as drivers of late-Holocene vegetational change in the Faroe Islands. *Holocene* 5(15): 639-647.

Abstract: Changes in Faroese land surfaces during the late Holocene reflect intimate interactions between cultural and environmental development. Analyses of fossil wood, pollen and plant macrofossils indicate that the present open landscape replaced shrubby vegetation that was present from c. 6000 BC Up to c. AD 660. Conditions altered during the late Holocene, with loss of woody vegetation and increasing erosion: trends that were initiated prior to human settlement. AMS dating of sub-fossil *Betula*, *Salix* and *Juniperus* found buried in peat profiles from the islands of Suouroy, Sandoy, Eysturoy, Vagar and Streymoy, revealed that the islands had at least partial woody vegetation cover up to the time of continuous settlement. The settlement horizon, identified in a lacustrine sequence on the island of Eysturoy, dated to c. AD 570. It comprised pollen evidence for the cultivation of *Hordeum*, cultural macrofossil assemblages, charcoal fragments, diatom assemblage changes indicating lake nutrient enrichment and physical measurements showing increased sedimentation rates. The pollen record showed that heathland development was initiated prior to anthropogenic impact. The ecosystem impacts of settlement were therefore superimposed on landscape changes that began around AD 250. The earlier changes were most likely forced by increased storminess and declining atmospheric temperatures.

304: L. A. Hansson, C. Bronmark, P. A. Nilsson and K. Abjornsson,. 2005. Conflicting demands on wetland ecosystem services: nutrient retention, biodiversity or both?. *Freshwater Biology* 4(50): 705-714.

Abstract: 1. Wetland ecosystems may, besides having considerable economical value, increase landscape biodiversity and function as traps for nutrients from land to freshwater- and marine systems. As a result of these features, wetlands are nowadays often protected and restored, and many countries have even initiated wetland construction programmes. 2. In the present study, we aim at increasing the knowledge on how to improve the design of a wetland with respect to both biodiversity and nutrient retention, by analysing physical, chemical and biological features of a large set of constructed wetlands. 3. Our results show that a combination of the wetland features, namely shallow depth, large surface area and high shoreline complexity are likely to provide a high biodiversity of birds, benthic invertebrates and macrophytes and to have high nitrogen retention, whereas a small, deep wetland is likely to be more efficient in phosphorus retention, but less valuable in terms of biodiversity. 4. Hence, among the features used to design new wetlands, area, depth and shoreline complexity have fundamental, and sometimes conflicting, effects on nutrient retention and biodiversity. This means that there are, within limits, possibilities to direct the ecosystem function of a specific wetland in desired directions.

305: E. L. Harbott and M. R. Grace,. 2005. Extracellular enzyme response to bioavailability of dissolved organic C in streams of varying catchment urbanization. *Journal of the North American Benthological Society* 3(24): 588-601.

Abstract: We assessed the potential effects of urbanization on bioavailability of dissolved organic C (DOC) in stream ecosystems, by quantifying bacterial extracellular enzymatic activity (EEA). We measured activities of 6 enzymes by incubating water samples with 4-methylumbelliferyl substrates from streams across an urbanization gradient east of Melbourne, Australia. A principal components analysis (PCA) ordination separated streams according to their relative urbanization, as indicated by effective imperviousness (proportion of each catchment covered by impervious surface directly connected to streams by pipes). Activities of leucine aminopeptidase and esterase were higher in streams in more urbanized catchments than in less-urbanized streams, where moderate activities of a diverse range of enzymes were observed. High relative contributions of leucine aminopeptidase and esterase to overall enzyme activity in urban streams stressed the increased importance of peptides as a C source for heterotrophic bacteria and nonspecific extracellular hydrolytic activity. In contrast, high contributions of beta-N-acetyl glucosaminidase and P-xylosidase in less-urbanized streams highlighted the significance of microbial detrital material as a C source and processing of plant-derived xylo-oligosaccharide substrates in these environments. Our results suggest a shift in organic C bioavailability across streams of contrasting urbanization, despite all streams having roughly similar DOC concentrations. We propose that relative EEA rates show promise as an ecological indicator of stream health across an urban gradient.

306: G. Harris and A. L. Heathwaite,. 2005. Inadmissible evidence: knowledge and prediction in land and riverscapes. Journal of Hydrology 1-4(304): 3-19.

Abstract: Analyses of daily water quality data from two streams draining a pair of small coastal catchments in South Devon, England reveal that what conventionally would be thought to show random noise, has a discernable structure and is clear evidence of process. Catchment and aquatic systems are non-equilibrium systems and climate drivers cause fluctuations in water quality both in terms of the concentrations of individual parameters and in the correlations between parameters. The data reveal non-linear coupling at small scales and show evidence of fractal properties both of which may be evidence of self-organised phenomena at small scales in catchments and streams. These data show that: (a) water quality and catchment nutrient export data may be strongly aliased, and (b) there is a fundamental degree of indeterminacy underlying the data we can collect and the knowledge we can generate from the data. New techniques of data based modelling that use the data itself to define more parsimonious predictive models are needed because such an approach recognises the partial nature of our knowledge and requires adequate monitoring and adaptive management programs. Crown Copyright (c) 2004 Published by Elsevier B.V. All rights reserved.

307: J. A. Harrison, P. A. Matson and S. E. Fendorf,. 2005. Effects of a diel oxygen cycle on nitrogen transformations and greenhouse gas emissions in a eutrophied subtropical stream. *Aquatic Sciences* 3(67): 308-315.

Abstract: Rivers and streams constitute a major pathway for material transport from land to sea and an important source of greenhouse gases. Short-term variation in stream chemistry due to day-night oxygen (O₂) fluctuations could significantly affect a stream's capacity to transport nutrients and produce greenhouse gases. Though it is well established that diel cycles are important in controlling O₂ and CO₂ dynamics, the study of diel dynamics of other redox-sensitive elements has been fairly limited. Here we show that a subtropical stream can undergo complete reduction and oxidation sequences in just a few hours. This redox fluctuation has important consequences for downstream transfer of nutrients and for greenhouse gas production. Among these consequences are decreased denitrification rates relative to estimates made using only daytime measurements (17-38% during our observation period), increased downstream nitrogen (N) transfer, a striking change in form of transported N (decreased nitrate and increased ammonium), and decreased estimates of in-stream nitrous oxide (N₂O) flux (36-38% during our observation period). Additionally, methane (CH₄) concentrations doubled and carbon dioxide (CO₂) concentrations rose from 4.6 to 30.7 mg L⁻¹ during the 24-hour period of our observations. Diel shifts like the one we describe have implications for our understanding of nutrient transport and greenhouse gas production in eutrophied streams.

308: K. E. Havens and D. E. Gawlik,. 2005. Lake Okeechobee conceptual ecological model. Wetlands 4(25): 908-925.

Abstract: With a surface area of nearly 1,800 square kilometers, Lake Okeechobee is a prominent central feature of the South Florida aquatic ecosystem. The lake provides regional flood protection, supports a prized recreational fishery, provides habitat for migratory waterfowl and regional wading bird populations, and is a source of fresh water for irrigation, drinking, and restoration of downstream ecosystems. The main stressors on Lake Okeechobee are (1) large inputs of phosphorus from agricultural and other anthropogenic land uses in the watershed, (2) unnatural variation in water levels due to channelization of inflows and dike containment, and (3) rapid expansion of non-native plants. Ecological effects are complicated due to three distinct in-lake zones with different water chemistry, physical properties, and biota. A central pelagic zone has turbid, nutrient-rich water and phytoplankton dominance; a shallow south and western near-shore zone has submerged plant or phytoplankton dominance (at low vs. high water levels, respectively); and a western littoral zone is dominated by emergent wetland plants. Changes in water level influence the flow of nutrients between zones, thereby creating a synergistic effect between stressors. Under high water conditions, there is considerable advective transport of nutrients from the pelagic zone into the littoral zone. Under low water conditions, the littoral zone is cut off hydrologically and is a rainfall-driven oligotrophic wetland. Low water also facilitates drying and wildfires in the littoral zone, which in turn has an influence on expansion of non-native plants and recovery of native plants from buried seed banks. All of these factors influence fish, wading birds, and other animals, which depend on littoral and near-shore plant communities for nesting and foraging habitat. This paper describes our current knowledge of these complex processes, the lake's expected responses to ongoing and planned restoration programs, and key areas

309: D. J. Hawke and R. N. Holdaway,. 2005. Avian assimilation and dispersal of carbon and nitrogen brought ashore by breeding Westland petrels (*Procellaria westlandica*): a stable isotope study. *Journal of Zoology* (266): 419-426.

Abstract: Only a small proportion of the marine nutrients brought ashore by breeding colonial seabirds is retained in colony soils. However, means by which these marine nutrients can be dispersed to the wider terrestrial ecosystem have rarely been identified. In this study, moulted feathers from *Hemiphaga novaeseelandiae* (an endemic pigeon; n = 9) and *Gallirallus australis* (an endemic flightless rail; n = 3) and from a *Procellaria westlandica* (Westland petrel) colony were analysed for C-13 and N-15 enrichment. Potential diet items from both the colony and a control location were also analysed, and their contributions to the diets of *H. novaeseelandiae* and *G. australis* calculated. *Hemiphaga novaeseelandiae* assimilated marine N but not marine C, and showed a wide range in the significance of different diet sources. Food for most *H. novaeseelandiae* came from within the colony, implying minimal transport of marine nutrients to the wider terrestrial environment. All *G. australis* food came from within the colony, but 29-39% was from petrel tissue, or invertebrates feeding on petrel material. Thus, both *H. novaeseelandiae* and *G. australis* assimilated nutrients brought ashore by *P. westlandica*, but neither was shown to disperse the nutrients much beyond the petrel colony. However, birds that are now locally extinct may have dispersed marine nutrients more widely. Future research should focus on the consequences of restoring these species to petrel colonies as part of attempts to re-establish the functioning of pre-human ecosystems in New Zealand.

310: M. J. Hayden and D. S. Ross,. 2005. Denitrification as a nitrogen removal mechanism in a Vermont peatland. Journal of Environmental Quality 6(34): 2052-2061.

Abstract: Atmospheric deposition of nitrogenous compounds to ombrotrophic peatlands (i.e., those that have peat layers higher than their surroundings and receive nutrients and minerals exclusively by precipitation) has the potential to significantly alter ecosystem functioning. This study utilized the acetylene inhibition technique to estimate the relative importance of denitrification in nitrogen removal from a primarily ombrotrophic peatland, in an attempt to estimate the threat of increased nitrogen loadings to these areas. Estimates of mean rates of denitrification ranged from -2.76 to 84.0 ng N₂O-N cm⁻³ h⁻¹ (equivalent to -150 to 4800 μg N₂O-N m⁻² h⁻¹) using an ex situ core technique and from -8.30 to 5.98 μg N₂O-N m⁻¹ h⁻¹ using an in situ chamber technique. Core rates may have been elevated over natural field levels due to effects of disturbance on substrate availability, and chamber rates may have been low due to diffusional constraints on acetylene and N₂O. Net nitrification was also measured in an attempt to evaluate this process as a source of nitrate for denitrifiers. The low rates of net nitrification measured, in combination with the low rates of in situ denitrification and the very low amounts of free nitrate measured in this peatland, suggests that inorganic N turnover in this wetland is low. Results showed that nitrate was a limiting factor for denitrification in this peatland, with mean rates from nitrate-amended cores ranging from 13.1 to 260 ng N₂O-N cm⁻¹ h⁻¹, and it is expected that increases in nitrogen loadings will increase denitrification rates in this ecosystem.

311: B. L. Hayford and L. C. Ferrington,. 2005. Biological assessment of Cannon Creek, Missouri by use of emerging Chironomidae (Insecta : Diptera). Journal of the Kansas Entomological Society 2(78): 89-99.

Abstract: A biological assessment was done to determine the impact of heavy metal discharge from the Schuykill Metals Recycling Plant (SMCP) on Cannon Creek, Missouri, its receiving stream. The relationship between sediment chemistry and chironomid emergence was examined. Twenty-four heavy metals and nutrients from the SMCP discharge effluent were examined in Cannon Creek from above the effluent, at the effluent, and below the effluent. Five heavy metals (barium, cadmium, lead, manganese, and zinc) and sodium varied significantly between sites. Changes in community composition, mean abundance of emerging chironomids, and Kansas Biotic Index Values were used to detect impairment by heavy metals and nutrients in Cannon Creek. Concentrations of lead and zinc in Cannon Creek were at levels potentially lethal to chironomids, yet mean abundance of emerging chironomids actually increased with the increase of heavy metals and nutrients and showed a strong and positive correlation with barium and sodium, and a weaker correlation with increases in lead and cadmium. Chironomid diversity patterns did not correlate with the concentrations of heavy metals in Cannon Creek. Community similarity between sites was greatest between the reference site and the site at the SMCP discharge effluent. Low similarity between sites was attributed to gross changes in stream morphology rather than to any effects from the SMCP effluent. Finally, the KBI tolerance values to heavy metals for chironomids in Cannon Creek were above those encountered in the reference condition for the Western Cornbelt Plains Ecoregion, indicating minimal impairment.

312: M. M. Hefting, J. C. Clement, P. Bienkowski, D. Dowrick, C. Guenat, A. Butturini, S. Topa, G. Pinay and J. T. A. Verhoeven,. 2005. The role of vegetation and litter in the nitrogen dynamics of riparian buffer zones in Europe. *Ecological Engineering* 5(24): 465-482.

Abstract: Plant uptake and denitrification are considered to be the most important processes responsible for N retention and mitigation in riparian buffers. In many riparian buffers, however, nutrients taken up by plants remain in the system only temporarily and may be gradually released by mineralization later. Still, plants increase the residence time of nutrients considerably by reducing their mobility. We investigated the importance of plant N uptake and N immobilization in litter for N retention in riparian buffers. Nitrogen uptake in vegetation and N dynamics in litter were measured over a two-year period in a range of forested and herbaceous riparian buffers along a climatic gradient in Europe, receiving different loadings of N-enriched groundwater. Plant production, nitrogen uptake, and N retention were significantly higher in the forested buffer sites compared to the herbaceous buffer sites. However, in herbaceous buffers, periodic harvesting of herbaceous biomass contributed considerably to the N retention. No relationship between lateral N loading and plant productivity or N uptake was observed; this indicated that plant growth was not N-limited. In the winter period, decaying leaf litter had a small but significant role in N retention in a majority of the riparian ecosystems studied. Moreover, no responses to the climatic gradient were found. Generally, we can state that annual N retention in the vegetation and litter compartment is substantial, making up 13-99% of the total N mitigation. (c) 2005 Elsevier B.V. All rights reserved.

313: O. Heiri and A. F. Lotter,. 2005. Holocene and Lateglacial summer temperature reconstruction in the Swiss Alps based on fossil assemblages of aquatic organisms: a review. *Boreas* 4(34): 506-516.

Abstract: The taxonomic composition of chironomid, cladoceran and diatom assemblages in small lakes in the Alpine serve well and remain identifiable in lake sediments, summer temperature transfer-functions can be developed based on the modern distribution of these organisms and applied to fossil records to reconstruct past summer temperature variability. We provide a summary of the chironomid-, cladoceran- and diatom-based transfer functions available from the Swiss Alps and discuss the potential problem of co-variation between summer temperature and lake nutrient conditions for transfer-function development. Whereas the diatom-based summer temperature transfer function remains to be evaluated in down-core reconstructions, the cladoceran- and chironomid-based transfer functions have been used successfully to produce summer temperature records on Lateglacial and Holocene time scales that are in good agreement with other temperature reconstructions in the Alps. Major problems that can be encountered when using fossil assemblages of aquatic organisms for temperature reconstruction in the Alpine region are biases in the inferred temperatures associated with human impact on lakes and parameters other than temperature affecting the fossil assemblages. A multi-proxy approach to palaeoenvironmental reconstruction is recommended to keep a close control on past catchment and within-lake processes during the time interval of interest.

314: B. M. Herrick and A. T. Wolf,. 2005. Invasive plant species in diked vs. undiked Great Lakes wetlands. Journal of Great Lakes Research 3(31): 277-287.

Abstract: We compared the standing vegetation, seed banks, and substrate conditions in seven pairs of diked and undiked wetlands near the shores of Lake Michigan and Lake Huron, North America. Our analysis tested the null hypothesis that construction of artificial dikes has no effect on the vulnerability of Great Lakes coastal wetlands to non-native and native invasive species. Both the standing vegetation and seed banks in diked wetlands contained significantly more species and individuals of invasive plants. In addition, diked wetlands exhibited significantly higher levels of organic matter and nutrient levels, and significantly higher average pH. Two pervasive non-native invasive species in the Great Lakes region, *Lythrum salicaria* (purple loosestrife) and *Phalaris arundinacea* (reed canary grass) were significantly more abundant in diked wetlands. *Typha* spp. (cattail) also formed a much higher percent vegetation cover in the diked wetlands. Our results support the view that diking of shoreline wetlands modifies natural hydrologic regimes, leading to nutrient-rich aquatic environments that are vulnerable to invasion. The shallower, more variable water levels in non-diked wetlands, on the other hand, appear to favor another undesirable invasive species, *Phragmites australis* (common reed grass).

315: A. Herr-Turoff and J. B. Zedler,. 2005. Does wet prairie vegetation retain more nitrogen with or without *Phalaris arundinacea* invasion?. *Plant and Soil* 1-2(277): 19-34.

Abstract: Elevated nitrogen (N) levels accelerate expansion of *Phalaris arundinacea* L. (reed canary grass), a highly aggressive invader that displaces native vegetation and forms monotypes. Hence, *Phalaris* is commonly presumed to have high nutrient uptake that contributes to higher N retention in a wetland. We compared the capability of wet prairie vegetation with and without invading *Phalaris* under low-N and high-N treatments to (1) accumulate N in plant tissues, (2) retain N in soil and (3) remove N from water flowing through mesocosms. With high-N treatment, above-ground biomass increased by > 90% ($P < 0.0004$; yrs. 1-2) and percent total N in above-ground tissues increased by > 46% ($P = 0.0005$; yrs. 1-2). Consequently, there was similar to 3 times as much total N accumulation in above-ground tissue (calculated from biomass and percent total N in tissues) with high-N treatment vs. low-N treatment ($P < 0.0001$; yrs. 1-2). Without invading *Phalaris*, wet prairie vegetation produced over 49% more above-ground biomass ($P \leq 0.022$; yrs. 1-2) and accumulated over 38% more N in its above-ground tissues ($P = 0.009$; yrs. 1-2), compared to invaded mesocosms. The high-N treatment increased concentrations of soil ammonium ($\text{NH}_4\text{-N}$) up to 157% ($P = 0.0001$) and soil nitrate ($\text{NO}_3\text{-N}$) up to 549% ($P < 0.001$). After N treatments began, we found no differences in total N or $\text{NO}_3\text{-N}$ in soils ($P > 0.05$) or in concentrations of $\text{NH}_4\text{-N}$ or $\text{NO}_3\text{-N}$ released in the discharged water ($P > 0.1$) from wet prairie mesocosms with and without invading *Phalaris*. Soil $\text{NH}_4\text{-N}$ did not differ between the wet prairie mesocosms with and without *Phalaris* invasions on five dates ($P > 0.05$); the one exception was in August 2004 (27% greater with invasion; $P = 0.02$). Our results from wet prairie mesocosms do not support the presumption that *Phalaris* retains more N than native plant assemblages.

316: D. O. Hessen, E. van Donk and R. Gulati,. 2005. Seasonal seston stoichiometry: effects on zooplankton in cyanobacteria-dominated lakes. *Journal of Plankton Research* 5(27): 449-460.

Abstract: Seasonal dynamics in elemental composition [carbon (C), nitrogen and phosphorus (P)] of seston and zooplankton were studied over several years in three hypereutrophic Dutch lakes with persistent dominance and high biomass of cyanobacteria. In all three lakes, there was a strong pattern with decreased P-content and increased C:P ratio in seston (< 150 μm) coinciding with the increase in water temperature. The seston C:P ratios (at:at) were more than doubled with the rising temperature, i.e. from similar to 200 (at:at) in winter to 500 in summer. Sestonic C:P ratios increased over the growing season, suggesting that seasonal dynamics among autotrophs with high P-uptake in winter and support of subsequent phytoplankton growth by consumption of internal cellular P (P-quota) was the main cause of low sestonic P contents in late summer. This could, however, occur in concert with a physiologically driven decrease in cell-specific P at higher temperatures in summer. In contrast, the annual variation of C:P ratios of the zooplankton fraction was only 10% of that of seston. The variations of C:P ratios of the zooplankton were, nevertheless, strongly correlated with those of seston. For most of the summer, seston C:P ratios were far above the threshold ratio for P-limitation in *Daphnia* and other P-demanding species. This will pose further constraints on growth performance of *Daphnia* in these lakes, thus adding to the fish predation pressure and the poor food quality of cyanobacteria per se. The low grazing pressure causes a high biomass of low-quality autotrophs, promoting a stable state with low trophic transfer efficiency.

317: J. E. Hewitt, M. J. Anderson, and S. F. Thrush,. 2005. ASSESSING AND MONITORING ECOLOGICAL COMMUNITY HEALTH IN MARINE SYSTEMS. *Ecological Applications*: 3(15): 942-953.

Abstract: The increased potential for long-term degradative change associated with large-scale diffuse impacts in urban marine environments highlights the need to develop methods for assessing the ecological significance of any observed changes. This study defines "health" on the basis of the range of communities observed along gradients of anthropogenic impacts. This definition identifies both acute effects and broader scale degradation in community structure. Three multivariate constrained ordination techniques were used to assess changes in communities occurring along an anthropogenic disturbance gradient of stormwater pollution in two different habitats (estuaries and harbors). All three techniques detected changes, even when historical data sets, not specifically designed for the purpose, were utilized. Comparison with five diversity indices suggested that the multivariate approach was more successful in defining change and, thus, ecological health. Moreover, the information can easily be examined for changes in individual species, or for changes in function, trophic status, or biomass/size structure, improving interpretation of the ecological consequences of change. As this multivariate approach allows for monitoring community composition to determine whether sites are improving or degrading over time, it would be useful for aiding management decisions and assessing the efficiency of management actions. While this study occurred in one region only, the approach should be able to be utilized in other marine (or freshwater or terrestrial) systems where commensurable regional-scale multivariate databases exist.

318: L. M. Hewitt, M. G. Dube, S. C. Ribey, J. M. Culp, R. Lowell, K. Hedley, B. Kilgour, C. Portt, D. L. MacLatchy and K. R. Munkittrick,. 2005. Investigation of cause in pulp and paper environmental effects monitoring. Water Quality Research Journal of Canada 3(40): 261-274.

Abstract: Environmental Effects Monitoring (EEM) Programs in Canada have been developed for the pulp and paper and metal mining industries. The EEM Program conducts cyclical evaluations of receiving environments to determine whether effects exist when facilities comply with existing regulations. Investigation of cause (IOC) is a specific stage in the EEM Program that is used after environmental effects in fish and/or benthos have been detected, confirmed and their extent and magnitude have been documented. This paper presents an overview of the processes associated with this phase of monitoring. The objective of an IOC is to obtain sufficient information so that the source of the effect can be identified and removed, or its effects reduced to an acceptable level. The initial direction of an IOC is dependent upon the type of response patterns observed for fish and/or benthos during EEM cycles and extent/magnitude studies. The framework presented in this paper is based on an amalgamation of research projects conducted at Canadian pulp mills over the last decade and selected studies are summarized as examples. It also represents an integration of several research philosophies and scientific disciplines. The framework is based on national response patterns from the second cycle of pulp and paper EEM studies. IOCs are directed into either an eutrophication-based investigation or a contaminant-based investigation (including metabolic disruption in fish). The framework is constructed with a progression of investigative levels designed to provide more information on the causative factors. Each of these phases also represents a decision point for stakeholders to determine if sufficient information has been attained about the causal factor(s) and whether the IOC should be concluded. It is expected that the framework will evolve with a growing knowledge base of causal factors, as facilities enter into this phase of the EEM Program.

319: D. L. Hey, L. S. Urban and J. A. Kostel,. 2005. Nutrient farming: The business of environmental management. Ecological Engineering 4(24): 279-287.

Abstract: Restored wetlands could be used successfully to address our recurring problems of excess nutrients (and sediments) and flood damages along U.S. rivers. Credit markets for flood storage, nitrogen, phosphorous, carbon, atrazine, sediment, and many other constituents would economically motivate landowners to restore wetlands. The resulting high-quality open space would provide for recreation, wildlife habitat, and biodiversity. By instigating the market for nitrate-nitrogen, we can jumpstart the entire process of using markets to manage ecosystems. The nitrogen market will create a new land-economics paradigm and new opportunities for landowners, particularly farmers. (c) 2005 Elsevier B.V. All rights reserved.

320: B. J. Hicks, M. S. Wipfli, D. W. Lang and M. E. Lang,. 2005. Marine-derived nitrogen and carbon in freshwater-riparian food webs of the Copper River Delta, southcentral Alaska. *Oecologia* 4(144): 558-569.

Abstract: After rearing to adulthood at sea, coho salmon (*Oncorhynchus kisutch*) return to freshwater to spawn once and then die on or near their spawning grounds. We tested the hypothesis that spawning coho salmon return marine N and C to beaver (*Castor canadensis*) ponds of the Copper River Delta (CRD), Cordova, southcentral Alaska, thereby enhancing productivity of the aquatic food webs that support juvenile coho salmon. We sampled three types of pond treatment: (1) natural enrichment by spawning salmon, (2) artificial enrichment via addition of salmon carcasses and eggs, and (3) ponds with no salmon enrichment. All ponds supported juvenile coho salmon. Seasonal samples of stable isotopes revealed that juvenile coho salmon, threespine sticklebacks (*Gasterosteus aculeatus*), caddisfly larvae, leeches, and chironomid midge larvae were enriched with marine N and C. The aquatic vascular plants bur reed (*Sparganium hyperboreum*), pondweed (*Potamogeton gramineus*), and mare's tail (*Hippuris vulgaris*) were enriched with marine N only. Riparian vegetation (Sitka alder *Alnus viridis* ssp. *sinuata* and willow *Salix* spp.) did not show enrichment. Artificial additions of adult carcasses and eggs of coho salmon increased the $\delta(15)\text{N}$ and $\delta(13)\text{C}$ values of juvenile coho salmon. In this dynamic and hydrologically complex coastal environment, spawning coho salmon contributed marine N and C comprising 10-50% of the dietary needs of juvenile coho salmon through direct consumption of eggs and carcass material. Invertebrates that have assimilated marine N and C yield a further indirect contribution. This perennial subsidy maintains the productivity of the ecosystem of the coho salmon on the CRD.

321: W. R. Hill and I. L. Larsen,. 2005. Growth dilution of metals in microalgal biofilms. Environmental Science & Technology 6(39): 1513-1518.

Abstract: Despite the key role microalgae play in introducing toxicants into aquatic food webs, little is known about the effects of environmental factors on metal accumulation by these primary producers. Environmental factors such as light and nutrients alter growth rates and may consequently influence metal concentrations in microalgae through growth dilution. Laboratory experiments suggested that metal uptake and elimination by microalgal biofilms were gradual enough to enable dilution of metals within the biofilms by photosynthetically accrued carbon, and a simple kinetic model of metal accumulation predicted significant variation in metal content due to growth dilution over the natural range of microalgal growth rates. The ratio of metal uptake to carbon uptake by microalgal biofilms decreased exponentially with increasing light in short-term laboratory experiments because photosynthesis was much more sensitive to a light gradient than was metal uptake. The effect of light on biofilm metal concentrations was confirmed in situ with a long-term experiment in which experimental shading of biofilms in a metal contaminated stream decreased biofilm growth rates and caused a 3x increase in biofilm concentrations of twelve metals, including methylmercury. Slow growth at the primary producer level is a likely contributor to higher biotic metal concentrations in shaded, oligotrophic, or cold ecosystems.

322: H. Hillebrand,. 2005. Light regime and consumer control of autotrophic biomass. *Journal of Ecology* 4(93): 758-769.

Abstract: Autotrophic biomass is often regulated by resource supply and consumer presence. Most studies on top-down vs. bottom-up control of plant biomass focus on nutrients as basal resources, whereas light has received considerably less attention. Effects of light and nutrients may differ because light represents a vertical resource and plant adaptations to acquire light might counteract or facilitate consumer effects. I tested the interaction between light supply and consumer presence in a meta-analysis of experiments that manipulated both these factors factorially and measured the biomass of benthic algae (periphyton). Both grazer removal and light enhancement had positive effects on algal biomass. These two factors showed strong interactions, which exceeded previously observed interaction terms between nutrient supply and grazer removal. Positive light effects on algal biomass were primarily observed in the absence of grazers. Grazer effects became stronger at high light supply, which indicated that high light favours algal growth types that are easily ingested. Further analyses showed that light effects increased with trophic state of the habitat and with algal biomass, indicating enhanced importance of light limitation and self-shading at high nutrient supply. Grazer effects depended on grazer biomass and varied with type of experimental manipulation. This study implies that light is of similar importance as nutrients in resource control of benthic algal biomass. High light levels simultaneously enhance consumer control of algal biomass, resulting in strong resource vs. consumer interactions. Light competition and consumer presence pose a trade-off on algal growth, where growth form may distinguish between adaptations to acquire light and to avoid consumption.

323: H. Hirayama, K. Takai, F. Inagaki, Y. Yamato, M. Suzuki, K. H. Nealson and K. Horikoshi,. 2005. Bacterial community shift along a subsurface geothermal water stream in a Japanese gold mine. *Extremophiles* 2(9): 169-184.

Abstract: Change of bacterial community occurring along a hot water stream in the Hishikari gold mine, Japan, was investigated by applying a combination of various culture-independent techniques. The stream, which is derived from a subsurface anaerobic aquifer containing plentiful CO₂, CH₄, H₂, and NH₄⁺, emerges in a mine tunnel 320 m below the surface providing nutrients for a lush microbial community that extends to a distance of approximately 7 m in the absence of sunlight-irradiation. Over this distance, the temperature decreases from 69 degrees C to 55 degrees C, and the oxidation-reduction potential increases from - 130 mV to + 59 mV. In the hot upper reaches of the stream, the dominant phylotypes were: 1) a deeply branching lineage of thermophilic methane-oxidizing gamma-Proteobacteria, and 2) a thermophilic hydrogen- and sulfur-oxidizing *Sulfurihydrogenibium* sp. In contrast, the prevailing phylotypes in the middle and lower parts of the stream were closely related to ammonia-oxidizing *Nitrosomonas* and nitrite-oxidizing *Nitrospira* spp.. Changes in the microbial metabolic potential estimated by competitive PCR analysis of genes encoding the enzymes, particulate methane monooxygenase (*pmoA*), ammonia monooxygenase (*amoA*), and putative nitrite oxidoreductase (*norB*), also substantiated the community shift indicated by 16S rRNA gene analysis. The diversity of putative *norB* lineages was assessed for the first time in the hot water environment. Estimation of dominant phylotypes by whole-cell fluorescent in situ hybridization and changes in inorganic nitrogen compounds such as decreasing ammonium and increasing nitrite and nitrate in the mat-interstitial water along the stream were consistent with the observed transition of the bacterial community structure in the stream.

324: S. Hobara, K. Koba, T. Osono, N. Tokuchi, A. Ishida and K. Kameda,. 2005. Nitrogen and phosphorus enrichment and balance in forests colonized by cormorants: Implications of the influence of soil adsorption. Plant and Soil 1(268): 89-101.

Abstract: Although much concern has been directed at nitrogen (N) cycling in terrestrial ecosystems with bird colonies, little has been clarified on the processes of phosphorus (P) cycling itself, and few comparisons between P and N cycling in bird colonies have been made. On the Isaki Headland and Chikubu Island, which are located on or near the shore of Lake Biwa, Central Japan, a dramatic increase in the population of cormorants has occurred since the 1980s. There has been a concomitant increase in the transport of nutrients from the lake to the waterside ecosystems. We compared the pools and dynamics of N and P in the cormorant-colony forests in order to clarify the effects of differences in soil N and P dynamics on the N-P balance of these colony forests. The total N concentration in the forest floor at excrement-influenced sites was not significantly different from that at sites without such influence, in spite of the heavy load of cormorant-derived N. In contrast to N, forest floor P concentration at the sites with excrement influence was significantly higher compared to sites without such influence, resulting in the lower forest floor N/P ratio at the excrement-influenced sites even after colony abandonment. The site pattern of total N and P concentrations and N/P ratio for mineral soil was similar to that for the forest floor. It seems that the leaky character for N and the accumulative character for P are due to the high mobility of nitrate in soils and the tight absorption of inorganic P to clay minerals, respectively. The site pattern of N/P ratios observed for *Chamaecyparis obtusa* Sieb. et Zucc. leaves is consistent with that for the forest floor and/ or mineral soil, suggesting that the soil geochemical property was reflected in the foliar N/P ratio. The chemistry of throughfall and soil solution was also changed due to deposition of cormorant excrement, and the changes continued for a few years after abandonment of the colony. The quantitative analyses for N a

325: W. Hobbs, K. Irvine and I. Donohue,. 2005. Using sediments to assess the resistance of a calcareous lake to diffuse nutrient loading. Archiv Fur Hydrobiologie 1(164): 109-125.

Abstract: The capacity of lake sediments to retain phosphorus can provide an important buffer to eutrophication. Concentrations of total phosphorus (TP) in the surface sediment of a shallow calcareous lake (Lough Carta, Ireland) varied significantly across three basins and were correlated strongly with iron and manganese, but correlated inversely with calcium carbonate. The concentrations of phosphorus in the surficial sediments of each basin were observed to reflect the mean annual TP of overlying waters, such that the North Basin > South Basin > Mid Basin. Phosphorus sorption experiments on the most TP-enriched sediments predicted a saturation concentration of 0.15 mg P g⁻¹. Geochemically similar sediments from the northern basin had slightly lower measured TP concentrations (0.10 mg P g⁻¹), while those sediments with higher Fe concentrations had up to 0.54 mg P g⁻¹. Decreasing Fe:P in the upper sections of sediment cores taken from each lake basin show clearly a reduction in the ability of the lake sediments to bind P, reducing the resistance of the lake to eutrophication. The reduced capacity of the sediments to adsorb P should be viewed as a warning signal that indicates increasing risk to water quality and current high conservation status of Lough Carra. The risk that the lake could "flip" to an alternative state, with high concentrations of phytoplankton and a loss of extensive charophyte beds, requires that measures are effected that will prevent or reduce nutrient loads to the lake. This will necessitate a reversal of the current trend of increasing catchment pressures from intensification of agriculture and increased rural housing.

326: K. A. Hobson, J. E. Thompson, M. R. Evans and S. Boyd,. 2005. Tracing nutrient allocation to reproduction in Barrow's goldeneye. *Journal of Wildlife Management* 3(69): 1221-1228.

Abstract: Naturally occurring stable isotopes in foodwebs can be used to determine the relative contributions of endogenous and exogenous nutrients to avian eggs in cases where birds move between isotopically distinct biomes or habitats to breed. We measured $\delta(13)\text{C}$ and $\delta(15)\text{N}$ values in somatic muscle tissues and eggs of Barrow's goldeneye (*Bucephala islandica*) together with those isotope values in amphipods from wetlands used by birds breeding on the Chilcotin Plateau in central British Columbia, Canada. Females that had recently arrived on the breeding grounds had muscle tissue isotope values similar to those found in coastal wintering birds and were considerably more enriched in C-13 than were samples from local foodwebs. However, $\delta(15)\text{N}$ values of amphipods were highly variable among wetlands, resulting in a nondistinct exogenous $\delta(15)\text{N}$ endpoint: for our dual-isotope mixing model. Therefore, we only used the model based on $\delta(13)\text{C}$ values to estimate nutrient sources to eggs. In 2000, first-laid eggs were more enriched in both isotopes than fourth- or eighth-laid eggs. Considerable endogenous protein input to egg yolk and albumen was detected for the first laid egg (yolk: range = 0-92.7%, median = 23.7%; albumen: range = 0-78.6%, median = 28.7%) with less endogenous contribution of somatic lipids (first egg: range = 0-100%, median = 4.9%). Using archived tissue samples of muscle and developing ovarian follicles from birds collected in 1993-1994, we found no $\delta(13)\text{C}$ isotopic evidence for endogenous protein contribution to egg yolk. Our results demonstrate the utility of the stable isotope approach in cases where isotopic endpoints are well established. Barrow's goldeneye showed a mixed strategy of endogenous vs. exogenous nutrient allocation to reproduction that varied by individual females, laying order, and year. We encourage managers to use this approach to quantify nutrient allocations from various biomes to reproduction in waterfowl to better unders

327: Y. Hodoki,. 2005. Effects of solar ultraviolet radiation on the periphyton community in lotic systems: comparison of attached algae and bacteria during their development. *Hydrobiologia* 1-3(534): 193-204.

Abstract: The effects of solar ultraviolet radiation (UVR) on the development of a periphyton community were studied in an outdoor artificial stream apparatus. Algal biomass, species composition, and bacterial cell density were measured under full sunlight and non-UVR (photosynthetically active radiation [PAR]-only) conditions. Attachment of algae was detected on days 6-9. Although the chlorophyll-a concentration under non-UVR conditions was 2-4 times that under full sunlight (PAR + UVR) throughout the experiment, neither net algal growth rate nor species composition differed significantly between the two light conditions. The relative carotenoid pigment contents of attached algae in the PAR + UVR condition were 1.1-1.3 times those in the non-UVR condition. Rates of increase of bacterial cell densities under the PAR + UVR condition were depressed by solar UVR for the first few days, although there were no apparent differences in the rates of increase between the light conditions later in the experiment. The small effect of UVR on the development of this periphyton community may be attributable to low UV flux at this study site and to the experimental conditions under which the algae were kept: a high physiological state with high nutrient conditions. Attached bacteria and algae that colonize substrata first are likely to be sensitive to solar UVR, and the negative effects of UVR are mitigated by the development of a periphyton community.

328: N. Holmqvist, P. Stenroth, O. Berglund, P. Nystrom, W. Graneli and P. Larsson,. 2005. Lake trophic status and bioaccumulation of polychlorinated biphenyls in benthic organisms: a comparison between littoral and profundal invertebrates. Canadian Journal of Fisheries and Aquatic Sciences 6(62): 1201-1209.

Abstract: We investigated the influence of lake trophic status on accumulation of polychlorinated biphenyls (PCBs) in littoral and profundal invertebrates from 19 lakes in southern Sweden. The PCB concentration in profundal chironomids (*Chironomus* sp.) was negatively correlated with lake trophy but the concentration in littoral crayfish (*Pacifastacus leniusculus*) was unrelated to shifting nutrient regimes. PCB concentrations in chironomids were negatively correlated, while crayfish did not correlate with lake total phosphorus. Two findings indicate that different processes determine bioaccumulation in littoral and profundal invertebrates: (i) a lack of correlation between PCB concentrations in crayfish and chironomids within lakes and (ii) some differences in congener distribution in the two species. We suggest a possible explanation in that chironomids are directly exposed to settling material from the pelagic zone, while crayfish are omnivorous and feed mainly in the littoral zone. A intensive investigation on one pond population could not reveal any individual factors, such as lipid content, size, or sex, influencing bioaccumulation of PCBs in crayfish.

329: E. Hood, M. W. Williams and D. M. McKnight,. 2005. Sources of dissolved organic matter (DOM) in a Rocky Mountain stream using chemical fractionation and stable isotopes. *Biogeochemistry* 2(74): 231-255.

Abstract: Dissolved organic matter (DOM) is an important vehicle for the movement of nutrients from terrestrial to aquatic systems. To investigate how the source and composition of aquatic DOM change in both space and time, we used chemical, spectroscopic, and isotopic analyses to characterize DOM in a headwater catchment in the Colorado Front Range. Streamwater samples for DOM analyses were collected from 2 sites, a lightly vegetated alpine site and a forested, subalpine site, in the North Boulder Creek catchment during the snowmelt runoff season (May-September). Concentrations of dissolved organic carbon (DOC) peaked on the ascending limb of the snowmelt hydrograph at both the alpine (2.6 mg C l⁻¹) and the subalpine sites (7.0 mg C l⁻¹) and decreased sharply on the descending, limb of the hydrograph. Fractionation of DOM into operationally defined humic and non-humic components showed that the fulvic acid content of DOC decreased through the season at both sites and that spectroscopic (fluorescence and ultraviolet) properties of the humic DOM fraction shifted in a manner consistent with an increase in the proportion of humic DOM derived from instream sources as compared to terrestrial catchment sources. Humic and non-humic fractions of DOM isolated near peak flow in June and during low flows in September showed a seasonal enrichment in N-15 and C-13 as well as a seasonal decrease in the ratio of aromatic to aliphatic carbon, both of which were correlated with a decrease in the C:N ratio of the DOM fractions. These results suggest that seasonal shifts in the isotopic and chemical characteristics of DOM are a result of changes in catchment sources of DOM. In particular, it appears that DOM production in alpine lakes is an important contributor to the streamwater DOM load during late season low flows, especially in the alpine reach of the catchment. Our results further suggest that stable isotopes of C and N are useful tools, particularly when combined with ancillary data

330: J. M. Hood, M. J. Vanni and A. S. Flecker,. 2005. Nutrient recycling by two phosphorus-rich grazing catfish: the potential for phosphorus-limitation of fish growth. *Oecologia* 2(146): 247-257.

Abstract: In ecosystems where excretion by fish is a major flux of nutrients, the nitrogen (N) to phosphorus (P) ratio released by fish can be important in shaping patterns of algal biomass.. community composition, primary production.. and nutrient limitation. Demand for N and P as well as energy influences N/P excretion ratios and has broad implications in ecosystems where nutrient recycling by fishes is substantial. Bioenergetics and stoichiometric models predict that natural fish populations are generally energy-limited and therefore N/P recycling by fishes is relatively invariant. Yet, the potential for P limitation of growth has not been examined in herbivorous fishes, which are common in many aquatic habitats. We examined N/P excretion ratios and P demand in two P-rich herbivorous catfishes of the family Loricariidae, *Ancistrus triradiatus* (hereafter *Ancistrus*) and *Chaetostonia milesi* (hereafter *Chaetostoma*). Both fishes are common grazers in the Andean piedmont region of Venezuela where we conducted this study. Mass balance (MB) models indicate that these fishes have a high P demand. In fact, our *Ancistrus* P MB model predicted negative P excretion rates, indicating that *Ancistrus* did not consume enough P to meet its P demand for growth. Direct measurement of excretion rates showed positive, but very low P excretion rates and high N/P excretion ratios for both taxa. To obtain measured P excretion rates of *Ancistrus* from the MB model, gross growth efficiency must be reduced by 90%. Our results suggest that growth rates of both of these herbivorous and P-rich fish are likely P-limited. If P limitation of growth is common among herbivorous fish populations, herbivorous fishes recycle likely at high N/ P ratios and act to diminish the quality of their food.

331: A. M. Hook and J. A. Yeakley,. 2005. Stormflow dynamics of dissolved organic carbon and total dissolved nitrogen in a small urban watershed. *Biogeochemistry* 3(75): 409-431.

Abstract: We examined patterns of dissolved organic carbon (DOC) and total dissolved nitrogen (TDN) loading to a small urban stream during baseflow and stormflow. We hypothesized that lower DOC and TDN contributions from impervious surfaces would dilute natural hydrologic flowpath (i.e., riparian) contributions during storm events in an urban watershed, resulting in lower concentrations of DOC and TDN during storms. We tested these hypotheses in a small urban watershed in Portland, Oregon, over a 3-month period during the spring of 2003. We compared baseflow and stormflow chemistry using Mann - Whitney tests (significant at $p < 0.05$). We also applied a mass balance to the stream to compare the relative significance of impervious surface contributions versus riparian contributions of DOC and TDN. Results showed a significant increase in stream DOC concentrations during stormflows (median baseflow DOC = 2.00 mg l⁻¹ vs. median stormflow DOC = 3.46 mg l⁻¹). TDN streamwater concentrations, however, significantly decreased with stormflow (median baseflow TDN = 0.75 mg l⁻¹ vs. median stormflow TDN = 0.56 mg l⁻¹). During storms, remnant riparian areas contributed 70 - 74% of DOC export and 38 - 35% of TDN export to the stream. The observed pattern of increased DOC concentrations during stormflows in this urban watershed was similar to patterns found in previous studies of forested watersheds. Results for TDN indicated that there were relatively high baseflow nitrogen concentrations in the lower watershed that may have partially masked the remnant riparian signal during stormflows. Remnant riparian areas were a major source of DOC and TDN to the stream during storms. These results suggest the importance of preserving near-stream riparian areas in cities to maintain ambient carbon and nitrogen source contributions to urban streams.

332: K. Hornak, M. Masin, J. Jezbera, Y. Bettarel, J. Nedoma, T. Sime-Ngando and K. Simek,. 2005. Effects of decreased resource availability, protozoan grazing and viral impact on a structure of bacterioplankton assemblage in a canyon-shaped reservoir. *Fems Microbiology Ecology* 3(52): 315-327.

Abstract: We conducted a transplant experiment to elucidate the effects of different levels of grazing pressure, nutrient availability, especially phosphorus, and the impact of viruses on the changes in the structure of bacterioplankton assemblage in a meso-eutrophic reservoir. A sample taken from the nutrient-rich inflow part of the reservoir was size-fractionated and incubated in dialysis bags in both inflow and dam area. The structure of bacteria] assemblage was examined by fluorescence in situ hybridization using oligonucleotide probes with different levels of specificity. In terms of the relative proportions of different bacterial groups, we found very few significant changes in the bacterioplankton composition after transplanting the treatments to the nutrient-poor dam area. However, we observed marked shifts in morphology and biomass towards the development of filaments, flocs and "vibrio-like" morphotypes of selected probe-defined groups of bacteria induced by increased grazing pressure. Despite the very high abundances of viruses in all the treatments, their effects on bacterioplankton were rather negligible. (c) 2004 Federation of European Microbiological Societies. Published by Elsevier B.V. All rights reserved.

333: J. N. Houser, P. J. Mulholland and K. O. Maloney,. 2005. Catchment disturbance and stream metabolism: patterns in ecosystem respiration and gross primary production along a gradient of upland soil and vegetation disturbance. *Journal of the North American Benthological Society* 3(24): 538-552.

Abstract: Catchment characteristics determine the inputs of sediments and nutrients to streams. As a result, natural or anthropogenic disturbance of upland soil and vegetation can affect instream processes. The Fort Benning Military Installation (near Columbus, Georgia) exhibits a wide range of upland disturbance levels because of spatial variability in the intensity of military training. This gradient of disturbance was used to investigate the effect of upland soil and vegetation disturbance on rates of stream metabolism (ecosystem respiration rate [ER] and gross primary production rate [GPP]). Stream metabolism was measured using an open-system, single-station approach. All streams were net heterotrophic during all seasons. ER was highest in winter and spring and lowest in summer and autumn. ER was negatively correlated with catchment disturbance level in winter, spring, and summer, but not in autumn. ER was positively correlated with abundance of coarse woody debris, but not significantly related to % benthic organic matter. GPP was low in all streams and generally not significantly correlated with disturbance level. Our results suggest that the generally intact riparian zones of these streams were not sufficient to protect them from the effect of upland disturbance, and they emphasize the role of the entire catchment in determining stream structure and function.

334: C. J. Howell, D. M. Crohn and M. Omary,. 2005. Simulating nutrient cycling and removal through treatment wetlands in arid/semiarid environments. Ecological Engineering 1(25): 25-39.

Abstract: The Constructed Wetlands Algorithm for Nutrient Transformations (CWANT) computer program was designed to mathematically simulate the fate, transformation, and transport of nutrients as they move through ammonium-rich treated secondary wastewater in constructed surface-flow wetland systems. CWANT employs empirically derived mathematical functions to represent a wetland water budget, water temperature, emergent vegetation, and algae dynamics, reactions involving important elements (N, P, CBOD5, and O), and ultimately the water quality of wetland outflow over time. Sensitivity analysis was used to calibrate model parameters. The model was verified with weekly data from the Hemet/San Jacinto Multipurpose Demonstration Wetland, owned and operated by the Eastern Municipal Water District (EMWD), in Riverside County, California, USA. Graphical illustrations showed that, on average, predicted values corresponded to seasonal trends exhibited by the measured data. Overall, the model was determined to slightly overpredict outflow concentrations for most nutrients (mean percent error (MPE) = 1.22% for organic N, 2.1% for NO₃⁻, 8.69% for NH₄⁺, 9-96% for CBOD, and 20.2% for total P). In its current state, CWANT serves as a screening tool to increase understanding of the nutrient transforming mechanisms dominating constructed treatment wetlands. (C) 2005 Elsevier B.V. All rights reserved.

335: T. R. Hrabik, B. K. Greenfield, D. B. Lewis, A. I. Pollard, K. A. Wilson and T. K. Kratz,. 2005. Landscape-scale variation in taxonomic diversity in four groups of aquatic organisms: The influence of physical, chemical, and biological properties. *Ecosystems* 3(8): 301-317.

Abstract: We evaluated several factors influencing the taxonomic richness of macrophytes, benthic invertebrates, snails, and fish in a series of northern Wisconsin lakes. We chose the study lakes to decouple the potential effects of ionic strength of lake water and stream connection, two factors that are usually highly correlated and therefore have been confounded in previous studies. In addition, our study lakes covered a wide range in a variety of characteristics, including residential development, abundance of exotic species, nutrient concentrations, predator abundance, and lake size. Species richness within each of the four taxonomic groups was significantly positively related to ionic strength (as measured by specific conductance); we also found secondary associations with other variables, depending on the specific group of organisms. The relationship between richness and lake area was dependent on the specific conductance of the lake and the vagility of the organisms; less vagile groups of organisms showed stronger and steeper species-area relationships in low-conductivity lakes. Further, after variance owing to specific conductance was removed, the presence of stream connections was positively related to species richness for fish, snails, and macrophytes as well as familial richness in benthic invertebrates. Our results indicate that lakes with relatively more groundwater input have lower extinction rates for all four groups of taxa and that lakes with stream inlets and outlets have enhanced immigration rates for fish, snails, benthic invertebrate families, and macrophytes. These findings link processes of immigration and extinction of four groups of organisms of varying vagility to landscape-level hydrologic characteristics related to the glacial history of the region.

336: R. Hrivnak,. 2005. Effect of ecological factors on the zonation of wetland vegetation. Acta Societatis Botanicorum Poloniae 1(74): 73-81.

Abstract: The influence of some ecological factors to aquatic and marsh vegetation was studied during 1998-2000. Three basic vegetation units (*Caricetum buekii*, *Typhetum latifoliae* and *Ceratophylletum submersi*) and three transitional communities were defined in the belt transect, which was established along the moisture gradient. The content of available soil nutrients in individual vegetation types differed only in case of the *Ceratophyllum submersum* community, where a higher magnesium and nitrogen content accumulated due to specific environmental conditions. Water and marsh vegetation is usually characterised by a pronounced spatial and temporal dynamics. In the studied area, its zonation was dependent from the terrain morphology, and both depth and duration of floods. The fluctuation of ground and surface water table during a three-year period caused changes in the occurrence and cover of several species (e.g. *Carex buekii*, *Typha latifolia*, aquatic macrophytes). Pronounced changes in the cover of some species occurred even within a single vegetation season due to the long-term sink of water table below the ground surface.

337: C. M. Hu, J. R. Nelson, E. Johns, Z. Q. Chen, R. H. Weisberg and F. E. Muller-Karger,. 2005. Mississippi River water in the Florida Straits and in the Gulf Stream off Georgia in summer 2004. Geophysical Research Letters 14(32): .

Abstract: A coherent plume from the Mississippi River was detected in MODIS imagery in July - October 2004 extending from the eastern Gulf of Mexico into the Florida Straits (FS), and reaching the Gulf Stream (GS) off Georgia. The plume was sampled from ships in the FS and the GS. In early August, the plume was about 10 - 20 km wide in the western FS and about 50 km wide off Georgia. The FS ship survey (16 - 26 August) documented a 50 km, 10 - 20 m deep band with anomalies in surface salinity (- 0.8), temperature (0.5 degrees C), and surface chlorophyll concentration (2 x) relative to FS waters outside the plume. Nutrient concentrations were only slightly higher in the FS plume and there was no apparent increase in colored dissolved organic matter. We estimate that the plume carried some 23% (similar to 2778 m(3) s(-1)) of the Mississippi River discharge between July and September 2004 into the GS.

338: D. O. Huett, S. G. Morris, G. Smith and N. Hunt,. 2005. Nitrogen and phosphorus removal from plant nursery runoff in vegetated and unvegetated subsurface flow wetlands. Water Research 14(39): 3259-3272.

Abstract: Subsurface horizontal flow reed beds are being evaluated for Nitrogen (N) and Phosphorus (P) removal from plant nursery runoff water in New South Wales Australia. The need to include plants (*Phragmites australis*), the effect of reaction time (3.5 v 7.0d) and dissolved organic carbon (DOC) on N and P removal in batch fed gravel wetland tubs (55 L) was studied over 19 months. Simulated nursery runoff water containing N (10.1 mg L⁻¹, 74% as NO₃) and P (0.58 mg L⁻¹, 88% as PO₄) and DOC (2-5 mg L⁻¹) was used. The planted wetland tubs removed > 96% TN and TP over most of the 19-month study period while unplanted tubs were inefficient (< 16% N and < 45% P removal) and occasionally discharged nutrients. Doubling the reaction time to 7.0 days had no effect on nutrient removal. Plant nutrient uptake accounted for most of the N (76%) and P (86%) removed while roots and rhizomes were the dominant sink (N 58%, P 67%). The addition of methanol (C:N-3:1) to unplanted tubs achieved 81-98% N removal. In Carbon limited low nutrient nursery runoff, plants were essential to a gravel-based wetland to achieve efficient nutrient removal with effluent TN and TP concentrations of < 1 mg L⁻¹ and 0.05 mg L⁻¹, respectively with a 3.5 day reaction time. Crown Copyright (c) 2005 Published by Elsevier Ltd. All rights reserved.

339: K. J. Hughes, W. L. Magette and I. Kurz,. 2005. Identifying critical source areas for phosphorus loss in Ireland using field and catchment scale ranking schemes. Journal of Hydrology 1-4(304): 430-445.

Abstract: Phosphorus (P) in agricultural runoff is a major pollutant in many of Ireland's surface waters. Identification of areas that are at a high risk for P loss to surface waters is a critical component of river basin management. Two P ranking schemes (PRS's) were developed for Ireland, based on multi-criteria analysis approaches proposed in both the US and Europe, to predict the relative likelihood of P loss at both the field and catchment scales. The Field PRS was evaluated by comparing predicted rankings of potential P loss and transport against measured edge-of-field Dissolved Reactive P (DRP) loss for three fields with varying soil P levels. Qualitatively, results indicated that the Field PRS rankings corresponded to the magnitudes of measured P loss for the field sites, as well as to a reasoned evaluation of the relative likelihood that the fields would lose P that would subsequently make its way to surface water. The Catchment PRS was evaluated on a total of 31 catchments and sub-catchments by comparing predicted rankings of potential P loss and transport against measured in-stream median Molybdate Reactive P (MRP). Rankings of the relative likelihood of P loss and transport predicted by the Catchment PRS were positively correlated with median instream MRP ($r=0.51$, $P < 0.05$). Although the data available for these evaluations were limited, especially at field scale, and further research may identify the opportunity for modifications, both field and catchment scale P ranking schemes demonstrated a potential for identifying critical P source areas within catchments dominated by grass-based agricultural production systems, such as those in Ireland. (c) 2004 Elsevier B.V. All rights reserved.

340: C. C. Hung, K. W. Warnken and P. H. Santschi,. 2005. A seasonal survey of carbohydrates and uronic acids in the Trinity River, Texas. *Organic Geochemistry* 3(36): 463-474.

Abstract: Due to their potential significance as indicators of ecological health, the biogeochemical cycling of carbohydrates and uronic acids was investigated in the Trinity River Texas, during 2000 2001. Concentrations of dissolved organic carbon (DOC), total carbohydrates (TCHO), polysaccharides (PCHO), monosaccharides (MCHO), uronic acids (URA), as well as of oxygen, suspended particulate matter, nutrients and trace metals (Cu, Pb, Cd) were assessed at various stages of discharge. TCHO/DOC ratios, as well as nutrient and hydrogen ion concentrations, were inversely related to temperature, which suggests that biological processes in Lake Livingston, the largest freshwater reservoir along the Trinity River, are not only regulating nutrient concentrations but also the preferential degradation of carbohydrates over that of bulk DOC. However, uronic acids were selectively preserved during this temperature controlled biological process, as is evident from the positive correlation of URA/TCHO ratios and temperature. Thus, uronic acids are more refractory compounds than bulk TCHO. Significant correlations between TCHO and dissolved Cu, Pb and Cd suggest that their pathways and cycles are linked through common sources or removal processes. (C) 2004 Published by Elsevier Ltd.

341: R. J. Hunt and V. F. Matveev,. 2005. The effects of nutrients and zooplankton community structure on phytoplankton growth in a subtropical Australian reservoir: An enclosure study. *Limnologica* 1-2(35): 90-101.

Abstract: Patterns of zooplankton-phytoplankton interactions in Subtropical lakes of the Southern Hemisphere may deviate from those established for north-temperate lakes. We tested the responses of phytoplankton growth to different community structures of zooplankton and nutrient enrichment in a Subtropical Australian reservoir for the prediction of potential outcomes of lake biomanipulation. Two zooplankton communities were created in lake enclosures over 4 weeks: a rotifer-dominated community developed in the presence of planktivorous fish (*Hypseleotris* spp,) and a *Ceriodaphnia*-dominated community developed in the absence of fish. Biomass gradients of both communities were established in 20 L containers and several separate containers received no additions (controls) or were enriched with nitrogen and/or phosphorus. The growth rate of total phytoplankton significantly increased in response to nutrient enrichment, indicating nutrient limitation. Most phytoplankton taxa were not markedly affected by grazing or either zooplankton community. However, both communities had significant stimulatory effects on the growth of inedible chlorophytes. The ability of zooplankton grazing to negatively affect phytoplankton growth during the summer was counteracted regardless of zooplankton community structure, possibly by nutrients regenerated by zooplankton. We hypothesise that in the subtropical system studied, changes in food web nutrient recycling may be more important for the outcome of biomanipulation than grazing impacts. (C) 2005 Elsevier GmbH. All rights reserved.

342: S. L. Hunt, A. M. Gordon and D. M. Morris,. 2005. Aspects of ecological development in managed stands of jack pine and black spruce in northern Ontario: Understory vegetation and nutrient relations. *Forestry Chronicle* 1(81): 61-72.

Abstract: This study investigated relationships between understory vegetation and nutrient pools in managed stands of jack pine (*Pinus banksiana* Lamb.) and black spruce (*Picea mariana* [Mill.] BSP) in the Lake Nipigon region of northern Ontario. The species composition, biomass, and nutrient pool sizes in the understory vegetation, as well as biomass and nutrient pools in trees and soils, were determined in 16 managed stands ranging in age from 10 to 53 years since establishment and one mature, natural stand. Patterns of above-ground biomass accumulation in understory vegetation varied with overstory tree species and general site type (dry, sandy soils, or mesic, finer-textured soils). Understory vegetation contributed little (0.3 to 2.6%) to total above-ground organic matter (live biomass plus forest floor) but accounted for higher proportions of total above-ground nutrient pools (e.g., 0.7 to 3.4% of N; 3.2 to 11.7% of K) and net primary productivity (1.2 to 21.2%). The species composition of the understory vegetation was strongly related to stand basal area as well as to concentrations of nutrients (N, P, K, Ca, Mg) in the forest floor and mineral soil. The greatest amount of change in vegetation community composition occurred from the pre-to post-canopy closure stages of stand development; fewer differences were observed among stands of a given species and site type 35 to 50 years after establishment. The effects of silvicultural practices were detected in certain stands 35 years after establishment; for example the most severely treated (bladed and thinned) jack pine stand differed from other stands of similar age and soils with its *Cladina/Vaccinium*-dominated understory, and large amounts of biomass in the moss/lichen stratum. The understory vegetation communities in other managed jack pine stands, by 35 to 50 years, were similar to that of the mature, natural stand, indicating resilience to silvicultural disturbances. Silviculture may have lasting effects on understory

343: A. D. Huryn, K. A. Slavik, R. L. Lowe, S. M. Parker, D. S. Anderson and B. J. Peterson,. 2005. Landscape heterogeneity and the biodiversity of Arctic stream communities: a habitat template analysis. Canadian Journal of Fisheries and Aquatic Sciences 8(62): 1905-1919.

Abstract: We predicted that substratum freezing and instability are major determinants of the variability of stream community structure in Arctic Alaska. Their effects were conceptualized as a two-dimensional habitat template that was assessed using a natural experiment based on five stream types (mountain-spring, tundra-spring, tundra, mountain, glacier). Detrended correspondence analysis (DCA) indicated distinct macroinvertebrate assemblages for each stream type. The contribution of functional feeding groups to assemblage biomass varied systematically among stream types, indicating that structure and function are linked. Assemblage position within a DCA biplot was used to assess factors controlling its structure. Springs separated from other stream types along a gradient of nutrient concentration and freezing probability. Glacier and mountain streams separated from springs and tundra streams along a gradient of substratum instability and freezing probability. Owing to differences in sources of discharge to streams, the effects of nutrients and substratum stability could not be separated from freezing. Although many factors likely contribute to the variability of Arctic stream communities, the major determinants may be conceptualized as a template structured by gradients in (i) nutrient supply and substratum freezing and (ii) substratum instability and substratum freezing. This template provides a basis for predicting the response of Arctic stream communities to climate change.

344: B. J. Huser and E. Rydin,. 2005. Phosphorus inactivation by aluminum in Lakes G(a)over-circlerdsjon and Harsvatten sediment during the industrial acidification period in Sweden. Canadian Journal of Fisheries and Aquatic Sciences 8(62): 1702-1709.

Abstract: Acidification of lakes exposed to acid deposition is generally accompanied by a severe decrease in production (oligotrophication). In this study, we examined sediment from Lakes Gardsjon and Harsvatten, Sweden, to determine whether sediment phosphorus (P) retention increased during the years corresponding to lake acidification. Sediment from both lakes had increases in aluminum (Al) in the upper 10 cm, and dating of Lake Gardsjon sediment revealed that the Al increase occurred from 1950 to 2001 in this lake. The increase in Al input caused an increase in Al-bound P (Al-P) formation and overall sediment total phosphorus retention during the same period. Lake Gardsjon received an additional 12.9 g center dot m(-2) of Al, above preacidification background levels, that bound 1.1 g center dot m(-2) of P and removed it from the in-lake P cycle from 1950 to 2001. A substantial portion (up to 76%) of the total external P load eventually was converted to Al-P and buried in the sediment over this period. The increase in sediment P burial due to increased formation of Al-P in systems similar to Lake Gardsjon may have detrimental effects on nutrient cycling, and as a result, on productivity within the lake, leading to acido-oligotrophication.

345: S. Hutchinson,. 2005. The recent sedimentation history of Aqualate Mere (central England): assessing the potential for lake restoration. *Journal of Paleolimnology* 2(33): 205-228.

Abstract: As part of English Nature's Lakes Flagship Project to address adverse environmental impacts on selected, important lakes, a proposal has been made to dredge Aqualate Mere. The site has experienced rapid, 'recent' sedimentation thought to be derived from a nearby canal. The aim of this study has been to determine the recent sedimentation history of the site in order to assess the possibility of the disposal to land of its sediments and the efficacy of this form of lake restoration. A predominantly clayey silt layer was found across the lake beneath which darker, organic-rich sediments were noted. This transition may represent the input of canal-derived sediments, although it may reflect other environmental changes at this time. The radiometric dating technique employed was unable to date this sediment boundary. A further change in the characteristics of the upper part of the clayey silt layer may represent an additional influence of the canal. Heavy metal levels were modest, whereas nutrient levels were relatively high and some pesticides were detected. Topsoil erosion supplying nutrients and other compounds associated with agriculture have been an important source of the lower layers of the clayey silt sediments in particular. The highest levels of most pollutants were found in the finer sediments in the uppermost (post-1950s) part of the sediment profile. These sediments appear to reflect a change in the characteristics of the sediments of the canal, which was associated with a change in the nature of its water supply. The key geochemical properties of the sediments should not preclude the land-based disposal of dredged materials under current UK regulations for waste management. Accurate estimation of sediment quantities was limited, as the interface between the 'recent' and underlying sediments was not positively identified at all sample points.

346: D. W. Hwang, G. B. Kim, Y. W. Lee and H. S. Yang,. 2005. Estimating submarine inputs of groundwater and nutrients to a coastal bay using radium isotopes. Marine Chemistry 1-2(96): 61-71.

Abstract: We have measured the concentrations of nutrients and radium isotopes (Ra-223, Ra-224, and Ra-226) in surface seawater and coastal groundwater in Yeosu Bay (in the southern sea of Korea) to estimate submarine groundwater discharge (SGD) and associated nutrient fluxes. In general, the radium and nutrient concentrations in brackish groundwater were an order of magnitude higher than those in ambient bay water or stream water. We determined the water residence time and SGD in the bay using the simultaneous equations for Ra-226, Ra-223, and Si mass balances. The mean residence time of bay water was about 7 days in Yeosu Bay. The inputs of submarine groundwater to the surface layer (0-3 m) were estimated to be approximately $2.6 \times 10^7 \text{ m}^3 \text{ day}^{-1}$. The nutrient fluxes driven by SGD were approximately 26, 0.11, and 26 mmol $\text{m}^{-2} \text{ day}^{-1}$ for dissolved inorganic nitrogen (DIN), phosphorus (DIP), and silicate (DSi), respectively. These fluxes of nutrients through SGD were much higher than those through stream flow and/or diffusion from bottom sediments in this bay. This excess nutrient input from coastal groundwater is the most likely cause of harmful algae blooms occurring in the open sea areas out from the bay. (c) 2004 Elsevier B.V. All rights reserved.

347: A. Iho,. 2005. Does scale matter? Cost-effectiveness of agricultural nutrient abatement when target level varies. Agricultural and Food Science 3(14): 277-292.

Abstract: Agriculture is facing stringent requirements for nutrient loss reductions. These reductions should be done cost-effectively. For instance, the European Water Framework Directive (WFD) emphasizes cost-effectiveness in reaching good water status in European river basins by 2015. River Basin Management Plans specify the eventual reduction targets, which will differ between the basins. These differences have implications on cost-effectiveness assessments: changing the level of total abatement changes the relative shares of measures in the cost-effective allocation. In this paper we develop a model which determines the cost-effective allocation of three alternative measures to reduce phosphorus loss from fields. The model allows for comparisons with cost and reductions of all possible allocations. We show that, even for homogenous regions, the cost-effective allocation of measures is strongly dependent on the target level, and that using the allocation from one reduction level as a guideline for other levels violates cost-effectiveness seriously. On the grounds of these results we give recommendations for cost-effectiveness assessments in the context of the WFD.

348: A. Iital, P. Stalnacke, J. Deelstra, E. Loigu and M. Pihlak,. 2005. Effects of large-scale changes in emissions on nutrient concentrations in Estonian rivers in the Lake Peipsi drainage basin. *Journal of Hydrology* 1-4(304): 261-273.

Abstract: The fall of the Iron Curtain resulted in dramatic changes in Eastern Europe, including substantial reductions in the use of fertilisers and livestock production, as well as a marked decrease in water consumption by both the general population and industries. This situation has created a unique opportunity to study the way that rivers have responded to these changes. Here, the impact of these reductions on concentrations of nutrients (N and P) at 22 sampling sites on Estonian rivers are examined. There were statistically significant downward trends (one-sided test at the 5% level) in total nitrogen (TN) concentrations at 20 of the 22 sites. These decreases in TN relate to: (i) substantial reductions in the use of organic and inorganic fertilisers, (ii) reduction of cultivated and ploughed areas and increased proportions of grassland and abandoned land and (iii) improvements in farm management practices. For total phosphorus (TP), significant downward trends were detected at only two sites, and there were also two upward trends. The TP trends can be mainly explained by changes in phosphorus discharges from municipal sewage treatment plants. Fifteen downward trends and one statistically significant upward trend were found for the TN:TP ratio. The general decline in this ratio has likely been conducive to blue-green algae blooms in the recipient, Lake Peipsi. (c) 2004 Elsevier B.V. All rights reserved.

349: S. E. Inwood, J. L. Tank and M. J. Bernot,. 2005. Patterns of denitrification associated with land use in 9 midwestern headwater streams. *Journal of the North American Benthological Society* 2(24): 227-245.

Abstract: The effects of land use on the relationships among denitrification, $\text{NO}_3\text{--N}$, dissolved organic C (DOC), and other environmental parameters were examined in 9 headwater streams (3 each in forested, agricultural, and urban-dominated subwatersheds) in the Kalamazoo River Watershed, Michigan. Sediment denitrification rates were determined using the chloramphenicol-amended acetylene inhibition technique. Agricultural streams had high concentrations of $\text{NO}_3\text{--N}$, DOC, soluble reactive P, and $\text{NH}_4\text{+--N}$, whereas forested streams had the lowest concentrations of these nutrients, and urban streams generally exhibited intermediate concentrations. Sediment denitrification rates were highest in agricultural streams and lowest in forested streams throughout the study period. Availability of $\text{NO}_3\text{--N}$ was the dominant environmental predictor of sediment denitrification rates, limiting denitrification when $\text{NO}_3\text{--N}$ concentrations were below a calculated threshold of 0.4 mg $\text{NO}_3\text{--N/L}$. Other potential controlling variables (e.g., DOC, dissolved O-2, water temperature, and sediment organic matter content) influenced denitrification rates secondarily. Despite higher denitrification rates in agricultural and urban streams compared to forested streams, sediment denitrification removed a smaller proportion of the stream $\text{NO}_3\text{--N}$ load in agricultural and urban streams relative to forested streams.

Abstract: Allelopathy of filamentous green algae (FGA) has been less studied than that of macrophytes. Little Budworth Pool, Cheshire, UK is a small, shallow, clear-water lake with high TP concentrations, very high NO₃-N concentrations, only moderate phytoplankton density, high FGA growth (mainly *Spirogyra* sp.) and no submerged plants. Experiments were carried out to test the possible allelopathic effects of *Spirogyra* on the phytoplankton of this lake and on a submerged plant *Elodea nuttallii*. Changes in phytoplankton growth, phytoplankton species dynamics and species composition were apparently not influenced by allelopathy of live or decaying *Spirogyra*. A shift from diatom (*Cyclotella* sp) - cryptomonad (*Chroomonas acuta* and *Cryptomonas erosa*) dominance to Chlorococcales (*Micractinium pusillum*, *Monoraphidium contortum* and *Scenedesmus opoliensis*) - Volvocales (*Chlorogonium elongatum* and *Pandorina morum*) dominance was recorded in both control and FGA treatments, suggesting an effect of nutrient enrichment. Nutrient concentrations and differences in competitiveness among phytoplankton species can also explain differences in their growth rates in *Spirogyra* filtrate. *Spirogyra* also did not influence apex number per plant, shoot length or growth rate of *E. nuttallii*. This FGA species probably cannot control phytoplankton or *E. nuttallii* growth in nutrient rich conditions through allelopathy.

351: H. M. Irfanullah and B. Moss,. 2005. A filamentous green algae-dominated temperate shallow lake: Variations on the theme of clearwater stable states?. Archiv Fur Hydrobiologie 1(163): 25-47.

Abstract: Shallow lakes can have two alternative stable states over wide range of nutrient concentrations: a macrophyte-dominated clear-water state and a phytoplankton-dominated turbid-water state. Little Budworth Pool, Cheshire, UK is a small (surface area 3 ha), shallow (max. depth < 1 m), clear-water lake with very high nitrate concentrations (annual mean 9.2 mg NO₃-N l⁻¹), relatively low phytoplankton growth (annual mean 13.5 µg chlorophyll-a l⁻¹) and high metaphytic filamentous green algal abundance (FGA, mainly *Spirogyra*), but without any submerged plant-beds. To understand the mechanism limiting phytoplankton biomass in summer, the lake was sampled every two weeks for two years (November 2001-October 2003) for water chemistry, phytoplankton, zooplankton, benthic macroinvertebrates, FGA and benthic diatoms. Phytoplankton growth was mainly dominated by small species like *Cyclotella* spp., *Chroomonas acuta* and *Cryptomonas* spp., whereas among the zooplankton Cladocera showed high abundance of both small and large species (*Bosmina longirostris* and *Daphnia longispina*) especially in summer and autumn. FGA attained highest biomass in the warmer months and showed negative correlations with nitrate-N and total nitrogen concentrations suggesting nutrient removal ability of these plants, but also possible increased denitrification in summer. While phytoplankton growth was negatively correlated with FGA biomass, cladoceran densities were positively related to the latter. A comparison among macrophyte-dominated lakes and FGA-dominated lakes showed similarities among them regarding water clarity, nutrient concentrations, phytoplankton growth and species composition, zooplankton assemblage and abundance, but not for abundance of benthic macroinvertebrates. We suggest that in a lake lacking submerged plants, abundance of FGA may act as a buffer against a forward switch to phytoplankton dominance, thus maintaining a clear-water state. The control of phytoplankton growth was primari

352: H. M. Irfanullah and B. Moss,. 2005. Limnology of an unusual eutrophic acid forest lake. Journal of Freshwater Ecology 3(20): 441-449.

Abstract: Delamere Lake is a small (<2 ha), shallow (mean depth 1.7 m), acidic (pH 4.5) lake amid coniferous forest in Cheshire, England. It showed high total nutrient concentrations (200 +/- SEM 14 $\mu\text{g L}^{-1}$ total phosphorus, 2.2 +/- 0.1 mg L^{-1} total nitrogen), very high phytoplankton biomass (290 +/- 30 $\mu\text{g L}^{-1}$ chlorophyll a), and monospecific green algal dominance (*Dictyosphaerium pulchellum*, maximum biovolume 33.8 $\text{mm}^3 \text{L}^{-1}$, > 99% of total phytoplankton biovolume). Zooplankton was dominated by rotifers (mainly *Keratella quadrata* and *Brachionus urceolaris*), with a few cladoceran species (*Alona guttata*, *Chydorus sphaericus*, and *Scapholeberis mucronata*). Abundant *Chaoborus flavicans* larvae were the top predators in this fishless lake.

353: N. V. Ivanikova, R. M. L. McKay and G. S. Bullerjahn,. 2005. Construction and characterization of a cyanobacterial bioreporter capable of assessing nitrate assimilatory capacity in freshwaters. *Limnology and Oceanography-Methods* (3): 86-93.

Abstract: The use of cyanobacterial whole-cell luminescent bioreporters has enhanced our ability to monitor nutrient availability in aquatic ecosystems. We have constructed a *Synechocystis* sp. strain PCC6803 bioluminescent reporter for the assessment of nitrate bioavailability. Specifically, a 380-base pair DNA fragment containing the NtcA/B-dependent nitrate/nitrite-activated nirA promoter (regulating expression of genes encoding nitrite reductase) was fused to the bacterial luciferase genes, luxAB, and introduced into *Synechocystis* by genetic transformation. Characterization of this strain, designated AND100, yielded dose-dependent increased bioluminescence coincident with increased nitrate added to the growth medium from 1 to 100 μM . Bioluminescence in response to nitrate addition was light dependent up to 50 $\mu\text{mol quanta m}^{-2} \text{s}^{-1}$. Assessing environmental samples collected from oligotrophic Lake Superior, we demonstrated that the onset of luminescence coincided with the drawdown of nitrate by simultaneously monitoring nitrate depletion from reaction vessels. Nitrate in the Lake Superior samples was consistently underestimated by the bioreporter. Only by following amendment of these samples with phosphate and iron was total nitrate accurately reflected by the cyanobacterial bioreporter. Thus, strain AND100 can be used to elucidate factors that constrain use of nitrate in freshwaters. This is pertinent to a system such as Lake Superior where the concentration of nitrate has increased 6-fold in the last century. Indeed, pilot experiments with the bioreporter suggest that nutrient co-limitation (P and Fe), as well as low light, may reduce the capacity for nitrate assimilation in field samples from Lake Superior.

354: T. Iyobe and A. Haraguchi, . 2005. Seasonal frost, peat, and outflowing stream-water chemistry in ombrogenous mires in Ochiishi, Eastern Hokkaido, Japan. *Wetlands* 2(25): 449-461.

Abstract: To clarify the nutrient dynamics in peat-covered watersheds during frost, soil, chemical properties of atmospheric deposition (bulk deposition and throughfall) on mires, peat pore water, and stream-water outflows from mires were investigated at three ombrogenous mires with *Picea glehnii* M. forests and *Sphagnum* spp. communities in Ochiishi, eastern Hokkaido, Japan. We investigated the depth of frozen ground as one of the factors determining chemical properties of outflowing stream water from mires. Na⁺ and Cl⁻ were the dominant ion species in bulk deposition and throughfall, implying the influence of sea salts on precipitation chemistry. The electrical conductivity (EC) and Na⁺, Mg²⁺, Ca²⁺, Cl⁻, and SO₄²⁻ concentrations in throughfall (snow) were 5-10 times higher than bulk deposition after a 25-day period without precipitation in February 2001. Throughfall was enriched with sea salts from dry deposition on the canopy, while snow was intercepted by the forest canopy. The first rain event during the seasonal soil freezing led to the enrichment of chemical components in the stream-water outflows from the mire. The frozen layer in the upper peat soil prevented the infiltration of snow melt into peat soil during the period of frost soil, and hence large amounts of salts (Na⁺ and Cl⁻) accumulated on the snow surface or within the snow cover. Rain water flowed over the frost soil layer and was enriched with chemicals from accumulated salts in the snow cover. This subsequently led to the high salt concentration in stream water just after the rain events during the season when soil was frozen.

355: O. Izagirre and A. Elozegi,. 2005. Environmental control of seasonal and inter-annual variations of periphytic biomass in a North Iberian stream. *Annales De Limnologie-International Journal of Limnology* 1(41): 35-46.

Abstract: During 2001 - 2002, we studied periphytic biomass at 5 sites along the Aguera stream (Northern Iberian Peninsula), and compared the results to those from two previous researches (1990 - 1991 and 1992 - 1993). Sampling sites showed large differences in cover, conductivity and nutrient contents, as well as some inter-annual differences, resulting from changes in discharge and in human activities. Most environmental variables showed low seasonality, main variations being produced by floods. Solar radiation changed little during 2001 - 2002, because of the coincidence of a sunny winter followed by a cloudy summer, and seasonal differences in riparian cover resulted in more sunlight reaching the streambed of closed sites during winter, and small differences at the open ones. The growth and abscission of riparian leaves results in a strong light regime at the closed sites, with more sunlight during winter, but this pattern changes from year to year, depending on the weather. Spatial differences and highest values of periphytic biomass were much lower than those measured in 1990 - 91, because of contrasting weather patterns. Variables controlling periphytic biomass in the Aguera change from reach to reach. At open sites flow is the main temporal controller, whereas at closed sites the effects of light availability prevail, thus giving more similar seasonal patterns from year to year. Nutrients seem to play a minor role in temporal variations.

356: S. Jacquet, J. F. Briand, C. Leboulanger, C. Avois-Jacquet, L. Oberhaus, B. Tassin, B. Vincon-Leite, G. Paolini, J. C. Druart, O. Anneville and J. F. Humbert,. 2005. The proliferation of the toxic cyanobacterium *Planktothrix rubescens* following restoration of the largest natural French lake (Lac du Bourget). *Harmful Algae* 4(4): 651-672.

Abstract: Lac du Bourget, in the Alps, is the largest natural French lake. Following major restoration programmes during the 1970s and early 1980s, involving massive efforts to reduce nutrient loads and pollution in the lake, the water quality has improved over the past two decades. This can be inferred from the increase in the nitrate: phosphate ratio, the intensification of the "clear-water phase" (i.e. the increase in the water column transparency in spring), and the reduction in the total phosphorus and chlorophyll a concentrations. However, blooms of the filamentous, phycoerythrin-rich, non-nitrogen fixing and hepatotoxic cyanobacterium *Planktothrix rubescens* have occurred since 1996 and have been maintained subsequently, at least during summer and autumn periods. Nutrients (especially phosphorus) are usually thought to be one of the most important factors responsible for cyanobacterial blooms, and so the question is asked if this bloom is a paradoxical outcome of the restoration programs? Using a large set of data taken from surveys of Lac du Bourget, from the literature, and from recent laboratory experiments, and also using field data for the neighboring Lake Geneva, we propose a realistic scenario to account for the population dynamics of the cyanobacterium and the occurrence and maintenance of the bloom in Lac du Bourget. The characteristics of the lake (high water column stability, deepening of the nutrient-depleted layer during the last decade, a long water residence time), local conditions (the nutrient load and charge) and global changes (global warming) all had to be taken into account to explain this bloom. We suggest that the success of *P. rubescens* in Lac du Bourget is probably due to increased transparency and a longer stratified period following (1) the restriction of other phytoplankton species following reduced phosphorus, which has allowed *P. rubescens* to make use of organic phosphorus to improve its competitiveness; (2) warmer than average winter/spring

357: C. James, J. Fisher, V. Russell, S. Collings and B. Moss,. 2005. Nitrate availability and hydrophyte species richness in shallow lakes. *Freshwater Biology* 6(50): 1049-1063.

Abstract: 1. Submerged plant richness is a key element in determining the ecological quality of freshwater systems; it has often been reduced or completely lost. 2. The submerged and floating-leaved macrophyte communities of 60 shallow lakes in Poland and the U.K. have been surveyed and species richness related to environmental factors by general linearised models. 3. Nitrogen, and more specifically winter nitrate, concentrations were most important in explaining species richness with which they were inversely correlated. Phosphorus was subsidiary. Such an inverse relationship is consistent with findings in terrestrial communities. Polish lakes, with less intensively farmed catchments, had greater richness than the U.K. lakes. 4. The richest U.K. communities were associated with winter nitrate-N concentrations of up to about 1-2 mg L⁻¹ and may correspond with 'good' ecological quality under the terms of the European Water Framework Directive. Current concentrations in European lowlands are often much higher.

358: R. T. James and K. E. Havens,. 2005. Outcomes of extreme water levels on water quality of offshore and nearshore regions in a large shallow subtropical lake. *Archiv Fur Hydrobiologie* 2(163): 225-239.

Abstract: The effects of extreme water levels on water quality were examined for shallow nearshore vs. deeper offshore regions of Lake Okeechobee, a large subtropical lake in Florida USA. Water quality attributes were compared using mid-summer (June-August) observations for the highest and lowest five years of water levels since 1988. Differences in chlorophyll-a (Chl-a), chloride (Cl), color, nutrients, total nitrogen to total phosphorus ratio (TN: TP), Secchi Disk depth, transparency ratio (defined as the ratio of Secchi Disk depth to total depth), and total suspended solids (TSS) were examined to test hypotheses of interactions within and between the two regions under high and low water levels. The offshore region had consistently higher nutrient and TSS concentrations and lower Secchi Disk depth and transparency ratio. At high water levels within the offshore region, Cl, color, TSS, TP and TN were lower and Secchi Disk depth and color were higher. In contrast, at high water levels within the nearshore region, Chl-a, TP, TN, dissolved inorganic N and TSS concentrations were higher, and Cl, color, and transparency ratio were lower. Submerged aquatic vegetation, epiphyton, and benthic algae grow and compete for nutrients with phytoplankton in the nearshore region, but are absent from the deeper offshore region. The contrasting responses of the two lake regions indicate that water-level management actions taken to reduce eutrophication symptoms (e. g., algal blooms) in one region may not work in the other. In the case of Lake Okeechobee, the nearshore region supports most of the lake's ecological and societal values, so low water levels have a net benefit to ecosystem functions. In other lakes this may not be the case, highlighting the importance of understanding spatial variation of phytoplankton responses to water level in large shallow lakes.

359: W. F. James and J. W. Barko,. 2005. Biologically labile and refractory phosphorus loads from the agriculturally-managed Upper Eau Galle River Watershed, Wisconsin. *Lake and Reservoir Management* 2(21): 165-173.

Abstract: Fractionation techniques were used to quantify various biologically labile (i.e., directly available for biological uptake or subject to recycling pathways) and refractory (i.e., biologically unavailable and subject to burial) particulate and soluble phosphorus (P) forms along the longitudinal axis of the agriculturally-managed Upper Eau Galle River watershed in west-central Wisconsin. P loading increased as a function of increasing distance from the river's headwaters. However, areal P export rates were similar longitudinally, indicating a relatively homogeneous land-use mosaic throughout the watershed. P loads were composed of predominantly biologically labile constituents (i.e., 79%), with soluble P forms (i.e., soluble reactive and unreactive P) accounting for 49% and labile particulate P forms (i.e., loosely-bound PP, iron-bound PP, and labile organic/polyphosphate PP) accounting for 30% of the P load. Soluble P forms are either directly available for biological uptake or can be converted to available forms through enzymatic (i.e., alkaline phosphatase) reactions. Deposition and retention of loosely-bound and iron-bound PP in the receiving impoundment, Eau Galle Reservoir, can become an important source of internal P loading via eH and pH chemical reactions. Suspended solids loads also exhibited a high equilibrium P concentration (i.e., EPC > 0.10 mg L⁻¹) that was similar to flow-weighted soluble reactive P concentrations in the river, suggesting equilibrium control of soluble P as loads entered the reservoir. The high EPC and a linear adsorption coefficient approaching 1000 L kg⁽⁻¹⁾ indicated that binding sites of eroded soils in the runoff were enriched with P due to soil nutrient management. Our results indicated that transformations, transport, and fate of biologically labile PP, as well as soluble P, need to be considered in load reduction management to eutrophic receiving waters.

360: C. Jansen, H. M. Van de Steeg and H. De Kroon,. 2005. Investigating a trade-off in root morphological responses to a heterogeneous nutrient supply and to flooding. *Functional Ecology* 6(19): 952-960.

Abstract: 1. Flood-sensitive plant species are restricted to highly elevated sites in floodplains, but why flood-tolerant plants do not grow at higher elevations is much less clear. We test the hypothesis that a trade-off exists between flood-tolerance and selective root placement in nutrient-rich patches, a putatively important trait in the more competitive highly elevated sites. 2. *Achillea ptarmica*, *Achillea millefolium*, *Rumex palustris*, *Rumex thyrsoiflorus*, *Ranunculus repens*, *Ranunculus bulbosus*, *Festuca arundinacea* and *Festuca rubra* were subjected to a drained, waterlogged or partially submerged treatment to test their flood-tolerance. Within each species pair, the former are more tolerant to flooding while the latter are relatively flood-sensitive. In another experiment, plants were grown in soil with either a homogeneous or a heterogeneous nutrient distribution. All species placed their roots selectively in the enriched patch, but overall the flood-tolerant species were less selective than the flood-sensitive ones. The wetland species *R. palustris* was an exception, with very high root plasticity in response to both flooding and nutrient heterogeneity. 3. The negative correlation between selective root placement and flood-tolerance for seven out of eight species suggests that each of these traits has been selected for in its own environment. The exception of *R. palustris* indicates that there are no physiological or genetic trade-offs involved in explaining this correlation. Species from more frequently flooded habitats were less able to respond morphologically to nutrient-rich patches in the soil, and are therefore more likely to be outcompeted at the more highly elevated sites. *Rumex palustris* may use its ability to place roots selectively in nutrient-enriched patches to benefit from the nutrients released during drained periods in its dynamic habitat.

361: L. Jardillier, D. Boucher, S. Personnic, S. Jacquet, A. Thenot, D. Sargos, C. Amblard and D. Debroas,. 2005. Relative importance of nutrients and mortality factors on prokaryotic community composition in two lakes of different trophic status: Microcosm experiments. *Fems Microbiology Ecology* 3(53): 429-443.

Abstract: The effect of nutrient resources (N and P enrichment) and of different grazing communities on the prokaryotic community composition (PCC) was investigated in two freshwater ecosystems: Sep reservoir (oligomesotrophic) and lake Aydat (eutrophic). An experimental approach using microcosms was chosen, that allowed control of both predation levels, by size fractionation of predators, and resources, by nutrient amendments. Changes in PCC were monitored by fluorescent in situ hybridization (FISH) and terminal-restriction fragment length polymorphism (T-RFLP). The main mortality agents were (i) heterotrophic nanoflagellates and virus-like particles in Aydat and (ii) cladocerans in Sep. All the nutritional elements assayed (N-NO₃, P-PO₄ and N-NH₄) together with prokaryotic production (PP) always accounted for a significant part of the variations in PCC. Overall, prokaryotic diversity was mainly explained by resources in Sep, by a comparable contribution of resources and mortality factors in lake Aydat and, to a lesser extent, by the combined action of both. (c) 2005 Published by Elsevier B.V. on behalf of the Federation of European Microbiological Societies.

362: T. D. Jardine, M. A. Gray, S. M. McWilliam and R. A. Cunjak,. 2005. Stable isotope variability in tissues of temperate stream fishes. Transactions of the American Fisheries Society 5(134): 1103-1110.

Abstract: Previous measurements of stable isotope ratios in fishes have typically used white muscle, but potential applications exist for the use of other tissues. We tested three tissues (liver, fin, and gonad) in three freshwater species (juvenile Atlantic salmon *Salmo solar*, slimy sculpin *Cottus cognatus*, and brook trout *Salvelinus fontinalis*) to investigate potential ecological applications of stable isotopes in tissues other than muscle. Caudal fin tissue correlated closely with muscle tissue for Atlantic salmon and brook trout for $\delta(13)C$ ($r = 0.96$ and 0.94 , respectively) and $\delta(15)N$ ($r = 0.80$ and 0.74). Liver $\delta(13)C$ values were tightly linked to muscle values, and differences were due to lipid effects. Associations between liver and muscle $\delta(15)N$ suggested subtle changes in nutritional status. Isotope ratios of gonads differed markedly between male and female slimy sculpin; these differences were probably governed by differences in the allocation of specific nutrients. Knowledge of isotopic fractionation among tissues will aid fish biologists in nonlethal sampling of fishes for stable isotope analysis and in using stable isotopes to assess nutritional status and the allocation of nutrients to reproduction.

363: H. P. Jarvie, C. Neal, P. J. A. Withers, C. Wescott and R. A. Acornley,. 2005. Nutrient hydrochemistry for a groundwater-dominated patchment: The Hampshire Avon, UK. Science of the Total Environment 1-3(344): 143-158.

Abstract: The patterns in nitrate and phosphorus. sources, loads and concentrations in a groundwater-dominated lowland catchment, the Hampshire Avon, are examined and water quality signatures are used to identify a typology of headwater stream types. The major separations in water quality are linked to geology and groundwater chemistry as modified by the impacts of point source sewage effluents. The water quality of the major tributaries and the main stem of the River Avon are linked to the relative contributions of these source types, the impact of further direct effluent inputs to the main channel and in-stream-processing. The tributaries and main stem of the Avon act as net sinks for total reactive phosphorus (TRP). Low concentrations of TRP were found in the Chalk groundwater and the groundwater system acts as an efficient buffer, removing and retaining TRP from water draining from the catchment surface into the aquifer. Thermodynamic analysis of calcium carbonate (CaCO_3) solubility controls indicates that this natural self-cleansing mechanism' system within the groundwater may be directly. linked to CaCO_3 -P co-precipitation within the aquifer matrix. (c) 2005 Elsevier B.V All rights reserved.

364: H. W. Jeng and Y. J. Hong,. 2005. Assessment of a natural wetland for use in wastewater remediation. Environmental Monitoring and Assessment 1-3(111): 113-131.

Abstract: An environmental study was conducted to assess various aspects of the water and sediment quality of a natural wetland to determine its feasibility for advanced wastewater treatment in Louisiana. Nitrate (NO₃), nitrite (NO₂), ammonia (NH₄), total Kjeldahl nitrogen (TKN), total phosphorus, chloride, total organic carbon, pH, trace metals, fecal coliform, dissolved oxygen (DO), and biochemical oxygen demand (BOD) were monitored. Productivity of a dominant shrub, *Iva frutescens*, in the wetland was also assessed. Research results indicated that gradients of chloride and salinity concentrations showed a broad mixing of the discharged fresh water into the more saline natural brackish waters. This provided an ideal pattern for nutrient assimilation by the receiving marsh. NH₄ was reduced in the range of 50-100% when all combinations of sources and outflows were considered. For total phosphorus and TKN, reduction ranged from 0-95.1% and 11.2-89.7%, respectively. Some nutrient concentrations in the effluent outlet, NO₃ in particular, were lower than background concentrations found in the reference wetland. Sediment and water showed no significant deficiency or toxicity problems for the major nutrients and metals analyzed. The secondary effluent discharges had little demonstrable negative impact on the wetland during the study period from 1995 to 1996.

365: E. Jeppesen, J. P. Jensen, M. Sondergaard and T. L. Lauridsen,. 2005. Response of fish and plankton to nutrient loading reduction in eight shallow Danish lakes with special emphasis on seasonal dynamics. *Freshwater Biology* 10(50): 1616-1627.

Abstract: 1. For 13 years the response of the plankton and fish community to a decline in external phosphorus loading was studied in eight lakes with a mean depth < 5 m. We conducted chi-square analyses of sign of slope (positive or negative) of bimonthly averages of plankton variables for the eight lakes versus time. For fish, we compared results from two periods, i.e. 1989-1994 versus 1994-2001 as less data were available. 2. Fish community structure tended to respond to the lowered concentration of total phosphorus (TP), although not all changes were significant. While catch per unit effort (multi-mesh sized gill nets) of cyprinids (especially bream, *Abramis brama* and roach, *Rutilus rutilus*) was highest in the first 5-year period, the quantitative importance particularly of perch (*Perca fluviatilis*), pike (*Esox lucius*) and rudd (*Scardinius erythrophthalmus*), a littoral species, increased significantly after 1994. 3. No changes occurred in zooplankton biomass, except for an increase in November and December. Biomass of small cladocerans, however, declined during summer and autumn, and the proportion of *Daphnia* to cladoceran biomass also increased. Average body weight of *Daphnia* and that of all cladocerans increased. The proportion of calanoids among copepods decreased in summer and the average body weight of cyclopoids and calanoids decreased during summer and autumn/early winter. 4. Total biovolume of phytoplankton declined significantly in March to June and tended to decline in November and December as well, while no significant changes were observed during summer and autumn. Non-heterocystous cyanobacteria showed a decreasing trend during summer and autumn, while heterocystous cyanobacteria increased significantly in late summer. An increase in late summer was also evident for cryptophytes and chrysophytes, while diatoms tended to decline during most seasons. 5. We conclude that phytoplankton, and probably also fish, responded rapidly to reduced loading, whereas the effec

366: E. Jeppesen, M. Sondergaard, J. P. Jensen, K. E. Havens, O. Anneville, L. Carvalho, M. F. Coveney, R. Deneke, M. T. Dokulil, B. Foy, D. Gerdeaux, S. E. Hampton, S. Hilt, K. Kangur, J. Kohler, E. Lammens, T. L. Lauridsen, M. Manca, M. R. Miracle, B. Moss, P. Noges, G. Persson, G. Phillips, R. Portielje, C. L. Schelske, D. Straile, I. Tatrai, E. Willen and M. Winder,. 2005. Lake responses to reduced nutrient loading - an analysis of contemporary long-term data from 35 case studies. *Freshwater Biology* 10(50): 1747-1771.

Abstract: 1. This synthesis examines 35 long-term (5-35 years, mean: 16 years) lake re-oligotrophication studies. It covers lakes ranging from shallow (mean depth < 5 m and/or polymictic) to deep (mean depth up to 177 m), oligotrophic to hypertrophic (summer mean total phosphorus concentration from 7.5 to 3500 $\mu\text{g L}^{-1}$ before loading reduction), subtropical to temperate (latitude: 28-65 degrees), and lowland to upland (altitude: 0-481 m). Shallow north-temperate lakes were most abundant. 2. Reduction of external total phosphorus (TP) loading resulted in lower in-lake TP concentration, lower chlorophyll a (chl a) concentration and higher Secchi depth in most lakes. Internal loading delayed the recovery, but in most lakes a new equilibrium for TP was reached after 10-15 years, which was only marginally influenced by the hydraulic retention time of the lakes. With decreasing TP concentration, the concentration of soluble reactive phosphorus (SRP) also declined substantially. 3. Decreases (if any) in total nitrogen (TN) loading were lower than for TP in most lakes. As a result, the TN : TP ratio in lake water increased in 80% of the lakes. In lakes where the TN loading was reduced, the annual mean in-lake TN concentration responded rapidly. Concentrations largely followed predictions derived from an empirical model developed earlier for Danish lakes, which includes external TN loading, hydraulic retention time and mean depth as explanatory variables. 4. Phytoplankton clearly responded to reduced nutrient loading, mainly reflecting declining TP concentrations. Declines in phytoplankton biomass were accompanied by shifts in community structure. In deep lakes, chrysophytes and dinophytes assumed greater importance at the expense of cyanobacteria. Diatoms, cryptophytes and chrysophytes became more dominant in shallow lakes, while no significant change was seen for cyanobacteria. 5. The observed declines in phytoplankton biomass and chl a may have been further augmented by enhanced zo

367: X. C. Jin, Z. S. Chu, W. L. Yi and X. Z. Hu,. 2005. Influence of phosphorus on *Microcystis* growth and the changes of other environmental factors. *Journal of Environmental Sciences-China* 6(17): 937-941.

Abstract: The growth processes of *Microcystis aeruginosa* (FACHB-41) in simulated Taihu Lake water with different phosphorus concentrations were investigated using laboratory microcosms. The algal biomass increased with the increase of phosphorus concentration when it was lower than 0.445 mg/L, while the dissolved oxygen (DO) and pH increased, dissolved inorganic nitrogen (DIN) and light intensity underwater(I) decreased. Responding to the changes of the "environmental factors", the cellular carbohydrate and its ratio to cellular protein decreased generally as phosphorus increased. However, when phosphorus concentration was higher than 1.645 mg/L, the biomass, the "environmental factors", the cellular carbohydrate and its ratio to cellular protein did not change likewise. Since the environmental factors and the physiological and biochemical responses are important factors, the change of environmental factors and cell physiology and biochemistry induced by phosphorus may become the key factors that steer the growth and dominance of *Microcystis* under certain conditions. To sum up, phosphorus not only stimulate the growth of *Microcystis* directly by supplying nutrient element, but also has complex interactions with other "environmental factors" and play important roles in the growth processes of *Microcystis*.

368: X. C. Jin, S. R. Wang, Y. Pang, H. C. Zhao and X. N. Zhou,. 2005. The adsorption of phosphate on different trophic lake sediments. Colloids and Surfaces a-Physicochemical and Engineering Aspects 1-3(254): 241-248.

Abstract: The difference of phosphate adsorption on the different trophic lake sediments was investigated, including adsorption isotherms, adsorption kinetics, effect of temperature on adsorption, effect of pH on adsorption, thermodynamic parameters of adsorption and adsorption-desorption equilibrium concentration. Three isotherm models were used to characterize the adsorption behavior. The results indicate that the Linear model was the best to describe the adsorption behavior of phosphate on the heavily contaminated sediment with high phosphorus concentration, while for the slightly contaminated sediments the Freundlich model was the best. The adsorption kinetic data were fitted with three kinetic models, while the power function equation was the best kinetic equation, and there was no obvious difference between the different trophic sediments. The phosphate adsorption-desorption equilibrium concentration had a positive correlation with the nutrient level. The slightly contaminated sediment was the sink for phosphate. However, the heavily eutrophic sediment was the source for phosphate, and had the trend to release phosphate to the overlying water. The pH values were different for the various trophic sediments when the phosphate adsorption rates were in maximum and minimum, which may be attributed to the phosphate release. The adsorption process of phosphate on sediments was the endothermic reaction. The phosphate adsorption ability of the heavily contaminated sediments was stronger, and was less affected by temperature than that of the slightly contaminated sediments. (C) 2004 Published by Elsevier B.V.

369: L. S. Johansson, S. L. Amsinck, R. Bjerring and E. Jeppesen,. 2005. Mid- to late-Holocene land-use change and lake development at Dallund So, Denmark: trophic structure inferred from cladoceran subfossils. *Holocene* 8(15): 1143-1151.

Abstract: Analyses of cladoceran remains were conducted on an 11-m sediment core from Dallund So, Denmark, covering approximately the last 7000 years. The densities of planktivorous fish and macrophyte coverage were inferred from previously established transfer functions for Danish lakes using pelagic and plant-associated cladocerans, respectively, as palaeoenvironmental indicators. This is the first reconstruction of the abundance of fish and macrophytes covering millennial timescales. The cladoceran assemblages indicated an early period (4830 BC to c. 750 BC) with low species diversity, being dominated mainly by small-sized pelagic taxa. An intervening period (750 BC-AD 1100) followed, dominated by macrophyte-associated taxa and large-sized pelagic species. A marked increase in the abundance of remains occurred at c. AD 1200 coincident with the introduction of the mouldboard plough to Denmark and major forest clearance in the lake catchment. Further upcore (AD 1300-1700) mud-dwelling taxa increased in importance. Finally (AD 1700-1998), a shift occurred towards taxa characterizing eutrophic conditions. Redundancy analyses and cladoceran-inferred submerged macrophyte coverage and planktivorous fish density indicated overall low levels of nutrients and chlorophyll a, moderate macrophyte coverage (10-24%) and moderate to high fish predation prior to the Roman Iron Age (AD 0-400) followed by higher levels of nutrients and chlorophyll a and lower macrophyte coverage (< 10%) and moderate fish predation in recent times. The results suggest that the lake became increasingly eutrophic through time, not least after forest clearance and intensification of agriculture in Mediaeval times.

370: D. W. Johnson, J. F. Murphy, R. B. Susfalk, T. G. Caldwell, W. W. Miller, R. F. Walker and R. F. Powers,. 2005. The effects of wildfire, salvage logging, and post-fire N-fixation on the nutrient budgets of a Sierran forest. *Forest Ecology and Management* 1-3(220): 155-165.

Abstract: The effects of fire, post-fire salvage logging, and revegetation on nutrient budgets were estimated for a site in the eastern Sierra Nevada Mountains that burned in a wildfire in 1981. Approximately two decades after the fire, the shrub (former fire) ecosystem contained less C and more N than the adjacent forest ecosystem. Reconstruction of pre-fire nutrient budgets suggested that most C was exported in biomass during salvage logging and will not be recovered until forest vegetation occupies the site again. Salvage logging may have resulted in longer-term C sequestration in wood products than would have occurred had the logs been left in the field to decay, however. Reconstructed budgets suggested that most N was lost via volatilization during the fire rather than in post-fire salvage logging (assuming that foliage and O horizons were combusted). Comparisons of the pre-fire and present day N budgets also suggested that the lost N was rapidly replenished in O horizons and mineral soils, probably due to N-fixation by snowbush (*Ceanothus velutinus* Dougl.), the dominant shrub on the former fire site. There were no significant differences in ecosystem P, K, or S contents and no consistent, significant differences in soil extractable P or S between the shrub and forested plots. Exchangeable K⁺, Ca²⁺, and Mg²⁺ were consistently and significantly greater in shrub than in adjacent forested soils, however, and the differences were much larger than could be accounted for by estimated ash inputs. In the case of Ca, even the combustion of all aboveground organic matter could not account for more than a fraction of the difference in exchangeable pools. We speculate that the apparent large increase in soil and ecosystem Ca content resulted from either the release of Ca from non-exchangeable forms in the soil or the rapid uptake and recycling of Ca by post-fire vegetation.

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371: S. Johnson and E. Rejmankova,. 2005. Impacts of land use on nutrient distribution and vegetation composition of freshwater wetlands in Northern Belize. Wetlands 1(25): 89-100.

Abstract: The coastal plain of northern Belize consists of relatively undisturbed freshwater marshes that are strongly phosphorus-limited and characterized by monodominant stands or mixtures of emergent macrophytes. In order to assess the impact of agricultural activities on the nutrient dynamics and plant species composition in adjacent wetlands, we sampled along transects in 40 marshes - 20 located downslope from agricultural fields and 20 bordered by scrub or broadleaf forest. Soil, water, and plant tissue samples were collected for nutrient analyses, and plant species composition was recorded at points along transects during both the wet and dry seasons. Marshes downslope from agricultural activity had significantly greater percent cover of *Typha domingensis*, a competitive dominant in the system (20% vs. 6%) and significantly more soil phosphorus (128-144 $\mu\text{g cm}^{-3}$) than marshes bordered by forest (70-98 $\mu\text{g cm}^{-3}$). Plant tissue P content was positively correlated with soil P content but not with soil N for *Typha* ($r=0.55$) and *Eleocharis* spp. ($r=0.72$). Canonical Correspondence Analysis (CCA) identified soil P as the variable most strongly affecting *Typha* abundance. Abundance of species common to unimpacted marshes (*Eleocharis* spp., *Cladium jamaicense*) was negatively correlated with soil P. Further intensification of agriculture in this region may result in expansion of *T. domingensis*, as has occurred in the Florida Everglades.

372: I. Jones, G. George and C. Reynolds,. 2005. Quantifying effects of phytoplankton on the heat budgets of two large limnetic enclosures. *Freshwater Biology* 7(50): 1239-1247.

Abstract: 1. The aestival heat budgets of two large limnetic enclosures within a small lake in the English Lake District were studied. During summer, these enclosures had different nutrient supplies and consequently different phytoplankton populations. 2. As initial temperature profiles were similar and the incoming surface heat and momentum fluxes for the two enclosures were identical, subsequent changes in the heat budget were assumed to be induced by the biological differences between the enclosures. The proposed mechanism is an increased surface absorption of solar radiation leading to extra surface warming and a consequent excess loss of heat to the atmosphere through long-wave emittance and sensible and latent heat fluxes, conservatively estimated to be of the order of $10\text{-}30\text{ W m}^{-2}$. 3. Theoretical calculations show that potential effects on a heat budget could be considerably larger than those observed here. The inherent non-linearity of the heat fluxes implies that such effects will be more important in warmer lakes than in colder ones. 4. Thermocline depth and strength were also altered by the response to differences in phytoplankton. 5. Any changes in climate or in nutrient loading from the catchment which substantially affect abundance or timing of phytoplankton populations in a lake will consequently also change the thermal structure of the lake.

373: J. R. Jones and M. F. Knowlton,. 2005. Chlorophyll response to nutrients and non-algal seston in Missouri reservoirs and oxbow lakes. Lake and Reservoir Management 3(21): 361-371.

Abstract: When unaggregated summer chlorophyll data (Chl) from 184 Missouri reservoirs are plotted against total phosphorus (TP) a 'bow' in the distribution develops among a group of points with low Chl:TP ratios (averaging < 0.05). Low Chl:TP is mostly associated with turbid, nutrient-rich inflows in reservoirs across the entire trophic range. Non-algal seston (NAS) is our best metric of these inflows and is a co-variable in Chl-TP regressions. This influence is most prominent in years of high runoff and is distinctly seasonal, being most prevalent in early summer prior to full stratification. In late summer, inflows typically enter as subsurface density currents, and nitrogen accounts for more variation in Chl-TP than NAS. Neither variable, however, greatly influences the long-term relation between Chl and TP, which is linear, relatively consistent, and matches the global pattern. In several oxbow lakes, high NAS caused by sediment resuspension is a chronic condition; it seems neither light nor flushing greatly influence Chl:TP in these shallow systems, and values approximate the statewide average. Temporal variation in Chl:TP is demonstrated by daily samples ($n=1676$) from a single reservoir, with average variability, that covers about 94% of the statewide Chl and about a third of the TP range. The Chl-TP pattern in over half of Missouri reservoirs deviates somewhat from predictions based on cross-system regression models. Nonetheless, for 97% of the study reservoirs, long-term Chl is within a factor of two above or below model predictions, and most are within $\pm 25\%$. Such differences are modest when compared to the temporal variation measured in an intensively studied reservoir.

374: J. R. Jones and M. F. Knowlton,. 2005. Suspended solids in Missouri reservoirs in relation to catchment features and internal processes. Water Research 15(39): 3629-3635.

Abstract: Mean total suspended solids (TSS), in 135 Missouri reservoirs range from 1.2 to 47 mg/l. The volatile (VSS) and nonvolatile (NVSS) fractions range from 0.6 to 9.6 mg/l and 0.5 to 37 mg/l, respectively. %NVSS is the larger fraction and declines through summer as %VSS increases. Suspended solids (particularly VSS) correlate with metrics of lake trophic state and are positively related with the proportion of cropland (%C, $r = 0.69-0.74$) in their catchments, negatively related with forest cover ($r = -0.54$ to -0.56), and weakly related with grassland ($r < 0.31$). Regressions including %C with dam height (representing morphometry) and flushing rate (representing hydrology), explain similar to 70% of cross-system variation in TSS and 67% in VSS. Dam height and %C explain 57% of variation in NVSS. Residual analysis shows statewide models under-predict suspended solids in urban reservoirs. Effects of catchment features on summer TSS largely reflect internal plankton growth mediated by influent nutrients (affecting VSS) over direct sediment input (affecting NVSS). (c) 2005 Elsevier Ltd. All rights reserved.

375: G. Jordan, A. van Rompaey, P. Szilassi, G. Csillag, C. Mannaerts and T. Woldai,. 2005. Historical land use changes and their impact on sediment fluxes in the Balaton basin (Hungary). *Agriculture Ecosystems & Environment* 2(108): 119-133.

Abstract: Agricultural land use changes can influence soil erosion process. The objective of this study was to investigate impact of historical land use changes on soil erosion and sediment transport in the Kali Basin study area, a small catchment located in a national park at Lake Balaton, Hungary. The Kali Basin is of high landscape value where vine (*Vitis* spp.) growing has been ongoing since the Roman times. Lake Balaton is a recreational area of international significance, thus research on sediment and nutrient fluxes is of paramount importance for lake protection. The SEDEM/WATEM distributed erosion and sediment transport model was used to calculate sediment fluxes from the Kali Basin catchment into the lake. The model was calibrated against long-term measured suspended sediments at the catchment outlet and it was validated against independent soil survey data. Application of GIS methods for model development and interpretation was emphasised. Results showed that, despite the low overall sediment export from the catchment, land use changes introduced by property ownership and agricultural changes have decreased average sediment production in the catchment but increased relative sediment export to Lake Balaton. This is due to changes in the land cover pattern that allow more sediment transported to the river system. Erosion impact of dramatic land use changes such as change to centrally directed economy after the WWII and transition to market economy a decade ago in the study area are discussed. Similar land use changes due to socio-economic changes are typical in most of Central and Eastern European New Member States and Candidate Countries, thus the investigation of similar sites is an important contribution to the understanding of erosion impact of land use changes and to efficient agricultural and landscape management in the enlarged European Union. (c) 2005 Elsevier B.V. All rights reserved.

376: K. E. Judd, H. E. Adams, N. S. Bosch, J. M. Kostrzewski, C. E. Scott, B. M. Schultz, D. H. Wang and G. W. Kling,. 2005. A case history: Effects of mixing regime on nutrient dynamics and community structure in Third Sister Lake, Michigan during late winter and early spring 2003. *Lake and Reservoir Management* 3(21): 316-329.

Abstract: We studied the winter to spring transition in Third Sister Lake (TSL), a small glacial lake in southeastern Michigan, to determine the effect of mixing regime on nutrient dynamics and community structure in an urban temperate lake. After ice-off, the oxycline was mixed downward from 3 to 6 m depth, resulting in addition of 5 mg m⁻² P-SRP, 857 mg m⁻² N-NH₄⁺, and 400 mg m⁻² N-NO₃⁻ to the epilimnion, but trapping 299 mg m⁻² P-SRP, 7877 mg m⁻² N-NH₄⁺ and 36 mg m⁻² N-NO₃⁻ in the bottom waters. Nutrients supplied by snow melt runoff (138 mg m⁻² P-SRP, 430 mg m⁻² N-NH₄⁺, 596 mg m⁻² N-NO₃⁻) were an order of magnitude greater than rain event loads (0.13 mg m⁻² P-SRP, 0.17 mg m⁻² N-NH₄⁺, and 1.05 mg m⁻² N-NO₃⁻) during the transition time from ice cover to open water. Reduced spring mixing did not have a large impact on N:P molar ratios, because external N:P ratios were low (7.5) compensating for reduced supply of P from the bottom waters. Bacterial production was greater in the hypolimnion than in the epilimnion, and mesocosm experiments showed that bacteria were P limited in the epilimnion but not in the hypolimnion. Total algal and zooplankton densities increased after ice-out, while *Daphnia* and *Bosmina* densities decreased. Increases in zooplankton grazing rates after ice-off were most dramatic in small-bodied zooplankton. Sediment core analysis showed that *Asterionella* relative abundance continues to increase, suggesting that the lake has become more brackish and oligotrophic. Our findings suggest that TSL has undergone a transition from dimictic to meromictic conditions, and that continued salt inputs have altered the structure and function of this ecosystem.

377: P. Judova and B. Jansky,. 2005. Water quality in rural areas of the Czech Republic: Key study Slapanka River catchment. *Limnologica* 3(35): 160-168.

Abstract: The article evaluates the water quality in rural areas in the Czech part of Labe River catchment using the example of Slapanka River catchment. This river drains a typical landscape of Ceskomoravska Highland. Water quality in rural areas is still very low and the attention is paid to organic substances and nutrients. Increased amount of them in streams is caused mainly by agriculture and production of municipal wastewater resulting in increased eutrophication. A significant part of the article consists in the evaluation of point and non-point sources of water pollution. Identifying the type of the pollution source is helped by regression analysis using data from the public monitoring network. Eleven sampling sites were selected for evaluating the water quality. Physical and chemical analyses were made 12 times during the field monitoring in the years 2001-2003. In long-term development water quality has improved in all monitored parameters during the last 15 years. Least significant improvement has been found with the concentration of nitrate nitrogen. The water quality within the whole catchment area still remains low. To reduce the influence of pollution sources, we recommend the sanitation of diffuse sources of pollution from small settlements with less than 2000 inhabitants, and a successive change from agricultural management and intensive mass production to extensive ways, especially in mountain and sub-mountain areas. (c) 2005 Elsevier GmbH. All rights reserved.

378: R. H. Kadlec,. 2005. Phosphorus removal in emergent free surface wetlands. Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering 6-7(40): 1293-1306.

Abstract: Constructed and natural wetlands are capable of absorbing new phosphorus loadings, and, in appropriate circumstances, can provide a low-cost alternative to chemical and biological treatment. Phosphorus interacts strongly with wetland soils and biota, which provide both short-term and sustainable long-term storage of this nutrient. Soil sorption may provide initial removal, but this partly reversible storage eventually becomes saturated. Uptake by biota, including bacteria, algae, and duckweed, as well as macrophytes, forms an initial removal mechanism. Cycling through growth, death, and decomposition returns most of the biotic uptake, but an important residual contributes to long term accretion in newly formed sediments and soils. Despite the apparent complexity of these several removal mechanisms, data analysis shows that relatively simple equations can describe the sustainable processes. Previous global first order removal rates characterize the sustainable removal, but do not incorporate any biotic features. This article reviews the relevant processes and summarizes quantitative data on wetland phosphorus removal.

379: M. Kalin, W. N. Wheeler and G. Meinrath,. 2005. The removal of uranium from mining waste water using algal/microbial biomass. Journal of Environmental Radioactivity 2(78): 151-177.

Abstract: We describe a three step process for the removal of uranium (U) from dilute waste waters. Step one involves the sequestration of U on, in, and around aquatic plants such as algae. Cell wall ligands efficiently remove U(VI) from waste water. Growing algae continuously renew the cellular surface area. Step 2 is the removal of U-algal particulates from the water column to the sediments. Step 3 involves reducing U(VI) to U(IV) and transforming the ions into stable precipitates in the sediments. The algal cells provide organic carbon and other nutrients to heterotrophic microbial consortia to maintain the low E-H, within which the U is transformed. Among the microorganisms, algae are of predominant interest for the ecological engineer because of their ability to sequester U and because some algae can live under many extreme environments, often in abundance. Algae grow in a wide spectrum of water qualities, from alkaline environments (Chara, Nitella) to acidic mine drainage waste waters (Mougeotia, Ulothrix). If they could be induced to grow in waste waters, they would provide a simple, long-term means to remove U and other radionuclides from U mining effluents. This paper reviews the literature on algal and microbial, adsorption, reduction, and transformation of U in waste streams, wetlands, lakes and oceans. (C) 2004 Elsevier Ltd. All rights reserved.

380: B. Kang, W. W. Xian and R. Y. Liu,. 2005. Transporting nutrients from sediments: nitrogen and carbon as indicators to measure scavenging ability of a detritivorous fish, *Liza haematocheila*. *Environmental Biology of Fishes* 3-4(74): 283-290.

Abstract: The redlip mullet, *Liza haematocheila*, is a common species in polyculture as a scavenger in China. Feeding on detritus, redlip mullet transports nutrients from sediments up into the water column and converts them into forms that can be utilized by phytoplankton and affects the relative abundance of detritus and dissolved inorganic nutrients to phytoplankton, zooplankton and other fishes. We used nitrogen and carbon as the indicators in this study to measure the scavenging ability, which means intake of nitrogen or carbon by redlip mullet, and the loss of nutrients. Temperature and body weight significantly affected growth nitrogen, faecal nitrogen and faecal carbon. At a certain temperature, the proportion of growth nitrogen or growth carbon increased while the proportion of excretion nitrogen or respiration carbon decreased with increasing body weight.

381: H. J. Kang, S. Y. Kim, N. Fenner and C. Freeman,. 2005. Shifts of soil enzyme activities in wetlands exposed to elevated CO₂. Science of the Total Environment 1-3(337): 207-212.

Abstract: Wetlands play a key role in global biogeochemical cycles, and as such, the effects of global climatic changes on these systems are of great importance. In this study, we assessed impacts of elevated CO₂ on soil enzyme activities in different types of wetlands. We hypothesised that elevated CO₂, by increasing DOC supply into the soil, would modify enzyme activities. Intact soil cores collected from four wetlands (a bog, a fen, a gully mire, and a marsh) in north Wales and Korea were incubated either under ambient conditions (370 ppm) or elevated CO₂ conditions (double ambient) for 4-2 months. Elevated CO₂ increased DOC concentrations in the pore-water, by which soil microbes appeared to be affected. Enzyme activities exhibited various responses. For example, elevated CO₂ had no effect on beta-glucosidase activity in any soil, suggesting little direct impact on carbon mineralisation. However, N-acetylglucosaminidase activity increased significantly ($P < 0.05$, $n = 5$) in the cores from the bog, whilst a similar response was found in the gully mire for phosphatase activity. Such changes were absent from the fen and marsh where inorganic nutrients were abundant, suggesting that enzyme activities involved in N or P mineralisation only increase under elevated CO₂ when nutrient limitation is strongly exerted. (C) 2004 Elsevier B.V. All rights reserved.

382: W. J. Kang, K. V. Kolasa and M. W. Rials,. 2005. Groundwater inflow and associated transport of phosphorus to a hypereutrophic lake. Environmental Geology 4(47): 565-575.

Abstract: Hydrogeochemical data from lake, sediment pore, and well waters were used to quantify groundwater seepage and the associated transport of phosphorus to Lake Persimmon, Florida, USA. The data show that lake chloride concentrations vary as a function of lake elevations that are controlled by groundwater inflow. A whole-lake average seepage rate, estimated using a simple one dimensional advection-diffusion model fitted to the lake chloride profile, currently averages $2.3 \pm 0.3 \text{ cm yr}^{-1}$ and is in reasonable agreement with the rate of advective flow obtained from the pore water chloride profile. The ratios of nutrient regeneration versus sulfate consumption indicate that the phosphorus enrichment in deeper portions of sediment pore water is most likely a result of groundwater phosphorus transport through sediment. Thus, the net inputs of groundwater phosphorus to the lake, calculated using the deep pore water phosphorus concentration, are about $7.4 \pm 4.3 \text{ mg P m}^{-2} \text{ yr}^{-1}$ and comparable with recent in situ estimates from seepage meters. This study provides a simple hydrogeochemical method for estimating hydrologic and phosphorus inputs via groundwater to the lake, thereby supporting current efforts for lake management.

383: K. Kangro, R. Laugaste, P. Noges and I. Ott,. 2005. Long-term changes and seasonal development of phytoplankton in a strongly stratified, hypertrophic lake. *Hydrobiologia* (547): 91-103.

Abstract: Changes in the phytoplankton community of the hypertrophic, sharply stratified Lake Verevi have been studied over eight decades. Due to irregular discharge of urban wastewater, the trophic state of the lake has changed from moderately eutrophic to hypertrophic. We found that the trophic state in summer increased in the 1980s and remained at a hypertrophic level since then. *Planktothrix agardhii* was recorded first in the 1950s and became the dominant species in the 1980s, forming biomass maxima under the ice and in the metalimnion during the vegetation period. In summer 1989, *P. agardhii* contributed almost 100% of the phytoplankton biomass. Generally, the highest biomass values occurred in the metalimnion. In spring, when *P. agardhii* was less numerous, diatoms and cryptophytes prevailed. In springs 2000 and 2001 different diatoms dominated - *Synedra acus* var. *angustissima* (18.6 g m⁻³) and *Cyclotella choctawhatcheeana* (9.2 g m⁻³), respectively. In recent years, the spring overturn has been absent. In the conditions of strong thermal stratification sharp vertical gradients of light and nutrients caused a large number of vertically narrow niches in the water column. During a typical summer stage, the epilimnion, dominated by small flagellated chrysophytes, is nearly mesotrophic, and water transparency may reach 4 m. The lower part of the water column is hypertrophic with different species of cryptophytes and euglenophytes. A characteristic feature is the higher diversity of Chlorococcales. Often, species could form their peaks of biomass in very narrow layers, e.g. in August 2001 *Ceratium hirundinella* (18.6 g m⁻³) was found at a depth of 5 m (the lower part of the metalimnion with hypoxic conditions), *Cryptomonas* spp. (56 g m⁻³) at 6 m (with traces of oxygen and a relatively high content of dissolved organic matter) and euglenophytes (0.6 g m⁻³) at 7 m and deeper (without oxygen and a high content of dissolved organic matter).

384: F. Kansiime, H. Oryem-Origa and S. Rukwago,. 2005. Comparative assessment of the value of papyrus and cocoyams for the restoration of the Nakivubo wetland in Kampala, Uganda. Physics and Chemistry of the Earth 11-16(30): 698-705.

Abstract: Nakivubo wetland, located on the northern shores of Lake Victoria, separates the city of Kampala from the Inner Murchison Bay of Lake Victoria (the sole raw water supply for Kampala). It provides tertiary treatment for the secondary effluent from the Bugolobi sewage treatment works, and heavily polluted wastewater (run-off, domestic and industrial effluents) from the Nakivubo channel. However, more than half of the wetland has been drained for agriculture and the natural papyrus vegetation (*Cyperus papyrus*) has been progressively replaced by cocoyams (*Colocasia esculenta*). In order to provide information that could be used in the restoration of Nakivubo wetland, a pilot study was carried out to assess the ecological characteristics (nutrient retention and growth characteristics) of the two plants. The plants were grown in wastewater effluent from the Bugolobi sewage treatment works, in experimental buckets under floating and rooted conditions. The wastewater was replaced every seven days. Papyrus plants were more efficient at removing $\text{NH}_4\text{-N}$ while growing floating in wastewater or rooted in gravel (maximum values being 89.4% and 79%, respectively) than were cocoyams (67.7% and 68.3%) or the controls without plants (11% and 9%, respectively). The removal of orthophosphate by papyrus was also greater under the two growing conditions (values being 80% and 73%) than by cocoyams (66% and 63%) or the controls (11% and 14%). Biomass densities of papyrus were also higher (16.9 kg Dw/m²) for the floating plants and 18.7 kg Dw/m² for the rooted ones) than of yams (5.9 kg DW/m²) and 6.8 kg DW/m², respectively). It was also observed that the rhizomes of yams did not develop well under the floating conditions and were often rotten. It is concluded that, since papyrus has better wastewater treatment efficiency and superior growth characteristics, it should be encouraged to grow again in the wetland. It was also noted that if encroachment of the wetland by agricultural activi

385: J. Karlsson, A. Jonsson and M. Jansson,. 2005. Productivity of high-latitude lakes: climate effect inferred from altitude gradient. *Global Change Biology* 5(11): 710-715.

Abstract: Climate change is predicted to be dramatic at high latitudes. Still, climate impact on high latitude lake ecosystems is poorly understood. We studied 15 subarctic lakes located in a climate gradient comprising an air temperature difference of about 6°C. We show that lake water productivity varied by one order of magnitude along the temperature gradient. This variation was mainly caused by variations in the length of the ice-free period and, more importantly, in the supply of organic carbon and inorganic nutrients, which followed differences in terrestrial vegetation cover along the gradient. The results imply that warming will have rapid effects on the productivity of high latitude lakes, by prolongation of ice-free periods. However, a more pronounced consequence will be a delayed stimulation of the productivity following upon changes of the lakes terrestrial surroundings and subsequent increasing input of elements that stimulate the production of lake biota.

386: I. Karlsson-Elfgren, P. Hyenstrand and E. Riydin,. 2005. Pelagic growth and colony division of *Gloeotrichia echinulata* in Lake Erken. *Journal of Plankton Research* 2(27): 145-151.

Abstract: *Gloeotrichia echinulata* colony development was monitored in Lake Erken, Sweden and studied in enclosure experiments. Significant colonial division did not occur in mesh bags, although the abundance of the pelagic population in the lake increased during the experimental periods. On the basis of these findings, it is suggested that circulation of *G. echinulata* to deeper nutrient rich water supports pelagic growth. In support of this, a large part of the buoyant *G. echinulata* colonies in Lake Erken was found at several meters depth. In an experiment with nutrient additions, the only treatment that favoured *G. echinulata* development was additions of phosphate, nitrate and iron. Trace element additions had a negative effect on the development of *G. echinulata*. On the basis of these findings, the nutritional requirements of *G. echinulata* are discussed.

387: P. Kauppila, K. Weckstrom, S. Vaalgamaa, A. Korhola, H. Pitkanen, N. Reuss and S. Drew,. 2005. Tracing pollution and recovery using sediments in an urban estuary, northern Baltic Sea: are we far from ecological reference conditions?. Marine Ecology-Progress Series (290): 35-53.

Abstract: One of the primary challenges of the Water Framework Directive (WFD) of the European Union is to provide a guide for the recovery of surface waters from pollution. However, few studies deal with reference conditions according to the WFD in coastal waters. Using the urbanised Laajalahti Bay (Helsinki, Finland) as an example, reference conditions and pollution history were defined using the stratigraphy of diatoms, sediment geochemistry, stable isotopes, sedimentary pigments, long-term monitoring results of water quality, and nutrient-loading. Principal components analysis was used to generate a multidimensional index of water quality on the basis of the sediment data. We distinguished 5 phases: (1) a pre-industrial phase (before ca. 1815); (2) a phase of slight hum-in disturbance (ca. 1815 to 1900); (3) an onset of anthropogenic impact (ca. 1900 to 1955); (4) a severe pollution phase (ca. 1955 to 1975); (5) basin recovery and a phase of internal loading (from ca. 1975 onwards). Phase 2 was used to define reference conditions. Phase 1 was not used as it occurred before the formation of the semi-enclosed bay by post-glacial isostatic land-uplift. There was good agreement between the sedimentary record and the water-quality data during Phase 4. Despite an improvement in water quality after the local municipal treatment plant closed in 1986, Laajalahti Bay is still far from reference conditions due to internal loading.

388: S. S. Kaushal and W. M. Lewis,. 2005. Fate and transport of organic nitrogen in minimally disturbed montane streams of Colorado, USA. Biogeochemistry 3(74): 303-321.

Abstract: In two montane watersheds that receive minimal deposition of atmospheric nitrogen, 15-71% of dissolved organic nitrogen (DON) was bioavailable in stream water over a 2-year period. Discharge-weighted concentrations of bulk DON were between 102 and 135 $\mu\text{g/l}$, and the C:N ratio differed substantially between humic and non-humic fractions of DON. Approximately 70% of DON export occurred during snowmelt, and 40% of that DON was biologically available to microbes in stream sediments. Concentrations of bioavailable DON in stream water were 2-16 times greater than dissolved inorganic nitrogen (DIN) during the growing season, and bioavailable DON was depleted within 2-14 days during experimental incubations. Uptake of DON was influenced by the concentration of inorganic N in stream water, the concentration of non-humic DON in stream water, and the C:N ratio of the non-humic fraction of dissolved organic matter (DOM). Uptake of DON declined logarithmically as the concentration of inorganic N in stream water increased. Experimental additions of inorganic N also caused a decline in uptake of DON and net production of DON when the C:N ratio of non-humic DOM was high. This study indicates that the relative and absolute amount of bioavailable DON can vary greatly within and across years due to interactions between the availability of inorganic nutrients and composition of DOM. DOM has the potential to be used biotically at a high rate in nitrogen-poor streams, and it may be generated by heterotrophic microbes when DIN and labile DOM with low relative nitrogen content become abundant.

389: L. D. Keigwin, J. P. Sachs, Y. Rosenthal and E. A. Boyle,. 2005. The 8200 year BP event in the slope water system, western subpolar North Atlantic. *Paleoceanography* 2(20): .

Abstract: Stable isotope, trace metal, alkenone paleothermometry, and radiocarbon methods have been applied to sediment cores in the western subpolar North Atlantic between Hudson Strait and Cape Hatteras to reveal the history of climate in that region over the past similar to 11 kyr. We focus on cores from the Laurentian Fan, which is known to have rapid and continuous accumulation of hemipelagic sediment. Although results among our various proxy data are not always in agreement, the weight of the evidence (alkenone sea surface temperature (SST), $\delta(18)O$ and abundance of *Globigerinoides ruber*) indicates a continual cooling of surface waters over Laurentian Fan, from about 18 degrees C in the early Holocene to about 8 degrees C today. Alternatively, Mg/Ca data on planktonic foraminifera indicate no systematic change in Holocene SST. The inferred long-term decrease in SST was probably driven by decreasing seasonality of Northern Hemisphere insolation. Two series of proxy data show the gradual cooling was interrupted by a two-step cold pulse that began 8500 years ago, and lasted about 700 years. Although this event is associated with the final deglaciation of Hudson Bay, there is no $\delta(18)O$ minimum anywhere in the Labrador Sea, yet there is some evidence for it as far south as Cape Hatteras. Finally, although the 8200 year B. P. event has been implicated in decreasing North Atlantic ventilation, and hence widespread temperature depression on land and at sea, we find inconsistent evidence for a change at that time in deep ocean nutrient content at similar to 4 km water depth.

390: J. K. Keller, S. D. Bridgham, C. T. Chapin and C. M. Iversen,. 2005. Limited effects of six years of fertilization on carbon mineralization dynamics in a Minnesota fen. *Soil Biology & Biochemistry* 6(37): 1197-1204.

Abstract: Peatlands, including fens, are important ecosystems in the context of the global carbon cycle. Future climate change and other anthropogenic activities are likely to increase nutrient loading in many peatland ecosystems and a better understanding of the effects of these nutrients on peatland carbon cycling is necessary. We investigated the effects of six years of nitrogen and phosphorus fertilization, along with liming, on carbon mineralization dynamics in an intermediate fen in northern Minnesota. Specifically, we measured CO₂ and CH₄ emission from intact peat cores, as well as CH₄ production and CH₄ consumption at multiple depths in short-term laboratory incubations. Despite increased nitrogen and phosphorus availability in the upper 5 cm of peat, increased pH, and clear shifts in the vegetation community, fertilization and liming had limited effects on microbial carbon cycling in this fen. Liming reduced the net flux Of CO₂ approximately 3-fold compared to the control treatment, but liming had no effect on CH₄ emissions from intact cores. There were no nutrient effects on CO₂ or CH₄ emissions from intact cores. In all treatments, rates of CH₄ production increased with depth and rates of CH₄ consumption were highest near the in situ water-table level. However, nutrient and liming had no effect on rates of CH₄ production or CH₄ consumption at any depth. Our results suggest that over at least the intermediate term, the microbial communities responsible for soil carbon cycling in this peatland are tolerant to wide ranges of nutrient concentrations and pH levels and may be relatively insensitive to future anthropogenic nutrient stress. (c) 2005 Elsevier Ltd. All rights reserved.

391: T. A. Keller, M. L. Moy, A. L. Stock and B. A. Hazlett,. 2005. Stream periphyton responses to nutrient enrichment and crayfish reductions. *Journal of Freshwater Ecology* 2(20): 303-310.

Abstract: We used agar-filled clay pots and large cages to examine how periphyton responded to in situ manipulations of nutrient availability and crayfish in a pristine Michigan stream. By day 40, nutrient additions stimulated the autotrophic portion of the periphyton community and resulted in elevated chlorophyll a, algal abundance and biovolume. Diatoms dominated the periphyton with *Oscillatoria* and *Spirogyra* the primary filamentous genera. Crayfish, (*Orconectes* spp.) density had no effect on any indicator of periphyton growth. Low crayfish densities ($\sim 1 \text{ m}^{-2}$) and the absence of filamentous algal dominance likely limited crayfish effects.

392: R. H. Kennedy,. 2005. Toward integration in reservoir management. Lake and Reservoir Management 2(21): 128-138.

Abstract: Reservoirs are engineered features of hydrologic landscapes with characteristics defined by engineering design criteria. Many of these characteristics impact water quality. Reservoir management has historically been dictated by water control requirements; environment and water quality have been secondary considerations. Management approaches that address inputs of nutrients, sediment and organic material as root causes of eutrophication have been difficult to implement due to the location of reservoirs in large, complex watersheds. Costly engineering solutions that reduce symptoms of problems rather than address their cause are favored over watershed-based approaches applied to smaller natural lakes. To be successful, future management initiatives will require more integrative approaches that recognize reservoirs as integral components of watersheds and river basins. Understanding interactions between engineering practice and water quality fosters the development and implementation of effective management approaches that address environmental and water quality concerns as well as water quantity.

393: R. Kent, K. Belitz and C. A. Burton,. 2005. Algal productivity and nitrate assimilation in an effluent dominated concrete lined stream. Journal of the American Water Resources Association 5(41): 1109-1128.

Abstract: This study examined algal productivity and nitrate assimilation in a 2.85 km. reach of Cucamonga Creek, California, a concrete lined channel receiving treated municipal wastewater. Stream nitrate concentrations observed at two stations indicated nearly continuous loss throughout the diel study. Nitrate loss in the reach was approximately 11 mg/L/d or 1.0 g/m(2)/d as N, most of which occurred during daylight. The peak rate of nitrate loss (1.13 mg/l/hr) occurred just prior to an afternoon total CO₂ depletion. Gross primary productivity, as estimated by a model using the observed differences in dissolved oxygen between the two stations, was 228 mg/L/d, or 21 g/m(2)/d as O₂. The observed diel variations in productivity, nitrate loss, pH, dissolved oxygen, and CO₂ indicate that nitrate loss was primarily due to algal assimilation. The observed levels of productivity and nitrate assimilation were exceptionally high on a mass per volume basis compared to studies on other streams; these rates occurred because of the shallow stream depth. This study suggests that concrete-lined channels can provide an important environmental service: lowering of nitrate concentrations similar to rates observed in biological treatment systems.

394: F. A. Khan and A. A. Ansari,. 2005. Eutrophication: An ecological vision. Botanical Review 4(71): 449-482.

Abstract: The present review deals with the studies conducted on the impact of phosphorus on growth of aquatic plants causing eutrophication in well-known water bodies the world over. The review covers the definition and concept of eutrophication and the adverse effects on quality and ecosystem functioning. The eutrophication of several water bodies leads to significant changes in the structure and function of the aquatic ecosystem. Several activities of human interest, including navigation and power generation, are hampered. A large number of lakes in the United States, Europe, and Asia have recently been found to be highly eutrophic. Water, the precious fluid, is not uniformly distributed throughout the surface of the earth. Most of the water bodies world over are surrounded with densely populated human settlement areas and agricultural fields. The size of smaller water bodies in human settlement areas is on the decrease with rise in population. After treatment, a large quantity of sewage from the households is regularly discharged into the water bodies. The runoff brings down fertilizers and other chemicals from agricultural fields. The phosphorus contained in these effluents is known to promote excessive growth of plants. This review is an account of the role, sources, and monitoring of phosphorus, as well as its cycle. The natural phosphorus cycle originating from the weathering of phosphate rock is now a two-way operation, due to significant addition of phosphorus from anthropogenic sources. The detergents that are the major source of phosphorus inputs into water bodies (through sewage and drainage systems) have been thoroughly discussed. The major part of detergents comprises builders containing polyphosphate salts. An environment-friendly and effective synthetic builder is yet to be developed to replace existing phosphorus containing builders of detergents. The utility of the alternative builders available has been reviewed. Nitrogen has also been reported to affect

395: J. G. Kie, A. A. Ager and R. T. Bowyer,. 2005. Landscape-level movements of North American elk (*Cervus elaphus*): effects of habitat patch structure and topography. *Landscape Ecology* 3(20): 289-300.

Abstract: We examined movements of North American elk (*Cervus elaphus*) in northeastern Oregon, USA. Movement vectors at 449 locations over a 7762 ha area were calculated based on 16,724 sequential observations of 94 female elk-year combinations during spring (15 April-14 May) 1993, 1995, 1996. We calculated movement vectors at the start of morning and evening feeding bouts (0500, 1900 h) and during periods of least activity (0 100, 1500 h). Here, we measured characteristics of habitat patches (habitat type, mean patch size, coefficient of variation in patch size, edge density, mean shape index, and mean nearest neighbor) at two levels of habitat grain (eight habitat types, two habitat types) and at three spatial scales (250, 500, and 1000 m) around each movement vector. We also measured topographic features around each vector including distance to nearest stream, direction of drainage, elevation, slope, and convexity (a measure of ridge top vs. valley bottom land form). We used mixed models adjusted for positive spatial correlation among vectors to examine the relationship between vector length, or speed of movement, and habitat patch characteristics, and between vector direction and topographic features. Speed of movements by elk were not related to characteristics of habitat patches that we measured. The direction of movement, however, was dependent on topography. Elk were more likely to move parallel to major drainages than perpendicular to them. Furthermore, elk were less likely to move perpendicular to drainages when close to the nearest stream, in valley bottoms vs. ridge tops, and on steep slopes. The dendritic nature of movements by elk with respect to topography may help elucidate ecosystem processes such as nutrient flows, nutrient cycling, and successional trajectories of plant communities.

396: U. Kienel, M. J. Schwab and G. Schettler,. 2005. Distinguishing climatic from direct anthropogenic influences during the past 400 years in varved sediments from Lake Holzmaar (Eifel, Germany). *Journal of Paleolimnology* 3(33): 327-347.

Abstract: A 336-year floating varve chronology from Lake Holzmaar (Eifel, Western Germany) covering the recent period has been established by microfacies analysis of thin sections. This sequence terminates 23 cm below the core top. In the top 23 cm, the varves are disturbed. By means of linear regression, the varve sequence was dated to the period AD 1607 - 1942. The influences of climatic variability and anthropogenic activities in the lake's catchment (e. g., forestry, agriculture) on lithology, fabric, and microfossil content of the varve sublaminae could be discriminated by applying statistical analyses (ordination and clustering) to the combination of the sublaminae in the varves and their thickness. Four clusters are obtained. Cluster 1 indicates cold springs, and shorter, cooler summers reflected primarily in below-average varve thickness (VT) for two stable phases: from AD 1650 - 1700 (during the Maunder Minimum) and from AD 1750 - 1785. Cluster 2 indicates years with conditions transitional to that indicated by cluster 1, characterized by vigorous and prolonged spring circulation with massive blooms of the nordic-alpine *Aulacoseira subarctica*. The samples assigned to Cluster 3 and Cluster 4 show the imprint of anthropogenic influences. Cluster 3 (AD 1795 - 1815 and AD 1825 - 1885) is characterized by above-average VT due to high detritus input throughout the year. The increased soil erosion can be linked to anthropogenic deforestation as a consequence of the production increase of the Eifelian iron industry at the end of the 18th century. This input dampens the climatic signal of a colder Dalton Minimum, which is reflected in a short drop in VT centered around AD 1810. At about AD 1885, Cluster 4 conditions, characterized by increased nutrient concentrations, low detritus input, and longer periods of stable summer stratification, become the stable state in Lake Holzmaar. They indicate the response of the lake to natural reforestation and the use of artificial fertili

397: G. Kilroy, C. Coxon, J. Ryan, A. O'Connor and D. Daly,. 2005. Groundwater and wetland management in the Shannon river basin (Ireland). Environmental Science & Policy 3(8): 219-225.

Abstract: This paper examined groundwater and wetlands in the Shannon river basin in the context of implementation of the European water framework directive (WFD). The particular wetland example of turloughs (groundwater fed temporary lakes in karst areas) was examined in the context of defining river basin district boundaries and in the delineation of their catchment areas for risk assessment as required by Articles 3 and 5, respectively of WFD. Groundwater dependent terrestrial ecosystems such as turloughs are particularly challenging in terms of delineating their catchment areas for the purposes of risk assessment and implementation of measures. Turloughs are a habitats directive Annex I priority habitat, which occur mainly in Ireland and consequently, many turloughs in Ireland have been designated as special areas of conservation. Better understanding of such complex systems with high degrees of groundwater-surface water interaction will be required to ensure their protection in river basin management plans. (c) 2005 Elsevier Ltd. All rights reserved.

398: J. Kim, Y. S. Chang, M. Y. Corapcioglu and M. C. Drew,. 2005. Experimental study of solute transport and extraction by a single root in soil. Plant and Soil 1-2(269): 213-224.

Abstract: The fate of C-14-2,4,6-trinitrotoluene ([U-C-14]TNT) in soil/plant systems was studied using onion (*Allium cepa* L.) plants with only a single root. It was found that the single roots grew exponentially and that the rate of water uptake of the onion plants increased exponentially, as well. The concentration of [U-C-14] in the roots at first increased and then appeared to reach a steady state, while the [U-C-14] concentration in the leaves was found to increase linearly with time. The [U-C-14] concentration in the rhizosphere increased gradually, while in the bulk soil it decreased slowly. The accumulation of [U-C-14] in the rhizosphere is likely to difference between movement into the rhizosphere (through advective mass flow of soil water by root uptake) and its uptake into the roots. The distribution of C-14 in the soil/plant system was found to be 60-85% in the soil solid phase, 7-11% in the soil liquid phase, <1% in the soil air phase, <1% in the root compartment, and <0.01% in the leaf compartment. The maximum RCF (root concentration factor) value for TNT and its derivates was found to be about 20, and the maximum TSCF (transpiration stream concentration factor) was 0.18. These values can be changed by a variety of factors in soil-plant systems.

399: J. G. Kim,. 2005. Assessment of recent industrialization in wetlands near Ulsan, Korea. *Journal of Paleolimnology* 4(33): 433-444.

Abstract: The structure and function of many Korean ecosystems have been rapidly modified since the 1960' s when industrialization of the nation began. Ulsan City was the first in Korea to develop into a major industrial complex. To assess anthropogenic impacts on ecosystems surrounding Ulsan, sediment cores were collected from Mujechi- neup (bog) and Sanggae reservoir of Ulsan, and these cores were Pb-210 dated using the CRS model. Physical and chemical characteristics and pollen were analyzed, and the rates of sediment accumulation were calculated. Unsupported Pb-210 inventories in Mujechi- neup and the Sanggae reservoir were 18.04 and 16.53 pCi cm(-2), and the corresponding Pb-210 fluxes were 0.56 and 0.52 pCi cm(-2) yr(-1), respectively. The overall accumulation rate of dry matter was 0.26 kg m(-2) yr(-1) since 1852 (14 cm in depth) in Mujechi- neup. In the Sanggae reservoir, the accumulation rates of dry matter were increased from 2.1 in 1965 to 6.0 kg m(-2) yr(-1) in 1999. Pollen analysis revealed that three pollen zones existed in Mujechi- neup; a Pinus pollen- dominated zone from 0 to 5 cm in depth (1974 year), an Alnus pollen- dominated zone from 5 to 15 cm in depth (1827 year), and a Quercus pollen- dominated zone below 15 cm in depth. The shift from an Alnus dominated zone to a Pinus dominated zone was related to the Korean War between 1951 and 1953 and reforestation activities in the 1970's. In the Sanggae reservoir, there was an increase of Humulus pollen since 1996, an increase of Ambrosia pollen since the 1960' s and the decrease of Graminae pollen since 1993 with the expansion of the industrial area. Similar to Mujechi- neup, the Sanggae reservoir also consists of three pollen zones: a Pinus and Typha pollen- dominated zone from 0 to 10 cm in depth (since 1993), a Graminae pollen- dominated zone from 10 to 22 cm in depth (between 1947 and 1993), and a Pinus pollen- dominated zone below 22 cm in depth (before 1947). The increase of Typha and Humulus in the 1990

400: K. K. Kim, H. S. Bae, P. Schumann and S. T. Lee,. 2005. *Chryseobacterium daecheongense* sp nov., isolated from freshwater lake sediment. International Journal of Systematic and Evolutionary Microbiology (55): 133-138.

Abstract: A novel nitrate-reducing bacterium, CPW406(T), was isolated from the sediment of a shallow, freshwater lake. The strain was a Gram-negative, non-motile, non-spore-forming rod, which formed yellow-pigmented colonies on nutrient agar and contained a polyamine pattern with sym-homospermidine as the major compound, MK-6 as the predominant menaquinone, 15: 0 iso and 17 : 0 iso, 3-OH as the major fatty acids and phosphatidylethanolamine and several unknown lipids in the polar lipid profile. The 16S rRNA gene sequence of strain CPW406(T) was found to be most similar to that of the type strain of *Chryseobacterium defluvii* (DSM 14219(T); 97(.)9 % similarity). However, DNA-DNA relatedness data and its phenotypic properties showed that strain CPW406(T) could be distinguished from all known *Chryseobacterium* species and thus represented a novel species, for which the name *Chryseobacterium daecheongense* sp. nov. is proposed; the type strain is CPW406(T) (=DSM 15235(T) =KCTC 12088(T)).

401: C. King, V. Lecomte, Y. Le Bissonnais, N. Baghdadi, V. Souchere and O. Cerdan,. 2005. Remote-sensing data as an alternative input for the 'STREAM' runoff model. Catena 2-3(62): 125-135.

Abstract: Water erosion of cropland constitutes an issue for natural environments along runoff flowpaths due to property damage by soil-laden water and the associated transfer of nutrients and pesticides. In the Pays de Caux region of northwestern France, the silty soils with crusting properties induce a high risk of runoff and erosion. Changes in agricultural practices, land use and landscape patterns appear to have increased the occurrence of erosion and mud flows over the past few decades. A runoff and erosion model called STREAM, applicable to single rainfall events at catchment scale, has been developed to simulate the impacts of land-use modifications. The model takes into account processes that degrade surface states when calculating infiltration rates, as well as agricultural aspects when computing the runoff circulation network. STREAM is based on an expert-system approach that focuses on the dominant processes whilst having only a few input parameters: three of these are used to determine the runoff circulation network, and the other four to calculate infiltration rates. Input nevertheless requires field observations, which restricts application of the model to small catchments. Satellite data covering large areas is considered as an alternative input for such a model, the main objectives being to adapt STREAM accordingly, and to compare the obtained results with field data. In view of previous work involving the extraction and validation of roughness indices using RADARSAT data, this study is based on RADARSAT and LANDSAT TM data collected during the winter of 1998. After adaptation to receive remote-sensing data, the resulting STREAM-TED model requires less input, namely (1) slope and orientation, (2) land-use classification from optical remote-sensing data, (3) roughness indices from radar remote-sensing data, and (4) previous rainfall. Runoff volumes at a gauged catchment outlet (Bourville in Upper Normandy, France) are simulated by four successive versions of t

402: J. S. King, K. S. Pregitzer, D. R. Zak, W. E. Holmes and K. Schmidt,. 2005. Fine root chemistry and decomposition in model communities of north-temperate tree species show little response to elevated atmospheric CO₂ and varying soil resource availability. *Oecologia* 2(146): 318-328.

Abstract: Rising atmospheric [CO₂] has the potential to alter soil carbon (C) cycling by increasing the content of recalcitrant constituents in plant litter, thereby decreasing rates of decomposition. Because fine root turnover constitutes a large fraction of annual NPP, changes in fine root decomposition are especially important. These responses will likely be affected by soil resource availability and the life history characteristics of the dominant tree species. We evaluated the effects of elevated atmospheric [CO₂] and soil resource availability on the production and chemistry, mycorrhizal colonization, and decomposition of fine roots in an early- and late-successional tree species that are economically and ecologically important in north temperate forests. Open-top chambers were used to expose young trembling aspen (*Populus tremuloides*) and sugar maple (*Acer saccharum*) trees to ambient (36 Pa) and elevated (56 Pa) atmospheric CO₂. Soil resource availability was composed of two treatments that bracketed the range found in the Upper Lake States, USA. After 2.5 years of growth, sugar maple had greater fine root standing crop due to relatively greater allocation to fine roots (30% of total root biomass) relative to aspen (7% total root biomass). Relative to the low soil resources treatment, aspen fine root biomass increased 76% with increased soil resource availability, but only under elevated [CO₂]. Sugar maple fine root biomass increased 26% with increased soil resource availability (relative to the low soil resources treatment), and showed little response to elevated [CO₂]. Concentrations of N and soluble phenolics, and C/N ratio in roots were similar for the two species, but aspen had slightly higher lignin and lower condensed tannins contents compared to sugar maple. As predicted by source-sink models of carbon allocation, pooled constituents (C/N ratio, soluble phenolics) increased in response to increased relative carbon availability (elevated [CO₂]/low soil resource av

403: R. S. King, M.E. Baker, D. F. Whigham, D.E. Weller, T.E. Jordan, P.F. Kazyak, and M. K. Hurd,. 2005. SPATIAL CONSIDERATIONS FOR LINKING WATERSHED LAND COVER TO ECOLOGICAL INDICATORS IN STREAMS. Ecological Applications: 1(15): 137-153..

Abstract: Watershed land cover is widely used as a predictor of stream-ecosystem condition. However, numerous spatial factors can confound the interpretation of correlative analyses between land cover and stream indicators, particularly at broad spatial scales. We used a stream-monitoring data set collected from the Coastal Plain of Maryland, USA to address analytical challenges presented by (1) collinearity of land-cover class percentages, (2) spatial autocorrelation of land cover and stream data, (3) intercorrelations among and spatial autocorrelation within abiotic intermediaries that link land cover to stream biota, and (4) spatial arrangement of land cover within watersheds. We focused on two commonly measured stream indicators, nitrate-nitrogen ($\text{NO}_3\text{-N}$) and macroinvertebrate assemblages, to evaluate how different spatial considerations may influence results. Partial correlation analysis of land-cover percentages revealed that simple correlations described relationships that could not be separated from the effects of other land-cover classes or relationships that changed substantially when the influences of other land-cover classes were taken into account. Partial Mantel tests showed that all land-cover percentages were spatially autocorrelated, and this spatial phenomenon accounted for much of the variation in macroinvertebrate assemblages that could naively be attributed to certain classes (e.g., percentage cropland). We extended our use of partial Mantel tests into a path-analytical framework and identified several independent pathways between percentage developed land and in-stream measurements after factoring out spatial autocorrelation and other confounding variables; however, under these conditions, percentage cropland was only linked to nitrate-N. Further analyses revealed that spatial arrangement of land cover, as measured by areal buffers and distance weighting, influenced the amount of developed land, resulting in a threshold change in macroinvertebrate-assembl

404: R. S. King, M. E. Baker, D. F. Whigham, D. E. Weller, T. E. Jordan, P. F. Kazyak and M. K. Hurd,. 2005. Spatial considerations for linking watershed land cover to ecological indicators in streams. *Ecological Applications* 1(15): 137-153.

Abstract: Watershed land cover is widely used as a predictor of stream-ecosystem condition. However, numerous spatial factors can confound the interpretation of correlative analyses between land cover and stream indicators, particularly at broad spatial scales. We used a stream-monitoring data set collected from the Coastal Plain of Maryland, USA to address analytical challenges presented by (1) collinearity of land-cover class percentages, (2) spatial autocorrelation of land cover and stream data, (3) intercorrelations among and spatial autocorrelation within abiotic intermediaries that link land cover to stream biota, and (4) spatial arrangement of land cover within watersheds. We focused on two commonly measured stream indicators, nitrate-nitrogen (NO₃-N) and macroinvertebrate assemblages, to evaluate how different spatial considerations may influence results. Partial correlation analysis of land-cover percentages revealed that simple correlations described relationships that could not be separated from the effects of other land-cover classes or relationships that changed substantially when the influences of other land-cover classes were taken into account. Partial Mantel tests showed that all land-cover percentages were spatially autocorrelated, and this spatial phenomenon accounted for much of the variation in macroinvertebrate assemblages that could naively be attributed to certain classes (e.g., percentage cropland). We extended our use of partial Mantel tests into a path-analytical framework and identified several independent pathways between percentage developed land and instream measurements after factoring out spatial autocorrelation and other confounding variables; however, under these conditions, percentage cropland was only linked to nitrate-N. Further analyses revealed that spatial arrangement of land cover, as measured by areal buffers and distance weighting, influenced the amount of developed land, resulting in a threshold change in macroinvertebrate-assembla

405: A. E. Kirkwood, C. Nalewajko and R. R. Fulthorpe,. 2005. The impacts of cyanobacteria on pulp-and-paper wastewater toxicity and biodegradation of wastewater contaminants. Canadian Journal of Microbiology 7(51): 531-540.

Abstract: This study investigated the effects of cyanobacteria from pulp-and-paper waste-treatment systems on biological toxicity removal and biodegradation of certain wastewater contaminants. In field and batch studies, using the Microtox((R)) assay, cyanobacterial biomass and final wastewater toxicity were significantly correlated. In softwood-based wastewater, a decrease in toxicity was negatively correlated with cyanobacterial biomass, but the correlation was positive in hardwood-based wastewater. In the softwood-based wastewater, toxicity remained higher in the light than it was in the dark, whereas in hardwood-based wastewater, toxicity was lower in the light than it was in the dark. All of these results were light-dependent, suggesting that the photosynthetic growth of cyanobacteria is required to induce significant effects. When grown in mixed cultures with bacterial degraders, cyanobacteria from pulp-and-paper waste-treatment systems generally impeded the biodegradation of the wastewater contaminants phenol and dichloroacetate (DCA). However, there was one case where the cyanobacterium *Phormidium insigne* improved the bacterial degradation of DCA. Doubling inorganic nutrient concentrations did not improve phenol or DCA biodegradation in the majority of cases, indicating that nutrient competition is not a major factor. These data suggest that cyanobacteria play an important role during the biological treatment of contaminants, and, hence, toxicity removal in pulp-and-paper waste-treatment systems.

406: E. Kivrak and H. Gurbuz,. 2005. Seasonal variations in phytoplankton composition and physical-chemical features of Demirdoven Dam Reservoir, Erzurum, Turkey. Biologia 1(60): 1-8.

Abstract: The seasonal and vertical distribution of nutrients and dynamics of the phytoplankton were studied during 2000-2001 in Demirdbven Dam Reservoir. A total of 115 taxa belonging to Bacillariophyta, Chlorophyta, Cyanophyta, Euglenophyta and Dinophyta have been identified in the phytoplankton. Chlorophyta were dominant in terms of density of organisms. Sphaerocystis schroeteri, Staurastrum longiradiatum and Cyclotella ocellata were the most abundant species. Phytoplankton growth and its seasonal succession were affected by environmental factors, particularly water temperature. Total densities of phytoplankton were the highest between 0 and 5 m, and decreased with depth.

407: E. Kivrak and H. Gurbuz,. 2005. Seasonal variations of chlorophyll-a in Demirdoven Dam Reservoir (Erzurum, Turkey) in relation to phytoplankton density and environmental factors. Journal of Environmental Biology 3(26): 597-602.

Abstract: The seasonal variations of Chlorophyll-a was examined in relation to phytoplankton density and physico-chemical factors in Demirddven Dam Reservoir during 2000-2001. Chlorophyll-a concentrations ranged from 0.62 to 19 mg/m(3) and from 0.67 to 8.88 mg/m(3) in 2000 and 2001, respectively. Maximum Chlorophyll-a concentrations were found near the metalimnion and decreased with depth. Chlorophyll-a concentrations showed positive correlation to phytoplankton density, water temperature and nutrient concentrations, and negative correlations to Secchi depth. Demirdoven Dam Reservoir can be classified as a mesotrophic reservoir according to Chlorophyll-a concentrations.

408: M. Klisch, R. P. Sinha, E. W. Helbling and D. P. Hader,. 2005. Induction of thymine dimers by solar radiation in natural freshwater phytoplankton assemblages in Patagonia, Argentina. *Aquatic Sciences* 1(67): 72-78.

Abstract: Natural phytoplankton assemblages from a freshwater lake in Trelew (Province of Chubut, Patagonia, Argentina) were exposed to natural solar radiation at different depths in a water basin filled with fresh water rich in humic substances. Samples were taken at regular intervals for DNA extraction and subsequent analysis of DNA damage by determining the formation of thymine dimers using an immuno-dot-blot procedure. The use of a colorimetric detection system based on the reaction of alkaline phosphatase with BCIP (5-bromo-4-chloro-3-indolyl phosphate)/ NBT (nitro blue tetrazolium) proved unsatisfactory because of uneven and strong background signals. As a consequence the antibodies were stripped and the blots were reprobed successfully, using a chemoluminescence based detection system. Natural solar radiation caused an increase from 3.2 ± 0.9 thymine dimers ((TT)-T-boolean AND) per mega base pair (Mbp) to 50.9 ± 3.8 (TT)-T-boolean AND Mbp(-1) during the light period in natural phytoplankton exposed at the surface. When the UV-B component of the solar radiation was removed by a 320 nm cut-off filter, no thymine dimers were produced. After prolonged exposure at the surface, some but not total recovery occurred overnight. There was no significant DNA damage in the samples exposed at 85 cm depth ($k(d) = 3.62 \text{ m}^{-1}$) at 305 nm). The results indicate that the impinging UV-B radiation at the study site may be deleterious to the survival of phytoplankton exposed at the water surface and thus significantly alter the nutrient cycling and biomass production.

409: P. Klomjek and S. Nitisoravut,. 2005. Constructed treatment wetland: a study of eight plant species under saline conditions. Chemosphere 5(58): 585-593.

Abstract: A series of investigations was conducted to evaluate the feasibility of using constructed treatment wetlands to remove pollutants from saline wastewater. Eight emergent plants; cattail, sedge, water grass, Asia crabgrass, salt meadow cordgrass, kallar grass, vetiver grass and Amazon, were planted in experimental plots and fed with municipal wastewater that was spiked with sodium chloride (NaCl) to simulate a saline concentration of approximately 14-16 mS cm⁽⁻¹⁾. All macrophytes were found tolerant under the tested conditions except Amazon and vetiver grass. Nutrient assimilation of salt tolerant species was in the range of 0.006-0.061 and 0.0002-0.0024 gm⁽⁻²⁾ d⁽⁻¹⁾ for nitrogen and phosphorus, respectively. Treatment performances of planted units were found to be 72.4-78.9% for BOD₅, 43.2-56.0% for SS, 67.4-16.5% for NH₃-N and 28.9-44.9% for TP. The most satisfactory plant growth and nitrogen assimilation were found for cattail (*Typha angustifolia*) though the plant growth was limited, whereas Asia crabgrass (*Digitaria bicornis*) was superior for BOD₅ removal. Both were evaluated again in a continuous flow constructed wetland system receiving saline feed processing wastewater. A high removal rate regularly occurred in long-term operating conditions. The reduction in BOD₅, SS, NH₃-N and TP was in the range of 44.4-67.9%, 41.4-70.4%, 18.0-65.3% and 12.2-40.5%, respectively. Asia crabgrass often provided higher removal especially for BOD₅ and SS removal. Nutrient enriched wastewater promoted flourishing growth of algae and plankton in the surface flow system, which tended to reduce treatment performance. (C) 2004 Elsevier Ltd. All rights reserved.

410: J. L. Klug,. 2005. Bacterial response to dissolved organic matter affects resource availability for algae. Canadian Journal of Fisheries and Aquatic Sciences 2(62): 472-481.

Abstract: In aquatic systems, the presence of colored dissolved organic matter (DOM) may affect algal growth in numerous ways. This paper focuses on the effects of DOM on resource availability. DOM contains nitrogen and phosphorus, which may become available following microbial or photochemical degradation. Also, addition of DOM may stimulate bacterial growth, which in turn may change the availability of nitrogen, phosphorus, and inorganic carbon to algae. Experiments conducted in a moderately colored lake showed that the effect of DOM on algal growth depended on the amount of nutrients present in the peat extract and on bacterial response to DOM. There was evidence for competition for phosphorus between algae and bacteria in some treatments. In addition, when both bacteria growth and algal growth were high, bacterial respiration of DOM alleviated algal carbon limitation by providing algae with an inorganic carbon source. Thus, the degree to which bacteria are stimulated by the addition of DOM will affect the amount of phosphorus and inorganic carbon available for algal growth. These results suggest that part of the difficulty in predicting algal response to changes in DOM and nutrient concentration may be due partially to variability in bacterial responses.

411: K. Kochi and T. Kagaya,. 2005. Green leaves enhance the growth and development of a stream macroinvertebrate shredder when senescent leaves are available. *Freshwater Biology* 4(50): 656-667.

Abstract: 1. Freshly fallen green leaves and flowers of terrestrial plants enter temperate streams in spring and summer, when senescent leaf litter is often scarce. These resources appear to provide good supplementary food for macroinvertebrate shredders, but have some potential shortcomings as food or case material for caddisflies. 2. To compare suitability of green leaves or flowers and senescent leaves for the growth and development of stream shredders, we reared the caddisfly *Lepidostoma complicatum* in the laboratory with treatments that provided larvae with senescent (oak) and green (oak or maple) leaves separately, and also together, in case the combined use of both types of leaf may benefit the shredder. 3. Larvae supplied with green leaves alone grew at 65% of the rate of those provided with senescent leaves alone, due to their lower consumption rate. No individuals given green leaves alone developed into adults, whereas 70% of the individuals given senescent leaves alone did. Green leaves may inhibit larval consumption due to their high phenol content, or they may be unsuitable for case material because they are less tough than senescent leaves. 4. Larvae supplied with both senescent and green leaves (or flowers) had a higher growth rate and developed faster, than those given senescent leaves alone, whereas the proportions of successfully emerged individuals did not differ. *Lepidostoma* probably benefits from the higher nitrogen content of the green leaves when used together with senescent leaves. 5. These results suggest that green leaves (or flowers) cannot serve as an alternative food resource to senescent leaves, but that they can enhance the growth and development of a *Lepidostoma* stream shredder if senescent leaves are also available.

412: J. Kohler, S. Hilt, R. Adrian, A. Nicklisch, H. P. Kozerski and N. Walz,. 2005. Long-term response of a shallow, moderately flushed lake to reduced external phosphorus and nitrogen loading. *Freshwater Biology* 10(50): 1639-1650.

Abstract: 1. The responses of nutrient concentrations, plankton, macrophytes and macrozoobenthos to a reduction in external nutrient loading and to contemporary climatic change were studied in the shallow, moderately flushed Lake Muggelsee (Berlin, Germany). Weekly to biweekly data from 1979 to 2003 were compared with less frequently collected historical data. 2. A reduction of more than 50% in both total phosphorus (TP) and total nitrogen (TN) loading from the hypertrophic (1979-90) to the eutrophic period (1997-2003) was followed by an immediate decline in TN concentrations in the lake. TP concentrations only declined during winter and spring. During summer, phosphorus (P) release from the sediments was favoured by a drastic reduction in nitrate import. Therefore, Muggelsee acted as a net P source for 6 years after the external load reduction despite a mean water retention time of only 0.1-0.16 years. 3. Because of the likely limitation by P in spring and nitrogen (N) in summer, phytoplankton biovolume declined immediately after nutrient loading was reduced. The formerly dominant cyanobacteria (Oscillatoriales) *Limnothrix redekei* and *Planktothrix agardhii* disappeared, but the mean biovolume of the N-2-fixing species *Aphanizomenon flos-aquae* remained constant. 4. The abundance of *Daphnia* spp. in summer decreased by half, while that of cyclopoid copepod species increased. Abundances of benthic macroinvertebrates (mainly chironomids) decreased by about 80%. A resource control of both phytoplankton and zooplankton is indicated by significant positive correlations between nutrient concentrations and phytoplankton biovolume and between phytoplankton and zooplankton biomass. 5. Water transparency in spring increased after nutrient reduction and resulted in re-colonisation of the lake by *Potamogeton pectinatus*. However, this process was severely hampered by periphyton shading and grazing by waterfowl and fish. 6. Water temperatures in Muggelsee have increased in winter, early spring

413: T. Koiv and K. Kangro,. 2005. Resource ratios and phytoplankton species composition in a strongly stratified lake. *Hydrobiologia* (547): 123-135.

Abstract: The epilimnetic phytoplankton and its relations to nutrient content in Lake Verevi through the whole vegetation period in 2000 were studied. Lake Verevi (surface 12.6 ha, mean depth 3.6 m, maximum depth 11 m) is a hypertrophic hard-water lake, where the so-called spring meromixis occurs due to an extremely warm spring. Most dissolved nutrients in the epilimnion were low already in spring, and their concentrations were quite stable during the study period. The concentration of total silicon was very low in spring but increased rapidly in summer. Total phosphorus followed the pattern for stratified eutrophic lakes, and total nitrogen was quite high. The stoichiometric N:P ratio fluctuated between 25 and 81. The dynamics of phytoplankton biomass with a spring peak from April to May and a late summer peak from July to August is typical of Estonian eutrophic lakes. Green algae and chrysophytes occurred in the phytoplankton throughout the vegetation period. The spring peak was dominated by diatoms (*Synedra ulna* and *Synedra acus* var. *angustissima*) and the summer peak was caused by *Aphanizomenon klebahnii* and *Ceratium hirundinella*. The study showed that in physically stratified systems, the total concentration of limiting resources and plain physical factors (light and temperature) may be more important in the determination of phytoplankton dominants than different resource ratios. A combination of light and temperature optimum, along with nutrient utilization and transport capacity, effectively segregates phytoplankton species and can be used for the explanation of seasonal succession pattern.

414: D. Kominkova, D. Stransky, G. St'astna, J. Caletkova, J. Nabelkova and Z. Handova,. 2005. Identification of ecological status of stream impacted by urban drainage. Water Science and Technology 2(51): 249-256.

Abstract: The adoption and implementation of the Directive 2000/60/EC with respect to crucial changes in an approach to water protection require a complex methodology for river and stream status assessment. This paper presents a possible method for assessing the ecological status of urban streams, on for example the Botic creek, the largest tributary of the Vltava River in Prague. The study stream does not possess a good ecological status. The degradation of the ecosystem quality is caused mainly by combined sewer overflows, which reduce water and sediment quality and induce chemical and hydraulic stress for the benthic community.

415: C. O. Koning,. 2005. Vegetation patterns resulting from spatial and temporal variability in hydrology, soils, and trampling in an isolated basin marsh, New Hampshire, USA. *Wetlands* 2(25): 239-251.

Abstract: This study investigated the role of hydrology, soils, and trampling in determining the distribution of vegetation in an isolated wetland from 1996 to 1999. Grassy Pond, in Litchfield, New Hampshire, is a seasonally flooded basin marsh situated in sandy soils. It is a depressional wetland consisting of three connected basins; it has no surface-water inlets or outlets. This acidic, low-nutrient wetland contains several rare species and represents an uncommon ecosystem type in New England. A network of wells and piezometers monitored from 1996 to 1999 established that the wetland receives an average of 95.4% of its growing season inputs from precipitation and the rest from shallow ground water flowing through the wetland; as a result, it experiences large fluctuations in water levels. Vegetation in the wetland fell into five major elevation zones. Variation in plant diversity within each zone, and differences between adjacent zones, result in part from differences in depth of organic layer, trampling by hikers, all-terrain vehicles, and native wildlife, and the extent of water-level fluctuations. Several of the low basin species are more likely to be found in trampled areas. Shrub invasion of the open basin areas is prevented by trampling in some areas and by high water levels in others. Variability in hydrology resulted in temporal, as well as spatial, variability in the plant community, as dry years yielded significantly greater diversity, including a large increase in tree seedlings. Both hydrologic variability and trampling are external factors that explain a significant portion of the variation in vegetation on a large scale and connect this geographically isolated wetland to the surrounding landscape. On a smaller scale, however, autogenic forces related to soil formation and plant species interactions may be more important in explaining the plant diversity in the wetland.

416: T. Koottatep, N. Surinkul, C. Polprasert, A. S. M. Kamal, D. Kone, A. Montangero, U. Heinss and M. Strauss,. 2005. Treatment of septage in constructed wetlands in tropical climate: lessons learnt from seven years of operation. Water Science and Technology 9(51): 119-126.

Abstract: In tropical regions, where most of the developing countries are located, septic tanks and other onsite sanitation systems are the predominant form of storage and pre-treatment of excreta and wastewater, generating septage and other types of sludges. The septage is disposed of untreated, mainly due to lack of CID affordable treatment options. This study presents lessons that have been learned from the operation of pilot-scale constructed wetlands (CWs) for septage treatment since 1997. The experiments have been conducted by using three CW units planted with narrow-leave cattails (*Typha augustitolia*) and operating in a vertical-flow mode. Based on the experimental results, it can be suggested that the optimum solids loading rate be 250 kg TS/m² yr and 6-day percolate impoundment. At these operational conditions, the removal efficiencies of CW units treating septage at the range of 80-96% for COD, TS and TKN were achieved. The biosolid accumulated on the CW units to a depth of 80 cm has never been removed during 7 years of CID operation, but bed permeability remained unimpaired. The biosolid contains viable helminth eggs below critical limit of sludge quality standards for agricultural use. Subject to local conditions, the suggested operational criteria should be reassessed at the full-scale implementation.

417: E. A. Korkusuz, M. Beklioglu and G. N. Demirer,. 2005. Comparison of the treatment performances of blast furnace slag-based and gravel-based vertical flow wetlands operated identically for domestic wastewater treatment in Turkey. Ecological Engineering 3(24): 187-200.

Abstract: In 2001, to foster the practical development of constructed wetlands (CWs) used for domestic wastewater treatment in Turkey, vertical subsurface flow constructed wetlands (30 m² of each) were implemented on the campus of the METU, Ankara, Turkey. The main objective of the research was to quantify the effect of different filter media on the treatment performance of vertical flow wetlands in the prevailing climate of Ankara. Thus, a gravel-filled wetland and a blast furnace granulated iron slag-filled wetland were operated identically with primarily treated domestic wastewater (3 m³ d⁻¹) at a hydraulic loading rate of 0.100 m d⁻¹, intermittently. Both of the wetland cells were planted with *Phragmites australis*. According to the first year results, average removal efficiencies for the slag and gravel wetland cells were as follows: total suspended solids (TSS) (63% and 59%) chemical oxygen demand (COD) (47% and 44%), NH₄⁺-N (88% and 53%) total nitrogen (TN) (44% and 39%), PO₄³⁻-P (44% and 1%) and total phosphorus (TP) (45% and 4%). The treatment performances of the slag-filled wetland were better than that of the gravel-filled wetland in terms of removal of phosphorus and production of nitrate. Since this study was a pioneer for implementation of subsurface constructed wetlands in Turkey using local sources, it has proved that this eco-technology could also be used effectively for water quality enhancement in Turkey. 2004 Elsevier B.V. All rights reserved.

418: R. Kornijow, K. Vakkilainen, J. Horppila, E. Luokkanen and T. Kairesalo,. 2005. Impacts of a submerged plant (*Elodea canadensis*) on interactions between roach (*Rutilus rutilus*) and its invertebrate prey communities in a lake littoral zone. *Freshwater Biology* 2(50): 262-276.

Abstract: 1. Using 5-m² field enclosures, we examined the effects of *Elodea canadensis* on zooplankton communities and on the trophic cascade caused by 4-5 year old (approximately 16 cm) roach. We also tested the hypothesis that roach in *Elodea* beds use variable food resources as their diet, mainly benthic and epiphytic macroinvertebrates, and feed less efficiently on zooplankton. Switching of the prey preference stabilises the zooplankton community and, in turn, also the fluctuation of algal biomass. The factorial design of the experiment included three levels of *Elodea* (no-, sparse- and dense-*Elodea*) and two levels of fish (present and absent). 2. During the 4-week experiment, the total biomass of euplanktonic zooplankton, especially that of the dominant cladoceran *Daphnia longispina*, decreased with increase in *Elodea* density. The *Daphnia* biomass was also reduced by roach in all the *Elodea* treatments. Thus, *Elodea* provided neither a favourable habitat nor a good refuge for *Daphnia* against predation by roach. 3. The electivity of roach for cladocerans was high in all the *Elodea* treatments. Roach were able to prey on cladocerans in *Elodea* beds, even when the abundance and size of these prey animals were low. In addition to cladocerans, the diet of roach consisted of macroinvertebrates and detrital/plant material. Although the biomass of macroinvertebrates increased during the experiment in all *Elodea* treatments, they were relatively unimportant in roach diets regardless of the density of *Elodea* beds. 4. Euplanktonic zooplankton species other than *Daphnia* were not affected by *Elodea* or fish and the treatments had no effects on the total clearance rate of euplanktonic zooplankton. However, the chlorophyll a concentration increased with fish in all the *Elodea* treatments, suggesting that fish enhanced algal growth through regeneration of nutrients. Thus, our results did not unequivocally show that *Elodea* hampered the trophic cascade of fish via lowered predation on grazing zoopl

419: I. Kostrzewska-Szlakowska,. 2005. Surface microlayer in lakes of different trophic status: Dissolved organic matter and microbial community. Polish Journal of Ecology 3(53): 343-351.

Abstract: The aim of this paper was to recognize the abundance and frequency of occurrence of neustonic organisms (i.e. bacteria and algae) and accumulation of organic matter in the surface microlayer of three lakes of various trophic status. Water samples of surface microlayer (0.5-0.6 mm) were taken (with Larsson plate) as well as from respective epilimnion layer (0.5 m deep). The samples were collected from shallow, humic (Sphagnum bog) lake (L. Flosek), shallow, eutrophic (L. Zelwazek) and deeper, mesotrophic lake (L. Kuc) in the period May-October during several years. The ratio of the organisms' density in the surface microlayer to that in deeper (0.5 m) layer was considered as the enrichment factor (Ef). Heterotrophic bacteria accumulation in the surface microlayer was more frequent in the humic lake (75% of samples), than in meso- and eutrophic lakes (64%). Mean Ef values for bacteria ranged from 1.3 to 1.4. Frequent, but not strong accumulation of dissolved organic matter measured as the absorbance A₂₅₄ was noted in the surface microlayer. Dissolved organic carbon (DOC) measured in automatic analyzer showed much stronger accumulation in microlayer, particularly in humic lake. Concentration of chlorophyll a in the surface microlayer was found as the most fluctuating and the highest mean Ef value was found in the mesotrophic lake (Ef = 6.3). An attempt was undertaken to explain these differences between the lakes in terms of variable ratio between allochthonous and autochthonous production in humic, mesotrophic and eutrophic lakes.

420: M. E. Kotti, A. G. Vlessidis, N. C. Thanasoulas and N. P. Evmiridis,. 2005. Assessment of river water quality in Northwestern Greece. Water Resources Management 1(19): 77-94.

Abstract: The effect of land use patterns on river water quality was studied in three different river basins located in Epirus, Northwestern Greece. Studies were conducted from October 2000 to September 2001. During this period, the parameters chemical oxygen demand (COD), biological oxygen demand (BOD), NO₂⁻, NO₃⁻, NH₄⁺ and PO₄³⁻ were measured, employing standard methods of analysis. The results were subjected to principal component analysis (PCA) for the estimation of the underlying variable correlations and were further explored by means of cluster analysis. The values of the above parameters were also compared with those awkward in the Fresh Water Fisheries Directive (78/659/EEC). It was found that the phosphate content was much higher than the upper limiting criteria for eutrophication for salmonid waters, whereas nitrate levels were lower than the permissible criteria according to the Nitrates Directive 91/676/EEC for drinking water. The inorganic nutrient load was mostly attributed to sites that drain agricultural areas, especially during winter and spring. The organic matter was due to urban activities during autumn.

421: A. A. Koutinas, R. H. Wang and C. Webb,. 2005. Development of a process for the production of nutrient supplements for fermentations based on fungal autolysis. *Enzyme and Microbial Technology* 5-6(36): 629-638.

Abstract: This study verifies the potential of fungal autolysis as an alternative process for the production of nutrient-rich solutions similar to yeast extracts. Autolytic experiments were carried out on fermentation solids derived from either batch or continuous submerged cultivations of *Aspergillus awamori* on various wheat flour milling streams. The degree of autolysis was not affected by the pH range used (3-6.5), whereas it was severely affected by temperature (30-55 degrees C), initial solids concentration (10-45 g/L) and incubation time. The enzymatic disruption of the fungal cell wall was identified by image analysis as well as by the reduction in total dry weight and the gradual release of various components, such as free amino nitrogen and phosphorus. The novel method of autolysate recycling enabled the enrichment of the solution with lytic enzymes leading to increased fungal cell degradation rates. In this way, it was made possible to reduce the initial total dry weight by 47% and produce a nutrient-rich solution containing 1.6 g/L free amino nitrogen, 5.3g/L total nitrogen and 0.5g/L phosphorus. (c) 2004 Elsevier Inc. All rights reserved.

422: A. Koyama, K. Kavanagh and A. Robinson,. 2005. Marine nitrogen in central Idaho riparian forests: evidence from stable isotopes. Canadian Journal of Fisheries and Aquatic Sciences 3(62): 518-526.

Abstract: Terrestrial and marine ecosystems are linked by the annual migration of salmonids. We examined the contribution of anadromous fish to foliar nitrogen (N) in central Idaho riparian forests where anadromous fish have been in sharp decline for approximately 30 years. To determine if the amount of N from anadromous fish carcasses can be assessed from conifer foliage, we fertilized seedlings with varying proportions of N from marine sources and analyzed their foliar N-15/N-14 ratio ($\delta(15)\text{N}$). Also, to evaluate whether N obtained from marine sources was evident in riparian forests, we analyzed the $\delta(15)\text{N}$ of conifer foliage, above and below waterfalls, along historically salmon-bearing and non-salmon-bearing streams and rivers in central Idaho. In the seedling study, the amount of marine N was positively correlated with foliar $\delta(15)\text{N}$. Furthermore, we determined that foliar $\delta(15)\text{N}$ values in riparian forests were explained by the historical occurrence of salmon. Foliar $\delta(15)\text{N}$ declined significantly from bankside to upslope trees in transects along salmon-bearing streams and rivers, whereas there was no significant gradient along transects perpendicular to non-salmon-bearing reaches. We therefore conclude that marine nutrient sources have historically contributed to the N pool in riparian conifer forests and marine N persisted following 30 years of severe populations declines.

423: K. W. Krauss, T. W. Doyle, R. R. Twilley, T. J. Smith, K. R. T. Whelan and J. K. Sullivan,. 2005. Woody debris in the mangrove forests of South Florida. *Biotropica* 1(37): 9-15.

Abstract: Woody debris is abundant in hurricane-impacted forests. With a major hurricane affecting South Florida mangroves approximately every 20 yr, carbon storage and nutrient retention may be influenced greatly by woody debris dynamics. In addition, woody debris can influence seedling regeneration in mangrove swamps by trapping propagules and enhancing seedling growth potential. Here, we report on line-intercept wood), debris surveys conducted in mangrove wetlands of South Florida 9-10 yr after the passage of Hurricane Andrew. The total volume of woody debris for all sites combined was estimated at 67 m³/ha and varied from 13 to 181 m³/ha depending upon differences in forest height, proximity to the storm, and maximum estimated wind velocities. Large volumes of woody debris were found in the eyewall region of the hurricane, with a volume of 132 m³/ha and a projected woody debris biomass of approximately 36 t/ha. Approximately half of the woody debris biomass averaged across all sites was associated as small twigs and branches (fine woody debris), since coarse woody debris > 7.5 cm diameter was fairly well decomposed. Much of the small debris is likely to be associated with post-hurricane forest dynamics. Hurricanes are responsible for large amounts of damage to mangrove ecosystems, and components of associated downed wood may provide a relative index of disturbance for mangrove forests. Here, we suggest that a fine:coarse woody debris ratio < 0.5 is suggestive of a recent disturbance in mangrove wetlands, although additional research is needed to corroborate such findings.

424: V. Krivtsov, E. G. Bellinger and D. C. Sigee,. 2005. Elemental composition of *Microcystis aeruginosa* under conditions of lake nutrient depletion. *Aquatic Ecology* 2(39): 123-134.

Abstract: Electron probe X-ray microanalysis (XRMA) was used to determine the elemental composition of the blue-green alga, *Microcystis aeruginosa*, in a stratified freshwater lake during the late summer. Colonies of this alga were initially observed in mid-July, at a time when phosphorus concentration in the lake water had decreased to minimal levels (total P 0.04 mg l⁻¹). The P quota of these cells was high (mean concentration 132 mmol kg⁻¹ dry weight) with a cell P to lake water P concentration ratio of 10(5). The elemental concentrations of *Microcystis* remained relatively stable throughout the sampling period (July-September), with mean cell concentrations of Mg, P, S and Ca showing no significant changes. Mean elemental ratios and the ratio of monovalent/divalent cations were also relatively constant (SE < 10% mean). The pattern of cell elemental associations, determined by Factor and Pearson correlation analysis, was consistent throughout - with Mg, P, K and S forming a core tetrad of inter-correlated elements. The relative constancy of cell composition seen in *Microcystis* would be expected of an alga with a K-selection strategy. The continued high P quota over a period of nutrient depletion in lake water is consistent with the ability of this alga to sink to nutrient-rich lower regions of the water column.

425: R. Kroger and K. H. Rogers,. 2005. Roan (*Hippotragus equinus*) population decline in Kruger National Park, South Africa: influence of a wetland boundary. *European Journal of Wildlife Research* 1(51): 25-30.

Abstract: Effective management of grazers requires understanding of the mechanisms influencing population declines. Roan antelope, a specialist grazer, has declined in population numbers within Kruger National Park, South Africa. The most widely accepted hypothesis is that habitat deterioration throughout the entire northern plains landscape is responsible for declines in this species. Observations suggest, however, that on the northern plains of Kruger National Park, roan antelope grazes at the boundary between ephemeral wetland and the savanna matrix. The boundary is characterized by nutrient-rich soil and forage, and thus attracts grazing from both generalist and specialist species. We hypothesize that competition for resources at this ecotone, and not at other places in the landscape, is responsible for the observed declines in roan antelope. Changing management strategies to be more cognizant of patchiness and savanna heterogeneity, i.e. more spatially informed, will improve the likelihood that management will result in increasing roan population numbers.

426: B. Kronvang, M. Bechmann, H. Lundekvam, H. Behrendt, G. H. Rubaek, O. F. Schoumans, N. Syversen, H. E. Andersen and C. C. Hoffmann,. 2005. Phosphorus losses from agricultural areas in river basins: Effects and uncertainties of targeted mitigation measures. *Journal of Environmental Quality* 6(34): 2129-2144.

Abstract: In this paper we show the quantitative and relative importance of phosphorus (P) losses from agricultural areas within European river basins and demonstrate the importance of P pathways, linking agricultural source areas to surface water at different scales. Agricultural P losses are increasingly important for the P concentration in most European rivers, lakes, and estuaries, even though the quantity of P lost from agricultural areas in European catchments varies at least one order of magnitude ($< 0.2 \text{ kg P ha}^{-1}$ to $> 2.1 \text{ kg P ha}^{-1}$). We focus on the importance of P for the implementation of the EU Water Framework Directive and discuss the benefits, uncertainties, and side effects of the different targeted mitigation measures that can be adopted to combat P losses from agricultural areas in river basins. Experimental evidence of the effects of some of the main targeted mitigation measures hitherto implemented is demonstrated, including: (i) soil tillage changes, (ii) treatment of soils near ditches and streams with iron to reduce P transport from source areas to surface waters, (iii) establishment of buffer zones for retaining P from surface runoff, (iv) restoration of river-floodplain systems to allow natural inundation of riparian areas and deposition of P, and (v) inundation of riparian areas with tile drainage water for P retention. Furthermore, we show how river basin managers can map and analyze the extent and importance of P risk areas, exemplified by four catchments differing in size in Norway, Denmark, and the Netherlands. Finally, we discuss the factors and mechanisms that may delay and/or counteract the responses of mitigation measures for combating P losses from agricultural areas when monitored at the catchment scale.

427: B. Kronvang, E. Jeppesen, D. J. Conley, M. Sondergaard, S. E. Larsen, N. B. Ovesen and J. Carstensen,. 2005. Nutrient pressures and ecological responses to nutrient loading reductions in Danish streams, lakes and coastal waters. Journal of Hydrology 1-4(304): 274-288.

Abstract: The Danish National Aquatic Monitoring and Assessment Programme (NOVA) was launched in 1988 following the adoption of the first Danish Action Plan on the Aquatic Environment in 1987 with the aim to reduce by 50% the nitrogen (N) loading and by 80% the phosphorus (P) loading to the aquatic environment. The 14 years of experience gathered from NOVA have shown that discharges of total N (TN) and P (TP) from point sources to the Danish Aquatic Environment have been reduced by 69% (N) and 82% (P) during the period 1989-2002. Consequently, the P concentration has decreased markedly in most Danish lakes and estuaries. Considerable changes in agricultural practice have resulted in a reduction of the net N-surplus from 136 to 88 kg N ha⁻¹ yr⁻¹ (41%) and the net P-surplus from 19 to 11 kg P ha⁻¹ yr⁻¹ (42%) during the period 1985-2002. Despite these efforts Danish agriculture is today the major source of both N (> 80%) and P (> 50%) in Danish streams, lakes and coastal waters. A non-parametric statistical trend analysis of TN concentrations in streams draining dominantly agricultural catchments has shown a significant ($p < 0.05$) downward trend in 48 streams with the downward trend being stronger in loamy compared to sandy catchments, and more pronounced with increasing dominance of agricultural exploitation in the catchments. In contrast, a statistical trend analysis of TP concentrations in streams draining agricultural catchments did not reveal any significant trends. The large reduction in nutrient loading from point and non-point sources has in general improved the ecological conditions of Danish lakes in the form of increased summer Secchi depth, decreased chlorophyll a and reduced phytoplankton biomass. Major changes have also occurred in the fish communities in lakes, with positive cascading effects on water quality. In Danish estuaries and coastal waters only a few significant improvements in the ecological quality have been observed, although it is expected tha

428: K. Kujawa-Roeleveld, T. Fernandes, Y. Wiryawan, A. Tawfik, W. Visser and G. Zeeman,. 2005. Performance of UASB septic tank for treatment of concentrated black water within DESAR concept. Water Science and Technology 1-2(52): 307-313.

Abstract: Separation of wastewater streams produced in households according to their origin, degree of pollution and affinity to a specific treatment constitutes a starting point in the DESAR concept (decentralised sanitation and reuse). Concentrated black water and kitchen waste carry the highest load of organic matter and nutrients from all waste(water) streams generated from different human activities. Anaerobic digestion of concentrated black water is a core technology in the DESAR concept. The applicability of the UASB septic tank for treatment of concentrated black water was investigated under two different temperatures, 15 and 25 degrees C. The removal of total COD was dependent on the operational temperature and attained 61 and 74% respectively. A high removal of the suspended COD of 88 and 94% respectively was measured. Effluent nutrients were mainly in the soluble form. Precipitation of phosphate was observed. Effective sludge/water separation, long HRT and higher operational temperature contributed to a reduction of E coli. Based on standards there is little risk of contamination with heavy metals when treated effluent is to be applied in agriculture as fertiliser.

429: I. Kurz, H. Tunney and C. E. Coxon,. 2005. The impact off agricultural management practices an nutrient bosses to water: data on the effects of soil drainage characteristics. Water Science and Technology 3-4(51): 73-81.

Abstract: Against the background of increasing nutrient concentrations in Irish water bodies, this study set out to gain information on the potential of agricultural grassland to lose nutrients to water. Overland flow, flow from artificial subsurface drains and stream flow were gauged and sampled during heavy rainfall events. Dissolved reactive phosphorus (DRP), potassium (K), total ammonia (TA), and total oxidised nitrogen (TON) were measured in water samples. When the nutrient concentrations in water were examined in relation to the grassland management practices of the study catchments it emerged that soil P levels, the application of organic and inorganic fertilisers before heavy rainfall and the presence of grazing animals could all influence nutrient concentrations in surface and subsurface drainage water. Overall, the drainage characteristics of soil were found to have a considerable influence on the potential of land to lose nutrients to water.

430: V. Kuusemets and K. Lohmus,. 2005. Nitrogen and phosphorus accumulation and biomass production by *Scirpus sylvaticus* and *Phragmites australis* in a horizontal subsurface flow constructed wetland. Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering 6-7(40): 1167-1175.

Abstract: We studied plant biomass production and nutrient accumulation by wood club-rush (*Scirpus sylvaticus*) and reed (*Phragmites australis*) in a horizontal subsurface flow constructed wetland in 2001 and 2002. The wetland consists of two beds, one with dry and another with wetter conditions. From both beds, 5 above-ground, below-ground, and litter samples were taken in the summer, during the maximum flowering period of the dominant species. The average dry biomass of whole plant and litter was considerable higher in 2002 (3071 g m⁻²) than in 2001 (620 g m⁻²) due to the climatic conditions. The average dry weight biomass of 5 plots in 2001 was 513 g m⁻² in the dry bed and 729 g m⁻² in the wet bed. In 2002 these values were 2,520 and 3,765, respectively. Variations in biomasses will also appear in values for nutrient accumulation, in all cases the N and P accumulation was higher in 2002. The average nitrogen accumulation by plants was 16.6 g m⁻² in the wet and 10.7 g m⁻² in the dry bed in 2001, and 51.7 and 83.5 g m⁻² in 2002 respectively. Phosphorus accumulation was higher in the wet bed during 2001-2.8 g m⁻², in the dry bed this value was 1.9 g m⁻². In 2002, the phosphorus accumulation was higher in the dry bed-12.8 g m⁻², in the wet bed it was 12.43 g m⁻². The total biomass at the same conditions in the wet bed was slightly higher in case of wood club-rush-765 g m⁻² in 2001 and 3846 g m⁻² in 2002, same values for reed were 674 g m⁻² and 3,646, respectively.

431: J. Kyambadde, F. Kansiime and G. Dalhammar,. 2005. Nitrogen and phosphorus removal in substrate-free pilot constructed wetlands with horizontal surface flow in Uganda. Water Air and Soil Pollution 1-4(165): 37-59.

Abstract: In constructed wetlands (CWs) with horizontal sub-surface flow, nutrient removal, especially phosphorus, is limited because the root biomass fills the pore spaces of the substrate (usually gravel), directing wastewater flow to deeper wetland media; plants are not regularly harvested; the litter formed by decomposing vegetation remains on the surface of the substrate and thus does not interact with the wastewater; and the substrate media often used provide only limited adsorption. Effective nutrient removal including rootzone oxidation, adsorption and plant uptake therefore requires sufficient interaction of wastewater with the treatment media. We assessed the feasibility of biological nutrient removal from wastewater using substrate-free CWs with horizontal flow, planted with two tropical macrophytes namely, *Cyperus papyrus* and *Miscanthidium violaceum*. The objectives were to evaluate the system treatment efficiency under semi-natural conditions, and to assess microbial and plant biomass contributions to nutrient removal in the CWs. Results showed high removal efficiencies for biochemical oxygen demand, ammonium-nitrogen (NH₄-N) and phosphorus (P) fractions in papyrus-based CWs (68.6-86.5%) compared to *Miscanthidium* (46.7-61.1%) and unplanted controls (31.6-54.3%). Ammonium oxidizing bacteria in CW root-mats (10(8)-10(9) cells/gram dry weight) and residual nitrite and nitrate concentrations in the water phase indicated active system nitrification. Papyrus showed higher biomass production and nutrient uptake, contributing 28.5% and 11.2%, respectively, of the total N and P removed by the system compared to 15% N and 9.3% P removed by *Miscanthidium* plants. Compared to literature values, nitrification, plant uptake and the overall system treatment efficiency were high, indicating a high potential of this system for biological nutrient removal from wastewaters in the tropics.

432: R. Laane,. 2005. Applying the critical load concept to the nitrogen load of the river Rhine to the Dutch coastal zone. Estuarine Coastal and Shelf Science 3(62): 487-493.

Abstract: To reduce negative impacts on the aquatic environment, policymakers in various countries have agreed to reduce the emission load. The goal is a nearly zero emission for man-made synthetic substances and near background value emission for natural occurring substances. Remarkable is the fact that this policy is much stricter and pronounced than the international policy for acidification. To manage the acidification problem the critical load concept was developed. This concept is not aimed at a nearly zero reduction, but is based on the idea that a certain load is acceptable. It takes into account the buffer capacity of bedrocks, soils and freshwater and the no-effect level on organisms of acidifying substances. Based on quality targets (background values and objectives) for nitrogen (in fresh and sea water) and policy measures (e.g. 50% reduction in the load between the years 1985 and 1995) the critical load concept is applied and discussed for the river Rhine and the associated Dutch coast. The annual average critical load for nitrogen in the river Rhine, based on the ecological objectives in the coastal zone, appeared to be smaller than the critical load calculated on the quality objective for the river Rhine: respectively, 79 and 97 ktonnes Na-1. The average near background load for riverine nitrogen to the coastal zone is 26 ktonnes Na-1. It is concluded that when the critical load concept is applied to the riverine loads of hazardous substances there must be first of all a harmonization in ecological objectives in the whole catchment continuum and the associated coastal zone. (C) 2004 Elsevier Ltd. All rights reserved.

433: J. F. LaBounty and N. M. Burns,. 2005. Characterization of boulder basin, Lake Mead, Nevada-Arizona, USA - Based on analysis of 34 limnological parameters. Lake and Reservoir Management 3(21): 277-307.

Abstract: Lake Mead is a 66,000 ha-deep subtropical reservoir located on the Colorado River, Nevada-Arizona. This largest U.S. reservoir by volume is limnologically complex with four inflows, three basins, plus variable seasonal and annual operational patterns. This investigation is about the most downstream basin, Boulder Basin. Thirty-four measured parameters are used to describe limnological conditions of Boulder Basin, including Las Vegas Bay, from 1990-2004. Some assessments use data sets from May 2000 to April 2004; other assessments use more extensive data sets spanning up to 14 years of records. Selected parameters, trends, basic and reservoir-specific processes, and limnologically important relationships are illustrated and discussed. Boulder Basin is well stratified and ecologically complex due to the existence of two interflows. A super- to mesotrophic gradient exists from the nutrient rich inner basin, which has inflow from an urban tributary, to the middle and outer basins, which become progressively less productive. Secchi depth increases, chlorophyll (Chl a), plankton abundance, conductivity and total organic carbon (TOC) decrease going from the inner to outer basins. Lake Mead is strongly phosphorus (P)-limited and subject to a variety of algae blooms that depend on the presence and amounts of phosphorus. Due to ecological complexity, managing this resource is difficult and fraught with risk when conditions change. Along with the changing hydrologic conditions of the watershed that heavily influence Lake Mead, man-made products and toxin-producing algae are being introduced that need monitoring and management.

434: P. Lacoul and B. Freedman,. 2005. Physical and chemical limnology of 34 lentic waterbodies along a tropical-to-alpine altitudinal gradient in Nepal. International Review of Hydrobiology 3(90): 254-276.

Abstract: Physical and chemical factors were studied in 34 lentic waterbodies distributed along a steep altitudinal gradient ranging from tropical (77 m) to high alpine (up to 4,980 m) environments in Nepal. Bicarbonate and calcium were dominant among anions and cations, respectively, reflecting a strong influence of carbonate weathering and watershed area, rather than altitudinal climate. The relative patterns of dominant ions were similar among lakes in all altitudinal regions, although total concentrations increased with decreasing altitude. Total suspended solids were relatively high in the study lakes, as is also typical of rivers in the Ganges watershed. Suspended solids had a greater influence on water transparency than did algal biomass in the study lakes. In general, high-altitude waterbodies were oligotrophic, while those at low altitude were eutrophic. The productivity of high-altitude study lakes appeared to be limited by both available phosphorus and nitrogen, while lowland ones were nitrogen-limited.

435: C. Ladd, G. L. Hunt, C. W. Mordy, S. A. Salo and P. J. Stabenog, 2005. Marine environment of the eastern and central Aleutian Islands. Fisheries Oceanography (14): 22-38.

Abstract: To examine the marine habitat of the endangered western stock of the Steller's sea lion (*Eumetopias jubatus*), two interdisciplinary research cruises (June 2001 and May to June 2002) measured water properties in the eastern and central Aleutian Passes. Unimak, Akutan, Amukta, and Seguam Passes were sampled in both years, and three additional passes (Umnak, Samalga, and Tanaga) were sampled in 2002. In the North Pacific (and to a lesser extent in the Bering Sea), a strong front in water properties was observed near Samalga Pass in June of both years, with significantly warmer, fresher, and more nitrate-poor water east of Samalga Pass than west of the pass. These water properties reflect differences in source waters (Alaska Coastal Current versus Alaskan Stream), mixing depth, and Bering Sea influence. Strong cross-Aleutian gradients were also observed with warmer, fresher water on the North Pacific side of the archipelago. The nutrient content of the waters flowing through the passes, combined with the effects of mixing within the passes, influences the transport of nutrients into the Bering Sea. As water moves away from the strong mixing of the passes and becomes more stratified, phytoplankton can take advantage of the enhanced nutrient concentrations. Thus, the northern side of the Aleutian Islands (especially in the lee of the islands) appears to be more productive. Combined with evidence of coincident changes in many ecosystem parameters near Samalga Pass, it is hypothesized that Samalga Pass forms a physical and biogeographic boundary between the eastern and central Aleutian marine ecosystems.

436: C. Ladd, P. Stabeno and E. D. Cokelet,. 2005. A note on cross-shelf exchange in the northern Gulf of Alaska. Deep-Sea Research Part II-Topical Studies in Oceanography 5-6(52): 667-679.

Abstract: The continental shelf of the Gulf of Alaska (GOA) is a complex system characterized by large freshwater runoff and strong winds. The GOA Supports one of the world's richest ecosystems, including numerous species of fishes, marine mammals and sea birds. The mechanisms that provide nutrients to Support this ecosystem are not well understood. The rivers and streams that provide freshwater to the shelf are low in nitrate, and the regional winds favor downwelling. High concentrations of nitrate Lire available in the deep basin of the GOA, but these must be introduced to the shelf in order to Support the high productivity. We present evidence for cross-shelf exchange Clue to three different mechanisms. Episodes of downwelling relaxation result in a flux of saline, nutrient-rich water onto the shelf at depth. Eddies, formed in the northeastern GOA, propagate along the shelf-break influences cross-shelf exchange by carrying shelf-origin water from the formation region into the basin and by interacting with the shelf-break Circulation. Bathymetric steering in the many canyons that incise the GOA shelf results in flow into the canyons where strong tidal mixing results in cross-isobath movement of water properties. (c) 2005 Elsevier Ltd. All rights reserved.

437: G. Langergraber,. 2005. The role of plant uptake on the removal of organic matter and nutrients in subsurface flow constructed wetlands: a simulation study. Water Science and Technology 9(51): 213-223.

Abstract: Plants in constructed wetlands have several functions related to the treatment processes, It is generally agreed that nutrient uptake is a minor factor in constructed wetlands treating wastewater compared to the loadings applied. For low loaded systems plant uptake can contribute a significant amount to nutrient removal. The contribution of plant uptake is simulated for different qualities of water to be treated using the multi-component reactive transport module CW2D. CW2D is able to describe the biochemical elimination and transformation processes for organic matter, nitrogen and phosphorus in subsurface flow constructed wetlands, The model for plant uptake implemented describes nutrient uptake coupled to water uptake. Literature values are used to calculate potential water and nutrient uptake rates. For a constructed wetland treating municipal wastewater a potential nutrient uptake of about 1.9% of the influent nitrogen and phosphorus load can be expected. For lower loaded systems the potential uptake is significantly higher, e.g. 46% of the nitrogen load for treatment of greywater. The potential uptake rates could only be simulated for high loaded systems i.e. constructed wetlands treating wastewater. For low loaded systems the nutrient concentrations in the liquid phase were too low to simulate the potential uptake rates using the implemented model for plant uptake.

438: G. Langergraber and E. Muellegger,. 2005. Ecological Sanitation - a way to solve global sanitation problems?.
Environment International 3(31): 433-444.

Abstract: Today about 2.4 billion people in rural and urban areas do not have access to adequate sanitation services. Within 20 years, it is expected that an additional 2 billion will live in towns and cities, mainly in developing countries, demanding sanitation. Still over 90% of sewage in developing countries is discharged untreated, polluting rivers, lakes and coastal areas. Conventional sanitation concepts, based on flush toilets, a water wasting technology, are neither an ecological nor economical solution in both industrialized and developing countries. The water-based sewage systems were designed and built on the premises that human excreta are a waste; suitable only for disposal and that the environment is capable of assimilating this waste. A sanitation system that provides Ecological Sanitation (EcoSan) is a cycle-a sustainable, closed-loop system, which closes the gap between sanitation and agriculture. The EcoSan approach is resource minded and represents a holistic concept towards ecologically and economically sound sanitation. The underlying aim is to close (local) nutrient and water cycles with as less expenditure on material and energy as possible to contribute to a sustainable development. Human excreta are treated as a resource and are usually processed on-site and then treated off-site. The nutrients contained in excreta are then recycled by using them, e.g., in agriculture. EcoSan is a systemic approach and an attitude; single technologies are only means to an end and may range from near-natural wastewater treatment techniques to compost toilets, simple household installations to complex, mainly decentralised systems. These technologies are not ecological per se but only in relation to the observed environment. They are picked from the whole range of available conventional, modern and traditional technical options, combining them to EcoSan systems. The paper presents an introduction to EcoSan principles and concepts including re-use aspects (available nutri

439: G. Langergraber and J. Simunek,. 2005. Modeling variably saturated water flow and multicomponent reactive transport in constructed wetlands. Vadose Zone Journal 4(4): 924-938.

Abstract: Constructed wetlands (CWs) are becoming increasingly popular worldwide for removing organic matter (OM), nutrients, trace elements, pathogens, or other pollutants from wastewater and/ or runoff We present a multicomponent reactive transport model CW2D (i.e., Constructed Wetlands 2D), as an extension of the HYDRUS-2D saturated water flow and solute transport software package. CW2D was developed to model the biochemical transformation and degradation processes in subsurface-flow CWs. Such wetlands involve a complex mixture of water, substrate, plants, litter, and a variety of microorganisms to provide optimal conditions for improving water quality. The water flow regime in subsurface-flow CWs can be highly dynamic and requires the use of a transient variably saturated flow model. The biochemical components defined in CW2D include dissolved oxygen (DO), three fractions of OM (readily and slowly biodegradable, and inert), four N compounds (ammonium, nitrite, nitrate, dinitrogen), inorganic P, and heterotrophic and autotrophic microorganisms. Organic N and organic P were modeled as part of the OM. The biochemical degradation and transformation processes were based on Monod-type rate expressions. All process rates and diffusion coefficients were assumed to be temperature dependent. Heterotrophic bacteria were assumed to be responsible for hydrolysis, mineralization of OM (aerobic growth), and denitrification (anoxic growth). Autotrophic bacteria were assumed to be responsible for nitrification, which was modeled as a two-step process. Lysis was considered to be the sum of all decay and sink processes. We demonstrate the use of the model for one- and two-stage subsurface vertical flow CWs. Model simulations of water flow, tracer transport, and biochemical compounds are compared with experimental observations. Limitations of the model are discussed, and needs for model improvements are summarized.

440: J. H. Langwaldt, U. Munster and J. A. Puhakka,. 2005. Characterization and microbial utilization of dissolved organic carbon in groundwater contaminated with chlorophenols. Chemosphere 7(59): 983-996.

Abstract: The aim of this study was to characterize the labile part of dissolved organic carbon (DOC) present in groundwater by identification of natural organic carbon substrates and to assess their microbial utilization during aeration of the groundwater. The studied chlorophenol (CP) contaminated groundwater contained 60-2650 $\mu\text{mol l}^{-1}$ of DOC of which up to 98.0% were CPs; 1.7% were low-molecular weight organic acids and 0.2% were dissolved free amino acids. Traces of following natural organic carbon substrates were identified: L-alanine, L-isoleucine, L-leucine, L-serine, L-threonine, L-tyrosine, L-valine, L-aspartic, acetic, citric, formic, lactic, malic and oxalic acid. Dissolved oxygen concentration inside the CP-plume was lower (mean 25 $\mu\text{mol l}^{-1}$) than outside of the plume (mean 102 $\mu\text{mol l}^{-1}$). Over a monitoring period of four years the concentrations of CPs, Fe(II) and NH_4^+ were higher inside than outside of the CP-plume. Oxygen availability within the CP-plume limits in situ biological oxidation of CPs, DOC, NH_4^+ and Fe(II). The microbial enzymatic hydrolysis rates of 4-methylumbelliferyl and 7-amino-4-methylcoumarin-linked substrates varied from 0.01 to 52 $\mu\text{mol l}^{-1} \text{ h}^{-1}$ and was slightly higher inside than outside the plume. Microbial uptake rates of C-14-acetate, C-14-glucose and C-14-leucine were on average 28, 4 and 4 $\text{pmol l}^{-1} \text{ h}^{-1}$ outside and 17, 25 and 8 $\text{pmol l}^{-1} \text{ h}^{-1}$ inside the plume, respectively. The indigenous microorganisms were shown able of hydrolysis of dissolved organic matter, uptake and utilization of natural organic carbon substrates. Therefore, the labile part of DOC serves as a pool of secondary substrates beside the CP-contaminants in the groundwater and possibly help in sustaining the growth of CP-degrading bacteria. (c) 2004 Elsevier Ltd. All rights reserved.

441: S. P. Lawler and D. A. Dritz,. 2005. Straw and winter flooding benefit mosquitoes and other insects in a rice agroecosystem. *Ecological Applications* 6(15): 2052-2059.

Abstract: Rice fields are Widespread agroecosystems that provide wetland habitat for many species, including pests like mosquitoes and beneficial insects. They can be used as models to understand how basal resources affect food web dynamics in seasonal wetlands. Rice field management may also influence adjacent communities by affecting mosquitoes, wildlife, and air quality. Rice straw incorporation and winter flooding have become common methods used to prepare seedbeds, largely replacing burning of straw. These methods could affect aquatic insects, including mosquitoes, because they increase nutrient availability during the growing season. We studied 16 fields where straw was either. burned or incorporated into soil after the previous growing season; these treatments were crossed with either winter flooding or no winter flooding. Algae, mosquitoes, other herbivorous insects. and predatory insects all responded positively to one or both treatments that increased nutrients (straw incorporation and winter flooding). While the overall increase in insect production could benefit wildlife, mosquito abatement personnel may need to monitor unburned fields more closely. The issue of mosquito production adds to the complexity of agricultural and environmental concerns bearing on rice, field management. Straw incorporation and winter flooding reduce particulate pollutants caused by burning, reduce fertilizer needs, and increase densities of beneficial insects. However, these techniques may increase mosquitoes, methane production, and fungal diseases of rice. Further improvement of straw management practices could minimize these problems.

442: P. J. Leahy, J. Tibby, A. P. Kershaw, H. Heijnis and J. S. Kershaw,. 2005. The impact of European settlement on Bolin Billabong, a Yarra River floodplain lake, Melbourne, Australia. *River Research and Applications* 2-3(21): 131-149.

Abstract: Bolin Billabong is a shallow, eutrophic and turbid oxbow lake located on the lower Yarra River floodplain, in suburban Melbourne (Victoria, Australia). A combination of radiometric dating, historical data, fossil markers and mineral magnetics has been used to develop a sediment chronology for the billabong that extends from about AD 1120 to the present. Fossil pollen and diatoms have been used to provide a high-resolution record of vegetation and aquatic ecosystem change through this period, with the aim of developing a better understanding of human disturbance in floodplain lakes. Specifically we aim to investigate the development and trajectory of eutrophic and turbid conditions that exist in the lake at present. The pre-European contact diatom assemblage at Bolin Billabong is dominated by a planktonic taxon, *Cyclotella stelligera*, and had very low diversity, with little evidence of species turnover. This suggests that the billabong had low nutrient concentrations and contrasts with the generally accepted notion of billabongs as naturally diverse, productive and variable systems. The initial period of European occupation was characterized by catchment disturbance with high levels of erosion and sedimentation. Sedimentation rates in the post-European contact period appear to be 30 times higher than prior to European settlement. Evidence suggests that the Yarra River was not naturally turbid. Changes to the diatom assemblage, reflective of water quality perturbation following European contact, were dramatic and unprecedented. Following an initially high sedimentation rate in the post-European contact period, the sedimentation rate gradually slowed towards the present day. The increase in nutrients available to the diatom assemblage appears to have been moderate from European contact (C. AD 1840) to until around AD 1920, then more pronounced from this point onwards. Recent changes in the diatom assemblage at Bolin Billabong appear moderate compared with other regulat

443: V. A. Lee and T. B. Johnson,. 2005. Development of a bioenergetics model for the round goby (*Neogobius melanostomus*). *Journal of Great Lakes Research* 2(31): 125-134.

Abstract: The round goby (*Neogobius melanostomus*) was introduced into the Great Lakes in the 1990s through ballast water transfer. Gobies are potential vectors for material transfer between the benthic and pelagic zones. A bioenergetics model was developed for round gobies to enable us to quantify the flow of energy, contaminants, and nutrients from the benthos to pelagic fishes. Weight- and temperature-dependent coefficients for metabolism and consumption were derived. Food consumption increased with temperature up to 26 degrees C before sharply decreasing, and weight-specific consumption decreased with increasing fish weight (allometric coefficient = -0.256, SE = 0.160). Specific oxygen consumption was inversely related to body mass (allometric coefficient = -0.157, SE = 0.025) and increased exponentially with temperature. Estimated Q_{10} for respiration was 1.84. Additional parameters were obtained from the literature to describe specific dynamic action, egestion, excretion, and reproductive losses. The bioenergetics model explained growth of round gobies in Lake Erie and in their native range.

444: S. Lefebvre, P. Marmonier, G. Pinay, O. Bour, L. Aquilina and J. Baudry,. 2005. Nutrient dynamics in interstitial habitats of low-order rural streams with different bedrock geology. *Archiv Fur Hydrobiologie* 2(164): 169-191.

Abstract: We Studied water exchange, nutrient dynamics, and microbial activities between the Surface and interstitial habitats of six low-order streams with catchments dominated by agriculture during high and low water periods. In each stream, surface (open) water and interstitial water form downwelling and Upwelling zones were considered. Interstitial habitats of most streams acted as a sink for nitrate, but as a source for ammonium and soluble reactive phosphorus (SRP). The nitrate sink persisted in shallow sediments of downwelling zones, while the source of ammonium and SRP persisted in deeper sediments of upwelling zones, where organic matter was decomposed and microbial uptake was lower than the production of nutrients. Geology (granite versus schist substratum) was the main variable controlling the nutrient contents and the microbial activity within interstitial habitats due to varying sediment grain size and hydraulic properties. Schist streams had the finest sediment grain size and lowest hydrologic connectivity between Surface water and interstitial habitats, and had the highest potential microbial activities, especially for denitrification. Land-use of the catchments (percentage of forested area), channel morphology (river incision), and local characteristics of the benthic sediment (partial clogging) also influenced nutrient concentrations and microbial activities irrespectively of the geology of the catchment.

445: C. Legout, J. Molenat, S. Lefebvre, P. Marmonier and L. Aquilina,. 2005. Investigation of biogeochemical activities in the soil and unsaturated zone of weathered granite. *Biogeochemistry* 2(75): 329-350.

Abstract: This study, based on field and laboratory work, investigates the biogeochemical activity below the organic top soil horizons, particularly the potential for nitrate removal processes in the deep vadose zone (1-2.5 m depth) of a weathered granite. An experimental site located in the Kerbernez agricultural catchment (Brittany) has been equipped with ceramic cups from 0.5 to 2.5 m depth since November 2001. This arrangement allowed collection of water samples from the soil profile and the upper part of the unsaturated weathered granite. Samples were analysed twice a month for chloride, nitrate and sulphate concentrations over a period of 2.5 years. Laboratory measurements were carried out on three soil horizons and four weathered granite facies sampled in October 2003 for hydrolasic activity, potential nitrification, potential denitrification and batch experiments to study nutrient dynamics. Anion analyses in the field show that the nitrate and chloride concentrations were linearly correlated at each depth. The nitrate/chloride ratio decreased with depth in the upper part of the weathered granite from 4.93 to 2.82. This suggests that nitrate was removed during its vertical transport in the unsaturated zone. The laboratory experiments show that the bacterial activity decreased with depth. However, a significant potential for biogeochemical reactions exists below the organic soil layers. The denitrification rates obtained in the laboratory were significant, up to $800 \text{ ng N h}^{-1} \text{ g}^{-1}$ after about 100 h of incubation for the most reactive weathered granite facies. These rates agree with effective rates usually measured in riparian zones, but they were 50 times higher than those observed in the field. This difference suggests that the denitrification processes occurring in the field were spatially limited to localised anaerobic microsites, where the bacterial activities are controlled by the availability of N and C substrate. Finally, the laboratory measurements lead us to

446: M. Leira,. 2005. Diatom responses to Holocene environmental changes in a small lake in northwest Spain. Quaternary International (140): 90-102.

Abstract: The Holocene history of Lagoa Grande (1360m a.s.l; northwest Spain) has been investigated through the analyses of diatom remains found in a sediment core. Changes in the lake have been interpreted in terms both of climatic variability and major changes in the catchment area. The diatom record begins at about 9800 yr BP and exhibits three marked changes at 8200, 6000, 4200 and at 2600 yr BP, which are interpreted as responses to climatic changes detected by marine and other terrestrial palaeoclimatic records. The initial lake was shallow and Aulacoseira species characteristic of acidic and oligotrophic waters were dominant. The early Holocene is characterised by the presence of Aulacoseira ambigua, which suggests an increase in water depth and nutrient levels. Throughout the Holocene, diatom assemblages underwent several changes linked to fluctuating limnological conditions. These changes in lake characteristics coincide with the regional succession of vegetation, suggesting that climate forcing initiated these limnological changes. During the last 2000 years catchment processes appear to be the major factor controlling lake characteristics in Lagoa Grande site. Diatom responses reflected the progressive peatland development and growth of littoral vegetation in the lake, and not only a change in the regional environment. (c) 2005 Elsevier Ltd and INQUA. All rights reserved.

447: J. T. Lennon and L. E. Pfaff,. 2005. Source and supply of terrestrial organic matter affects aquatic microbial metabolism. *Aquatic Microbial Ecology* 2(39): 107-119.

Abstract: Aquatic ecosystems are connected to their surrounding watersheds through inputs of terrestrial-derived dissolved organic matter (DOM). The assimilation of this allochthonous resource by recipient bacterioplankton has consequences for food webs and the biogeochemistry of aquatic ecosystems. We used laboratory batch experiments to examine how variation in the source and supply (i.e. concentration) of DOM affects the productivity, respiration and growth efficiency of heterotrophic lake bacterioplankton. We created 6 different DOM sources from soils beneath near-monotypic tree stands in a temperate deciduous - coniferous forest. We then exposed freshwater microcosms containing a natural microbial community to a 1100 μ M supply gradient of each DOM source. Bacterial productivity (BP) and bacterial respiration (BR) increased linearly over the broad gradient, on average consuming 7% of the standing pool of dissolved organic carbon (DOC). Bacterial metabolism was also influenced by the chemical composition of the DOM source. Carbon-specific productivity declined exponentially with an increase in the carbon:phosphorus (C:P) ratio of the different DOM sources, consistent with the predictions of ecological stoichiometry. Together, our short-term laboratory experiments quantitatively describe the metabolic responses of freshwater bacterioplankton to variation in the supply of terrestrial-derived DOM. Furthermore, our results suggest that dissolved organic phosphorus (DOP) content, which may be linked to the identity of terrestrial vegetation, is indicative of DOM quality and influences the productivity of freshwater bacterioplankton.

448: J. A. Leonard and H. W. Paerl,. 2005. Zooplankton community structure, micro-zooplankton grazing impact, and seston energy content in the St. Johns river system, Florida as influenced by the toxic cyanobacterium *Cylindrospermopsis raciborskii*. *Hydrobiologia* (537): 89-97.

Abstract: Zooplankton can influence the phytoplankton community through preferential grazing. In turn, nuisance cyanobacteria may affect zooplankton community structure by allowing certain species to out-compete others. We examined zooplankton-phytoplankton interactions, micro-zooplankton (< 200 μ m) grazing, and biochemical components of the seston in the St. Johns River System (SJR), Florida in the presence and absence of the toxin-producing cyanobacterium *Cylindrospermopsis raciborskii*. We tested whether this cyanobacterium would cause a decrease in the size structure of the zooplankton community and postulated a resultant decline in the metabolic energy and carbon available to higher consumers (i.e. fish). When numbers of *C. raciborskii* were low or undetectable, zooplankton were more diverse and were comprised of larger species. Rotifers were the dominant zooplankton, and their numbers relative to other zooplankton increased as *C. raciborskii* concentrations increased. Micro-zooplankton grazing was higher in times of *C. raciborskii* abundance, suggesting competitive and predatory exclusion by larger zooplankton in times of higher phytoplankton diversity. Total caloric content of the seston was higher in times of *C. raciborskii* abundance. However, essential fatty acids and phosphorus may be lacking in the seston, or nutrients may potentially be sequestered by the cyanobacteria and remain as organic matter in the water column. In such cases, higher trophic levels would not be able to obtain optimal energy requirements. Overall, there was a greater impact of micrograzers on phytoplankton in the presence of *C. raciborskii* and apparent negative effects on the larger zooplankton species, suggesting a potential for changes in zooplankton and higher trophic level community structure.

449: S. N. Levine, R. F. Zehrer and C. W. Burns,. 2005. Impact of resuspended sediment on zooplankton feeding in Lake Waihola, New Zealand. *Freshwater Biology* 9(50): 1515-1536.

Abstract: 1. Wind-induced sediment resuspension in shallow lakes affects many physical and biological processes, including food gathering by zooplankton. The effects of suspended sediment on clearance rate were determined for a dominant cladoceran, *Daphnia carinata*, and calanoid copepod, *Boeckella hamata*, in Lake Waihola, New Zealand. 2. Animals were incubated at multiple densities for 4 days in lake water containing different amounts of suspended lake sediment. Rates of harvest of major food organisms were determined for each sediment level (turbidity) from changes in net growth rate with grazer density. 3. *Daphnia* cleared all food organisms 7-40 μ m in length at similar rates, but was less efficient in its removal of free bacteria, phytoplankton < 7 μ m, and large cyanobacterial filaments. Elevation of sediment turbidity from 2 to 10 nephelometric turbidity units (NTU) (63 mg DW L⁻¹ added sediment) reduced *Daphnia* clearance of phytoplankton, heterotrophic flagellates and ciliates by 72-100%, and of amoebae and attached bacteria by 21-44%. Further inhibition occurred at higher turbidity. 4. *Boeckella hamata* removed microzooplankton primarily, rather than phytoplankton. The rate at which it cleared rotifers was reduced by 56% when turbidity was increased from 2.5 to 100 NTU. 5. In the absence of macrozooplankton, algal growth increased with sediment turbidity, suggesting that sediment also inhibits rotifer grazing. 6. As mid-day turbidity in Lake Waihola is \geq 10 NTU about 40% of the time, sediment resuspension may play a major role in moderating energy flow and structuring pelagic communities in this lake.

450: J. Lewandowski, M. Schädach and M. Hupfer, 2005. Impact of macrozoobenthos on two-dimensional small-scale heterogeneity of pore water phosphorus concentrations: in-situ study in Lake Arendsee (Germany). *Hydrobiologia* (549): 43-55.

Abstract: An in-situ study was conducted in Lake Arendsee to study the influence of macrozoobenthos on pore water phosphate concentrations, and to investigate the importance of macrozoobenthos in causing small-scale heterogeneity. Two-dimensional pore water samplers with a high spatial resolution were exposed for 14 days at two sampling points with different water depths. Macrozoobenthos densities and the corresponding pore water phosphate concentrations were determined. In profundal sediments with chironomids (mean density: 480 m⁻²) the pore water phosphate concentration showed more patchiness (heterogeneity index 0.69) than in sediments without chironomids (heterogeneity index 0.38). Macrozoobenthos might affect the sediment environment mainly through bioirrigation, bioturbation, secretion, and digestion. It is most likely that the hot spots are caused by secretions from chironomids which intensify the microbially mediated P-release. The small-scale horizontal heterogeneity of pore water concentrations due to macrozoobenthos activities is insufficiently considered in many limnological studies focusing on vertical changes of pore water concentrations to investigate biogeochemical processes in sediment and to estimate internal nutrient loading. In sediments inhabited by macrozoobenthos the number of replicates should be high due to the extreme variability of single profiles of the two-dimensional sampler, as well as of averaged profiles simulating classical one-dimensional pore water analysis techniques. In cases where the profundal sediment is macrozoobenthos-free, single deployments of one-dimensional pore water samplers are well suited to describing pore water chemistry. Thus, determination of macrozoobenthos density is essential for study design.

451: S. W. Li, L. T. Martin, S. R. Pezeshki and F. D. Shields,. 2005. Responses of black willow (*Salix nigra*) cuttings to simulated herbivory and flooding. *Acta Oecologica-International Journal of Ecology* 2(28): 173-180.

Abstract: Herbivory and flooding influence plant species composition and diversity in many wetland ecosystems. Black willow (*Salix nigra*) naturally occurs in floodplains and riparian zones of the southeastern United States. Cuttings from this species are used as a bioengineering tool for streambank stabilization and habitat rehabilitation. The present study was conducted to evaluate the photosynthetic and growth responses of black willow to simulated herbivory and flooding. Potted cuttings were subjected to three levels of single-event herbivory: no herbivory (control), light herbivory, and heavy herbivory; and three levels of flooding conditions: no flooding (control), continuous flooding, and periodic flooding. Results indicated that elevated stomatal conductance partially contributed to the increased net photosynthesis noted under both levels of herbivory on day 30. However, chlorophyll content was not responsible for the observed compensatory photosynthesis. Cuttings subjected to heavy herbivory accumulated the lowest biomass even though they had the highest height growth by the conclusion of the experiment. In addition, a reduction in root/shoot ratio was noted for plants subjected to continuous flooding with no herbivory. However, continuously flooded, lightly clipped plants allocated more resources to roots than shoots. This study provides evidence that it is feasible to use black willow for habitat rehabilitation along highly eroded streambanks where both flooding and herbivory are present. (c) 2005 Elsevier SAS. All rights reserved.

452: X. Z. Li, R. H. G. Jongman, Y. M. Hu, R. C. Bu, B. Harms, A. K. Bregt and H. S. He,. 2005. Relationship between landscape structure metrics and wetland nutrient retention function: A case study of Liaohe Delta, China. Ecological Indicators 4(5): 339-349.

Abstract: The relationship between landscape pattern and the function of nutrient reduction in the natural reed marsh of Liaohe Delta is studied with the help of some landscape metrics. The results discovered that not all the metrics selected are explanative in representing the function of nutrient reduction. Network connectivity, area size, and source to centre metrics are closely related to the simulation results from different pattern scenarios, while other metrics like area-weighted mean shape, fractal, contagion and aggregation are not related with the reduction process at all. Different metrics should be chosen according to the purpose of the study, based on the criteria of simplicity, generality and ecological meaning. (c) 2005 Elsevier Ltd. All rights reserved.

453: L. Liboriussen, E. Jeppesen, M. E. Bamm and M. F. Lassen,. 2005. Periphyton-macroinvertebrate interactions in light and fish manipulated enclosures in a clear and a turbid shallow lake. *Aquatic Ecology* 1(39): 23-39.

Abstract: In a clear and a turbid freshwater lake the biomasses of phytoplankton, periphytic algae and periphyton-associated macrograzers were followed in enclosures with and without fish (*Rutilus rutilus*) and four light levels (100%, 55%, 7% and < 1% of incoming light), respectively. Fish and light affected the biomass of primary producers and the benthic grazers in both lakes. The biomass of primary producers was generally higher in the turbid than the clear lake, and in both lakes fish positively affected the biomass, while shading reduced it. Total biomass of benthic grazing invertebrates was higher in the clear than in the turbid lake and the lakes were dominated by snails and chironomids + ostracods, respectively. While light had no effect on the biomass of grazers in the clear lake, snail breeding was delayed in the most shaded enclosures and presence of fish reduced the number of snails and the total biomass of grazers. In the turbid lake ostracod abundance was not influenced by light, but was higher in fish-free enclosures. Density of chironomids correlated positively with periphyton biomass in summer, while fish had no effect. Generally, light-mediated regulation of primary producers was stronger in the turbid than in the clear lake, but the regulation did not unambiguously influence the primary consumers. However, regulation by fish of the benthic grazer community was stronger in the clear than in the turbid lake, and in both lakes strong top-down effects on periphyton were seen. The results indicate that if present-day climate in Denmark in the future is found in coastal areas at higher latitudes, the effect of lower light during winter in such areas will be highest in clear lakes, with typically lower fish biomass and higher invertebrate grazer density.

454: L. Liboriussen, F. Landkildehus, M. Meerhoff, M. E. Bramm, M. Sondergaard, K. Christoffersen, K. Richardson, T. L. Lauridsen and E. Jeppesen,. 2005. Global warming: Design of a flow-through shallow lake mesocosm climate experiment. *Limnology and Oceanography-Methods* (3): 1-9.

Abstract: Shallow lakes are likely to be strongly impacted by climate changes and, in particular, by increased temperatures. To enable realistic experimental studies of the effects of higher temperatures on in-lake processes and dynamics, technologically advanced systems are required. This paper presents design details, operating characteristics, and background information on a currently operating experimental flow-through mesocosm system that allows investigation of the interactions between simulated climate warming and eutrophication and their impacts on biological structure and ecosystem processes in shallow lakes. We use 24 mesocosms to combine three temperature scenarios (one unheated and two heated relative to the Intergovernmental Panel on Climate Change climate scenario A2 and A2 + 50%, respectively) and two nutrient levels (enriched and nonenriched). Planktivorous fish (male sticklebacks, *Gasterosteus aculeatus*) are stocked in accordance with the nutrient level. The water residence time is regulated by the semicontinuous addition of water and is approximately 2.5 mo in each mesocosm. For heating, we use electrically powered heating elements. The heating system has performed well over 16 mo of continuous heating, and seasonal and diurnal temperature variations of the unheated reference mesocosms were paralleled well by the heated mesocosms. The performance of the flow- through system and the heating technique are discussed with special emphasis on strengths, limitations, and potential improvements of the system. To illustrate the performance of the system and its potential, we present data for selected periods on total phosphorus retention in the mesocosms and system primary production and respiration.

455: P. W. Lienesch, M. E. McDonald, A. E. Hershey, W. J. O'Brien and N. D. Bettez,. 2005. Effects of a whole-lake, experimental fertilization on lake trout in a small oligotrophic arctic lake. *Hydrobiologia* (548): 51-66.

Abstract: We tested whether increased phosphorus and nitrogen concentrations would affect a lake trout (*Salvelinus namaycush*) population in a small oligotrophic lake with a benthically dominated food web. From 1990 to 1994, nitrogen and phosphorus were added to Lake NI (4.4 ha) at the arctic Long-Term Ecological Research site in Alaska. We used mark/recapture methods to determine the lake trout population size, size structure, recruitment, and individual growth from 1987 to 1999. Data were also collected on water chemistry and food availability. Fertilization resulted in increased pelagic primary productivity, chlorophyll a, turbidity, snail density, and hypoxia in summer and winter. Lake trout density was not affected by the manipulation however growth and average size increased. Recruitment was high initially, but declined throughout the fertilization. These results suggest that lake trout were affected through increased food availability and changes to the physical characteristics of the lake. During fertilization, hypoxia near the sediments may have killed over-wintering embryos and decreased habitat availability. Although lake trout responded strongly to increased nutrients, loss of recruitment might jeopardize lake trout persistence if arctic lakes undergo eutrophication.

456: A. Liess and H. Hillebrand,. 2005. Stoichiometric variation in C : N, C : P, and N : P ratios of littoral benthic invertebrates. *Journal of the North American Benthological Society* 2(24): 256-269.

Abstract: Nutritional constraints on herbivores are important factors structuring food webs. Our study presents field data on the nutrient content of benthic invertebrates from Lake Erken (Sweden). The most abundant benthic invertebrates of the littoral community were sampled in 3 seasons at 5 sites to examine the influence of spatial and temporal variation of abiotic conditions on invertebrate C:N:P stoichiometry. The relationships between nutrient ratios and dry mass (DM) of invertebrates were evaluated using regression analysis. Nutrient ratios of periphyton, sampled in an earlier study, were compared to those of benthic invertebrates. C:N, C:P, and N:P ratios differed among invertebrate taxa. Coleoptera had relatively high C:N, C:P, and N:P ratios, whereas Isopoda had low C:N, C:P, and N:P ratios. Nutrient ratios differed with respect to season and location. C:P and N:P ratios were significantly lower and C:N ratios were significantly higher in autumn than in spring and summer. C:P and N:P ratios increased as a functions of invertebrate DM when all taxa were analyzed together. C:N and C:P ratios of periphyton were higher than those of benthic invertebrates, but N:P ratios were similar. Our results suggested that benthic invertebrates have taxon-specific C:N and C:P ratios, but the seasonal variability in ratios indicated that littoral invertebrates were rheostatic rather than homeostatic with respect to nutrient stoichiometry. The temporal and spatial variation in grazer nutrient content must be taken into account when applying stoichiometric theory to benthic food webs.

457: D. S. S. Lim, M. S. V. Douglas and J. P. Smol,. 2005. Limnology of 46 lakes and ponds on Banks Island, NWT, Canadian Arctic Archipelago. *Hydrobiologia* (545): 11-32.

Abstract: The goal of this study was to describe and quantify the physical and chemical limnological properties of 46 lakes and ponds on Banks Island, to explore the effects of ecocliniatic differences on the water chemistry of these study sites, and to establish baseline conditions for this previously unexplored limnological region, which could then be used in subsequent long-term environmental monitoring programs. A key finding was that the study sites on Banks Island represented a large nutrient concentration gradient from ultra-oligotrophic to hypereutrophic waters. In general, the study sites were relatively nutrient rich by Arctic standards (i.e. mean total nitrogen (TN_{mean}) = 504.2 μ g/l and mean total phosphorus (TPU_{mean}) = 18.0 μ g/l); concentrations that are amongst the highest of any previous limnological survey from similar latitudes. Dissolved organic carbon (DOC) concentrations were also some of the highest reported to date amongst all other Canadian Arctic island limnological surveys. These values reflect the milder climate, concentrated animal life and lushness of Banks Island, as compared to other Canadian Arctic Archipelago islands. Principal components analysis (PCA) separated sites along a conductivity/ionic and elevation gradient on Axis 1 ($\lambda_1 = 0.343$), and a metal (Fe, Zn, Al) and alkalinity-related (DIC, pH) gradient on the second axis ($\lambda_2 = 0.187$). Canonical variate analysis (CVA) was used to explore the classification of the study sites into Low Arctic, Mid Arctic or High Arctic designations based on their limnological characteristics.

458: D. S. C. Lin and T. P. Caramaschi,. 2005. Responses of the fish community to the flood pulse and siltation in a floodplain lake of the Trombetas River, Brazil. *Hydrobiologia* (545): 75-91.

Abstract: The distributions of the fish species were examined in relation to environmental variables, to evaluate the effects of environmental degradation on the fish community of Batata Lake, a typical Amazonian clear-water lake. From 1979 to 1989, tailings composed of water and clay, extracted from bauxite by water jets, were discharged into Batata Lake. The tailings spread into about 30% of the lake's area, where the level of the lake bottom rose and turbidity increased. In the present study, multivariate analyses were performed on data for environmental parameters and fish density and biomass. Fish were collected with gillnets during the annual hydrological cycle (filling, flood, drawdown and dry periods), in the silted area, the partly silted area (intermediate) and the natural area. Values of the Shannon index, density and biomass were compared among areas and periods to evaluate the effects of the tailings on community structure. Sediment resuspension, which reduces transparency, is accentuated in shallow water, and was the main factor regulating differences in the community structure between the natural and silted areas. The decrease in transparency occurs mainly during the filling period in the silted area and during the low-water period in the silted and intermediate areas, when sediment resuspension increases concentrations of nutrients and chlorophyll-a. The strong influence of migratory and piscivore species in low-transparency waters is likely associated with the greater bacterioplankton productivity and turnover rate observed by other authors in the silted area, increasing the importance of the heterotrophic food chain in Batata Lake. Reduction of transparency in the silted area was a selective factor for fish species. The death of part of the flooded forest vegetation was decisive in lowering densities of the igapo-associated species in the silted area. The unconsolidated substrate, the death of part of the igapo forest and the negative effects of low transpar

459: S. E. Lindberg, W. J. Dong, J. Chanton, R. G. Qualls and T. Meyers,. 2005. A mechanism for bimodal emission of gaseous mercury from aquatic macrophytes. *Atmospheric Environment* 7(39): 1289-1301.

Abstract: We performed intensive sampling campaigns of Hg-0 fluxes over emergent macrophytes in the Florida Everglades to find a surrogate for Hg fluxes from water and vegetation to identify the mechanisms of emission. We measured daytime lacunal and sediment gas concentrations of Hg-0, which suggested that the lacunal space acts as temporary storage for He and CH₄. The absence of detectable He fluxes measured over uprooted (floating) plants and sediment incubation experiments suggest that the Hg-0 emitted from emergent macrophytes such as Typha and Cladium originates in the sediment. HgII in the rhizosphere is reduced to Hg-0 in these sediments by various processes, and is then transported by the plants to the atmosphere by two separate processes. At night, He and CH₄ formed in the sediment accumulate in the lacunal space after crossing the root-sediment barrier. At sunrise, a form of pressurized through-flow purges the lacunal space of Typha into the atmosphere forming an early morning emission pulse for both gases, and coincidental peaks of CH₄ and He suggest that the same lacunal gas transport mechanism is involved. Later in the day while the release of methane continues to deplete the lacunal pool, the He flux increases again to form a second peak in the afternoon when the CH₄ emission has decreased. This peak parallels that of transpiration, and is presumably due to xylem transport of He from continued production of He in the rhizosphere, perhaps in response to release of root exudates. A mass balance for this similar to 1500 ha wetland suggested that the total transpiration of Hg-0 is similar to 1 kg yr⁻¹, or similar to 20 times the amount evaded from the water surface. (C) 2004 Elsevier Ltd. All rights reserved.

460: J. H. Lipps and S. Rieboldt,. 2005. Habitats and taphonomy of Europa. *Icarus* 2(177): 515-527.

Abstract: Jupiter's moon Europa possesses an icy shell kilometers thick that may overlie a briny ocean. The inferred presence of water, tidal and volcanic energy, and nutrients suggests that Europa is potentially inhabited by some kind of life; indeed Europa is a primary target in the search for life in the Solar System although no evidence yet exists for any kind of life. The thickness of the icy crust would impose limits on life, but at least 15 broad kinds of habitats seem possible for Europa. They include several on the sea floor, at least 3 in the water column, and many in the ice itself. All of these habitats are in, or could be transported to, the icy shell where they could be exposed by geologic activity or impacts so they might be explored from the surface or orbit by future planetary missions. Taphonomic processes that transport, preserve, and expose habitats include buoyant ice removing bottom habitats and sediment to the underside of the ice, water currents depositing components of water column habitats on the ice bottom, cryovolcanoes depositing water on the surface, tidal pumping bringing water column and ice habitats to the near-surface ice, and subice freezing and diapiric action incorporating water column and bottom ice habitats into the lower parts of the icy shell. The preserved habitats could be exposed at or near the surface of Europa chiefly in newly-formed ice, tilted or rotated ice blocks, ridge debris, surface deposits, fault scarps, the sides of domes and pits, and impact craters and ejecta. Future exploration of Europa for life must consider careful targeting of sites where habitats are most likely preserved or exist close to the surface. (c) 2005 Elsevier Inc. All rights reserved.

461: S. L. Liu, W. L. Wang, D. T. Dy and C. C. Fu,. 2005. The effect of ulvoid macroalgae on the inorganic carbon utilization by an intertidal seagrass *Thalassia hemprichii*. Botanical Bulletin of Academia Sinica 3(46): 197-203.

Abstract: Blooms of ulvoid macroalgae (mainly *Enteromorpha* and *Ulva*) have covered 80% of the intertidal seagrass bed at Wanlitung, southern Taiwan, effectively shading the seagrass species *Thalassia hemprichii* resulting in a decrease in photosynthetic performance and low inorganic carbon (C) uptake. We looked for evidence of C-i limitation and investigated the C-i utilization characteristics of ulvoid-free and ulvoid-covered *T. hemprichii*. The rapid light curve (RLC) function of the Diving-PAM (Diving-PAM, Walz, Germany) was used to measure in situ photosynthetic performance (based on the effective quantum yield of PSII [Y] values) of intact seagrasses that were placed in small incubating chambers. Significantly, a lower RETRmax (maximum relative electron transport rate) and E-k (light intensity at the onset of saturation) were noted in the ulvoid-covered compared to the ulvoid-free *T. hemprichii*, suggesting that the former has acclimatized to the low light environment becoming a "shade type" plant. The ulvoid-covered *T. hemprichii* showed some evidence of C-i limitation since a significant increase in RETRmax (up to 46%; $P < 0.05$) was noted after an increase in the concentration of NaHCO_3 from 2.2 (normal seawater) to 6.2 mM. In terms of C-i utilization characteristics, *T. hemprichii* could directly absorb HCO_3^- as the major C-i source but partially depended on the extracellular carbonic anhydrase (CA) to convert HCO_3^- to CO_2 prior to uptake in the ulvoid-free, high light-adapted populations. A wastewater stream with a high nutrient load coming from the urbanized area may have caused the frequent blooms of ulvoid macroalgae.

462: W. C. Liu, S. Y. Liu, M. H. Hsu and A. Y. Kuo,. 2005. Water quality modeling to determine minimum instream flow for fish survival in tidal rivers. Journal of Environmental Management 4(76): 293-308.

Abstract: The Hsintien Stream is one of the major branches of the Danshuei River system, which runs through the metropolitan capital city of Taipei, Taiwan and receives a large amount of wastewater. The dissolved oxygen concentration is generally low in the tidal portion of the Hsintien Stream. Hypoxia/anoxia occurs often, particularly during the low-flow period when the Feitsui Reservoir, Chingtan Dam and Chihtan Dam impound the freshwater for municipal water supply. Fish kills happen from time to time. This paper describes the application of a numerical hydrodynamic and water quality model to the Danshuei River system, with special attention to the tidal portion of the Hsintien Stream. The model is recalibrated with the prototype conditions of the year 2000. The hydrodynamic portion of the model is recalibrated with measured surface elevation and velocity at various stations in the river system. The water quality portion of the model is recalibrated with respect to the field data provided by Taiwan EPA. The input data of point and nonpoint sources are also estimated. The model simulates the concentrations of various forms of nutrients, CBOD and dissolved oxygen. A series of sensitivity runs was conducted to investigate the effects of point source loadings and river flow on the DO level in the river. It is demonstrated that the augmentation of river flow has as much effect on raising DO level as the reduction of point source loadings. The completion of the Taipei sewer project is expected to reduce the point source loadings by at least 75%. Under these reduced loadings, if the daily instream flow is maintained above the monthly Q(75) flow throughout the year, the minimum DO concentration in the river would not fall below 1 mg/L, which is the suffocation level for most fish species in the Hsintien Stream. (Q(75) is the flow which is equaled or exceeded 75% of the days in the month.) The Feitsui Reservoir, Chingtan Dam and Chihtan Dam may impound water during the high flow per

463: W. X. Liu, M. F. Dahab and R. Y. Surampalli,. 2005. Nitrogen transformations modeling in subsurface-flow constructed wetlands. Water Environment Research 3(77): 246-258.

Abstract: Subsurface-flow constructed wetlands (CWs) wastewater treatment typically results in satisfactory organics removal. However, the removal of nutrients, particularly nitrogen, is often unreliable, and typically less than desired, and nitrogen transformations in wetlands systems are not well-understood. The principal objective of this study was to establish a basis for quantification of nitrogen transformations through subsurface flow CW systems. Actual performance data from a full-scale facility located near Lincoln, Nebraska, were used to calibrate a proposed nitrogen transformations model, which, in turn, was used to replicate and predict the wetlands performance. To realize this objective, a compartmental analysis technique, which uses a set of differential equations and nonlinear optimization numerical methods, was used for solving nitrogen transformation rates and for predicting wetland performance. The model satisfactorily reproduced the mean effluent concentrations for organic nitrogen, ammonium-nitrogen, and nitrate-nitrogen, but with lesser accuracy with respect to peak high and low effluent concentrations. Nitrogen mass balance in the wetland was used to identify Rely nitrogen transformation pathways. Generally, it was found that approximately one-third of the influent nitrogen mass was removed through nitrification and denitrification, one-third was removed through vegetative assimilation, and the remainder was discharged in the wetland effluent.

464: B. G. Lockaby, R. Governo, E. Schilling, G. Cavalcanti and C. Hartsfield,. 2005. Effects of sedimentation on soil nutrient dynamics in riparian forests. *Journal of Environmental Quality* 1(34): 390-396.

Abstract: The influence of sedimentation rates on biogeochemistry of riparian forests was studied near ephemeral streams at Fort Benning, GA. Upper reaches of seven ephemeral streams had received varying rates of sedimentation stemming from erosion along unpaved roadways at the military installation. Two reference catchments; were also included in the study. Decomposition of foliar litter, microbial C and N, N mineralization, and arthropod populations were compared within and among catchments. Rates of sedimentation over the past 25 yr ranged from 0 in references to 4.0 cm yr⁽⁻¹⁾. Decomposition rates declined exponentially with sedimentation rates as low as 0.20 to 0.32 cm yr⁽⁻¹⁾ and appeared to reach an equilibrium at a sedimentation rate of 0.5 cm yr⁽⁻¹⁾. Nitrogen mineralization and microbial C and N followed the same trend. Sedimentation had no discernible effect on arthropod populations. These data suggest that biogeochemical cycles may be altered by sedimentation rates that commonly occur in some floodplain forests.

465: P. Lombardo,. 2005. Applicability of littoral food-web biomanipulation for lake management purposes: Snails, macrophytes, and water transparency in northeast Ohio shallow lakes. Lake and Reservoir Management 2(21): 186-202.

Abstract: Seven shallow-to-intermediate-depth, meso-eutrophic lakes in northeast Ohio were surveyed July-August 1998 to evaluate a macrophyte-based littoral food-web (and its possible manipulation) role in increasing or maintaining water transparency. Macrophyte and periphyton growth were determined from pre-weighed *C. demersum* sprigs and biomass developed on glass tiles, respectively; littoral snail densities were estimated from assemblages in large-mesh cages at 1-m depth. Other variables were monitored weekly in situ. Lakes were generally phosphorus (P)-limited, but differed significantly in perceived state (turbid, stable or unstable clear-water), water transparency (SD), total phosphorus (TP) and chlorophyll a concentration (chl_a), vegetation cover (VC), snail density, sprig growth and periphyton biomass. The most richly vegetated lake was also the most stable (seasonally and long-term) clear-water lake, but midsummer SD was more strongly correlated with watershed:lake surface area. *C. demersum* growth was negatively correlated with periphyton biomass; meristem production was lower in turbid lakes, but was influenced by TP. Snail abundance tended to follow food (periphyton) and substrate (VC) availability, but was lower in crayfish-present lakes. Correlations between lake-describing variables were nonlinear with frequent outliers. When integrated with information from the literature, the results suggest that littoral food-web biomanipulation may be employed as a management technique in some cases. More often, macrophytes and the macrophyte-driven, snail-mediated clear-water stable state may (re)establish naturally in suitable lakes after conditions are brought above a "threshold" for plant growth. Frequent exceptions in observed patterns in this study and elsewhere suggest that applicability of littoral food-web biomanipulation should be evaluated on a case-by-case basis.

466: G. M. Lovett, G. E. Likens, D. C. Buso, C. T. Driscoll and S. W. Bailey,. 2005. The biogeochemistry of chlorine at Hubbard Brook, New Hampshire, USA. *Biogeochemistry* 2(72): 191-232.

Abstract: Chlorine is a minor constituent of most rocks and a minor (although essential) element in plants, but it cycles rapidly through the hydrosphere and atmosphere. In forest ecosystem studies, chloride ion (Cl-) is often thought to be conservative in the sense that the sources and sinks within the ecosystem are assumed negligible compared to inputs and outputs. As such, Cl- is often used as a conservative tracer to assess sources and transformations of other ions. In this paper we summarize research on chloride over the course of 36 years (1964 - 2000) at the Hubbard Brook Experimental Forest (HBEF) in central New Hampshire, USA. Evidence presented here suggests that in the 1960s and 1970s the dominant source of atmospheric Cl- deposition was from pollutant sources, probably coal burning. In the 1970s the Cl- inputs in bulk deposition declined, and the lower Cl- deposition in the last two decades is dominated by marine sources. Between 1964 and 2000 there was no significant trend in Cl- export in stream flow, thus the net hydrologic flux (NHF = bulk deposition inputs - streamflow outputs) has changed over this period. Early in the record the NHF was on average positive, indicating net retention of Cl- within the system, but since about 1980 the NHF has been consistently negative, indicating an unmeasured input or source within the ecosystem. Dry deposition can account for at least part of that unmeasured source, and it appears that release of Cl- from mineralization of soil organic matter (SOM) may also play an important role. We believe that accumulation of Cl- in vegetation during the 1960s and 1970s offset the unmeasured source and resulted in net ecosystem retention. Accumulation of vegetative biomass has ceased since about 1982, leading to the apparent net export (negative NHF) since that time. Although we have no direct measurements of Cl- accumulation in vegetation, our estimates suggest that an aggrading forest could sequester about 32 mol Cl ha(-1) year(-1),

467: R. Lowrance and J. M. Sheridan,. 2005. Surface runoff water quality in a. managed three zone riparian buffer. Journal of Environmental Quality 5(34): 1851-1859.

Abstract: Managed riparian forest buffers are an important conservation practice but there are little data on the water quality effects of buffer management. We measured surface runoff volumes and nutrient concentrations and loads in a riparian buffer system consisting of (moving down slope from the field) a grass strip, a managed forest, and an unmanaged forest. The managed forest consisted of sections of clear-cut, thinned, and mature forest. The mature forest had significantly lower flow-weighted concentrations of nitrate, ammonium, total Kjeldahl N (TKN), sediment TKN, total N (nitrate + TKN), dissolved molybdate reactive P (DMRP), total P, and chloride. The average buffer represented the conditions along a stream reach with a buffer system in different stages of growth. Compared with the field output, flow-weighted concentrations of nitrate, ammonium, DMRP, and total P decreased significantly within the buffer and flow-weighted concentrations of TKN, total N, and chloride increased significantly within the buffer. All loads decreased significantly from the field to the middle of the buffer, but most loads increased from the middle of the buffer to the sampling point nearest the stream because surface runoff volume increased near the stream. The largest percentage reduction of the incoming nutrient load (at least 65% for all nutrient forms) took place in the grass buffer zone because of the large decrease (68%) in flow. The average buffer reduced loadings for all nutrient species, from 27% for TKN to 63% for sediment P. The managed forest and grass buffer combined was an effective buffer system.

468: T. Lukondeh, N. J. Ashbolt and P. L. Rogers,. 2005. Fed-batch fermentation for production of *Kluyveromyces marxianus* FII 510700 cultivated on a lactose-based medium. *Journal of Industrial Microbiology & Biotechnology* 7(32): 284-288.

Abstract: A strain of *Kluyveromyces marxianus* was grown in batch culture in lactose-based media at varying initial lactose concentrations (10-60 g L⁻¹) at 30 degrees C, pH 5.0, dissolved oxygen concentrations greater than 20%. Increasing the concentration of mineral salts threefold at 40 g L⁻¹ and 60 g L⁻¹ initial lactose concentration showed only a small increase in the yield of biomass, from 0.38 g g⁻¹ to 0.41 g g⁻¹, indicating that the initial batch cultures were not significantly nutrient(mineral salts)-limited. A relatively high biomass concentration (105 g L⁻¹) was obtained in fed-batch culture following extended lactose feeding. An average specific growth rate (0.27 h⁻¹), biomass yield (0.38 g g⁻¹) and overall productivity (2.9 g L⁻¹ h⁻¹) were obtained for these fed-batch conditions. This fed-batch protocol provides a strategy for achieving relatively high concentrations and productivities of *K. marxianus* on other lactose-based substrate streams (e.g., whey) from the dairy industry.

469: E. Lyautey, B. Lacoste, L. Ten-Hage, J. L. Rols and F. Garabetian,. 2005. Analysis of bacterial diversity in river biofilms using 16S rDNA PCR-DGGE: methodological settings and fingerprints interpretation. Water Research 2-3(39): 380-388.

Abstract: Reliability of bacterial diversity assessment using polymerase chain reaction (PCR) denaturing gradient gel electrophoresis (DGGE) analysis of 16S rDNA fragments was evaluated for a particular complex microbial assemblage: river epilithic biofilm. By comparing 3 routine protocols on replicates of one river biofilm sample, we found that common DNA extraction procedures gave comparable diversity (from 28.0 to 30.7 bands detected) and community composition (> 75% of homology) despite differences in the total amount of extracted DNA (from 0.9 to 4.2 mug). Therefore methodological improvements only concerned electrophoretic separation of DNA fragments (range of denaturing gradient from 35% to 70% and migration time = 18 h) and standardisation of DNA amounts used (PCR-template = 50 ng, gel loading = 700 ng). Using such a standardised methodology we found a good reproducibility of all steps of the procedure. When an *Escherichia coli* strain was introduced as a contaminant in a biofilm sample, we were able to recover ribotypes from the strain. As concerns fields sampling, a satisfactory repeatability of banding patterns from neighbouring pebbles (sampling point) allowed discriminating between the biofilm intrasite variability (various points from a cross-profile). These trials confirmed that PCR-DGGE is suitable to assess a reliable genetic fingerprint of epilithic biofilms in the river. Phylogenetic analysis of 40 partial sequences of 16S rDNA from DGGE gels of two sets of river biofilms samples proved evidences for the retrieval of DNA fragments related to phototroph Eukarya. However, in both cases plastidial 16S rDNA represented less than 25% of the analysed operational taxonomic units. Taking into account that Cyanobacteria, as members of the Bacteria, were also detected, sequence analysis of relevant bands from the pattern is required to target "bacteria", i.e. the functional group of prokaryotic microorganisms to which one commonly refers as a key component in sustaini

470: A. J. MacGregor, P. A. Gell, P. J. Wallbrink and G. Hancock,. 2005. Natural and post-European settlement variability in water quality of the lower Snowy River floodplain, eastern Victoria, Australia. *River Research and Applications* 2-3(21): 201-213.

Abstract: Millennial to decadal resolution palaeoenvironmental records from the terminal floodplain takes of the lower Snowy River in eastern Victoria have been obtained to determine the water quality history of the lower Snowy River floodplain and more specifically, the ecological impact of the inter-basin diversion of water from one of Australia's hallmark river systems. Lake Curlip, as evidenced through variations in the fossil-diatom flora, has evolved through the Holocene from a saline (17-22 g salt/l) open system (c. 7000 years Lip) as sea levels reached their maxima, to a brackish (5-10 g/l), and then a fresh (as low as 0.4 g/l), possibly acidic system prior to European settlement (c. 300 years BP). The Lipper post-European sediments reveal a complex, highly variable, anthropogenically induced shift to a brackish and nutrient-tolerant diatom flora, with recent diatom-inferred salinities in the order of 20 M. Explained as a combination of land clearance, drainage practices, and more recently, the regulation of the Snowy River, recent changes are as pronounced as any experienced through the Holocene, but have occurred at a rate faster than any brought on by past climatic or geomorphic change. By quantifying the limnological changes before and after regulation this study informs on the relative benefits that may accrue from allocating environmental flows to the Snowy River. Copyright (c) 2005 John Wiley M Sons, Ltd.

471: M. Maddison, K. Soosaar, K. Lohmus and U. Mander,. 2005. Cattail population in wastewater treatment wetlands in Estonia: Biomass production, retention of nutrients, and heavy metals in phytomass. Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering 6-7(40): 1157-1166.

Abstract: The aim of this article is to evaluate and compare common cattail (*Typha latifolia*) biomass production and annual accumulation of nitrogen, phosphorus, carbon, and heavy metals (Cd, Cu, Pb, Zn) in phytomass in 3 treatment wetland systems in Estonia. The biomass samples (roots/rhizomes, shoots with leaves, and spadixes) and litter were collected from 1 x 1 m plots-15 plots in Tanassilma seminatural wetland, 15 plots in Poltsamaa constructed wetland, and 10 plots in Haademeeste constructed wetland. The highest average total cattail phytomass was 2.54 kg DW m⁽⁻²⁾ in Haademeeste. In Tanassilma and Poltsamaa this value was 2.3 and 2.11 kg DW m⁽⁻²⁾, respectively. The average total aboveground biomass production and roots/rhizomes phytomass was not significantly different in three studied wetland systems. We have found significantly less spadixes and litter in Tanassilma than in Poltsamaa and Haademeeste. In Poltsamaa, the N and P content in all plant fractions were higher than in other test areas. The Cd concentration in all samples (shoots, spadixes, litter) varied from < 0.01 to < 0.02 mg/kg. The average concentration of Zn in litter varied from 12.2 mg kg⁽⁻¹⁾ in Haademeeste to 12.6 mg kg⁽⁻¹⁾ in Tanassilma and 13.3 mg kg⁽⁻¹⁾ in Poltsamaa. There has been found a significantly higher average contents of Cu (39.3 mg kg⁽⁻¹⁾), Pb (30.4 mg kg⁽⁻¹⁾), and Zn (412.3 mg kg⁽⁻¹⁾) in Tanassilma than those in Haademeeste or Poltsamaa: Cu-11.6 and 15.9, Pb-2.3 and 3.3, and Zn-57.5 and 73.2 mg kg⁽⁻¹⁾, respectively. The highest heavy metal retention (303.2 mg Pb m⁽⁻¹⁾, 29.4 mg Zn m⁽⁻²⁾, 22.9 Mg. Cu m⁽⁻²⁾, and 0.35 mg Cd m⁽⁻²⁾) was observed in root and rhizome samples from the Tanassilma wetland.

472: H. Maemets and L. Freiberg,. 2005. Long- and short-term changes of the macrophyte vegetation in strongly stratified hypertrophic Lake Verevi. *Hydrobiologia* (547): 175-184.

Abstract: The aim of study was to bring out changes in the macrophyte vegetation, caused by eutrophication, short-term lowering of the water level and the following restoration of equilibrium in L. Verevi. Also biomass and N and P content of shoots of main submergent species were studied in 1999-2001, to follow the temporal and specific differences. Due to strong eutrophication, the type of the lake changed from a *Myriophyllum-Potamogeton-Charophyta* lake to a *Ceratophyllum-Lemna trisulca* lake in 1984-1988, obviously owing to the formation of loose organic-rich sediment. Water lowering by 0.7 m during summer months of 1998 facilitated mineralization of sediments, as a consequence of which a mass development of *Ranunculus circinatus* and a temporary increase in the abundance and biomass of other nutrient-demanding species took place during following years. Our data suggest differences in nutrient supply and release of submerged species and the need for more species-related approach to this group. The problem of nutrient supply of unrooted plants at the time of stratification arises. Regarding the increase of biomass of *Ceratophyllum demersum* in second half of summer, we suppose that one part of nutrients for this growth may derive from freshly decayed filamentous algae or vascular plants.

473: V. Magar and T. J. Pedley,. 2005. Average nutrient uptake by a self-propelled unsteady squirmer. Journal of Fluid Mechanics (539): 93-112.

Abstract: We present results for the average mass transfer to a spherical squirmer, a model micro-organism whose surface oscillates tangentially to itself. The surface motion drives a low-Reynolds-number flow which enables the squirmer either to swim relative to the fluid at infinity, at an average speed proportional to a streaming parameter, W , or to stir the fluid around it while remaining, on average, at rest (if $W = 0$), as represented by a hovering parameter, b . We assume that the amplitude of the time-periodic surface distortions is scaled by a dimensionless small parameter ϵ , and consider only high Peclet numbers P - a measure of convection versus diffusion - by setting $P^{-1} = \epsilon^2 \gamma$, where γ is a parameter of $O(1)$. It is shown that the average mass concentration distribution satisfies a steady convection-diffusion equation with an effective velocity field that is different from the actual mean velocity field. The model is used to calculate the mass transfer across the surface of the squirmer, measured by the mean Sherwood number Sh . We find asymptotic solutions for small and large γ and numerical results for the whole range of values. While the large- γ expansions are reproduced well by the numerical results, there is a discrepancy between the two at small γ . We believe this is due to very small recirculation regions, attached to the surface of the squirmer, which make boundary layer theory applicable only when $1/\gamma$ is immense. For the parameters chosen in this study, results indicate that both hovering and streaming contribute to the mass transfer, although streaming has a greater effect. Also, energy dissipation considerations show that an optimum swimming mode exists, at least at small and large γ , for any given uptake rate. However, other factors have still to be taken into account, and the model realism improved, if we want to make predictions for real aquatic micro-organisms.

474: F. Malard, T. Datry and J. Gibert,. 2005. Subsurface sediment contamination during borehole drilling with an air-actuated down-hole hammer. *Journal of Contaminant Hydrology* 3-4(79): 156-164.

Abstract: Drilling methods can severely alter physical, chemical, and biological properties of aquifers, thereby influencing the reliability of water samples collected from groundwater monitoring wells. Because of their fast drilling rate, air-actuated hammers are increasingly Used for the installation of groundwater monitoring wells in unconsolidated sediments. However, oil entrained in the air stream to lubricate the hammer-actuating device can contaminate subsurface sediments. Concentrations of total hydrocarbons, heavy metals (Cu, Ni, Cr, Zn, Pb, and Cd), and nutrients (particulate organic carbon, nitrogen, and phosphorus) were measured in continuous sediment cores recovered during the completion of a 26-m deep borehole drilled with a down-hole hammer in glaciofluvial deposits. Total hydrocarbons, Cu, Ni, Cr and particulate organic carbon (POC) were all measured at concentrations far exceeding background levels in most sediment cores. Hydrocarbon concentration averaged 124 ± 118 mg kg⁻¹ dry sediment (n = 78 samples) with peaks at depths of 8, 14, and 20 m below the soil surface (maximum concentration: 606 mg kg⁻¹). The concentrations of hydrocarbons, Cu, Ni, Cr, and POC were positively correlated and exhibited a highly irregular vertical pattern, that probably reflected variations in air loss within glaciofluvial deposits during drilling. Because the penetration of contaminated air into the formation is unpreventable, the representativeness of groundwater samples collected may be questioned. It is concluded that air percussion drilling has strong limitations for well installation in groundwater quality monitoring surveys. (c) 2005 Elsevier B.V. All rights reserved.

475: M. A. Mallory and J. S. Richardson,. 2005. Complex interactions of light, nutrients and consumer density in a stream periphyton-grazer (tailed frog tadpoles) system. *Journal of Animal Ecology* 6(74): 1020-1028.

Abstract: 1. Consumer-resource interactions may be modified by complex environmental interactions. We experimentally manipulated light, nutrients, consumer density (tailed frog tadpoles - *Ascaphus truei*), and enclosure sizes in two small and steep streams of coastal British Columbia, Canada. We used flow-through, screened enclosures in situ as experimental units and measured the responses of algae (as chlorophyll a), periphyton (ash-free dry mass) and growth rates of tailed frog tadpoles using a factorial model design. 2. Light exerted a strong, positive effect on algae and periphyton production with 30-40% higher biomass over shaded treatments, and a 14% higher relative growth rate of tadpoles. Nutrient additions had little to no effect on any measure, alone or in interaction with other factors. Tadpole growth, algae and periphyton standing crop were significantly reduced along a gradient of increasing consumer density. Enclosure size had a large effect on all three measures. 3. Algae and periphyton production were under simultaneous top-down (tadpole grazing) and bottom-up control (light); however, the relative importance of these effects was stream-dependent. At Klondike Creek algae and periphyton production was influenced primarily by grazing, and by light levels at Dipper Creek. 4. Mean growth rate of tadpoles was on average 45% higher at Klondike Creek than at Dipper Creek. Most of the effects of the abiotic treatments and consumer density interacted statistically with stream identity, despite these streams being very similar and < 6 km apart. The strong effect of stream on the outcomes may be a consequence of large temperature differences. 5. This study demonstrated that light, consumer density, stream, enclosure size and nutrients alone and in combination affected algae and periphyton production, and grazer growth rate. While the interactions between consumer and resources were tightly coupled, the relative importance of the driving factors varied significantly between

476: A. P. Mamolos, C. V. Vasilikos and D. S. Veresoglou,. 2005. Vegetation in contrasting soil water sites of upland herbaceous grasslands and N : P ratios as indicators of nutrient limitation. Plant and Soil 1-2(270): 355-369.

Abstract: Effects of differences in long-term water supply were examined on soil characteristics, primary production and species composition in a wet and a dry site of an upland herbaceous grassland. Also the responses of species to N and P enrichments were examined. N and P concentrations of non-legume species were positively related, indicating that biomass N:P ratios seem to be mainly determined by N:P supply ratios. Forbs had generally higher concentrations than graminoids. Intermittent water inundation of soil in the wet site resulted in greater soil N and P availability. The greater productivity of this site promoted the growth of forbs. A fertilizer experiment showed that biomass was limited by N only in the wet site, but by both nutrients in the dry one. The species with the higher N and P concentrations were favored more after N and P enrichment, respectively; however, species enhancement was not related to N:P ratios of species. This indicates that N and P concentrations of species, rather than N:P ratios of species, are better predictors of species responses to N and P enrichment. N:P ratios of whole communities were 8.73 for the wet and 11.36 for the dry site. These values in comparison with the responses of plant communities to N and P fertilization show that thresholds of N:P ratios indicative of N or P limitation are much lower than those found for European wetlands.

477: F. Maraslioglu, E. N. Soylu and A. Gonulol,. 2005. Seasonal variation of the phytoplankton of Lake Ladik Samsun, Turkey. Journal of Freshwater Ecology 3(20): 549-553.

Abstract: The composition and seasonal variations of phytoplankton of Lake Ladik were studied between June 2000 and May 2001. The taxa identified included members of Cyanoprokaryota (8), Bacillariophyta (46), Chlorophyta (54), Euglenophyta (30), Cryptophyta (2), Dinophyta (1) and Xanthophyta (1). In the phytoplankton, Cyclotella ocellata, Aulacoseria distans, Trachelomonas hispida, T volvocina var. punctata, Cryptomonas ovata, Pediastrum spp., and Scenedesmia spp. were common organisms. Seasonal variations in phytoplankton appeared to be related to availability of light and temperature rather than various measured nutrients.

478: M. Markmann and D. Tautz,. 2005. Reverse taxonomy: an approach towards determining the diversity of meiobenthic organisms based on ribosomal RNA signature sequences. Philosophical Transactions of the Royal Society B-Biological Sciences 1462(360): 1917-1924.

Abstract: Organisms living in or on the sediment layer of water bodies constitute the benthos fauna, which is known to harbour a large number of species of diverse taxonomic groups. The benthos plays a significant role in the nutrient cycle and it is, therefore, of high ecological relevance. Here, we have explored a DNA-taxonomic approach to access the meiobenthic organismic diversity, by focusing on obtaining signature sequences from a part of the large ribosomal subunit rRNA (28S), the D3-D5 region. To obtain a broad representation of taxa, benthos samples were taken from 12 lakes in Germany, representing different ecological conditions. In a first approach, we have extracted whole DNA from these samples, amplified the respective fragment by PCR, cloned the fragments and sequenced individual clones. However, we found a relatively large number of recombinant clones that must be considered PCR artefacts. In a second approach we have, therefore, directly sequenced PCR fragments that were obtained from DNA extracts of randomly picked individual organisms. In total, we have obtained 264 new unique sequences, which can be readily placed into taxon groups, based on phylogenetic comparison with currently available database sequences. The group with the highest taxon abundance were nematodes and protozoa, followed by chironomids. However, we find also that we have by far not exhausted the diversity of organisms in the samples. Still, our data provide a framework within which a meiobenthos DNA signature sequence database can be constructed, that will allow to develop the necessary techniques for studying taxon diversity in the context of ecological analysis. Since many taxa in our analysis are initially only identified via their signature sequences, but not yet their morphology, we propose to call this approach 'reverse taxonomy'.

479: V. Martinez-Almeida and R. Tavera,. 2005. A hydrobiological study to interpret the presence of desmids in Lake Zirahuen, Mexico. *Limnologica* 1-2(35): 61-69.

Abstract: Monthly collections of phytoplankton were supported by physical-chemical data and measures of chlorophyll a concentrations in the search for particular environmental factors that could explain the constant presence of desmids in a Mexican tropical lake, a characteristic not common among the phytoplanktic communities of Mexican lakes. Samplings were taken from the water column in the deepest part of the lake (40 m) and intensified in the metalimnetic zone, whose establishment was monitored by observations of temperature and oxygen profiles. The general behavior of Lake Zirahuen was typical of warm monomictic tropical lakes at high elevation: a short mixing phase during the hemispheric winter. The depth of Z(MIX) and Z(eu) revealed a well-illuminated epilimnion, suggesting that phytoplankton communities are not likely to be light-limited. The oligotrophic nature of the lake is indicated by discrete concentrations of inorganic nutrients, P-TOT in the interval of 0.01-0.03 mg l⁻¹ and chlorophyll a between 0.23 and 3.98 µg l⁻¹. These characteristics together with a low concentration of calcium, define a lacustrine environment different from other Mexican lakes, and one that could be suitable for desmids communities. (C) 2005 Elsevier GmbH. All rights reserved.

480: A. Masbough, K. Frankowski, K. J. Hall and S. J. B. Duff,. 2005. The effectiveness of constructed wetland for treatment of woodwaste leachate. Ecological Engineering 5(25): 552-566.

Abstract: Percolation of rainfall through woodwaste piles leaches natural chemicals from the wood residuals that can have adverse impacts on the environment. A study was conducted on a woodwaste storage site, adjacent to the Lower Fraser River, near Mission, BC, Canada. The objective of this research was to evaluate the effectiveness of constructed wetland for treatment of this woodwaste leachate. The leachate was characterized by high oxygen demand, tannin and lignin, and volatile fatty acids (VFAs), but low pH and nutrients. Diluted leachate passed through six pilot-scale wetland cells, four planted with cattail (*Typha latifolia*) and two unplanted controls, with a hydraulic retention time of 7 days and an average depth of 40 cm. Nutrient addition and pH adjustments were made to improve contaminant removal. Reductions in contaminants were consistently achieved, with average removals for BOD, COD, VFAs and tannin and lignin of 60, 50, 69 and 42%, respectively. Climatic conditions had an impact on the performance of the constructed wetland. Further operation of the system will help to elucidate the seasonal fluctuations. Aging of the constructed wetland system increased the treatment performance. (c) 2005 Elsevier B.V. All rights reserved.

481: G. Mataloni, A. Vinocur and P. D. Pinto,. 2005. Abiotic characterization and epilithic communities of a naturally enriched stream at Cierva Point, Antarctic Peninsula. *Antarctic Science* 2(17): 163-170.

Abstract: Pinguinera Stream is one of the two main lotic environments of Cierva Point (Antarctic Specially Protected Area No. 134) on the Danco Coast, Antarctic Peninsula. It originates in a large snowfield, flows through a penguin rookery, moss and grass banks, discharging into Cierva Cove. During late Antarctic summer 2003, we sampled the stream at six locations along its course. Abiotic features characterize it as a clear water system, yet receiving a very high amount of PO₄-P and NH₄-N from the rookery. These nutrients decrease downstream mainly due to uptake by epilithic algae and oxidation of NH₄⁺ to NO₃⁻, consequently lowering pH and dissolved O₂, which was always under-saturated. Strong correlations between all these parameters support these findings. The epilithic algal community shows both temporal and spatial changes in biomass, composition and relative frequencies. Dominant species at the higher reach of the stream are cyanobacteria, mainly *Chamaesiphon subglobosus* (Rostafinski) Lemm. and a mesh of *Leptolyngbya* spp. filaments. The chlorophyta *Prasiola calophylla* (Carmich.) Menegh. dominates the community in oxygenated, fast-flowing reaches. Comparison with the other main stream from Cierva Point, which is not influenced by the rookery, shows that growth and survival of the epilithic community in this area is limited by factors other than nutrient concentrations.

482: N. G. Matias and M. J. Boavida,. 2005. Effects of catchment development on the trophic status of a deep and a shallow reservoir in Portugal. *Lake and Reservoir Management* 3(21): 350-360.

Abstract: Although catchment nutrient flux regulation is considered vital for controlling eutrophication, direct measurement of runoff loads is difficult. Shallow eutrophic Divor and smaller deep mesotrophic Apartadura, with different catchment uses but almost identical lake-to-watershed area ratios, were studied. Ratios suggest both reservoirs should be oligo- to meso-trophic. Divor catchment intensive livestock farming opposes to subsistence farming in Apartadura catchment. Runoff coefficients indicated that cattle accounted for 75% of TP mass export in Divor but only about a third in Apartadura, where goats and sheep dominated. In both watersheds agriculture, including pasture, dominated TP export over woodland/brush cover. Because of the large agricultural component, people contributed < 1% TP loading to Divor and 2-4% to Apartadura, reflecting population densities. Despite differences in watershed use and lake morphometry, reservoirs showed similar behaviour (summer hypolimnion anoxia, photic zone algal biomass). Transparent Apartadura was dominated by large algal particles and probably P-limited, while turbid Divor contained surplus phosphorus because of large amounts of fine suspended clay particles. The differences in mean depth, not watershed loading, apparently accounted for most of the differences in trophic state. Based on results, management actions to reduce eutrophication in the two reservoirs will differ. Divor drainage will primarily require better manure disposal and fertilizer use reduction but will probably not show trophic state improvement. Apartadura drainage will require diffuse-source P-control (constructed wetlands, riparian buffers) and it should respond by regaining an oxygenated hypolimnion. Stakeholder voluntary cooperation as well as modifying people's perceptions regarding water resources will be needed to comply with the legally binding EU Water Directives.

483: T. Matsumura-Tundisi and J. G. Tundisi,. 2005. Plankton richness in a eutrophic reservoir (Barra Bonita Reservoir, SP, Brazil). *Hydrobiologia* (542): 367-378.

Abstract: Species richness of plankton was studied in a eutrophic reservoir (Barra Bonita Reservoir) of the Middle Tiete River, Sao Paulo State, Brazil, during the period 1985-1986. This reservoir is formed by two rivers: the Tiete and the Piracicaba (the main tributaries), of which the Tiete is more eutrophic, having conductivity and nutrient concentration values twice those of the Piracicaba. In addition, the reservoir is fed by 114 smaller tributaries. Monthly sampling was carried out at three stations representing different environmental conditions: St1 on the Tiete, S2 on the Piracicaba, and S3 at the confluence of the two rivers. For the phytoplankton community, the Piracicaba River (St2) proved the richest site, with a listed 72 species with abundance of Chlorophyta, while St1 and St3 registered 59 and 50 species, respectively, with abundance of Cyanophyta. For the zooplankton community a great difference was not registered in species number at the three stations but the species composition and dominant species of rotifers and copepods were quite different. The occurrence of *Mesocyclops meridianus* and *Metacyclops mendocinus*, specific for St2; *Mesocyclops ogunnus* and *Notodiaptomus iheringi*, specific for St1, and that of these two species plus *Mesocyclops meridianus* at S3 shows that the conditions combining at this station were favorable to *Mesocyclops meridianus* but not to *Metacyclops mendocinus*. Both for phytoplankton and zooplankton, high values found of species richness were compared to species richness of natural lakes, e.g., Dom Helvecio, a monomictic stable lake in eastern Brazil, and another fifteen lakes in the same region. In conclusion, this work shows that environmental gradients are strong selective factors that enhance plankton richness in eutrophic reservoirs exhibiting environmental instability. This fact could explain the presence of a high number of plankton species associated with a high number of individuals in Barra Bonita Reservoir, supporting the e

484: T. Mattsson, P. Kortelainen and A. Raike,. 2005. Export of DOM from boreal catchments: impacts of land use cover and climate. *Biogeochemistry* 2(76): 373-394.

Abstract: Dissolved organic matter (DOM) is an important fraction in carbon (C) and nutrient budgets for aquatic ecosystems and can have broad effects on food webs and nutrient cycling. To look at the role land use cover and climate might play in DOM transport from the boreal region, the export of total organic carbon (TOC), total organic nitrogen (TON) and dissolved organic phosphorus (DOP) was estimated for Finnish main rivers and their sub-catchments, altogether 86 catchments, situated between latitudes 60 degrees N and 69 degrees N and covering 297,322 km², 88% of the total area of Finland. On an average, 94% of the TOC, 90% of the total nitrogen (TN) and 40% of the total phosphorus (TP) in Finnish rivers was in a dissolved form. The majority of the DOM export from Finnish catchments consists of organic C. The TOC export increased with increasing peatland proportion ($r = 0.39$, $p = 0.003$), while TON export increased with the increasing percentage of agricultural land ($r = 0.60$, $p < 0.001$). Although upstream lakes covered only on average 9% of the catchment area, they were the most important predictor for TOC, TON and DOP export ($r = -0.83$, $r = -0.82$ and $r = -0.61$, respectively). The higher the upstream lake percentage, the lower the export indicating organic matter retention in lakes.

485: G. Matus, M. Papp and B. Tothmeresz,. 2005. Impact of management on vegetation dynamics and seed bank formation of inland dune grassland in Hungary. *Flora* 3(200): 296-306.

Abstract: Seed bank formation and 7 years of vegetation dynamics were studied on permanent plots on a dry sandy pasture, *Cynodonte-Festucetum pseudovinae*. A stand overgrazed by domestic geese and a reference stand void of overgrazing were compared. Apart from this both stands were accidentally grazed by cattle. Vegetation of the overgrazed stand was significantly more species-rich, especially in summer annuals. The reference was dominated with perennials and winter annuals. Composition and dominance changed considerably at both stands but only composition became more alike. Declining species richness and increasing dominance of perennials was found in the overgrazed stand. The reference stand became dominated with the dwarf-shrub *Thymus degenianus*. Species richness of the overgrazed stand showed greater seasonal and year-to-year variation than that of the reference. No temporal change of nutrient availability was found and neither was a difference detected between the stands. Greenhouse germination revealed more dense and more species-rich seed bank in the overgrazed stand. Its established vegetation and soil seed bank were also more alike. Higher species richness of the overgrazed stand can be associated with intensive propagule dispersal of geese, as indicated by dense seed banks of zoochorous hygrophytes delivered from neighbouring wetlands. Relatively high representation of persistent seed bank records suggests that, except for some sensitive perennials, the studied community is adapted to recurrent disturbances. Community regeneration seems to be limited by slow spread of perennial graminoids. (c) 2005 Elsevier GmbH. All rights reserved.

486: V. F. Matveev and L. K. Matveeva,. 2005. Seasonal succession and long-term stability of a pelagic community in a productive reservoir. *Marine and Freshwater Research* 8(56): 1137-1149.

Abstract: In Lake Hume, a reservoir located in an active agricultural zone of the Murray River catchment, Australia, time series for the abundances of phytoplankton and zooplankton taxa, monitored from 1991 through to 1996, were stationary (without trends), and plankton taxonomic composition did not change. This indicated ecosystem resilience to strong fluctuations in reservoir water level, and to other potential agricultural impacts, for example eutrophication and pollution. Although biological stressors such as introduced fish and invertebrate predators are known to affect planktonic communities and reduce biodiversity in lakes, high densities of planktivorous stages of alien European perch (*Perca fluviatilis*) and the presence of carp (*Cyprinus carpio*) did not translate into non-stationary time series or declining trends for plankton in Lake Hume. However, the seasonal successions observed in the reservoir in different years did not conform well to the Plankton Ecology Group (PEG) model. Significant deviations of the Lake Hume successional pattern from the PEG model included maxima for phytoplankton abundance being in winter and the presence of a clear water phase without large zooplankton grazers. The instability of the water level in Lake Hume probably causes the dynamics of most planktonic populations to be less predictable, but did not initiate the declining trends that have been observed in some other Australian reservoirs. Both the PEG model and the present study suggest that hydrology is one of the major drivers of seasonal succession.

487: T. D. Mayer,. 2005. Water-quality impacts of wetland management in the lower Klamath National Wildlife Refuge, Oregon and California, USA. *Wetlands* 3(25): 697-712.

Abstract: Insufficient water supply and poor water quality are major problems in the Klamath Basin of southern Oregon and northern California, USA. Various land-management practices and competing demands for water in much of the basin have led to degraded environmental conditions and poor water quality (excessive nutrients, warm temperatures, high pH, low dissolved oxygen). Of particular interest are the water-quality impacts of wetland management at Lower Klamath National Wildlife Refuge. Wetlands in the refuge are intensely managed through a system of canals, drains, and water-control structures, but the impacts of this management are not known. Data for inflows, outflows, field water-quality parameters, and nutrient concentrations were collected and analyzed in 1999 and 2000. Water budgets and nutrient loads were developed for the refuge. Water-quality impacts from wetland management include higher conductivity and water temperatures but lower turbidity. Outflow nutrient concentrations of N and P are generally increased relative to inflow concentrations, but nutrient loads are reduced. From 55 to 77% of the mass of N and 19 to 51% of the mass of P entering the refuge wetlands is retained. Seasonal wetlands retain less P than permanent wetlands or farmed units, possibly because of the annual drying cycle, the later drainage dates, and predominance of annual vegetation. For all refuge wetlands, dissolved inorganic N is retained more efficiently than particulate N, and particulate P is retained more efficiently than soluble reactive P. The ultimate effect of refuge wetland management is to decrease net N and P loads but increase the ratio of bioavailable P to bioavailable N in the refuge outflow.

488: W. M. Mayes, A. R. G. Large and P. L. Younger,. 2005. The impact of pumped water from a de-watered Magnesian limestone quarry on an adjacent wetland: Thrislington, County Durham, UK. Environmental Pollution 3(138): 443-454.

Abstract: Although quarrying is often cited as a potential threat to wetland systems, there is a lack of relevant, quantitative case studies in the literature. The impact of pumped groundwater discharged from a quarry into a wetland area was assessed relative to reference conditions in an adjacent fen wetland that receives only natural runoff. Analysis of vegetation patterns at the quarry wetland site, using Detrended Correspondence Analysis and the species indicator values of Ellenberg, revealed a clear disparity between community transitions in the quarry wetland and the reference site. Limited establishment of moisture-sensitive taxa, the preferential proliferation of robust wetland species and an overall shift towards lower species diversity in the quarry wetland were explicable primarily by the physico-chemical environment created by quarry dewatering. This encompassed high pH (up to 12.8), sediment-rich effluent creating a nutrient-poor substrate with poor moisture retention in the quarry wetland, and large fluctuations in water levels. (C) 2005 Elsevier Ltd. All rights reserved.

489: C. Mayr, M. Fey, T. Haberzettl, S. Janssen, A. Lucke, N. I. Maidana, C. Ohlendorf, F. Schabitz, G. H. Schleser, U. Struck, M. Wille and B. Zolitschka,. 2005. Palaeoenvironmental changes in southern Patagonia during the last millennium recorded in lake sediments from Laguna Azul (Argentina). *Palaeogeography Palaeoclimatology Palaeoecology* 3-4(228): 203-227.

Abstract: Marked environmental changes in the southern Patagonian steppe during the last 1100 years are detected by a multi-proxy study of radiocarbon-dated sediment cores from the crater lake Laguna Azul (52 degrees 05'S, 69 degrees 35'W). A prominent shift in carbon isotope records occurred between AD 1670 and AD 1890 induced by a change to cooler climate conditions with a concurrent lake level rise. A second perturbation of the lake ecosystem started with a fire event around AD 1830. The fire event triggered increased soil erosion initiating a change of the diatom assemblages. This shift in diatom assemblages may have been enhanced by shrinkage of littoral habitats and higher nutrient supply in the course of permanent European settlement at the end of the 19th century. The introduction of neophytes by European sheep farmers is confirmed by the permanent occurrence of *Rumex* pollen in the sediment record since the beginning of the 20th century. (c) 2005 Elsevier B.V. All rights reserved.

490: M. McBride and D. B. Booth,. 2005. Urban impacts on physical stream condition: Effects of spatial scale, connectivity, and longitudinal trends. Journal of the American Water Resources Association 3(41): 565-580.

Abstract: An assessment of physical conditions in urban streams of the Puget Sound region, coupled with spatially explicit watershed characterizations, demonstrates the importance of spatial scale, drainage network connectivity, and longitudinal downstream trends when considering the effects of urbanization on streams. A rapid stream assessment technique and a multimetric index were used to describe the physical conditions of multiple reaches in four watersheds. Watersheds were characterized using geographic information system (GIS) derived landscape metrics that represent the magnitude of urbanization at three spatial scales and the connectivity of urban land. Physical conditions, as measured by the physical stream conditions index (PSCI), were best explained for the watersheds by two landscape metrics: quantity of intense and grassy urban land in the subwatershed and quantity of intense and grassy urban land within 500 m of the site ($R^2 = 0.52$, $p < 0.0005$). A multiple regression of PSCI with these metrics and an additional connectivity metric (proximity of a road crossing) provided the best model for the three urban watersheds ($R^2 = 0.41$, $p < 0.0005$). Analyses of longitudinal trends in PSCI within the three urban watersheds showed that conditions improved when a stream flowed through an intact riparian buffer with forest or wetland vegetation and without road crossings. Results demonstrate that information on spatial scale and patterns of urbanization is essential to understanding and successfully managing urban streams.

491: A. McCardell, L. Davison and A. Edwards,. 2005. The effect of nitrogen loading on on-site system design: a model for determining land application area size. Water Science and Technology 10(51): 259-266.

Abstract: Designers of on-site wastewater management systems have six opportunities to remove pollutants of concern from the aqueous waste stream before it reaches ground or surface waters. These opportunities occur at source, at point of collection (primary treatment), secondary treatment, tertiary treatment, land application and buffers. This paper presents a computer based model for the sizing of on-site system land application areas applicable to the Lismore area in Northern New South Wales, a region of high rainfall. Inputs to the model include daily climatic data, soil type, number of people loading the system and size of housing allotment. Constraints include allowable phosphorus export, nitrogen export and hydraulic percolation. In the Lismore area nitrogen is the nutrient of most concern. In areas close to environmentally. sensitive waterways, and in dense developments, the allowable annual nitrogen export becomes the main factor determining the land application area size. The model offers system designers the opportunity to test various combinations of nitrogen attenuation strategies (source control, secondary treatment) in order to create a solution which offers an acceptable nitrogen export rate while meeting the client's household and financial needs. The model runs on an Excel spreadsheet and has been developed by Lismore City Council.

492: S. McGowan, P. R. Leavitt and R. I. Hall,. 2005. A whole-lake experiment to determine the effects of winter droughts on shallow lakes. *Ecosystems* 6(8): 694-708.

Abstract: Lake-level fluctuations are common in the North American Great Plains region, where large-scale climate systems (El Nino, the Pacific Decadal Oscillation) and periodic droughts cause substantial hydrologic variability in both summer and winter. To date, most such research has focused on the effects of summer droughts on prairie lake ecosystems; therefore, we studied the impact of water-level decline during winter on ecosystem structure and function. Specifically, we hypothesized that lower lake levels during winter would increase anoxia, freezing and scouring of benthos, fish kills, herbivory by zooplankton, and nutrient release from sediments. In addition, we tested the hypothesis that winter droughts may initiate a switch between alternative stable states (turbid, clear). Physical, chemical, and biological variables were monitored from 1996 to 2001 in both Wascana Lake, which experienced a 50% decline in lake level, and Buffalo Pound Lake, where water levels were constant. A combination of before-after-control-impact (BACI) and multivariate analyses showed that drawdown resulted in elevated NH₄-N concentrations following reinundation; otherwise there were few detectable effects on lake water chemistry (PO₄-P, NO₃-N, total dissolved nitrogen, total dissolved carbon) or pelagic food web structure (phytoplankton, zooplankton), and the experimental lake remained in a macrophyte-rich state. There was, however, a 2.5-fold increase in macrophyte abundance and a shift from a community dominated by *Ceratophyllum demersum* before drawdown to one composed of *Potamogeton pectinatus* after manipulation. Overall, the lack of substantial dewatering effects suggests that lakes of the northern Great Plains may be resilient to severe winter conditions, possibly because of the recruitment of fish from regional metapopulations during summer. Further, our results indicate that lower water levels during winter likely promote the buffer mechanisms that reinforce a macrophyte-rich, clear-w

493: N. L. McMaster and D. W. Schindler,. 2005. Planktonic and epipellic algal communities and their relationship to physical and chemical variables in alpine ponds in Banff National Park, Canada. Arctic Antarctic and Alpine Research 3(37): 337-347.

Abstract: We surveyed 14 ponds in 1999 and 28 ponds in 2000 to better understand the basic limnology of alpine ponds and to predict how the planktonic and epipellic (sediment-living) algal communities may respond to nutrient deposition and climate change. Based on nitrogen to phosphorus ratios, nitrogen limitation is likely common in these alpine ponds, which makes them particularly susceptible to current increases in atmospheric N deposition. Regression and redundancy analysis (RDA) showed phytoplankton abundance and community composition was best explained by total phosphorus (TP), pH, and conductivity. Epipellic abundance was best explained by nitrite plus nitrate and community composition was best explained by TP and dissolved organic carbon (DOC) in addition to nitrite plus nitrate. Some of these chemical variables, DOC, pH, and conductivity, have been linked to climate in alpine ponds and lakes and in low elevation lakes, which suggests alpine ponds may be sensitive to climate change. However, because we found interannual variability in the environmental-algal relationships, several years of study may be required in order to make realistic predictions on how algal communities will respond to increasing nutrient deposition and climate change.

494: E. P. Meehan, E. E. Seminet-Reneau and T. P. Quinn,. 2005. Bear predation on Pacific salmon facilitates colonization of carcasses by fly maggots. American Midland Naturalist 1(153): 142-151.

Abstract: The carcasses of Pacific salmon can be an important food resource for aquatic and terrestrial organisms, depending on where the carcasses are located. We hypothesized that the availability of sockeye salmon (*Oncorhynchus nerka*) carcasses to ovipositing flies (Family: Calliphoridae) would be facilitated by brown bears (*Ursus arctos*) moving salmon from the water to terrestrial environments. We further hypothesized that the proportion of carcasses in terrestrial environments (hence accessible to flies) would vary among streams as a function of stream size. In three small southwestern Alaska streams during 2 y, flies oviposited on about half of the carcasses in terrestrial habitats (44% on gravel, 54% on glass and 57% in the forest). Only 28% of the partially submerged carcasses and 0.5% of the fully submerged carcasses were colonized. The proportion of carcasses deposited outside the stream was strongly and positively influenced by the level of bear predation and negatively affected by stream complexity (in deeper more complex streams more carcasses remained in the water). Based on data from the past 12 y on sockeye salmon abundance and predation by bears (averaging about 40% of the salmon), we estimated that on average 204, 551 and 839 carcasses were colonized per km annually in the three streams (12 to 24% of the total number of carcasses). In these sites, where salmon are abundant and highly available to bears, a large fraction of the tissue is not consumed and so is available to flies. Fly maggots, numbering up to 50,000 per carcass, can consume virtually the entire salmon within 5 d. Thus bears as consumers and transporters of carcasses facilitate the scavenging of carcasses by maggots, increasing the transfer of marine-derived nutrients from aquatic to riparian habitats.

495: E. Meers, D. P. L. Rousseau, N. Blomme, E. Lesage, G. Du Laing, F. M. G. Tack and M. G. Verloo,. 2005. Tertiary treatment of the liquid fraction of pig manure with *Phragmites australis*. Water Air and Soil Pollution 1-4(160): 15-26.

Abstract: Since 2003, the pig industry in Flanders (Belgium) is obliged to process a portion of the nutrient overproduction. In general, pig manure processing occurs as follows: i) separation into liquid and solid fractions, ii) conversion of the solid fraction to an exportable product (e.g. composting) and iii) reduction of nutrient contents in the liquid fraction before discharge into surface water or spreading on arable land. The aim of this study was to evaluate the potential of constructed wetlands (CWs) planted with *Phragmites australis* to reduce nitrogen (N), phosphorus (P) and chemical oxygen demand (COD) in the liquid fraction to levels below discharge criteria. In addition, the removal efficiency of heavy metals (Cu, Zn) present at elevated levels in the liquid fraction was evaluated. A greenhouse experiment was conducted with subsurface flow (S SF) reed beds (2 x 0.125 x 0.11 m) filled with sand, loam, clayey sand or expanded clay (argex). The liquid manure load was set at 1 mm per day. Removal efficiencies varied between 64-75% for COD, 73-83% for N and 71-92% for P, depending on the matrix material used. However, effluent levels still remained significantly above the Flemish legal discharge criteria of 2 mg l⁻¹, 15 mg l⁻¹ and 125 mg l⁻¹ for P, N and COD respectively.

496: T. Mehner, F. Holker and P. Kasprzak,. 2005. Spatial and temporal heterogeneity of trophic variables in a deep lake as reflected by repeated singular samplings. *Oikos* 2(108): 401-409.

Abstract: Approaches to compare the strength of pelagic trophic cascades often use singular sampling programs for measuring trophic variables, thus potentially neglecting the spatial and temporal heterogeneity in the distribution of fish, zooplankton and phytoplankton. Here, we compared the composition of six trophic variables from three trophic levels in a deep oligotrophic lake within temporal (diel and seasonal) and spatial (horizontal and vertical) sampling resolutions. Mean values and ratios between the variables were compared between day and night, in three sampling months, four lake basins, and three water depths. Factor analysis was used to determine abiotic variables which may explain the heterogeneous distribution of the trophic variables. All six trophic variables were strongly heterogeneously distributed between the sampling months and the water depths, whereas horizontal and day-night differences were lower. Distribution of fish, zooplankton and phytoplankton correlated with water temperature and nutrient concentrations. Accordingly, for the use in comparative and meta-analyses, singular sampling programs in deep lakes have to integrate the entire water depth and are best repeated over several seasons. Alternatively, mean water temperature and nutrient concentrations may be used as covariates to diminish the unexplained variance between samples from different lakes.

497: T. Mehner, J. Ihlau, H. Dorner and F. Holker,. 2005. Can feeding of fish on terrestrial insects subsidize the nutrient pool of lakes?. *Limnology and Oceanography* 6(50): 2022-2031.

Abstract: We estimated consumption and excretion rates of terrestrial-borne phosphorus by a population of the insect-feeding fish species bleak (*Alburnus alburnus*) in a 0.12-km² mesotrophic lake of the German lowlands. Fish abundance, growth rates, and diet composition were determined, and consumption and nutrient metabolism were calculated by a bioenergetics model. Mean bleak abundance was about 77,000 ind. km⁻². About 84% of bleak consumption consisted of terrestrial insects. Annual consumption of lake-external phosphorus (P) by bleak was 432 g, representing similar to 2.1% of the lake internal P-pool. Annual excretion of terrestrial-derived phosphorus by bleak was equivalent to similar to 11% of the mean epilimnetic SRP concentration. A substantial subsidy of lake nutrient pools by insectivorous fish is more likely in lakes <0.03 km² owing to the increasing perimeter-to-area ratio between donor and recipient habitats. Terrestrial nutrient subsidy by fish feeding may be important only in small oligotrophic lakes in forested areas.

498: M. Mendez and P. S. Karlsson,. 2005. Nutrient stoichiometry in *Pinguicula vulgaris*: Nutrient availability, plant size, and reproductive status. *Ecology* 4(86): 982-991.

Abstract: Current understanding of the extent, causes for, and consequences of variation in nutrient composition in plants is limited. Important questions to be addressed include to what extent nutrients covary, how flexible nutrient ratios are within a population or species, how reproduction influences nutrient ratios, and how much the ratios of nutrients to mass and nutrients to each other change through ontogeny. This information is needed to assess the physiological and ecological consequences of plant nutrient composition and to what extent plants function as balanced systems in acquisition and allocation of resources. We studied the variation in nutrient stoichiometry (i.e., the ratio between contents of different nutrients within a plant) in relation to three factors: (1) environmental availability of nitrogen, (2) plant size, and (3) reproductive status. We investigated these questions in 11 populations of the carnivorous plant *Pinguicula vulgaris* in northern Scandinavia. Dry mass and N and P content were measured for reproductive and vegetative portions of flowering individuals and for winter buds corresponding to four reproductive states: control reproductive individuals, experimentally vegetative individuals (from which flower buds were removed), adult vegetative individuals, and individuals below the threshold size for reproduction. [N], [P], and to a lesser extent, N and P content were positively related to soil N, but not to prey capture. Nutrient stoichiometry was also size dependent; in general, small plants were relatively enriched in N and relatively depleted in P compared to larger plants. Reproductive status affected not only size, but also nutrient stoichiometry of the resulting winter bud. Winter buds derived from reproductive individuals had a higher [N] and lower [P] than those of the different types of nonreproductive individuals. Our findings indicate that studies of nutrient stoichiometry in plants must go beyond links between environmental and plant

499: F. P. Mendonca, W. E. Magnusson and J. Zuanon,. 2005. Relationships between habitat characteristics and fish assemblages in small streams of Central Amazonia. Copeia 4: 751-764.

Abstract: Small streams with acidic, nutrient-poor waters form a dense hydrological system in Central Amazonia. However, little is known about the fish assemblages that occur in these systems. We investigated the relationships among stream size, substrate, and other physical-chemical factors and fish distributions. Fish assemblages and stream characteristics were sampled in 50-m long sections of streams at 38 sites distributed throughout the 100-km² florestal reserve. Forty-nine species were encountered. The mean richness was similar among sites; however, community composition was correlated with physical and chemical characteristics of the streams. The mean number of species per site ($\bar{X} = 9$) was low in relation to the total number of species recorded from the reserve (49) and in relation to the ichthyofauna that has been recorded from small forest streams near the study area. This contrasts with studies in temperate zones where strong patterns of species addition along the river continuum were found, resulting in prominent species richness gradients. The high between-site turnover in species composition and the strong habitat specificity indicate that it will be necessary to create a network of reserves to efficiently conserve the fish fauna of small forest streams in Central Amazonia.

500: M. Menendez,. 2005. Decomposition of the common reed *Phragmites australis* in a Mediterranean stream pond. Archiv Fur Hydrobiologie 1(163): 101-115.

Abstract: In this study the dynamics of leaf fall, decomposition and nutrient dynamics of *Phragmites australis* was investigated beginning in the standing position and after leaves fall into the water. The study was conducted in a pond at the end of a temporary Mediterranean stream. The results showed that the decomposition rate was higher in the standing position (0.0098 d^{-1}) than after submergence of the detritus ($0.0034\text{-}0.0042 \text{ d}^{-1}$). A significant variation in leaf nutrient content was observed during the standing dead phase, increasing during the first days and decreasing afterwards. After submergence, significant effects of macroinvertebrates, mainly gastropods, were observed on the nutrient content of the detritus after 60 days. The overall decomposition rate, considering the 184 days from the beginning of the experiment with emerged leaves, in the standing position, to the end of measurements with submerged leaves, was 0.0076 d^{-1} . This rate is higher than values reported in the literature for *R australis* leaves in submerged conditions, suggesting that decomposition takes place mostly in the standing position.

501: N. Menetrey, L. Sager, B. Oertli and J. B. Lachavanne,. 2005. Looking for metrics to assess the trophic state of ponds. Macroinvertebrates and amphibians. Aquatic Conservation-Marine and Freshwater Ecosystems 6(15): 653-664.

Abstract: 1. Ponds are particularly rich habitats and play an essential role in the conservation of aquatic biodiversity. Therefore it is necessary to develop a specific method for evaluating their biological integrity, and particularly their water quality. Metrics have proved to be efficient for studies on running waters. Such an approach would be particularly useful for ponds and therefore needs to be tested. 2. Eight metrics based on the richness of invertebrates and amphibians and 73 others derived from the biological/ecological trait categories linked to Coleoptera, Odonata and Gastropoda were tested for their potential as indicators of the trophic state of 94 ponds in Switzerland. The relationships between these metrics and the state of water eutrophication were explored. 3. Four metrics based on richness responded to excessive nutrient levels in the colline vegetation belt. These were: aquatic Coleoptera species richness; the pooled species richness of aquatic Coleoptera, aquatic Gastropoda, adult Odonata and Amphibia (COGA); the family-level richness of macroinvertebrates and the family-level richness of the combined Megaloptera and Odonata groups (MO). At altitudes above 800 M (i.e. montane-subalpine and alpine vegetation belts), two to four other metrics were identified as pond water-quality indicators. 4. Furthermore, many trait categories were sensitive to excessive nutrient levels. In the colline belt, 13 out of the 33 metrics derived from the biological/ecological traits responded to an increase in the trophic state (i.e. at least one metric for each of the three invertebrate groups tested). However, the patterns of the relationships are unclear and further investigations are required to identify and select the relevant metrics for an assessment of water quality. 5. In conclusion, for the future assessment of pond quality, four metrics derived from richness could be taken into consideration. Nevertheless, further investigations are required to identify the biolo

502: A. Merino, M. A. Balboa, R. R. Soalleiro and J. G. A. Gonzalez,. 2005. Nutrient exports under different harvesting regimes in fast-growing forest plantations in southern Europe. *Forest Ecology and Management* 3(207): 325-339.

Abstract: In the humid and temperate areas of southern Europe, forest plantations are dominated by fast-growing species (*Eucalyptus globulus*, *Pinus radiata* and *Pinus pinaster*), which are grown on acidic soils with low reserves of available nutrients. In this study the amounts of nutrients exported from the plantations under different regimes and intensities of harvesting were evaluated and, on the basis of the results obtained, silvicultural management methods aimed at improving the nutritional status of the plantations were proposed. We found high ratios between nutrients exported by harvesting and those available in soil stores, indicating limitation for P, Ca and Mg over the long term, which is consistent with frequently found deficiencies of these nutrients. Current harvesting practices (removal of stem wood and bark) result in high rates of export of P, K, Ca and Mg, especially in eucalypt plantations, because of the high productivity and low nutrient efficiency of this species. Comparison of the amounts of nutrients exported by harvesting, with natural inputs (rainfall and weathering) and outputs (stream water), suggests that intensive exploitation of these plantations may result in negative budgets, especially if whole tree harvesting is carried out. The application of fertilizers containing P, Ca and Mg should be encouraged in all cases to favour the return of nutrients, especially where logging residues are extracted. The cost of harvesting in terms of nutrients can also be reduced by careful selection of the tree species planted and of the tree fractions harvested and by reducing the intensity of harvesting. (c) 2004 Published by Elsevier B.V.

503: F. Mermillod-Blondin, G. Nogaro, T. Datry, F. Malard and J. Gibert,. 2005. Do tubificid worms influence the fate of organic matter and pollutants in stormwater sediments?. Environmental Pollution 1(134): 57-69.

Abstract: In urban area, management of stormwater leads to the accumulation of polluted sediments at the water-sediment interface of various aquatic ecosystems. In many cases, these sediments are colonised by dense populations of tubificid worms. However, the influence of tubificid worms on the fate of stormwater sediments has never been tackled. The aim of this study was to measure in sediment columns the influence of tubificid worms on sediment reworking, organic matter processing (O-2 uptake and release of NH₄⁺, NO₃⁻, PO₄³⁻, and dissolved organic carbon), release of hydrocarbons and heavy metals, and microbial characteristics. Results showed that tubificid worms increased the release of NH₄⁺, PO₄³⁻, and dissolved organic carbon by 2-, 4-, and 3-fold, respectively. O-2 uptake also increased by more than 35% due to tubificid activity. The increase in the percentages of active bacteria and hydrolytic activity in the presence of worms indicated that the higher sediment respiration was caused by the stimulation of microbial communities. A reduction of the number of sulphate-reducing bacteria in the uppermost layers of the sediment was attributed to the penetration of O-2 due to worm activity. These significant effects of tubificid worms were probably linked to the dense network of burrows, which enhanced the exchange surface between the water column and the sediment. No release of heavy metals and hydrocarbons to the water phase was detected in the sediment columns. Understanding the fate and effect of organic stormwater sediments in the natural environment requires the integration of the role of bioturbation in urban pollution studies. (C) 2004 Elsevier Ltd. All rights reserved.

504: G. C. Merseburger, E. Marti and F. Sabater,. 2005. Net changes in nutrient concentrations below a point source input in two streams draining catchments with contrasting land uses. Science of the Total Environment 1-3(347): 217-229.

Abstract: We examined net changes in ammonium-Nitrogen ($\text{NH}_4^+\text{-N}$), nitrate-Nitrogen ($\text{NO}_3^-\text{-N}$), dissolved inorganic nitrogen (DIN), soluble reactive phosphorus (SRP), and dissolved organic carbon (DOC) chloride-corrected ambient concentrations along a reach located below a wastewater treatment plant (WWTP) input in a non-agricultural (12 dates) and an agricultural (6 dates) stream. Based on those net changes, we estimated processing length (S_{net}) and mass transfer coefficient (V_f) of the cited nutrients. In the agricultural stream, results suggest that diffuse nutrient inputs from adjacent agricultural fields had a greater effect on water chemistry than the WWTP input, and probably overwhelmed the stream capacity to retain and transform nutrients. In the non-agricultural stream we observed consistent longitudinal trends below the WWTP input only for $\text{NH}_4^+\text{ N}$ and $\text{NO}_3^-\text{-N}$. The tight coupling between longitudinal $\text{NO}_3^-\text{-N}$ decreases and $\text{NO}_3^-\text{-N}$ increases in the non-agricultural stream, and lack of longitudinal trends of DIN on most dates suggest that $\text{NH}_4^+\text{-N}$ from the WWTP input was being nitrified along the reach. These results suggest that WWTP inputs favor conditions to support hot spots for chemoautotrophic activity. (c) 2004 Elsevier B.V. All rights reserved.

505: J. L. Meyer, M. J. Paul and W. K. Taulbee,. 2005. Stream ecosystem function in urbanizing landscapes. Journal of the North American Benthological Society 3(24): 602-612.

Abstract: Ecologists have described an urban stream syndrome with attributes such as elevated nutrients and contaminants, increased hydrologic flashiness, and altered biotic assemblages. Ecosystem function probably also varies with extent of urbanization, although there are few stream networks in which this prediction has been studied. We examined functional characteristics of 6 tributaries of the Chattahoochee River near Atlanta, Georgia, USA, whose catchments differed in degree of urbanization. We conducted short-term NH_4 - and PO_4 -addition experiments to measure nutrient uptake velocity, which is the rate at which a nutrient moves through the water column toward the benthos. Both NH_4 and soluble reactive P uptake velocities decreased as indicators of urbanization (i.e., % of catchment covered by high-intensity urban development) increased. The amount of fine benthic organic matter (FBOM) also decreased with increasing urbanization, and uptake velocities were directly related to FBOM. Uptake velocities were not related to ecosystem metabolism (gross primary production [GPP], community respiration [CR], or net ecosystem production) as measured with diel oxygen curves. However, NH_4 uptake velocity increased as total stream metabolism (GPP + CR) increased in these streams as well as in other North American streams, suggesting that biotic demand drives NH_4 uptake velocities across a wide range of stream ecosystems. Measures of ecosystem function responded differently to urbanization: ecosystem metabolism was not correlated with indicators of urbanization, although breakdown rate of *Acer barbatum* leaves was positively correlated and nutrient uptake velocities were negatively correlated with indicators of urbanization. Elevated nutrient concentrations associated with urbanization are usually attributed to increased inputs from point and non-point sources; our results indicate that concentrations also may be elevated because of reduced rates of nutrient removal. Altered ecosystem f

506: T. E. Milette, C. N. Carlyle, C. R. Picard, K. M. Mulac, A. Landaw and L. H. Fraser,. 2005. Hydrology, water chemistry, and vegetation characteristics of a Tamarack Bog in Bath township, Ohio: Towards restoration and enhancement. Ohio Journal of Science 2(105): 21-30.

Abstract: The current state of the Bath Tamarack Bog has raised concern about the health and function of the system. Only 6 tamarack (*Larix laricina*) trees remain, while deciduous trees, particularly red maple (*Acer rubrum*) and invasive species such as glossy buckthorn (*Rhamnus frangula*) and multiflora rose (*Rosa multiflora*), dominate the bog. Our purpose was to assess the physical, chemical, and biological properties of the tamarack bog. Environmental and biological properties of Bath Tamarack Bog were measured from May 2001 through November 2002. In 2001, the center of the bog experienced water levels below those typically found in bogs, yet experienced normal water levels in the following year. Water chemistry results indicate the pH is much greater than that characteristic of a typical bog, ranging from 5.94 to 7.41. Nutrient levels fluctuated and were generally higher for calcium, potassium, and phosphate than a typical bog, while nitrogen levels remained low. These results indicate that the bog is not functioning normally and is in decline. The degradation of the bog is most likely due to anthropogenic activity. Ditching occurred between 1963 and 1969 and seems to have induced the progression of red maple trees and invasive species into the bog by lowering water levels. Since 1938, the first aerial photo we have record of, the bog has reduced to approximately a third of its size, which is approximately 1.99 hectares. The bog appears to be in a late successional stage, rapidly changing to a forested wetland. We discuss possible management and restoration efforts needed to restore or enhance the tamarack bog, including 1) planting Sphagnum mats, 2) introducing tamarack seedlings, 3) controlling invasive species, and 4) maintaining the hydrology close to the soil surface. All of these measures are suggested in association with educational outreach.

507: A. J. Miller, E. Di Lorenzo, D. J. Neilson, H. J. Kim, A. Capotondi, M. A. Alexander, S. J. Bograd, F. B. Schwing, R. Mendelssohn, K. Hedstrom and D. L. Musgrave,. 2005. Interdecadal changes in mesoscale eddy variance in the Gulf of Alaska circulation: Possible implications for the Steller sea lion ecline. Atmosphere-Ocean 3(43): 231-240.

Abstract: A distinct change in the ocean circulation of the Gulf of Alaska after the 1976-77 climate shift is studied in an eddy-permitting primitive equation model forced by observed wind stresses from. 1951-99. When the Aleutian Low strengthens after 1976-77, strong changes occur in the mean velocity, of the Alaskan Stream and in its associated mesoscale eddy field. In contrast, the Alaska Current and the eddy flows in the eastern Gulf remain relatively unchanged after the shift. Since mesoscale eddies provide a possible mechanism for transporting nutrient-rich open-ocean waters to the productive shelf region, the flow of energy through the food web may have been altered by this physical oceanographic change. This climate-driven mechanism, which has a characteristic east-west spatial asymmetry, may potentially help to explain changes in forage fish quality, in diet diversity of Steller sea lions whose populations have declined precipitously since the mid-1970s in the western Gulf while remaining stable in the eastern Gulf.

508: W. Miller and A. J. Boulton,. 2005. Managing and rehabilitating ecosystem processes in regional urban streams in Australia. *Hydrobiologia* (552): 121-133.

Abstract: Urbanization is acknowledged as one of the most severe threats to stream health, spawning recent research efforts into methods to ameliorate these negative impacts. Attention has focused on streams in densely-populated cities but less populous regional urban centres can be equally prone to some of the same threats yet might not meet the conventional definitions of urban. Several recent reviews have identified the changes to streams that occur during urbanization but they note that few ecological studies have explored ecosystem-level responses, typically focusing instead on state variables such as invertebrate abundance. In many regional urban streams, changes to the extent of impervious drainage have implications for their hydrology and channel morphology but the influence of these changes on fundamental ecosystem processes of leaf litter breakdown and transport compared with those in nearby rural streams are poorly known. The widespread practice of planting exotic trees along riparian zones and street margins draining into urban streams further exacerbates the disruption of natural organic matter dynamics. The combination of seasonal leaf fall by exotic species and the altered drainage patterns through urbanization in Armidale, a regional town in New South Wales, Australia, resulted in contrasting patterns of benthic organic matter storage over 18 months compared to nearby reference and rural streams. Macroinvertebrate detritivore densities were low in the urban stream, implying disruption of the usual biological pathways of leaf breakdown. Understanding the interactions of hydrology, drainage pattern, leaf input and biological attributes of a stream is crucial for managers trying to restore stream ecosystem services without incurring public concern about the appearance of regional urban streams.

509: W. W. Miller, D. W. Johnson, C. Denton, P. S. J. Verburg, G. L. Dana and R. F. Walker,. 2005. Inconspicuous nutrient laden surface runoff from mature forest Sierran watersheds. Water Air and Soil Pollution 1-4(163): 3-17.

Abstract: It is generally held that surface runoff in heavily forested ecosystems is minimal and therefore nutrient fluxes via runoff are unimportant. This is based in large measure on the absence of direct observation or remnant physical evidence. It is further held that protected forests with heavy understory and litter serve as a nutrient sink due to maximum uptake and interception. Our Sierran studies have detected the presence of surface runoff at several sites in the form of both overland and litter interflow with concentrations of $\text{NH}_4\text{-N}$ as high as 87.2 mg L^{-1} , $\text{NO}_3\text{-N}$ as high as 95.4 mg L^{-1} , and $\text{PO}_4\text{-P}$ as high as 24.4 mg L^{-1} . Data suggest that nutrients are derived from the mature O-horizons, and that there has been little contact with the mineral soil or root zone where strong retention and/or uptake of these ions would be expected. Such contributions from overland/interflow could be particularly important in areas where ultra-oligotrophic lakes (e.g., Lake Tahoe) are now trending towards meso-oligotrophic status. We believe that fire exclusion in these systems may have exacerbated N and P inputs to Lake Tahoe and elsewhere by allowing unnatural buildups of O-horizons that are apparently a source of nutrients to surface runoff.

510: N. Minakawa and R. I. Gara,. 2005. Spatial and temporal distribution of coho salmon carcasses in a stream in the Pacific Northwest, USA. *Hydrobiologia* (539): 163-166.

Abstract: During two consecutive spawning seasons, the movement and distribution of naturally occurring coho salmon (*Oncorhynchus kisutch*) carcasses were monitored, and the effectiveness of large woody debris (LWD) in retaining carcasses in a stream was evaluated. In both seasons studied, the proportion of carcasses trapped by LWD increased as the season progressed. Densities of salmon carcasses were higher in slow waters such as stream edges and backwaters throughout the study periods. The average distance drifted by carcasses was 19.5 m in the first season and 32.1 m in the second season. These results support the notion that LWD contributes to retention of salmon carcasses and enhances availability of salmon-derived nutrients for organisms near salmon spawning grounds.

511: C. Mitchell, J. Brodie and I. White,. 2005. Sediments, nutrients and pesticide residues in event flow conditions in streams of the Mackay Whitsunday Region, Australia. Marine Pollution Bulletin 1-4(51): 23-36.

Abstract: The Mackay Whitsunday region covers 9000 km² in northeastern Australia. A study of diffuse pollutants during high flow events was conducted in coastal streams in this region. Sampling was conducted in the Pioneer River catchment during a high flow event in February 2002 and in Gooseponds Creek, Sandy Creek and Carmila Creek in March 2003. Concentrations of five herbicides; atrazine (1.3 $\mu\text{g l}^{-1}$), diuron (8.5 $\mu\text{g l}^{-1}$), 2,4-D (0.4 $\mu\text{g l}^{-1}$), hexazinone (0.3 $\mu\text{g l}^{-1}$) and ametryn (0.3 $\mu\text{g l}^{-1}$) and high concentrations of nutrients (total nitrogen 1.14 mg l^{-1} , total phosphorus 0.20 mg l^{-1}) and suspended sediments (620 mg l^{-1}) were measured at Dumbleton Weir on the lower reaches of the Pioneer River. Drinking water guidelines for atrazine and 2,4-D were exceeded at Dumbleton Weir, low reliability trigger values for ecosystem protection for diuron were exceeded at three sites and primary industry guidelines for irrigation levels of diuron were also exceeded at Dumbleton Weir. Similar concentrations were found in the three smaller streams measured in 2003. Herbicides and fertilisers used in sugarcane cultivation were identified as the most likely major source of the herbicide residues and nutrients found. (c) 2004 Elsevier Ltd. All rights reserved.

512: C. P. J. Mitchell and B. A. Branfireun,. 2005. Hydrogeomorphic controls on reduction-oxidation conditions across boreal upland-peatland interfaces. *Ecosystems* 7(8): 731-747.

Abstract: The reduction-oxidation (redox) state of peatland pore waters plays an important role in many peatland biogeochemical processes. Recent research has also shown that the interface between ecosystems, or the ecotone, may be responsible for a disproportionate amount of biogeochemical activity when material and/or energy is hydrologically transported between ecosystems. The purpose of this research was to examine the spatiotemporal dynamics of redox conditions across two geomorphically distinct Boreal Precambrian Shield upland-peatland ecotones to determine the spatial and temporal scales at which these ecotones may be important. Pore water chemistry of iron and sulphur species was monitored across two upland-peatland ecotones in northwestern Ontario in conjunction with hydrological measurements under both stormflow and nonstormflow conditions. In addition, one upland-peatland ecotone was instrumented to make continuous measurements of in situ redox potential (Eh) over a 12-day period to determine whether measurements at a high temporal scale could provide additional insights into the transfer of nutrients across the upland-peatland interface. Results indicated that hydrology-specifically, groundwater flowpath and the strength of the hydrological connection between upland and peatland-determined the spatial extent of the ecotone as a biogeochemical hotspot. In situ Eh measurements showed that these ecotones may be most important over a scale of only several hours and are largely affected by lateral hydrological flows from the upland. The role of both hot spots and hot moments in biogeochemistry must be considered to accurately estimate the ability of a single ecosystem to process chemical inputs.

513: G. Mitchell,. 2005. Mapping hazard from urban non-point pollution: a screening model to support sustainable urban drainage planning. Journal of Environmental Management 1(74): 1-9.

Abstract: Non-point sources of pollution are difficult to identify and control, and are one of the main reasons that urban rivers fail to reach the water quality objectives set for them. Whilst sustainable drainage systems (SuDS) are available to help combat this diffuse pollution, they are mostly installed in areas of new urban development. However, SuDS must also be installed in existing built areas if diffuse loadings are to be reduced. Advice on where best to locate SuDS within existing built areas is limited, hence a semi-distributed stochastic GIS-model was developed to map small-area basin-wide loadings of 18 key stormwater pollutants. Load maps are combined with information on surface water quality objectives to permit mapping of diffuse pollution hazard to beneficial uses of receiving waters. The model thus aids SuDS planning and strategic management of urban diffuse pollution. The identification of diffuse emission 'hot spots' within a water quality objectives framework is consistent with the 'combined' (risk assessment) approach to pollution control advocated by the EU Water Framework Directive. (C) 2004 Elsevier Ltd. All rights reserved.

514: N. L. Mitchell and G. A. Lamberti,. 2005. Responses in dissolved nutrients and epilithon abundance to spawning salmon in southeast Alaska streams. *Limnology and Oceanography* 1(50): 217-227.

Abstract: Spawning Pacific salmon (*Oncorhynchus* spp.) historically transported massive quantities of marine-derived nutrients (MDN) into nutrient-poor streams of the Pacific Northwest. In southeast Alaska, we measured the effects of MDN on streamwater chemistry and epilithon standing stock (1) through time during two consecutive years in one stream, Fish Creek; (2) over space in six salmon streams; and (3) in a controlled mesocosm experiment. In Fish Creek during strong salmon runs in 2000 and 2001, streamwater concentrations of ammonium (NH_4) increased 10-fold and soluble reactive phosphorus (SRP) increased by 4- to 7-fold in the presence of salmon. NH_4 and SRP also increased with distance downstream in the salmon reach, likely related to a 'carcass-loading' effect. In contrast, nitrate (NO_3) and dissolved organic carbon concentrations varied only with discharge. In 2000, epilithon chlorophyll a increased by 20-fold during the salmon run, whereas no significant change was observed in 2001. Over space, the multistream survey revealed consistent increases in NH_4^+ and SRP, but no pattern in epilithon response to the salmon run. In the mesocosm experiment, NH_4 , SRP, and epilithon standing stock all increased in the presence of salmon carcasses in artificial streams. Overall, salmon clearly increased the concentrations of important dissolved nutrients in southeast Alaska streams. Responses in epilithon were more variable, however, suggesting that multiple environmental factors including light and disturbance likely regulate epilithon growth in salmon streams. Nutrient mass transport estimates revealed that a substantial amount of MDN (46%-60% depending on element) is exported directly back to the estuarine environment, suggesting that salmon represent a key marine-freshwater coupling in nutrient cycling.

515: V. I. Miteva and J. E. Brenchley,. 2005. Detection and isolation of ultrasmall microorganisms from a 120,000-year-old Greenland glacier ice core. *Applied and Environmental Microbiology* 12(71): 7806-7818.

Abstract: The abundant microbial population in a 3,043-m-deep Greenland glacier ice core was dominated by ultrasmall cells ($< 0.1 \mu\text{m}^3$) that may represent intrinsically small organisms or starved, minute forms of normal-sized microbes. In order to examine their diversity and obtain isolates, we enriched for ultrasmall psychrophiles by filtering melted ice through filters with different pore sizes, inoculating anaerobic low-nutrient liquid media, and performing successive rounds of filtrations and recultivations at 5 degrees C. Melted ice filtrates, cultures, and isolates were analyzed by scanning electron microscopy, flow cytometry, cultivation, and molecular methods. The results confirmed that numerous cells passed through 0.4- μm , 0.2- μm , and even 0.1- μm filters. Interestingly, filtration increased cell culturability from the melted ice, yielding many isolates related to high-G+C gram-positive bacteria. Comparisons between parallel filtered and nonfiltered cultures showed that (i) the proportion of 0.2- μm -filterable cells was higher in the filtered cultures after short incubations but this difference diminished after several months, (ii) more isolates were obtained from filtered (1,290 isolates) than from nonfiltered (447 isolates) cultures, and (iii) the filtration and liquid medium cultivation increased isolate diversity (Proteobacteria; Cytophaga-Flavobacteria-Bacteroides; high-G+C gram-positive; and spore-forming, low-G+C gram-positive bacteria). Many isolates maintained their small cell sizes after recultivation and were phylogenetically novel or related to other ultramicrobacteria. Our filtration-cultivation procedure, combined with long incubations, enriched for novel ultrasmall-cell isolates, which is useful for studies of their metabolic properties and mechanisms for long-term survival under extreme conditions.

516: W. J. Mitsch, L. Zhang, C. J. Anderson, A. E. Altor and M. E. Hernandez,. 2005. Creating riverine wetlands: Ecological succession, nutrient retention, and pulsing effects. *Ecological Engineering* 5(25): 510-527.

Abstract: Successional patterns, water quality changes, and effects of hydrologic pulsing are documented for a whole-ecosystem experiment involving two created wetlands that have been subjected to continuous inflow of pumped river water for more than 10 years. At the beginning of the growing season in the first year of the experiment (1994), 2400 individuals representing 13 macrophyte species were introduced to one of the wetland basins. The other basin was an unplanted control. Patterns of succession are illustrated by macrophyte community diversity and net aboveground primary productivity, soil development, water quality changes, and nutrient retention for the two basins. The planted wetland continued to be more diverse in plant cover 10 years after planting and the unplanted wetland appeared to be more productive but more susceptible to stress. Soil color and organic content continued to change after wetland creation and wetlands had robust features of hydric soils within a few years of flooding. Organic matter content in surface soils in the wetlands increased by approximately 1% per 3-year period. Plant diversity and species differences led to some differences in the basins in macrophyte productivity, carbon sequestration, water quality changes and nutrient retention. The wetlands continued to retain nitrate-nitrogen and soluble reactive phosphorus 10 years after their creation. There are some signs that sediment and total phosphorus retention are diminishing after 10 years of river flow. Preliminary results from the beginnings of a flood pulsing experiment in the two basins in 2003-2004 are described for water quality, nutrient retention, aboveground productivity, and methane and nitrous oxide gaseous fluxes. (c) 2005 Elsevier B.V. All rights reserved.

517: M. Mkandawire and E. G. Dudel,. 2005. Assignment of *Lemna gibba* L. (duckweed) bioassay for in situ ecotoxicity assessment. *Aquatic Ecology* 2(39): 151-165.

Abstract: To narrow the differences between the results obtained from radionuclides and heavy metal ecotoxicity investigations in the laboratory and in the abandoned uranium mines, a few standardised plant bioassay procedures were selected from the literature for testing with *Lemna gibba* L. The bioassay procedures were tested in situ and ex situ. The laboratory culturing was performed in batch and semicontinuous modes. The results revealed that most of the standardised plant bioassay procedures require modification for the *L. gibba* bioassay to predict the actual effects under field conditions. *L. gibba* performed relatively better in the field than laboratory batch cultures despite that the batch cultures had many-fold higher nutrient concentrations than in the field. For instance, the phosphorus concentration of the mine tailing water was $0.13 \pm 0.09 \mu\text{g l}^{-1}$ in the field, while the literature range for phosphorus in the laboratory culture media is $13.6 - 40 \text{ mg l}^{-1}$. *L. gibba* growth in the laboratory batch culture was influenced by speciation changes due to consumption of nutrients, CO_2 and O_2 phase exchanges, and excretion of organic substances by the test plants. Semicontinuous culture modes performed significantly better than batch cultivation even after 10x dilution of the nutrient solution. The growth behaviour revealed that *L. gibba* exhibited intrapopulation and probiotic interaction for best performance. Growth performance of *L. gibba* was influenced by the anions that balanced essential cations despite equal cation concentration in the culture media; e. g., the best growth was observed in culture media that had more SO_4^{2-} than Cl^- . Water samples from the field had higher SO_4^{2-} concentrations than Cl^- . The test vessel material, sterilisation and axenic culturing procedures also influenced the sensitivity of the bioassay. These, for instance, and a few others are neither described nor reported in most standard *Lemna* tests or the literature. Thus, this work presents

518: N. Mladenov, D. M. McKnight, P. Wolski and L. Ramberg,. 2005. Effects of annual flooding on dissolved organic carbon dynamics within a pristine wetland, the Okavango Delta, Botswana. *Wetlands* 3(25): 622-638.

Abstract: In the Okavango Delta in Botswana, dissolved organic matter (DOM) transport is controlled by the slow movement of an annual flood 'pulse' across permanently and seasonally flooded wetlands, known respectively as the Permanent Swamp and Seasonal Swamp. We studied temporal and spatial variations in fluorescence index (FI) and specific UV absorbance (SUVA) of DOM to identify DOM sources and fate during the flood. Dissolved organic carbon (DOC) concentrations ranged from 2 to 25 mg C L⁻¹ in channels of the Delta, with seasonal floodplains having consistently higher concentrations. Chemical indices, such as DOC concentrations, conductivity, specific UV absorbance (SUVA), fluorescence, total dissolved nitrogen, and chlorophyll a, were analyzed for channel and floodplain sites in the Seasonal Swamp. DOC concentrations increased during the rising limb of the flood in the Seasonal Swamp. SUVA of whole water samples and fluorescence index (FI) of fulvic acids isolated from channel and floodplain sites changed in a manner indicating the release of DOM by leaching of plant litter during the flood. After the flood receded, DOC concentrations and fulvic acid content decreased, and microbially-derived sources of organic matter dominated. Along two river reaches, measuring over 400 km each, variations in DOC concentrations were primarily due to geomorphology, with the effects of the annual flood overprinted atop the spatial controls. Increasing downstream DOC concentrations were found to be a product of inundation of DOC-rich seasonal floodplains and evaporation-enriched waters downstream. Increasing SUVA, dissolved nitrogen, and fulvic acid content, and decreasing FI downstream suggested microbial processing of terrestrial DOM and possible release of nutrients incorporated in the DOM.

519: R. J. R. Molica, E. J. A. Oliveira, P. V. C. Carvalho, A. Costa, M. C. C. Cunha, G. L. Melo and S. Azevedo,. 2005. Occurrence of saxitoxins and an anatoxin-a(s)-like anticholinesterase in a Brazilian drinking water supply. Harmful Algae 4(4): 743-753.

Abstract: Blooms of toxic cyanobacteria are very common in Brazilian waterbodies, as a consequence of eutrophication processes. Our investigations were focused on the detection of neurotoxins during a cyanobacterial bloom in Tapacura reservoir, which serves as a water supply for Recife city in northeastern Brazil. We also investigated the possible presence of neurotoxins in strains of *Anabaena spiroides* isolated from this environment. Samples were collected from March to May 2002 at the water surface and close to the dam. Limnological parameters (conductivity, pH, inorganic nutrients) and cyanobacterial abundance were measured. The samples were assayed for toxicity by mouse bioassay and acetylcholinesterase-inhibiting activity by a colorimetric method; saxitoxins (paralytic shellfish poisons) were quantified by a HPLC-FLD postcolumn derivatization method. The dominant cyanobacteria during the bloom were found to be *A. spiroides*, *Pseudanabaena* sp., *Cylindrospermopsis raciborskii* and *Microcystis aeruginosa*. The mouse bioassays showed the presence of neurotoxins during both *A. spiroides* and *C. raciborskii* dominance, whereas anticholinesterase activity was only observed during periods of *A. spiroides* dominance. The *A. spiroides* strains isolated during the study also exhibited an acetylcholinesterase inhibitor. HPLC-FLD chromatograms of bloom material extracts revealed the presence of saxitoxin, neosaxitoxin and dc-saxitoxin, probably produced by *C. raciborskii*. (c) 2004 Elsevier B.V. All rights reserved.

520: A. Moller, K. Kaiser and G. Guggenberger,. 2005. Dissolved organic carbon and nitrogen in precipitation, throughfall, soil solution, and stream water of the tropical highlands in northern Thailand. Journal of Plant Nutrition and Soil Science-Zeitschrift Fur Pflanzenernahrung Und Bodenkunde 5(168): 649-659.

Abstract: Dissolved organic matter (DOM) is important for the cycling and transport of carbon (C) and nitrogen (N) in soil. In temperate forest soils, dissolved organic N (DON) partly escapes mineralization and is mobile, promoting loss of N via leaching. Little information is available comparing DOC and DON dynamics under tropical conditions. Here, mineralization is more rapid, and the demand of the vegetation for nutrients is larger, thus, leaching of DON could be small. We studied concentrations of DOC and DON during the rainy seasons 1998-2001 in precipitation, canopy throughfall, pore water in the mineral soil at 5, 15, 30, and 80 cm depth, and stream water under different land-use systems representative of the highlands of northern Thailand. In addition, we determined the distribution of organic C (OC) and N (ON) between two operationally defined fractions of DOM. Samples were collected in small water catchments including a cultivated cabbage field, a pine plantation, a secondary forest, and a primary forest. The mean concentrations of DOC and DON in bulk precipitation were 1.7 ± 0.2 and 0.2 ± 0.1 mg L⁻¹, respectively, dominated by the hydrophilic fraction. The throughfall of the three forest sites became enriched up to three times in DOC in the hydrophobic fraction, but not in DON. Maximum concentrations of DOC and DON (7.9-13.9 mg C L⁻¹ and 0.9-1.2 mg N L⁻¹, respectively) were found in samples from lysimeters at 5 cm soil depth. Hydrophobic OC and hydrophilic ON compounds were released from the O layer and the upper mineral soil. Concentrations of OC and ON in mineral-soil solutions under the cabbage cultivation were elevated when compared with those under the forests. Similar to most temperate soils, the concentrations in the soil solution decreased with soil depth. The reduction of OC with depth was mainly due to the decrease of hydrophobic compounds. The changes in OC indicated the release of hydrophobic compounds poor in N in the forest canopy and the organic

521: W. M. Mooij, S. Hulsmann, L. N. D. Domis, B. A. Nolet, P. L. E. Bodelier, P. C. M. Boers, L. M. D. Pires, H. J. Gons, B. W. Ibelings, R. Noordhuis, R. Portielje, K. Wolfstein and E. Lammens,. 2005. The impact of climate change on lakes in the Netherlands: a review. *Aquatic Ecology* 4(39): 381-400.

Abstract: Climate change will alter freshwater ecosystems but specific effects will vary among regions and the type of water body. Here, we give an integrative review of the observed and predicted impacts of climate change on shallow lakes in the Netherlands and put these impacts in an international perspective. Most of these lakes are man-made and have preset water levels and poorly developed littoral zones. Relevant climatic factors for these ecosystems are temperature, ice-cover and wind. Secondary factors affected by climate include nutrient loading, residence time and water levels. We reviewed the relevant literature in order to assess the impact of climate change on these lakes. We focussed on six management objectives as bioindicators for the functioning of these ecosystems: target species, nuisance species, invading species, transparency, carrying capacity and biodiversity. We conclude that climate change will likely (i) reduce the numbers of several target species of birds; (ii) favour and stabilize cyanobacterial dominance in phytoplankton communities; (iii) cause more serious incidents of botulism among waterfowl and enhance the spreading of mosquito borne diseases; (iv) benefit invaders originating from the Ponto-Caspian region; (v) stabilize turbid, phytoplankton-dominated systems, thus counteracting restoration measures; (vi) destabilize macrophyte-dominated clear-water lakes; (vii) increase the carrying capacity of primary producers, especially phytoplankton, thus mimicking eutrophication; (viii) affect higher trophic levels as a result of enhanced primary production; (ix) have a negative impact on biodiversity which is linked to the clear water state; (x) affect biodiversity by changing the disturbance regime. Water managers can counteract these developments by reduction of nutrient loading, development of the littoral zone, compartmentalization of lakes and fisheries management.

522: A. A. a. M. A. P. Moore,. 2005. Invertebrate biodiversity in agricultural and urban headwater streams: implications for. Ecological Applications 15(4): 1169-1177.

Abstract: The urbanization of agricultural lands is currently one of the dominant patterns of land use change in developed countries. In the United States and parts of Europe, this has led to the implementation of agricultural land preservation programs and riparian protection and replanting efforts along urban streams. The ecological benefits of such programs for the conservation of freshwater biodiversity have yet to be fully explored. We designed a study to investigate the patterns of stream macroinvertebrate community structure along a gradient of agriculture to urban development, and the patterns among urban streams that vary in the amount of intact riparian buffer. In 2001 and 2002, we sampled the 29 small headwater streams comprising the outlying tributaries of four watersheds just north of Washington, DC in Montgomery County, Maryland, USA. This region has had dramatic urban development over the last 50 years, yet significant efforts have been made to maintain riparian buffers and promote preservation of agricultural land. Macroinvertebrate richness was strongly related to land use, with agricultural streams exhibiting the highest macroinvertebrate diversity. Decreased taxa richness was related negatively and linearly (no statistical threshold) to the amount of impervious surface cover. For the urban streams, there was a strong positive relationship between invertebrate diversity and riparian forest cover such that some urban streams with high amounts of intact riparian forest exhibited biodiversity levels more comparable to less urban areas despite high amounts of impervious cover in their catchments. The agricultural headwater streams in this study were not only more diverse than the urban headwaters, but their levels of macroinvertebrate diversity were high compared to other published estimates for agricultural streams. These higher richness values may be due to widespread use of "best management farming practices" (BMPs), including no-till farming and the impleme

523: T. R. Moore, J. A. Trofymow, M. Siltanen and C. Prescott,. 2005. Patterns of decomposition and carbon, nitrogen, and phosphorus dynamics of litter in upland forest and peatland sites in central Canada. Canadian Journal of Forest Research-
Revue Canadienne De Recherche Forestiere 1(35): 133-142.

Abstract: We tested whether upland or peatland location affected rates of litter decomposition and nutrient dynamics. We examined the patterns of mass loss and carbon (C), nitrogen (N), and phosphorus (P) gain, retention, or loss in 11 forest tissues over 6 years at three upland and three peatland sites in the Low Boreal, High Boreal, and Low Subarctic zones of central Canada. After 6 years of decomposition, the average litter mass remaining ranged from 35% for fescue grass to 75% for western redcedar needles and 94% for wood blocks placed on the soil surface, with exponential decay coefficients (k) of -0.16, -0.05, and -0.01, respectively. At one pair of sites, the mass remaining and the k values indicated that faster decomposition occurred in the upland site than in the nearby peatland site. The reverse was the case in a second pair. No overall pattern was apparent in the third. In general, Douglas-fir needles decomposed significantly faster in peatland than upland sites, and the reverse pattern occurred for bracken fern. Most foliar litters retained their original N mass and lost P as they decomposed. There were few major differences between N and P dynamics in litters decomposing at upland and peatland sites, though N and P retention in some cases was greater at the peatland sites. These results suggest that longer term (>6 years) differences in decomposition rate and differences in litter quality account for larger C accumulation in peatland than in upland soils.

524: L. Moosmann, B. Muller, R. Gachter, A. Wuest, E. Butscher and P. Herzog,. 2005. Trend-oriented sampling strategy and estimation of soluble reactive phosphorus loads in streams. Water Resources Research 1(41): .

Abstract: [1] Nutrient transfer from soils to surface waters is associated with large, hydrologically induced fluctuations. Consequently, stream-based estimation of long-term changes in nutrient leaching is masked by variations of stream discharge. Using high-resolution discharge and soluble reactive phosphorus (SRP) data from three small catchments (up to 42 km²), SRP loads are calculated by applying two different rating curves. Monte Carlo simulations are carried out to determine monitoring strategies for optimizing the number of water samples, their distribution between periods of low and high discharge, and the duration of composite sample collection. Trends in SRP load are isolated from natural variations by applying the discharge time series of 1 year each to annually changing rating curves. By applying this approach to various monitoring data sets, collected over the past 15 years, downward trends in SRP leaching of up to - 3% yr⁻¹ are detected. We describe how to determine the number of annual samples required to detect trends in nutrient load, depending on monitoring duration, available resources, and the magnitude of the expected trend.

525: C. W. Mordy, P. J. Stabeno, C. Ladd, S. Zeeman, D. P. Wisegarver, S. A. Salo and G. L. Hunt,. 2005. Nutrients and primary production along the eastern Aleutian Island Archipelago. Fisheries Oceanography (14): 55-76.

Abstract: The distribution of nutrients (nitrate, phosphate, and silicic acid), chlorophyll and primary productivity were examined in the central and eastern Aleutian Archipelago. The data were collected from moorings (temperature, salinity, nitrate, and currents) and two hydrographic research cruises (June 2001 and May-June 2002). During the hydrographic cruises salinity, temperature, nutrients, chlorophyll and primary production were measured in and around the eastern and central Aleutian Passes. The net nutrient transport through the passes was northward, and it was relatively low in the eastern passes compared to the central passes. In the shallow eastern passes the source water from the Pacific was the nutrient-poor Alaska Coastal Current, while in the deeper central passes it was the nutrient-rich Alaskan Stream. Within the passes, vigorous tidal mixing resulted in enriched surface concentrations, especially in the central passes. Chlorophyll sections and satellite composites from summer indicate high chlorophyll east of Samalga Pass and very low chlorophyll between Samalga and Seguam Passes. Production was relatively low across the study area, except at the northern end of Seguam Pass and in the vicinity of the shelf edge in the southeastern Bering Sea. Production and chlorophyll concentrations were lowest in the deep passes. These results suggest that, within the passes, deep mixing inhibits new production, but substantial blooms may occur downstream of the passes subsequent to stratification.

526: R. P. Morgan and S. E. Cushman,. 2005. Urbanization effects on stream fish assemblages in Maryland, USA. Journal of the North American Benthological Society 3(24): 643-655.

Abstract: We examined patterns in Maryland fish assemblages in 1(st)- through 3rd-order nontidal streams along an urbanization gradient in the Eastern Piedmont (EP) and Coastal Plain (CP) physiographic ecoregions of Maryland, USA, using 1995 to 1997 and 2000 to 2002 data from the Maryland Biological Site Survey (MBSS). Major urbanization and other historical stressors occur in both ecoregions, and there is potential for further stress over the next 25 y as urbanization increases. We assigned each MBSS site (n = 544 streams) to a class of urbanization based on land cover within its upsite catchment. We compared observed fish abundance and species richness to the probable (expected) assemblages within each ecoregion, and also assessed the accuracy of the Maryland fish index of biotic integrity (FIBI) to indicate catchment urbanization. Relationships between urbanization and fish assemblages and FIBI varied between the 2 ecoregions. Assemblages in EP streams exhibited stronger relationships with urbanization than those in CP streams, particularly when urban land cover was > 25% of the catchment. Across all EP stream orders (1(st), 2(nd), and 3(rd)), high urbanization was associated with low fish abundance and richness, low FIBI, and few intolerant fish species, resulting in assemblages dominated by tolerant species. Conservation practices minimizing urbanization effects on fish assemblages may be inadequate to protect sensitive fish species because of the invasiveness of urban development and stressors related to the urban stream syndrome.

527: B. Morse and F. Hicks,. 2005. Advances in river ice hydrology 1999-2003. Hydrological Processes 1(19): 247-263.

Abstract: In the period 1999 to 2003, river ice has continued to have important socio-economic impacts in Canada and other Nordic countries. Concurrently, there have been many important advances in all areas of Canadian research into river ice engineering and hydrology. For example: (1) River ice processes were highlighted in two special journal issues (Canadian Journal of Civil Engineering in 2003 and Hydrological Processes in 2002) and at five conferences (Canadian Committee on River Ice Processes and the Environment in 1999, 2001 and 2003, and International Association of Hydraulic Research in 2000 and 2002). (2) A number of workers have clearly advanced our understanding of river ice processes by bringing together disparate information in comprehensive review articles. (3) There have been significant advances in river ice modelling. For example, both one-dimensional (e.g. RIVICE, RIVJAM, ICEJAM, HEC-RAS, etc.) and two-dimensional (2-D; www.river2d.ca) public-domain ice-jam models are now available. Work is ongoing to improve RIVER2D, and a commercial 2-D ice-process model is being developed. (4) The 1999-2003 period is notable for the number of distinctly hydrological and ecological studies. On the quantitative side, many are making efforts to determine streamflow during the winter period. On the ecological side, some new publications have addressed the link to water quality (temperature, dissolved oxygen, nutrients and pollutants), and others have dealt with sediment transport and geomorphology (particularly as it relates to break-up), stream ecology (plants, food cycle, etc.) and fish habitat. There is the growing recognition, that these types of study require collaborative efforts. In our view, the main areas requiring further work are: (1) to interface geomorphological and habitat models with quantitative river ice hydrodynamic models; (2) to develop a manager's toolbox (database management, remote sensing, forecasting, intervention methodologies, etc.) to enable agen

528: L. W. a. S. P. Morton,. 2005. SELECTING SOCIO-ECONOMIC METRICS FOR WATERSHED. Environmental Monitoring and Assessment 103: 83-98.

Abstract: The selection of social and economic metrics to document baseline conditions and analyze the dynamic relationships between ecosystems and human communities are important decisions for scientists, managers, and watershed citizens. A large variety of social and economic data is available but these have limited use without theoretical frameworks. In this paper, several frameworks for reviewing social-ecosystem relations are offered, namely social sanctions, sense of place, civic structure, and cultural differences. Underlying all of these frameworks are attitudes, beliefs, values, and norms that affect which questions are asked and which indicators are chosen. Much work and significant challenges remain in developing a standard set of spatially based socio-economic metrics for watershed management.

529: B. Moss, T. Barker, D. Stephen, A. E. Williams, D. J. Balayla, M. Beklioglu and L. Carvalho,. 2005. Consequences of reduced nutrient loading on a lake system in a lowland catchment: deviations from the norm?. *Freshwater Biology* 10(50): 1687-1705.

Abstract: 1. Lake restoration from eutrophication often rests on a simple paradigm that restriction of phosphorus sources will result in recovery of former relatively clear-water states. This view has apparently arisen from early successful restorations of deep lakes in catchments of poorly weathered rocks. Lakes in the lowlands, however, particularly shallow ones, have proved less tractable to restoration. This study of three lowland lakes provides insights that illuminate a more complex picture. 2. The lakes lie in a sequence along a single stream in a mixed urban and rural landscape. Severely deoxygenating effluent from an overloaded sewage treatment works was diverted from the catchment in 1991. Effects on two lakes, Little Mere (z(max) < 2 m) and Rostherne Mere (z(max) 31 m) were followed until 2002. Mere Mere (z(max) = 8 m), upstream of the former works, acted as a comparison for changes in water chemistry. Mere Mere showed no change in total phosphorus (TP), total inorganic nitrogen, or planktonic chlorophyll a concentrations. Increased winter rainfall was associated with higher winter soluble reactive phosphorus (SRP) and ammonium concentrations in its water. 3. Little Mere changed from a deoxygenated, highly enriched, fishless system, with large populations of *Daphnia magna* Straus, clear water and about 40% aquatic plant cover, to a slightly less clear system following diversion. *Daphnia magna* was replaced by *D. hyalina* Leydig as fish recolonised. Spring peaks of chlorophyll a declined but summer concentrations increased significantly. Annual mean chlorophyll a concentrations thus showed no change. Submerged plants became more abundant (up to 100% cover), with fluctuating community composition from year to year. Summer release of SRP from the sediment was substantial and has not decreased since 1993. The summer phytoplankton was apparently controlled by nitrogen availability perhaps with some influence of zooplankton grazing. SRP was always very abundant. The lake ap

530: D. S. J. Mourad, M. Van der Perk, G. D. Gooch, E. Loigu, K. Piirimae and P. Stalnacke,. 2005. GIS-based quantification of future nutrient loads into Lake Pelpsi/Chudskoe using qualitative regional development scenarios. Water Science and Technology 3-4(51): 355-363.

Abstract: This study aims at the quantification of possible future nutrient loads into Lake Peipsi/Chudskoe under different economic development scenarios. This drainage basin is on the borders of Russia, Estonia and Latvia. The sudden disintegration of the Soviet Union in 1991 caused a collapse of agricultural economy, and consequently, a substantial decrease of diffuse and point-source nutrient emissions. For the future, uncertainties about economic development and the priorities that will be set for this region make it difficult to assess the consequences for river water quality and nutrient loads into the lake. We applied five integrated scenarios of future development of this transboundary region for the next twelve to fifteen years. Each scenario consists of a qualitative story line, which was translated into quantitative changes in the input variables for a geographical information system based nutrient transport model. This model calculates nutrient emissions, as well as transport and retention and the resulting nutrient loads into the lake. The model results show that the effects of the different development scenarios on nutrient loads are relatively limited over a time span of about 15 years. In general, a further reduction of nutrient loads is expected, except for a fast economic development scenario.

531: C. B. Mouw and J. A. Yoder,. 2005. Primary production calculations in the Mid-Atlantic Bight, including effects of phytoplankton community size structure. *Limnology and Oceanography* 4(50): 1232-1243.

Abstract: We developed an absorption-based primary production model that includes the effects of phytoplankton community size structure for the continental margin and adjoining Gulf Stream waters of the Middle Atlantic Bight (MAB). The model uses seasonal cycles of phytoplankton community size structure from previously published results, representative absorption spectra, remotely sensed chlorophyll concentration, sea surface temperature, photosynthetically active radiation, in situ determination of mixed layer dynamics, and previously determined nitrate concentration. The model allows for both light- and nutrient-limitation during the MAB seasonal cycle. Primary production was calculated every month for 5 yr for study areas representing shelf, shelf break, slope, and Gulf Stream waters. Two main approaches were taken to calculate production: using satellite observations integrating to the depth of the mixed layer and using profile observations integrating to the depth of the euphotic zone. The profile euphotic zone production estimates were greater than the satellite mixed layer estimates. Additionally, the timing of production peaks and troughs was largely related to the depth of integration, with profile euphotic zone peak production occurring generally 2 months after the satellite mixed layer estimates. Relative to cell size and seasonality, primary production was regulated more by biomass than light acquisition capability. Comparison of remotely based production estimates and estimates made with in situ depth-dependent data revealed that approximately 30% of daily water column photosynthesis was missed by satellite-based estimates.

532: P. N. Muendo, J. J. Stoorvogel, N. E. Gamal and M. C. J. Verdegem,. 2005. Rhizons improved estimation of nutrient losses because of seepage in aquaculture ponds. Aquaculture Research 13(36): 1333-1336.

There is no abstract for this article.

533: A. Mukherjee, A. E. Fryar and D. M. Lasage,. 2005. Using tracer tests to assess natural attenuation of contaminants along a channelized Coastal Plain stream. *Environmental & Engineering Geoscience* 4(11): 371-382.

Abstract: Tracer tests have been widely used in studies of solute transport, gas exchange, and nutrient cycling in streams. However, the use of tracer tests to assess natural attenuation of ground-water-derived contaminants in streams, particularly from point sources, has been limited. We used tracer tests in conjunction with stream gauging and contaminant analyses to study the fate of trichloroethene (TCE) and technetium-99 (Tc-99), which seep from industrial contaminant plumes into a channelized, first-order stream in the Coastal Plain of western Kentucky. Six tests were conducted over a 20-month period along a 300-m reach downstream of contaminated springs. Bromide, rhodamine WT, and nitrate were introduced as slug tracers to assess dilution, sorption, and reduction, respectively. Propane was added as a continuous, volatile tracer. Tracer transport was modeled as one-dimensional, with transient storage and first-order mass loss. Results indicate that (1) TCE is attenuated by volatilization; (2) TCE sorption, TCE reduction, and Tc-99 reduction are negligible or absent; and (3) dilution is negligible along the study reach.

534: G. Mukhopadhyay and A. Dewanji,. 2005. Presence of tropical hydrophytes in relation to limnological parameters - a study of two freshwater ponds in Kolkata, India. *Annales De Limnologie-International Journal of Limnology* 4(41): 281-289.

Abstract: The presence of different species of hydrophytes was investigated in relation to Secchi disk visibility, pH, dissolved oxygen, electrical conductivity, total Kjeldahl nitrogen, total phosphorus and chlorophyll-a concentration in two tropical ponds nearby Kolkata. India, during a three years period (June 1999 to May 2002). The dominant flora in the ponds namely, *Alternanthera philoxeroides*, *Nymphoides hydrophylla*, *Lemna aequinoctialis*, and *Vallisneria spiralis* were found to subsist over a wide amplitude of nutrient levels thereby showing their adaptability to highly eutrophic ecosystems, a common feature of the tropics. However, the presence of some minor species could be associated with a narrow range of specific limnological variables.

535: B. Muller, M. Maerki, M. Schmid, E. G. Vologina, B. Wehrli, A. Wuest and M. Sturm,. 2005. Internal carbon and nutrient cycling in Lake Baikal: sedimentation, upwelling, and early diagenesis. *Global and Planetary Change* 1-4(46): 101-124.

Abstract: The internal cycles of carbon, silica, nitrogen, and phosphorus in the South and North Basins of Lake Baikal were quantified in the frame of a multidisciplinary collaboration. Fluxes of particulate organic matter from the epilimnion to the deep water were quantified with integrating sediment traps deployed at 200- to 250-m water depth and compared with fluxes measured in near-bottom traps to reveal mineralization in the water column. Sedimentation rates were determined with dated sediment cores to calculate mass accumulation rates of elements in the sediment. Advective and turbulent transport of dissolved nutrients in the water column was based on a set of monitoring data, which included temperature and current data, as well as hydrochemical data of the water column. Diffusive fluxes from the sediment to the overlying water column were determined by applying different porewater sampling techniques. The combination of these data resulted in consistent internal budgets for carbon, nitrogen, and phosphorus in Lake Baikal: the new production in the South Basin was 1730 mmol C m⁻² year⁻¹ and the mass accumulation rate in the sediment 220 mmol C m⁻² year⁻¹, whereas in the more secluded North Basin, new production was only 1220 mmol C m⁻² year⁻¹ and mass accumulation rate 125 mmol C m⁻² year⁻¹. Fluxes of particle-bound nitrogen, phosphorus, and biogenic silica were by about 30% smaller in the North Basin than in the South Basin. Export fluxes of nitrogen from the surface zone to the deep water were 150 mmol N and 100 mmol N m⁻² year⁻¹. Denitrification rates in the sediment were estimated from mass-loss calculation to 38 and 53 mmol N m⁻² year⁻¹ for the South and North Basin, respectively, corresponding to 25% and 52% of the total nitrogen input to the hypolimnion. Nitrogen (19 and 13 mmol m⁻² year⁻¹) was finally buried in the sediments of the South and North Basins; 10.1 and 3.5 mmol P m⁻² year⁻¹, and 1830 and 1400 mmol Si m⁻² year⁻¹ wer

536: J. V. Muller and U. Deil,. 2005. The ephemeral vegetation of seasonal and semipermanent ponds in tropical West Africa. *Phytocoenologia* 2-3(35): 327-388.

Abstract: Seasonal ponds and semi-permanent freshwater lakes are a common landscape element in tropical West Africa. The vegetation, emerging in temporary waters and colonizing the amphibic shorelines of lakes with fluctuating water levels, was relatively poorly known for a long time, although these habitats offer an important resource for man and his livestock. Based upon the available phytosociological data from Senegal to Burkina Faso, a synopsis of the ephemeral wetland vegetation is presented. The associations and syntaxa of higher rank are published according to the ICPN. A schematic profile illustrates the spatial zonation (hydroseries) of these communities in the North Sudanian and Sahelian zones. To the north, water level fluctuations become stronger and the dry period is more extended. The dominant life forms are free-floating or rooting submerged pleustophytes, hydrogeophytes and short-living amphibic and terrestrial plants. Superimposition of several communities, dominated by different life-forms, is a common phenomenon. The hierarchical classification of 392 relevés resulted in 26 associations and 9 rankless communities, grouped into five different classes (*Rhamphicarpo fistulosae*-*Hygrophiletea senegalensis*, *Ceratophylletea*, *Lemnetea minoris*, *Drosero-Xyridetea Ludwigio octovalvis*-*Echinochloetea colonum*) and in two orders of unclear class-position (*Nymphaetalia loti*, *Papyretalia*). Water depth, duration of flooding, and the trophic level are the most important differentiating ecological factors. Floating leaf communities (*Nymphaeion micranthae*, *Nymphaeion guineensis*), submerged macrophytic vegetation (*Ceratophyllion demersi*) and free-floating communities (*Lemnetea*) are concentrated in deeper ponds. The new class *Rhamphicarpo-Hygrophiletea senegalensis* combines the vegetation of shallow and temporary ponds and of amphibic environments with short-term inundation. The mesotrophic communities of the *Echinochloion callopi* occur in rapidly draining depressions over later

537: B. Munkes,. 2005. Eutrophication, phase shift, the delay and the potential return in the Greifswalder Bodden, Baltic Sea. Aquatic Sciences 3(67): 372-381.

Abstract: Between the 1950s and 1980s concentrations of inorganic nutrients increased in the coastal areas of the Baltic Sea, including the Greifswalder Bodden. As a consequence, phytoplankton concentrations and suspended solids increased strongly and the light penetration decreased substantially. An increased turbidity led to a phase shift from a macrophyte-dominated to a phytoplankton-dominated ecosystem. Within 30 years, macrophyte cover declined from 90% to 15%. Macrophyte depth limit decreased from 14 m to 6 m in the Bodden. After 1985, nutrient loading declined strongly. Although nutrient loads in the Greifswalder Bodden were reduced (a 50% decrease in phosphate concentration and a 40% decrease in nitrogen concentration) in the last 15 years, an expected improvement in water quality did not coincide. Light conditions improved slightly and macrophytes showed no recovery. Possible reasons for the slow improvement are internal loading and subsequent release of iron-bound phosphorus from sediments. This process sustains continuous high nutrient concentrations in the water column and facilitates the high growth and dominance of phytoplankton. During summer, an abundant Cyanobacteria community fuels phytoplankton dominance. In addition, heavy losses in macrophyte cover result in an increase in sediment resuspension, which leads to a reduced light penetration. There is no sign of any change in current conditions.

538: M. Mwiganga and F. Kansiime,. 2005. The impact of Mpererwe landfill in Kampala-Uganda, on the surrounding environment. Physics and Chemistry of the Earth 11-16(30): 744-750.

Abstract: Mpererwe landfill site receives solid wastes from the city of Kampala, Uganda. This study was carried out to assess and evaluate the appropriateness of the location and operation of this landfill, to determine the composition of the solid waste dumped at the landfill and the extent of contamination of landfill leachate to the neighbouring environment (water, soil and plants). Field observations and laboratory measurements were carried out to determine the concentration of nutrients, metals and numbers of bacteriological indicators in the landfill leachate. The landfill is not well located as it is close to a residential area (< 200 m) and cattle farms. It is also located upstream of a wetland. The landfill generates nuisances like bad odour; there is scattering of waste by scavenger birds, flies and vermin. Industrial and hospital wastes are disposed of at the landfill without pre-treatment. The concentration of variables (nutrients, bacteriological indicators, BOD and heavy metals) in the leachate were higher than those recommended in the National Environment Standards for Discharge of Effluent into Water and on Land. A composite sample that was taken 1500 m down stream indicated that the wetland considerably reduced the concentration of the parameters that were measured except for sulfides. Despite the fact that there was accumulation of metals in the sediments, the concentration has not reached toxic levels to humans. Soil and plant analyses indicated deficiencies of zinc and copper. The concentration of these elements was lowest in the leachate canal. (c) 2005 Elsevier Ltd. All rights reserved.

539: K. Nagamine, N. Matsui, T. Kaya, T. Yasukawa, H. Shiku, T. Nakayama, T. Nishino and T. Matsue,. 2005. Amperometric detection of the bacterial metabolic regulation with a microbial array chip. *Biosensors & Bioelectronics* 1(21): 145-151.

Abstract: A microbial array chip with collagen gel spots entrapping living bacterial cells has been applied to investigate the metabolic regulation in *Paracoccus denitrificans*. Scanning electrochemical microscopy (SECM) was used to monitor the ferrocyanide production that reflects the electron flow in the respiratory chain located within the internal membrane of *P. denitrificans*. The ferrocyanide production from *P. denitrificans* largely depends on the types of the carbon source (glucose or lactate), suggesting that the electron flow rate in the respiratory chain depends on the activity of the metabolic pathway located up-stream of the respiratory chain. More importantly, it was found that the enzymes affecting glucose catabolic reactions were significantly up-regulated in cultures with a nutrient agar medium containing D-(+)-glucose as a sole carbon source. Enzyme assays using crude extracts of *P. denitrificans* were carried out to identify the enzymes expressed at a higher level in cultures supplemented with D-(+)-glucose. It was confirmed that the pyruvate kinase and enzymes of the overall Entner-Doudoroff pathway were highly induced in cultures containing D-(+)-glucose. (c) 2004 Elsevier B.V. All rights reserved.

540: L. Nagorskaya and D. Keyser,. 2005. Habitat diversity and ostracod distribution patterns in Belarus. *Hydrobiologia* (538): 167-178.

Abstract: Ostracod diversity and abundance was studied in 10 different types of water bodies of Belarus (bogs, brooks, canals, oxbows, ponds, reservoirs, rivers, springs, shoal of lake and temporary pools). Hydrochemical variables, sediment, and vegetation were analyzed. In total 156 different localities were investigated. Habitat diversity was based mainly upon the closely correlated hydrochemical variables of mineralization (hardness total and carbonate, conductivity, total value of dissolved substances), although bottom, vegetation characteristics and other factors (pH, dissolved oxygen, nutrients) were also significant. The ostracods found included 62 species in 27 genera comprising 8 cosmopolitan, 17 Holarctic, 13 Palearctic species; 21 of these species are known from central and southern Europe and adjacent areas, while 3 are characteristic for eastern Europe. The distribution of freshwater ostracod assemblages reflected the habitat and depended on water body type. Heterogeneous oxbows and temporary pools supported 37 species, while other types of pool maintained only 27-14 species. The population density of different species varied from 0.5 to more than 10 000 ind./m²) Indices of local alpha diversity were significantly correlated with the number of species and temperature and were maximal in heterogeneous habitats. The variation of population density was not connected with habitat patterns but appeared to be regulated by the biotic interactions in the community. Habitat diversity, verified by the beta-diversity indices, enabled us to find localities with a similar heterogeneity level and species richness. Beta-diversity values were independent of species number as well as abundance but a significant positive correlation ($p < 0.05$) was found with temperature, pH and dissolved oxygen. This index probably reflected the general patterns of different localities.

541: D. Nash, L. Clemow, M. Hannah, K. Barlow and P. Gangaiya,. 2005. Modelling phosphorus exports from rain-fed and irrigated pastures in southern Australia. Australian Journal of Soil Research 6(43): 745-755.

Abstract: Pasture-based grazing systems contribute to the excessive nutrients found in some streams in southeastern Australia. This study investigated phosphorus (P) exported in runoff from a rain-fed dairy pasture (Darnum) and 4 bays of irrigated dairy pasture (MRF). Runoff was monitored for 7 years at Darnum and 2 years at the MRF to identify factors associated with the variation in total P (TP) concentrations between events. The flow-weighted mean annual P concentrations in runoff varied between 3.3 and 28.2 mg TP/L for Darnum and 6.2 and 31.5 mg TP/L for the MRF. The relationships between TP concentrations in runoff and days between fertiliser application and runoff, days between grazing and runoff, and total storm flow were examined using an additive component model that explained 61% and 70% of the variation in log-transformed TP for Darnum and the MRF, respectively. The interval between application of fertiliser and runoff and the effect of year were highly significant and explained most of the variation in TP. Grazing and fertiliser application were identified as the major factors that may affect TP concentrations that the land manager can control (preventable). The estimates of year effect (i.e. the component of TP not explained by the other variables and over which the land manager had no apparent means of control) ranged from 1.60 mg (s.e. 1.99) to 7.14 mg (s.e. 1.90) TP/L in non-drought years (>45 kL/ha runoff annually). The year effect averaged 5.7 and 6.9 mg TP/L for Darnum and the MRF, respectively. It is shown that an additive component model provides a useful structure for investigating similar, field-scale data.

542: S. Nayar, B. P. L. Goh and L. M. Chou,. 2005. Settlement of marine periphytic algae in a tropical estuary. Estuarine Coastal and Shelf Science 2-3(64): 241-248.

Abstract: This note describes settlement studies of marine periphytic algae on glass substrata in a tropical estuary in Singapore. The rates of production in terms of C-14 radiotracer uptake, biomass in terms of chlorophyll a, community structure and cell abundance were measured from the settled periphytic algae at various depths in the water column and compared with the prevailing hydrographical conditions. Relatively higher periphytic algal settlement was observed at 1 m depth, even though it was not statistically different from other depths. Diatoms such as *Skeletonema costatum* and *Thalassiosira rotula* dominated the assemblage, together with the marine cyanobacteria *Synechococcus* sp. The three settlement parameters viz., periphytic algal production, chlorophyll a and cell counts showed significant differences between the days of settlement, with no significant differences observed for different depths. The periphytic algal community in this study comprised 30 microalgal species, dominated by diatoms (78%), followed by cyanobacteria (19% - primarily *Synechococcus* sp.), green flagellates (1%), dinoflagellates (1%) and other forms accounting for the remaining 1% of the total cell counts. Correlation studies and principal component analysis (PCA) revealed significant influence of silicate concentrations in the water column with the settlement of periphytic algae in this estuary. Though photoinhibited at the surface, photosynthetically available radiation did not seem to influence the overall settlement of periphytic algae. Diatoms and *Synechococcus* in the periphytic algal community were influenced by water temperature, PAR, pH and dissolved oxygen as seen in the PCA plots. (c) 2005 Elsevier Ltd. All rights reserved.

543: J. Naymik, Y. D. Pan and J. Ford,. 2005. Diatom assemblages as indicators of timber harvest effects in coastal Oregon streams. Journal of the North American Benthological Society 3(24): 569-584.

Abstract: Spatially patchy and temporally varied cycles of timber harvest across a landscape may have subtle effects on stream conditions that are difficult, but important, to assess. The objective of our study was to examine the relationship between benthic diatom composition and timber harvest in coastal Oregon watersheds. Physical habitat conditions, water chemistry, and periphyton composition were characterized for 46 sites from 2 subbasins with different timber harvest intensities (0.3 km²/y vs 3 km²/y, between 1972-1998). Landscape variables including geology, vegetative cover types, and harvest intensity, were quantified for the watershed upstream of each sample point. Nonmetric Multidimensional Scaling analysis of periphyton composition showed that the 1(st) axis was primarily driven by *Achnanthes minutissimum* ($r = -0.91$) whereas the 2(nd) axis was driven by *Nitzschia inconspicua* ($r = 0.77$). The 1(st) axis was positively correlated with % of upstream area harvested between 1972 and 1998 ($r = 0.54$) and waterquality variables such as total P (TP) (e.g., $r(\text{TP}) = 0.74$). A subset comparison ($n = 12$) between harvested (30% harvested 1972-1998, $n = 6$) and unharvested (0% harvested 1972-1998, $n = 6$) watersheds with similar geology (> 80% basalts), broadleaf vegetative cover (8-35% broadleaf), and other reach-scale characteristics revealed higher total N, TP, turbidity, and conductivity in the harvested than the unharvested watersheds ($p < 0.05$). Shannon diversity and species richness also were higher in the harvested group ($p < 0.05$). Our data suggest that diatom assemblages may be useful in assessing the long-term impact of timber harvest within coastal Oregon watersheds.

544: C. Neal and A. L. Heathwaite,. 2005. Nutrient mobility within river basins: a European perspective. Journal of Hydrology 1-4(304): 477-490.

Abstract: The research presented in this special issue of the Journal of Hydrology is brought together with associated information of relevance to the thematic area in this concluding paper. Some of the important gaps in our current knowledge are outlined with a view to identifying future research needs for the development of an integrated analysis of nutrients in river basins and their management. Identification of these needs is important if we are to meet the defined set of catchment management objectives specified under the EU Water Framework Directive that must be delivered against a specified timetable. The Directive raises wider concerns such as how to define 'good ecological status' and pertinent to this special issue: what role nutrients have in framing this definition. In this paper, the importance of nutrient pressures on receiving waters is evaluated in the context of the key scientific uncertainties and options for characterising the biological, physico-chemical and hydro-morphological parameters necessary to meet the science needs of the Directive. An assessment of the significance of nutrient mobility within river basins for current understanding of freshwater systems functioning on a catchment and basin scale is made together with an evaluation of where research on nutrient pressures should be focussed in order underpin effective management. (c) 2004 Elsevier B.V. All rights reserved.

545: C. Neal, H. P. Jarvie, M. Neal, A. J. Love, L. Hill and H. Wickham,. 2005. Water quality of treated sewage effluent in a rural area of the upper Thames Basin, southern England, and the impacts of such effluents on riverine phosphorus concentrations. *Journal of Hydrology* 1-4(304): 103-117.

Abstract: Data for water quality surveys of effluent from sewage treatment works (STWs) in the rural Kennet/Dun sub-catchments of the upper Thames Basin are presented to characterize treated sewage effluent. Water quality determinand relationships with boron (B) are presented to provide information that can be used, with stream water quality information, to assess the relative inputs of treated sewage effluent pollutants to streams in rural areas. The approach is based on three points: (1) information on sewage effluent and agricultural pollution is of concern in relation to the management of UK lowland river systems in rural environments; (2) the lack of detailed information on sewage runoff chemistry and flow means that direct assessment of sewage effluent pollution to surface waters cannot be gauged; (3) B provides a clear chemically conservative marker of sewage sources in surface and ground waters. Three types of relationship to B were observed. Firstly, determinands such as Na, Cl, soluble reactive phosphorus (SRP) and NO₃ showed a positive linear relationship with B and there is a near zero intercept; these components are essentially derived from sewage sources. Secondly, Mg and SO₄ show linear relationships with B, but there is a non-zero intercept; these components have both a sewage component and a background component linked to water supplies from surface and groundwater sources. Thirdly, there are determinands that show no relationship with boron. In this study, an erratic pattern was observed for ammonium. This probably reflects the variable removal of this pollutant from sewage sources. Near constant concentrations of components such as Ca and alkalinity, which come from the background aquifer sources, were also found. SRP and B relationships for rivers in the upper Thames Basin showed the potential importance of (a) removal processes in the stream/groundwater for SRP derived from STW effluent inputs and (b) tertiary P stripping at the STWs on river water SRP I

546: C. Neofitou, A. Dimitriadis, P. Pantazis, A. Psilovikos, N. Neofitou and A. Paleokostas,. 2005. Self-purification of a long-stretched gully affects the restoration of an alpine-type lake in Northern Greece. *Fresenius Environmental Bulletin* 12A(14): 1141-1149.

Abstract: Vegoritis Lake in Macedonia, Greece, is part of an extensive water complex of smaller lakes and streams with Pentavrisos gully discharging at the southern point of the lake and affecting considerably the lake's nutrient cycles and biodiversity. During the last fifteen years, the lake has shown significant signs of degradation, such as disturbance of its aquifer bed, algal blooms, fish mass mortalities, and the transformation of its trophic status from an oligotrophic to a meso-trophic and, even, an eutrophic one. Such a transformation has an additional impact on terrestrial, avian and aquatic fauna, with alteration in species' composition, and a considerable decline in local fisheries and tourism. This study focused on investigating the role that gully Pentavrisos has on the physicochemical water quality status of Lake Vegoritis. Most parameters inside the lake (nitrates 0.55-1.95 mg.l⁻¹), nitrites 0.008-0.031 mg.l⁻¹, ammonia 0.011-0.158 mg.l⁻¹) indicate the existence of a natural purification process occurring between the sites of gully Pentavrisos, receiving the treated/untreated effluents, and the final recipient of those effluents, Lake Vegoritis. Suggested mitigation measures for the restoration of the lake and the management of the respective aquifer bed, mainly consist of rationalization of water consumption for irrigation purposes, recycling of industrial effluent water, establishment of depuration plants for the biological treatment of industrial and urban waste, appropriate planning and demarcation of landuse in the littoral areas of the lake, and qualitative upgrade of Pentavrisos gully.

547: S. C. Neubauer, K. Givler, S. K. Valentine and J. P. Megonigal,. 2005. Seasonal patterns and plant-mediated controls of subsurface wetland biogeochemistry. Ecology 12(86): 3334-3344.

Abstract: In tidal marshes, spatial and temporal variability in the importance of microbial metabolic pathways influences ecosystem-level processes such as soil carbon storage, the regeneration of inorganic nutrients, and the production of atmospherically important trace gases. We measured seasonal changes in rates of microbial Fe(III) reduction, sulfate reduction, and methanogenesis in tidal freshwater and brackish marshes on the Patuxent River, Maryland, USA, and assessed the ability of plant roots to influence these processes by regenerating electron acceptors and supplying electron donors. In both marshes, the importance of microbial Fe(III) reduction was greatest early in the summer and decreased through the study period. Coincident with the seasonal decline in Fe(III) reduction, methanogenesis (freshwater marsh) or sulfate reduction (brackish site) increased in importance. At the brackish marsh, the partitioning of anaerobic carbon metabolism between Fe(III) reduction and sulfate reduction was similar within and below the root zone, suggesting that rhizosphere processes did not control anaerobic metabolism at this site. Instead, seasonal biogeochemical patterns at the brackish marsh were affected by factors such as water table depth and iron-sulfur interactions. At the tidal freshwater site, our results suggest that changes in rates of Fe(III) reduction and methanogenesis were directly affected by plant-mediated processes. In midsummer, Fe(III) reduction accounted for a greater fraction of total anaerobic metabolism in rhizosphere-influenced surface soils than in soils below the root zone. High rates of Fe(III) reduction occurred at the expense of methanogenesis. This study documented strong temporal variations in the outcome of microbial competition for electron donors that ultimately affected the balance between Fe(III) reduction and methanogenesis within tidal freshwater marsh soils. Our data suggested that variations in microbial metabolic pathways were regulated by

548: P. Newall and C. J. Walsh,. 2005. Response of epilithic diatom assemblages to urbanization influences. *Hydrobiologia* (532): 53-67.

Abstract: Urbanization has long been recognized to alter the hydrology, water quality and channel form of waterways. Recently, consideration of urban impacts on waterways has expanded to include assessment of the aquatic biota, generally focusing upon the macroinvertebrate fauna. This study compares the impacts of urbanization on the structure of stream benthic diatom communities in 16 first- and second-order streams in the east of Melbourne, Australia. Relationships between the physical elements of urbanization, water quality and diatom communities were examined using multivariate analyses with compositional similarity, and univariate analyses with selected diatom species and indices,. There was a strong negative correlation between urban density and the diatom indices of water quality. The element of urbanization most strongly related to the measured decline in the diatom community was drainage connection. Electrical conductivity was the most influential water quality variable. It is hypothesized that, in addition to increasing electrical conductivity, drainage connection may be impacting the diatom community by increasing the delivery of phosphorus during small storm events. The study suggests that reducing directly piped drainage connection using infiltration and retention is a logical step in the mitigation of urban impacts upon receiving streams. A corollary part of the project indicated strong potential for using overseas diatom indices in studies on water quality in southeastern Australia.

549: S. C. Newbold,. 2005. A combined hydrologic simulation and landscape design model to prioritize sites for wetlands restoration. Environmental Modeling & Assessment 3(10): 251-263.

Abstract: Most landscape design models have been applied to the problem of maximizing species richness in a network of nature reserves. This paper describes a combined hydrologic simulation and landscape design model designed to prioritize sites for wetlands restoration, where the objective is to maximize the amount of nutrients in non-point-source runoff attenuated in the restored wetlands. Targeted site selection in four small watersheds in the Central Valley resulted in predicted levels of nitrogen attenuation two to eight times greater than that from maximizing wetland area without consideration of the location of the restoration sites.

550: I. Nhapi and H. J. Gijzen,. 2005. A 3-step strategic approach to sustainable wastewater management. Water Sa 1(31): 133-140.

Abstract: Many cities in developing countries are facing surface water and groundwater pollution problems. This deterioration of water resources needs to be controlled through effective and feasible concepts of urban water management. The Dublin Principles, Agenda21, Vision21, and the Millennium Development Goals provide the basis for the development of innovative, holistic, and sustainable approaches. Whilst highly efficient technologies are available, the infusion of these into a well-thought out and systematic approach is critical for the sustainable management of nutrient flows and other pollutants into and out of cities. Based on cleaner production principles, three intervention steps are proposed in this paper. The first step is to minimise wastewater generation by drastically reducing water consumption and waste generation. The second step is the treatment and optimal reuse of nutrients and water at the smallest possible level, like at the on-plot and community levels. Treatment technologies recommended make the best use of side products via reuse. Once the first two intervention steps have been employed to the maximum, the remaining waste flows could be safely discharged into the environment. The third step involves enhancing the self-purification capacity of receiving water-bodies (lakes, rivers, etc.), through intervention. The success of this so-called 3-step strategic approach requires systematic implementation, providing specific solutions to specific situations. This, in turn, requires appropriate planning, legal and institutional responses. In fact, the 3-step approach could be applied as an overall approach for waste management, although here the focus is on sewage. This paper offers examples under each step, showing that the systematic application of this approach could lead to cost savings and sustainability.

551: I. Nhapi, M. A. Siebel and H. J. Gijzen,. 2005. A strategic framework for managing wastewater: A case study of Harare, Zimbabwe. Water International 4(30): 456-467.

Abstract: Water quality is an urgent problem in Harare main water supply source, Lake Chivero, while water scarcity will be a problem soon. This study focuses on sustainable ways of urban water and nutrient (nitrogen and phosphorus) management in Harare, part of the Lake Chivero catchment. The Dublin Principles on water conservation, environmental protection, reuse, and economic utilization of water were used as a basis for formulating innovative and responsive solutions. External and internal drivers for future evolution of wastewater approaches are identified. Water conservation, treatment, and reuse strategies are developed including water-saving devices, regulation, leak detection and repair and including wastewater treatment and reuse. The three levels where wastewater can be handled onsite decentralized, and centralized-are discussed and solutions formulated. Based on this, a strategic framework, the so-called "3-Step Strategic Approach," is then developed aimed at the sustainable use of water nutrients, and other resources in the urban environment. This 3-Step Strategic Approach consists of pollution prevention and minimization (Step 1), reuse after treatment (Step 2), and discharge into the environment with stimulation of self-purification capacity of the receiving environment (Step 3). The 3-Step Strategic Approach was subsequently applied to the Lake Chivero catchment, which demonstrated that these strategies could substantially reduce current water pollution and future water scarcity problems in Harare.

552: M. Nieminen, E. Ahti, H. Nousiainen, S. Joensuu and M. Vuollekoski,. 2005. Capacity of riparian buffer zones to reduce sediment concentrations in discharge from peatlands drained for forestry. *Silva Fennica* 3(39): 331-339.

Abstract: In 1995-2001, the efficiency of riparian buffer zone areas to reduce the concentrations of suspended solids in discharge from peatlands drained for forestry purposes was studied at seven locations in south-central Finland. The two largest buffer zones reduced the concentration of suspended solids by > 70%. The efficiency of the three medium-sized buffer zones to reduce through-flow sediment concentrations was 50-60%, but no reduction occurred at the smallest two buffer areas. Thus, the capacity of buffer zones to reduce sediment concentrations was strongly related to their size. However, significant correlations were also found between reduction capacity and inflow water sediment concentrations, although the correlations at the two smallest buffer zones were low. The use of buffer zones in reducing sediment load from peatlands drained for forestry purposes is recommended, but relatively large areas for efficient removal capacity are needed.

553: M. Nieminen, E. Ahti, H. Nousiainen, S. Joensuu and M. Vuollekoski,. 2005. Does the use of riparian buffer zones in forest drainage sites to reduce the transport of solids simultaneously increase the export of solutes?. Boreal Environment Research 3(10): 191-201.

Abstract: Riparian buffer zone areas (BZAs) effectively reduce sediment transport and are considered as the most important water protection method in forest drainage sites in Finland. However, it has been questioned whether BZAs are a significant source of nutrients and other dissolved constituents to water-courses. At seven locations in south-central Finland a buffer zone was created below a drainage site and the effects on the concentrations of dissolved organic carbon (DOC), dissolved P, Fe and Al in through-flow were studied for 4-7 years. The effect of the two smallest BZAs (< 0.1% of watershed area) on through-flow quality was negligible. The three medium-sized BZAs (0.15%-0.23% of watershed area) either had no effect on through-flow quality or slightly increased solute concentrations (3%-30%). At the two largest BZAs (> 1% of watershed area) the concentrations of Fe either increased or decreased and the concentrations of DOC, Al and P were either unaffected or decreased (15%-27%). It was concluded that, although increased leaching may occur from some individual sites, BZAs are unlikely to act as a general source of P, Al, Fe, or DOC to water courses.

554: S. L. Niezgoda and P. A. Johnson,. 2005. Improving the urban stream restoration effort: Identifying critical form and processes relationships. Environmental Management 5(35): 579-592.

Abstract: Stream restoration projects are often based on morphological form or stream type and, as a result, there needs to be a clear tie established between form and function of the stream. An examination of the literature identifies numerous relationships in naturally forming streams that link morphologic form and stream processes. Urban stream restoration designs often work around infrastructure and incorporate bank stabilization and grade control structures. Because of these imposed constraints and highly altered hydrologic and sediment discharge regimens, the design of urban channel projects is rather unclear. In this paper, we examine the state of the art in relationships between form and processes, the strengths and weaknesses of these existing relationships, and the current lack of understanding in applying these relationships in the urban environment. In particular, we identify relationships that are critical to urban stream restoration projects and provide recommendations for future research into how this information can be used to improve urban stream restoration design. It is also suggested that improving the success of urban restoration projects requires further investigation into incorporating process-based methodologies, which can potentially reduce ambiguity in the design and the necessity of using an abundant amount of in-stream structures.

555: Y. Nishimura, C. Kim and T. Nagata,. 2005. Vertical and seasonal variations of bacterioplankton subgroups with different nucleic acid contents: possible regulation by phosphorus. *Applied and Environmental Microbiology* 10(71): 5828-5836.

Abstract: We used flow cytometry to examine seasonal variations in basin-scale distributions of bacterioplankton in Lake Biwa, Japan, a large mesotrophic freshwater lake with an oxygenated hypolimnion. The bacterial communities were divided into three subgroups: bacteria with very high nucleic acid contents (VHNA bacteria), bacteria with high nucleic acid contents (HNA bacteria), and bacteria with low nucleic acid contents (LNA bacteria). During the thermal stratification period, the relative abundance of VHNA bacteria (%VHNA) increased with depth, while the reverse trend was evident for LNA bacteria. Seasonally, the %VHNA was strongly positively correlated ($r = 0.87$; $P < 0.001$) with the concentration of dissolved inorganic phosphorus, but not with the concentration of chlorophyll a. The growth of VHNA bacteria was significantly enhanced by addition of phosphate or phosphate plus glucose but not by addition of glucose alone. Although the growth of VHNA and HNA bacteria generally exceeded that of LNA bacteria, our data also revealed that LNA bacteria grew faster than and were grazed as fast as VHNA bacteria in late August, when nutrient limitation was presumably severe. Based on these results, we hypothesize that in severely P-limited environments such as Lake Biwa, P limitation exerts more severe constraints on the growth of bacterial groups with higher nucleic acid contents, which allows LNA bacteria to be competitive and become an important component of the microbial loop.

556: C. R. Nitschke,. 2005. Does forest harvesting emulate fire disturbance? A comparison of effects on selected attributes in coniferous-dominated headwater systems. Forest Ecology and Management 1-3(214): 305-319.

Abstract: The emulation of natural disturbances is seen by many as an important management paradigm for achieving sustainable ecosystem management. To successfully emulate natural disturbances, managers must first have an understanding of the complex interactions that occur to the biophysical and chemical attributes of an ecosystem for both the natural and the "emulating" disturbance. The management of riparian ecosystems is an important issue faced by managers since the type of harvesting treatment can have a significant influence on the aquatic component. The removal or retention of riparian forests can have a direct influence on water quality and quantity, particularly on the smaller systems that are found at the headwaters of catchments, but do these treatments invoke a similar response as wildfire? To determine if emulation occurs, the affects of forest harvesting treatments and wildfire on temperature, water chemistry, summer stream flow, and sedimentation in headwater systems were compared using a meta-analysis. A statistically significant difference was found for temperature response between partial/selective harvesting and wildfire, but not after clear-cut harvesting. Water chemistry showed statistically significant differences for 11 out of 14 tested attributes, with dissolved organic carbon exhibiting the most marked difference. A significant difference was identified between clear-cut harvesting and wildfire for summer stream flow but not between wildfire and partial/ selective harvest systems. Forest harvesting operations were found to emulate sedimentation through forest roads but not harvest treatment. Partial/selective harvest systems may offer the greatest emulation congruency versus clear-cut harvest systems in terms of overall headwater response and recovery. Partial/selective harvest systems combined with prescribed burning may provide managers with the best solution when attempting to emulate wildfire in headwater systems and reduce the detrimental impac

557: G. B. Noe and C. R. Hupp,. 2005. Carbon, nitrogen, and phosphorus accumulation in floodplains of Atlantic Coastal Plain rivers, USA. Ecological Applications 4(15): 1178-1190.

Abstract: Net nutrient accumulation rates were measured in riverine floodplains of the Atlantic Coastal Plain in Virginia, Maryland, and Delaware, USA. The floodplains were located in watersheds with different land use and included two sites on the Chickahominy River (urban), one site on the Mattaponi River (forested), and five sites on the Pocomoke River (agricultural). The Pocomoke River floodplains lie along reaches with natural hydrogeomorphology and on reaches with restricted flooding due to channelization and levees. A network of feldspar clay marker horizons was placed on the sediment surface of each floodplain Site 3-6 years prior to sampling. Sediment cores were collected from the material deposited over the feldspar clay pads. This overlying sediment was separated from the clay layer and then dried, weighed, and analyzed for its total carbon (C), nitrogen (N), and phosphorus (P) content. Mean C accumulation rates ranged from 61 to 212 g.m⁻².yr⁻¹, N accumulation rates ranged from 3.5 to 13.4 g.m⁻².yr⁻¹, and P accumulation rates ranged from 0.2 to 4.1 g.m⁻².yr⁻¹ among the eight floodplains. Patterns of intersite variation in mineral sediment and P accumulation rates were similar to each other, as was variation in organic sediment and C and N accumulation rates. The greatest sediment and C, N, and P accumulation rates were observed on Chickahominy River floodplains downstream from the growing metropolitan area of Richmond, Virginia. Nutrient accumulation rates were lowest on Pocomoke River floodplains that have been hydraulically disconnected from the main channel by channelization and levees. Sediment P concentrations and P accumulation rates were much greater on the hydraulically connected floodplain immediately downstream of the limit of channelization and dense chicken agriculture of the upper Pocomoke River watershed. These findings indicate that (1) watershed land use has a large effect on sediment and nutrient retention in floodplains, and (2) limit

558: P. Noges,. 2005. Water and nutrient mass balance of the partly meromictic temperate Lake Verevi. *Hydrobiologia* (547): 21-31.

Abstract: Mass balances of total nitrogen and total phosphorus were calculated for Lake Verevi (area 0.126 km²), maximum depth 11 m, mean depth 3.6 m), a sharply stratified small lake located in South Estonia within the borders of the town Elva. The lake has up to 10 small inflows but only three of them are nearly permanent. Accidental overflows from near-by oxidation ponds during high floods have been the major source of the nutrient load of the lake in the past. L. Verevi receives a significant part of its inflow from groundwater, which is difficult to measure. In dry years the outflow is temporary. During summer the lake is sharply thermally and chemically stratified. The spring turnover is often incomplete even in homothermal conditions, thus giving the lake some meromictic features. The influx of nitrogen exceeded the outflux at any supposed proportion (20%, 50%, 80%) of surface runoff. The lake retained 45-90% of the nitrogen influx by sedimentation and/or by denitrification. The largest nitrogen losses with loss rates more than 10 kg N d⁻¹ occurred in May and June. The calculated phosphorus retention rate became strongly negative during mixing periods. From June to November, phosphorus release from the sediment exceeded sedimentation by 205 kg in 1991 and by 79 kg in 1993. Earlier stagnation and absence of a full spring turnover in the 2000 has slowed down the recovery of the lake because less phosphorus is flushed out. However, the stronger stratification and significantly smaller phosphorus content in the epilimnion limits biological activity and as a result improves the water quality of the surface layer.

559: T. Noges and K. Kangro,. 2005. Primary production of phytoplankton in a strongly stratified temperate lake. *Hydrobiologia* (547): 105-122.

Abstract: Lake Verevi (12.6 ha, maximum depth 11.0 m, mean depth 3.6 m) is a strongly eutrophic and stratified lake. *Planktothrix agardhii* is the most characteristic phytoplankton species in summer and autumn, while photosynthesizing sulphur bacteria can occur massively in the metalimnion. Primary production (PP) and chlorophyll a concentration (Chl a) were seasonally studied in 1991, 1993, 2000, and 2001. Vertical distribution of PP was rather complex, having usually two peaks, one at or near the surface (0-1 m), and another deeper (at 3-7 m) in the metalimnion. The values of dark fixation of CO₂ in the metalimnion were in most cases higher than those in the upper water layer. Considering the average daily PP 896 mg C m⁻² and yearly PP 162 mg C m⁻², Secchi depth 2.34 m, and epilimnetic concentrations of chlorophyll a (19.6 µg m⁻³), total nitrogen and total phosphorus (TP, 52 µg m⁻³) in 2000, L. Verevi is a eutrophic lake of a 'good' status. Considering the total amounts of nutrients stored in the hypolimnion, the average potential concentrations in the whole water column could achieve 1885 µg m⁻³ of TN and 170 µg m⁻³ of TP reflecting hypertrophic conditions and a 'bad' status. Improvement of the epilimnetic water quality from the 1990s to the 2000s may have resulted from incomplete spring mixing and might not reflect the real improvement. A decreased nutrient concentration in the epilimnion has supported the establishment of a 'clear epilimnion state' allowing light to penetrate into the nutrient-rich metalimnion and sustaining a high production of cyanobacteria and phototrophic sulphur bacteria.

560: T. Noges, R. Laugaste, E. Loigu, I. Nedogarko, B. Skakalski and P. Noges,. 2005. Is the destabilisation of Lake Peipsi ecosystem caused by increased phosphorus loading or decreased nitrogen loading?. Water Science and Technology 3-4(51): 267-274.

Abstract: Lake Peipsi (3,555 km², mean depth 7.1 m) located on the border of Estonia and Russia is the largest transboundary lake in Europe. L. Peipsi consists of three parts. The shared largest northern part L. Peipsi s.s. (2,611 km², 8.3 m) and the southern L. Pihkva (708 km², 3.8 m) which belongs mainly to Russia are connected by the river-shaped L. Lammijärvi (236 km², 2.5 m). The catchment area (44,245 km² without lake area) is shared between Estonia (33.3%), Russia (58.6%) and Latvia (8%). Intensive eutrophication of L. Peipsi started in the 1970s. The biomass of N-2-fixing cyanobacteria was low at heavy nutrient loading in the 1980s. After the collapse of soviet-type agriculture in the early 1990s, the loading of nitrogen sharply decreased. A certain improvement of L. Peipsi s.s. was noticed at the beginning of the 1990s together with the temporary reduction of phosphorus loading from Estonian catchment while in recent years a destabilisation of the ecosystem has been observed. This deterioration has been expressed mainly as intensive blue-green blooms and fish-kills in summer. Reappearance of blooms has been explained by the decrease in N/P loading ratio due to reduced N discharge while in some periods increased phosphorus loading could have supported this trend.

561: T. Noges and I. Solovjova,. 2005. The formation and dynamics of deep bacteriochlorophyll maximum in the temperate and partly meromictic Lake Verevi. *Hydrobiologia* (547): 73-81.

Abstract: Vertical distribution of phytoplankton and the formation of deep chlorophyll maximum (DCM) in the metalimnion of a small stratified and partly meromictic temperate lake was studied in 1999 and 2000. During summer DCM usually occurred on the borderline of H₂S and oxygen-containing waters. At the depths where the bacteriochlorophyll (Bchl) maxima were observed, the sulphide concentration was usually relatively low compared to the bottom layers, where its concentration reached as high as possible saturation level. In April 2000, DCM was formed at the depth of 3.5 m, and lowered thereafter slowly to 6.5 m by October. The concentration of Bchl d reached the highest values (over 1000 $\mu\text{g l}^{-1}$) just before the water column was mixed up in autumn. In December and April Bchl d was detectable only near the bottom of the lake. The concentration of chlorophyll a yielded by the spectrophotometric phaeopigment corrected method and by HPLC (high pressure liquid chromatography), fit rather well in the upper layers. In deeper water layers chlorophyll a concentration (Chl a) measured by spectrophotometry was overestimated about 47 times if compared to HPLC values because of the high Bchl d in that layer. In most cases vertical profiles of primary production (PP) did not coincide with the vertical distribution of the pigment content; the maximum values of PP were found in the epilimnion. In some cases PP had notably high values also at the depth of DCM. In the upper layers Chl a usually did not exceed 20 $\mu\text{g l}^{-1}$ in spring and 10 $\mu\text{g l}^{-1}$ in summer. The moderately high Chl a in the epilimnion in spring was significantly reduced after the formation of thermocline most probably because of the establishment of the nutrient limitation in epilimnion. Decreasing Chl a concentration in the epilimnion led to increased water transparency and better light conditions for photosynthetic bacteria in metalimnion.

562: J. I. Norlin, S. E. Bayley and L. C. M. Ross,. 2005. Submerged macrophytes, zooplankton and the predominance of low-over high-chlorophyll states in western boreal, shallow-water wetlands. *Freshwater Biology* 5(50): 868-881.

Abstract: 1. Shallow-water (< 2 m deep) wetlands in northern Alberta's western boreal forest tend to have either extremely high-chlorophyll, pea-green water or water that is low in chlorophyll and clear. The relative importance of top-down processes (e.g. zooplankton grazing) compared with bottom-up processes (e.g. nutrient limitation) for regulating the existence of these alternate states has yet to be explicitly investigated in these poorly studied waterbodies. 2. To assess the relationship between chemical and biological factors and the predominance of low-chlorophyll over high-chlorophyll states, a survey of 24 shallow-water wetlands in northern Alberta was conducted over the summers of 2001 and 2002. 3. In wetlands without fish, statistical analysis indicated that high- and low-chlorophyll sites could be differentiated with 82% accuracy based solely on whether submerged aquatic vegetation (SAV) coverage was greater or less than 25%. Further, high-SAV lakes with zooplankton communities dominated by large cladocerans were clear 96% of the time. 4. In the few wetlands that supported stickleback populations, large cladocerans were absent. However, the development of zooplankton communities dominated by small cladocera (*Bosmina*) with calanoid copepods in fish-containing wetlands corresponded with a shift from high- to low-chlorophyll states. 5. Results suggest that in fishless wetlands high-SAV coverage and grazing by large, SAV-associated cladocerans promotes low-chlorophyll states. Results also suggest that suppression of macroinvertebrate predators by sticklebacks allowing *Bosmina* to flourish may also promote low-chlorophyll, clear-water conditions.

563: T. G. Northcote, F. R. Pick, D. B. Fillion and S. P. Salter,. 2005. Interaction of nutrients and turbidity in the control of Phytoplankton in a large Western Canadian lake prior to major watershed impoundments. Lake and Reservoir Management 3(21): 261-276.

Abstract: Kootenay Lake is a large (over 392 km²) fjord-type lake, part of the upper Columbia River Basin, which has undergone significant limnological changes due to a range of human activities over the past half century. We analyzed the limnological conditions of the lake during the mid 1960s, prior to major dam construction on its main tributaries. At that time, large volumes (25.4 km³ yr⁻¹) of highly turbid (up to 180 JTU) but anthropogenically phosphate-enriched water entered the south end via the Kootenay River. This interacted with smaller volumes of less turbid and much lower nutrient waters entering from the Duncan River in the north and lateral lake drainages (15.6 and 9.8 km³ yr⁻¹ respectively) to produce complex spatial and temporal differences in physical and chemical features (temperature, light penetration, ionic composition, pH, dissolved oxygen and nutrients) as well as in phytoplankton biomass, productivity and taxonomic composition. In the southern part of the lake, phytoplankton biomass, cell density and C-14 uptake rates were severely depressed during late spring and summer by light limitation from incoming silt turbidity, in spite of high phosphate concentrations. In contrast, phytoplankton stock and production was elevated in the middle to northern parts where transparency was high. Experimental algal bioassays using filtered lake waters demonstrated that through this period nutrient (primarily phosphorus) limitation occurred in the northern but not in the southern parts of Kootenay Lake. Watershed impoundments during the 1970s homogenized and simplified this ecosystem. On-going efforts to rebuild fisheries through restoration of the pre-dam nutrient loading may not return Kootenay Lake to the spatial and temporal complexity that once existed.

564: I. M. K. Noumsi, J. Nya, A. Akoa, R. A. Eteme, A. Ndikeyfor, T. Fonkou and F. Brissaud,. 2005. Microphyte and macrophyte-based lagooning in tropical regions. Water Science and Technology 12(51): 267-274.

Abstract: A 720 m² plant made of 8 ponds in series, set in Yaounde (Cameroon), was successively operated as a macrophyte-based system (type M) from November 1997 to October 98, a microphyte-based system (type m) from October 1999 to September 2000 and a combination of macrophyte and microphyte ponds (type M + m) from May to July 2001. Average applied loads varied over the years; from 420 kg. BOD5 ha⁽⁻¹⁾ d⁽⁻¹⁾ on the year 1997/98, the loads reached 510 kg BOD5 ha⁽⁻¹⁾ d⁽⁻¹⁾ in 1999/2000 and 500 in 2001. Though the system became more and more overloaded and sludge accumulated rapidly in the first ponds, it provided average removals of SS, BOD5 and COD that were always higher than 90% whatever the type of lagooning. Performances in the removal of SS, organic matter and the abatement of N-NH₄⁺ and PO₄³⁻ did not significantly differ according to the type of lagooning and the applied load. Macrophyte lagooning did not show any definitive superiority as to nutrient removal when compared to microphyte lagooning. Microphyte lagooning was the most effective process in faecal indicators removal.

565: V. Novotny,. 2005. The next step - incorporating diffuse pollution abatement into watershed management. Water Science and Technology 3-4(51): 1-9.

Abstract: The majority of adverse changes in watersheds impairing water quality occurred over a period of thirty to more than one hundred years. In many areas over a period of about 80 years more than 90% of the wetlands were drained, cultivated and converted to agricultural and urban uses. This conversion changed the redox status of the soils and soil cover with a concurrent large increase of suspended solids, dissolved organic matter, nitrogen, and phosphate loads from the watersheds located in the affected regions. The question whether these adverse changes are reversible by reduction or discontinuation of excessive inputs of pollutants came to light and has been analyzed recently after the political changes in Eastern Europe. Reliable dynamic long term models that Would describe interactions between nutrient inputs, outputs, storage etc., have not been developed yet. It is becoming apparent that it may take longer for the watersheds to recover after nutrient loads to surface and groundwater are reduced if remedial measures are gradually implemented.

566: W. H. Nowlin, J. L. Evarts and M. J. Vanni,. 2005. Release rates and potential fates of nitrogen and phosphorus from sediments in a eutrophic reservoir. *Freshwater Biology* 2(50): 301-322.

Abstract: 1. Nutrients released from lake sediments can influence water column nutrient concentrations and planktonic productivity. We examined sediment nutrient release [soluble reactive phosphorus (SRP) and ammonia (NH_4^+)] at two sites in a eutrophic reservoir 4 (Acton Lake, OH, U.S.A.) that differed in physical mixing conditions (a thermally stratified and an unstratified site). 2. Sediment nutrient release rates were estimated with three methods: sediment core incubations, seasonal in situ hypolimnetic accumulation and a published regression model that predicted sediment phosphorous (P) release rate from sediment P concentration. All three methods were applied to the deeper stratified site in the reservoir; however, we used only sediment core incubations to estimate SRP and NH_4^+ release rates at the shallow 4 unstratified site because of the lack of thermal stratification. We also compared the total P concentration (TPS) of sediments and the concentration of P in various sediment fractions at both sites. 3. Anoxic sediments at the stratified site released SRP at rates more than an order of magnitude greater than oxic sediments at the shallow unstratified site. However, P accumulated in the hypolimnion at much lower rates than predicted by sediment core incubations. In contrast, NH_4^+ was released at similar rates at both sites and accumulated in 4 the hypolimnion at close to the expected rate, indicating that P was 'lost' from the hypolimnion through biogeochemical pathways for P, such as precipitation with inorganic material or biological uptake and sedimentation. 4. TPs was significantly greater at the deeper stratified site and organically bound P accounted for > 50 % of TPS at both sites. 5. We examined the magnitude of SRP fluxes into the study reservoir in 1996 by comparing the mean summer daily SRP fluxes from anaerobic sediments, aerobic sediments, stream inflows and gizzard shad excretion. While the SRP release from anaerobic sediments was high, we hypothesise tha

567: W. J. O'Brien, M. Barfield, N. Bettez, A. E. Hershey, J. E. Hobbie, G. Kipphut, G. Kling and M. C. Miller,. 2005. Long-term response and recovery to nutrient addition of a partitioned arctic lake. *Freshwater Biology* 5(50): 731-741.

Abstract: 1. To study the bottom-up linkages in arctic lakes, we treated one side of a partitioned lake with inorganic nitrogen and phosphorus for a 6-week period each summer for 6 years starting in the summer of 1985. We took a variety of weekly measurements to determine the impact of the nutrient loading on the lake and continued weekly measurements for 2-6 years after the cessation of nutrient loading to observe the recovery of the treated side. The loading rates ($2.91 \text{ mmol N m}^{-2} \text{ day}^{-1}$ and $0.23 \text{ mmol P m}^{-2} \text{ day}^{-1}$) were five times the calculated loading rates for Toolik Lake, located nearby. 2. In all 6 years of nutrient addition, phytoplankton biomass and productivity were greater in the treated sector than the reference sector. In the first 4 years of nutrient addition there was no flux of phosphorus from the mineral-rich sediments. This changed in the last 2 years of nutrient addition as phosphorus was released to the lake. 3. The response of the animal community to increased plant production was mixed. One of the four macro-zooplankton species (*Daphnia longiremis*) increased in number by about twofold in the first 5 years. However, the copepod *Cyclops scutifer* showed no response during the treatment phase of the study. The benthic invertebrate response was also mixed. After a 2-year lag time the snail *Lymnaea elodes* increased in the treated lake sector but chironomids did not. 4. Ecosystem response to fertilisation was not controlled solely by nutrient addition because phosphorus was not recycled from the sediments until the last 2 years of nutrient addition. Phytoplankton still showed the effects of nutrient addition in the recovery period and the hypolimnion of the treated sector was still anaerobic starting at 6 m in 1996.

568: P. R. Ode, A. C. Rehn, and J. T. May,. 2005. A quantitative tool for assessing the integrity of southern coastal California streams. Environmental Management 4(35): 493-504.

There is no abstract for this article.

569: O. Oenema, L. van Liere and O. Schoumans,. 2005. Effects of lowering nitrogen and phosphorus surpluses in agriculture on the quality of groundwater and surface water in the Netherlands. *Journal of Hydrology* 1-4(304): 289-301.

Abstract: The ecological status of many surface waters in the Netherlands (NL) is poor, due to relatively high discharges of N and P from agriculture, industry and wastewater treatment plants. Agriculture is suggested to be a major source, as discharges from industry and wastewater treatment plants have sharply decreased from the 1980s onwards. Agricultural land covers more than 60% of the total surface area in NL, and most of this land is managed intensively and is intersected by a dense network of ditches (total length similar to 300,000 km), streams and lakes. On average, groundwater levels are shallow to very shallow. It has been suggested that nutrient balances of agricultural land are easy to measure proxies for nutrient discharges from agricultural land, though the relationships between nutrient balances and nutrient discharges into groundwater and surface water are not well-established. Thus, we explored the effects of lowering N and P surpluses in NL agriculture on the quality of groundwater and surface waters. Effects of N surpluses in the range of 40-300 kg ha⁻¹ yr⁻¹, and of P surpluses in the range of 0.4-17.5 kg of P per ha per year were examined using an integrated set of mathematical models and databases. Results indicate that nitrate leaching to groundwater and N and P discharges to surface waters are related to both N and P surpluses, hydrological condition, land use and soil type. On a national scale, decreasing N surplus by 1 kg ha⁻¹, decreased nitrate leaching to groundwater on average by 0.08 kg ha⁻¹ and N leaching to surface waters on average by 0.12 kg ha⁻¹. Decreases of N and P concentrations in surface waters upon lowering surpluses were smaller than the calculated discharges. Decreases in N and P concentrations were much smaller in the coastal zone and Lake IJsselmeer, than in regional waters (ditches and small streams). The small improvement in the quality of surface waters upon lowering surpluses in agriculture is related to the relative

570: J. C. Ogden,. 2005. Everglades ridge and slough conceptual ecological model. Wetlands 4(25): 810-820.

Abstract: A conceptual ecological model of the effects of the major anthropogenic stressors on the Everglades ridge and slough system was developed as a planning tool for designing and assessing the Everglades restoration program. The pre-drainage Everglades ridge and slough system was an expansive, hydrologically integrated, long-hydroperiod, low-nutrient freshwater marsh, characterized by low-velocity sheet-flow, long-term water storage capacity, moderate-to-deep organic soils, and alternating sawgrass ridges and more open-water slough communities. Depth, distribution, and duration of surface flooding in this environment largely determined vegetation patterns, as well as distribution, abundance, seasonal movements, and reproductive dynamics of all aquatic and many terrestrial animals. Drivers on the system are urban and agricultural expansion, industrial and agricultural practices, water management practices, and human influences on species composition. These drivers lead to five major ecosystem stressors: reduced spatial extent, degraded water quality, reduced water storage capacity, compartmentalization, and exotic species. Attributes that are affected by these stressors and can be used as indicators of restoration success include periphyton, marsh plant communities, tree islands, alligators, wading birds, and marsh fishes, invertebrates, and herpetofauna.

571: J. C. Ogden, S. M. Davis, T. K. Barnes, K. J. Jacobs and J. H. Gentile,. 2005. Total System Conceptual Ecological Model. Wetlands 4(25): 955-979.

Abstract: The total South Florida ecosystem encompasses all natural areas that were once interconnected and embedded within the vast Everglades basin that originally extended from coast to coast and from the upper Kissimmee basin headwaters to Florida Bay, Biscayne Bay, the Gulf of Mexico, and Caloosahatchee and Indian River Lagoon estuaries. Restoration of this system will be successful once defining characteristics of the pre-altered system are recovered. Defining characteristics of the ecosystem are 1) abundant large vertebrates and aquatic prey bases, 2) animals with large spatial requirements, 3) healthy, dynamically sustainable estuaries, 4) oligotrophic freshwater wetlands, and 5) complex landscape mosaics and interactions. These defining characteristics have been altered by three external drivers that create stressors on the system: water management, land-use management and development, and climate change and sea-level rise. Stressors on the South Florida ecosystem include loss of spatial extent; loss of connectivity; altered geomorphology and topography; altered volume, timing, and distribution of regional hydroperiods; input of nutrients; altered fire patterns; and introduction and spread of exotic plants and animals. The Total System Conceptual Ecological Model links stressors to changes in the defining characteristics through major working hypotheses of cause-and-effect relationships. The linkages (ecological effects) relate to hydroperiod and depth patterns, sheet flow, salinity gradients, nutrient status and dynamics, fire patterns, habitat availability, and marsh aquatic fauna prey bases. For each defining characteristic, key ecological indicators are identified to collectively track the decline and restoration of the ecosystem.

572: N. Ogrinc, G. Fontolan, J. Faganeli and S. Covelli,. 2005. Carbon and nitrogen isotope compositions of organic matter in coastal marine sediments (the Gulf of Trieste, N Adriatic Sea): indicators of sources and preservation. *Marine Chemistry* 3-4(95): 163-181.

Abstract: Terrestrial organic carbon (OC) preserved in marine sediments is an important reservoir in the global carbon cycle, but remains poorly constrained. We determined the elemental and C- and N-isotopic compositions of organic material (OM) in surface sediments and sediment cores from the Gulf of Trieste (N Adriatic), an area characterized by relatively high riverine input. This multiple tracer approach permits evaluation of how sensitive each tracer is for constraining the terrestrial component of OM. Using the relevant terrestrial and marine OM end-members, we estimate that the terrestrial contribution ranges from about 90% at the mouth of the Isonzo River and decreases to $\leq 10\%$ in the center of the Gulf. In the southern part of the Gulf, 32-44% of terrestrial OC is contributed from smaller rivers, while the $\delta(15)\text{N}$ values of OM reflect more effective nutrient utilization. Analyses of different size fractions show that smaller particles are consistently more organic-rich and tend to be transported further from the river mouth, depending on river discharge. In the size fraction 2-16 μm , elemental ratios and $\delta(13)\text{C}(\text{org})$ and $\delta(15)\text{N}$ isotopic signatures are consistent with a sedimentary OM pool dominated by bacterially derived biomass. Radiocarbon analyses of sedimentary OC yield depleted $\Delta(14)\text{C}$ values (-338.7 parts per thousand to -429.4 parts per thousand), indicating a significant fraction of relatively old OC. The natural abundance of C-13 and C-14 tracers suggests a two-component mixture of ancient and modern C in the sediments down to approximately 60 cm sub-bottom, with an estimated similar to 45% of sedimentary OC probably being derived from ancient sedimentary OC (kerogen). In addition, there is a significant change in the source of organic material downcore in these sediments which, along with geological evidence, indicate contributions from freshwater swamps typical of coastal lakes with intermittent connections to the sea (brackish) prior to simulation

573: E. Ogun, E. Atalan and K. Ozdemir,. 2005. Some pollution parameters in water samples from Lake Van, Turkey. Fresenius Environmental Bulletin 11(14): 1031-1035.

Abstract: The east beach strip of Lake Van is heavily populated and the place of wastewater discharges from a municipal refinery plant. To assess both the pollution rate and heterotrophic bacterial population in the lake water, samples were collected from 8 selected stations, 10 and 100 m far from the coast between the towns of Edremit and Zeve (approximately 20 km along the coast). Physico-chemical features (pH, temperature, dissolved O₂, biochemical O₂ demand, suspended solid matter, total solid matter) of the lake have also been measured. Water samples were inoculated on starch casein agar supplemented with cycloheximide (50 µg/ml) and nystatine (50 µg/ml) to isolate actinomycetes, whereas nutrient agar and plate count agar technique were used to isolate the other microorganisms. The physico-chemical character of different water samples varied considerably. No actinomycetes were observed, but the total number of microorganisms was recorded to be 10(5) CFU ml⁻¹ in some water samples. The most diverse and active bacterial populations were found in the samples collected from the outlet of a wastewater treatment plant. Although a huge rate of organic matter flows into the lake, the water samples are polluted to a lesser degree owing to high soda content and high pH. Overall, the prokaryotic communities in the highly alkaline Lake Van represent an interesting new example of gram +/- bacteria well-adopted to a broad salinity range. But precaution should be taken into consideration as soon as possible to protect the east beach strip of Lake Van.

574: O. A. Olapade and L. G. Leff,. 2005. Seasonal response of stream biofilm communities to dissolved organic matter and nutrient enrichments. *Applied and Environmental Microbiology* 5(71): 2278-2287.

Abstract: Dissolved organic matter (DOM) and inorganic nutrients may affect microbial communities in streams, but little is known about the impact of these factors on specific taxa within bacterial assemblages in biofilms. In this study, nutrient diffusing artificial substrates were used to examine bacterial responses to DOM (i.e., glucose, leaf leachate, and algal exudates) and inorganic nutrients (nitrate and phosphate singly and in combination). Artificial substrates were deployed for five seasons, from summer 2002 to summer 2003, in a northeastern Ohio stream. Differences were observed in the responses of bacterial taxa examined to various DOM and inorganic nutrient treatments, and the response patterns varied seasonally, indicating that resources that limit the bacterial communities change over time. Overall, the greatest responses were to labile, low-molecular-weight DOM (i.e., glucose) at times when chlorophyll a concentrations were low due to scouring during significant storm events. Different types of DOM and inorganic nutrients induced various responses among bacterial taxa in the biofilms examined, and these responses would not have been apparent if they were examined at the community level or if seasonal changes were not taken into account.

575: J. A. Olive, L. E. Miranda and W. D. Hubbard,. 2005. Centrarchid assemblages in Mississippi state-operated fishing lakes. North American Journal of Fisheries Management 1(25): 7-15.

Abstract: We evaluated electrofishing catch per effort in 27 state-operated fishing lakes in Mississippi to identify patterns of centrarchid community composition and to determine whether those patterns were related to selected environmental characteristics and to artificial nutrient enrichment. Ordination with detrended correspondence analysis recognized two major axes accounting for 77% of the variability in species ordination. Axis 1 showed a distinct separation between the body sizes of various species. A notable exception was the density of small (< 30 cm) large-mouth bass *Micropterus salmoides*, which aligned with the large individuals of other centrarchid species. This pattern suggested that through predation, high densities of small largemouth bass exerted significant control over the size structure of fish communities. Axis 2 separated species of crappies *Pomoxis* spp., suggesting that conditions other than strong species interactions also moderated the composition of crappies in the assemblages. However, neither lake morphometry nor watershed composition exhibited a major influence over axes 1 or 2. In small, intensively managed lakes with low habitat complexity, the regulatory importance of biotic interactions may overwhelm that of abiotic factors. Nutrient enrichment influenced community structure by changing the densities of bluegill *Lepomis macrochirus* and largemouth bass substantially but had a minor or no effect on other species. The management techniques used in these state-operated lakes are usually targeted toward a particular species without adequately considering the other species within the community. Our results show that attention to community-level interactions could provide valuable insight into factors that affect the quality of the fishery, insight that is not available through traditional population-level assessments.

576: M. H. Olson, M. M. Hage, M. D. Binkley and J. R. Binder,. 2005. Impact of migratory snow geese on nitrogen and phosphorus dynamics in a freshwater reservoir. *Freshwater Biology* 5(50): 882-890.

Abstract: 1. We examined impacts of nutrient loading, particularly of nitrogen and phosphorus, from greater snow geese (*Chen caerulescens atlantica*) on a reservoir in south-eastern Pennsylvania, U.S.A. Approximately 100 000 geese use the reservoir for 2-6 weeks prior to their spring migration northward. 2. We estimated the magnitude of nutrient loading by geese during their presence and compared that to surface input and output rates. We also conducted nutrient limitation bioassay experiments to examine patterns of algal nutrient limitation upstream and downstream of the reservoir. 3. During their presence from 1 February to 27 March 2001, snow geese contributed 85-93% of the phosphorus and 33-44% of the nitrogen loaded to the reservoir. Both nutrients were exported from the reservoir slowly rather than as a quick pulse. Consequently, phosphorus concentrations in the outflow were higher than in the inflow from February to the end of July. However, nitrogen concentrations were consistently lower in the outflow than the inflow. 4. Nutrient limitation bioassays conducted in June and July indicated that primary production in the outflow was limited by nitrogen whereas the inflow was co-limited by nitrogen and phosphorus. Further downstream from the reservoir, primary production was consistently phosphorus limited. Therefore, nitrogen limitation persisted long after the geese had left, but was relatively localised.

577: S. P. Opsahl, 2005. Organic carbon composition and oxygen metabolism across a gradient of seasonally inundated limesink and riparian wetlands in the southeast Coastal Plain, USA. *Biogeochemistry* 1(76): 47-68.

Abstract: A set of three relatively pristine seasonally inundated limesink wetlands and one riparian wetland was studied over a 4-6 month long inundation period in 2001. Patterns in organic matter properties and oxygen consumption in the water column followed a previously documented ecological gradient based on soil composition, vegetation type, and canopy cover. The full canopy, cypress-gum swamp had the highest mean concentrations of dissolved organic carbon (DOC; 26.2 mg/l) and dissolved lignin (sum 6; 299 μ g/l) with lower concentrations observed in the partial canopy, cypress savanna (22.0 mg/l DOC; 252 μ g/l sum 6) and the open marsh savanna (20.6 mg/l DOC; 135 μ g/l sum 6), respectively. During the inundation period, DOC increased in concentration, dissolved lignin decreased, and $\delta(13)\text{C}$ shifted to more positive values which collectively indicate a large reduction in the percentage of aromatic carbon during the inundation period. All wetlands had very high concentrations of organic matter, yet microbial oxygen consumption was almost always stimulated by the addition of glucose rather than inorganic nutrients. Stimulation by glucose suggests that there were very small pools of highly bioavailable forms of DOC in the wetlands. A larger pool of moderately bioavailable organic matter had the capacity to sustain microbial oxygen consumption rates under dark conditions for at least 15 d. During the inundation period, the cypress-gum swamp had the lowest average rates of whole water oxygen consumption (1.0 μ M/h) with increasing rates observed in the cypress savanna (1.3 μ M/h), marsh savanna (1.6 μ M/h), and riparian wetland (1.9 μ M/h), respectively. The lignin compositional fingerprint varied across the gradient of limesink wetlands, and was useful for identifying different sources of vascular plant-derived DOM. Vascular plant production, algal production, microbial respiration, and UV degradation are all important drivers of DOM cycling, and the consistencies ob

578: J. D. Ortiz, E. Marti and M. A. Puig,. 2005. Recovery of the macroinvertebrate community below a wastewater treatment plant input in a Mediterranean stream. *Hydrobiologia* (545): 289-302.

Abstract: We sampled chlorophyll a, benthic organic matter, and benthic macroinvertebrates in June 2001 in La Tordera stream (Catalonia, NE Spain), receiving a wastewater treatment plant (WWTP) input. Samples were collected in six equidistant transects in three reaches located upstream (UP), few in below (DW1), and 500 in below the WWTP input (DW2). Our first objective was to assess the effects of the point source on the structure and functional organization of the benthic macroinvertebrate community. Our second objective was to determine if the self-purifying capacity of the stream implied differences between the communities of the DW1 and the DW2 reaches. The WWTP input highly increased discharge, nutrient concentrations, and conductivity and decreased dissolved oxygen. At the DW1 and the DW2 reaches, taxa richness, EPT taxa (Ephemeroptera, Plecoptera, and Trichoptera), and Shannon diversity decreased and gatherer relative density increased relative to the UP reach. At the UP reach, CPOM and FPOM standing crops were similar, whereas at the DW1 and the DW2 reaches CPOM was two times higher than FPOM. Detailed analysis showed that major changes in the benthic community occurred abruptly between 80 and 90 in downstream of the point source (middle of the DW1 reach). At this location, chlorophyll a concentration, density of macroinvertebrates, taxa richness, and scraper relative density increased, whereas gatherer relative percentage decreased. The macroinvertebrate community at the DW2 reach was comparable to that at the second middle of the DW1 reach (DW1B). The macroinvertebrate community at the DW1B and the DW2 reaches were quite similar to that at the UP reach, indicating that the recovery capacity of the stream from nutrient enrichment was high.

579: I. Ott, A. Rakko, D. Sarik, P. Noges and K. Ott,. 2005. Sedimentation rate of seston during the formation of temperature stratification after ice break-up in the partly meromictic Lake Verevi. *Hydrobiologia* (547): 51-61.

Abstract: The small strongly stratified hard-water hypertrophic lake Verevi (max. depth 11.0 m, surface area 12.6 ha, mean depth 3.6 m) was investigated in 2000 and in 2001. The lake is sheltered from winds, and the role of waves in mixing the water column is minimal. Eutrophication favours the strengthening of stratification. Early warm springs cause a fast stagnation of the water column forming partly meromictic conditions. Seston content of water and in sediment traps in 3 layers was measured several times during the formation of stratification. Besides measuring particulate matter, in 2001, the nutrient content of the trapped sediment was analysed. During the first 7 days of the investigation, 30% of the total particle sedimentation took place. The sedimentation rate of particulate matter was 0.4-6.3 g m⁻² d⁻¹ dry weight in different layers of the water column. Daily average sedimentation loss rate was 27% of the total amount of seston of the epilimnion, whilst from the meta- and hypolimnion the settling was much slower (9.6 and 7.3%, respectively). In our experiments with twin sediment traps, to one of which formaldehyde was added, the 4 concentration was 19% smaller in the trap without formaldehyde, probably due to planktonic uptake. The relationship between primary and export production is loop-like. The shape was irregular, indicating a high grazing rate of zooplankton.

580: R. Ouimet and L. Duchesne,. 2005. Base cation mineral weathering and total release rates from soils in three calibrated forest watersheds on the Canadian Boreal Shield. Canadian Journal of Soil Science 2(85): 245-260.

Abstract: Total release rates of base cations (Ca, Mg, K, and Na) from soils and from watersheds were evaluated using three methods. Three methods, one of which is new, were also used to evaluate mineral weathering rates of soils for three calibrated forest watersheds in the forest ministry's monitoring network (Reseau d'etude et de surveillance des ecosystems forestiers: Quebec Forest Ecosystem Research and Monitoring Network; RESEF) on the Canadian Boreal Shield. We also compiled an extensive literature review of forest soil base cation release rates, focussed on northeastern North American forest soils of granitic lithology. With the exception of the total release and mineral weathering of Ca from soils at the Lake Laflamme Watershed site, and the total release of K from the three watersheds, soils and watershed release rates for the three watersheds were within the confidence interval of release rates compiled for forest ecosystems with similar granitic environment (compiled data for solum [mmol (+) m⁻² yr⁻¹] +/- 95% CI], Ca: 33.8 +/- 16.3, Mg: 16.8 +/- 4.2, K: 13.0 +/- 5.6, Na: 11.1 +/- 3.0, and sum of base cations (BC): 61.2 +/- 11.0; compiled data from watersheds, Ca: 82.8 +/- 24.6, Mg: 50.8 +/- 17.0, K: 7.8 +/- 2.2, Na: 44.7 +/- 12.8, and BC: 186.0 +/- 49.9). Given the uncertainties associated with the calculations, there was little overall difference between total release rates and weathering release rates from soils for two of the three watersheds.

581: M. A. Pacheco, D.O McIntyre, and T.K. Linton,. 2005. Integrating chemical and biological criteria. Environmental Toxicology and Chemistry (24): 2983-2991.

There is no abstract for this article.

582: M. A. Palmer, E. S. Bernhardt, J. D. Allan, P. S. Lake, G. Alexander, S. Brooks, J. Carr, S. Clayton, C. N. Dahm, J. F. Shah, D. L. Galat, S. G. Loss, P. Goodwin, D. D. Hart, B. Hassett, R. Jenkinson, G. M. Kondolf, R. Lave, J. L. Meyer, T. K. O'Donnell, L. Pagano and E. Sudduth,. 2005. Standards for ecologically successful river restoration. *Journal of Applied Ecology* 2(42): 208-217.

Abstract: 1. Increasingly, river managers are turning from hard engineering solutions to ecologically based restoration activities in order to improve degraded waterways. River restoration projects aim to maintain or increase ecosystem goods and services while protecting downstream and coastal ecosystems. There is growing interest in applying river restoration techniques to solve environmental problems, yet little agreement exists on what constitutes a successful river restoration effort. 2. We propose five criteria for measuring success, with emphasis on an ecological perspective. First, the design of an ecological river restoration project should be based on a specified guiding image of a more dynamic, healthy river that could exist at the site. Secondly, the river's ecological condition must be measurably improved. Thirdly, the river system must be more self-sustaining and resilient to external perturbations so that only minimal follow-up maintenance is needed. Fourthly, during the construction phase, no lasting harm should be inflicted on the ecosystem. Fifthly, both pre- and post-assessment must be completed and data made publicly available. 3. Determining if these five criteria have been met for a particular project requires development of an assessment protocol. We suggest standards of evaluation for each of the five criteria and provide examples of suitable indicators. 4. Synthesis and applications. Billions of dollars are currently spent restoring streams and rivers, yet to date there are no agreed upon standards for what constitutes ecologically beneficial stream and river restoration. We propose five criteria that must be met for a river restoration project to be considered ecologically successful. It is critical that the broad restoration community, including funding agencies, practitioners and citizen restoration groups, adopt criteria for defining and assessing ecological success in restoration. Standards are needed because progress in the science and practice o

583: N. Palmstrom,. 2005. Development of regional nutrient criteria and implications for states and the regulated community. Lake and Reservoir Management 2(21): 174-185.

Abstract: Nutrient enrichment is a major threat to many of the nation's surface waters. The U.S. Environmental Protection Agency (EPA) has made development of nutrient criteria to protect the uses and functions of these waters a national priority (EPA 1998). Establishment of these nutrient criteria must take into account regional differences and waterbody characteristics. EPA has published related guidance documents for development of criteria, as well as ecoregional nutrient criteria documents for lakes and reservoirs and rivers and streams. Work is underway in states across the United States to gather data and develop regional nutrient criteria. The development of a database for EPA Region 3 to support regional nutrient criteria development is discussed, and use of the database for criteria development is demonstrated. Potential implications for states, River Basin Commissions (RBCs), tribes and wastewater dischargers are also addressed.

584: C. Palsson, E. S. Kritzberg, K. Christoffersen and W. Graneli,. 2005. Net heterotrophy in Faroe Islands clear-water lakes: causes and consequences for bacterioplankton and phytoplankton. *Freshwater Biology* 12(50): 2011-2020.

Abstract: 1. Five oligotrophic clear-water lakes on the Faroe Islands were studied during August 2000. Algal and bacterial production rates, community respiration, and CO₂ saturation were determined. In addition, we examined the plankton community composition (phytoplankton and heterotrophic nanoflagellates) and measured the grazing pressure exerted by common mixotrophic species on bacteria. 2. High respiration to primary production (6.6-33.2) and supersaturation of CO₂ (830-2140 μ atm) implied that the lakes were net heterotrophic and that the pelagic heterotrophic plankton were subsidised by allochthonous organic carbon. However, in spite of the apparent high level of net heterotrophy, primary production exceeded bacterial production and the food base for higher trophic levels appeared to be mainly autotrophic. 3. We suggest that the observed net heterotrophy in these lakes was a result of the oligotrophic conditions and hence low primary production in combination with an input of allochthonous C with a relatively high availability. 4. Mixotrophic phytoplankton (*Cryptomonas* spp., *Dinobryon* spp. and flagellates cf. *Ochromonas* spp.) constituted a large percentage of the plankton community (17-83%), possibly as a result of their capacity to exploit bacteria as a means of acquiring nutrients in these nutrient poor systems.

585: S. R. Parker, S. R. Poulson, C. H. Gammons and M. D. Degrandpre,. 2005. Biogeochemical controls on diel cycling of stable isotopes of dissolved O-2 and dissolved inorganic carbon in the Big Hole River, Montana. Environmental Science & Technology 18(39): 7134-7140.

Abstract: Rivers with high biological productivity typically show substantial increases in pH and dissolved oxygen (DO) concentration during the day and decreases at night, in response to changes in the relative rates of aquatic photosynthesis and respiration. These changes, coupled with temperature variations, may impart diel (24-h) fluctuations in the concentration of trace metals, nutrients, and other chemical species. A better understanding of diel processes in rivers is needed and will lead to improved methods of data collection for both monitoring and research purposes. Previous studies have used stable isotopes of dissolved oxygen (DO) and dissolved inorganic carbon (DIC) as tracers of geochemical and biological processes in streams, lakes, and marine systems. Although seasonal variation in $\delta^{18}\text{O}$ of DO in rivers and lakes has been documented, no study has investigated diel changes in this parameter. Here, we demonstrate large (up to 13 parts per thousand) cycles in $\delta^{18}\text{O}$ -DO for two late summer sampling periods in the Big Hole River of southwest Montana and illustrate that these changes are correlated to variations in the DO concentration, the C-isotopic composition of DIC, and the primary productivity of the system. The magnitude of the diel cycle in $\delta^{18}\text{O}$ -DO was greater in August versus September because of the longer photoperiod and warmer water temperatures. This study provides another biogeochemical tool for investigating the O-2 and C budgets in rivers and may also be applicable to lake and groundwater systems.

586: S. M. Parkyn, R. J. Davies-Colley, A. B. Cooper and M. J. Stroud,. 2005. Predictions of stream nutrient and sediment yield changes following restoration of forested riparian buffers. *Ecological Engineering* 5(24): 551-558.

Abstract: Riparian tree planting is widely recognised as a means to improve water quality and stream habitat. However, shading of riparian pasture grasses can lead to channel widening, and riparian shade may limit the growth of macrophytes and algae that assimilate dissolved nutrients from the water column. We investigated concerns that riparian management could lead to increased yields of nutrients and sediments through a conceptual modelling exercise. A simple model of the trade-off between interception of nutrients in runoff by forest buffers versus reduction of in-stream uptake due to shade, predicted that a buffer strip alongside a small headwater stream would reduce nutrient export, while a buffer strip instigated as an isolated patch alongside a larger stream (c. > 2.5 km² upstream catchment size) would increase nutrient export, as the relative amount of nutrients trapped by the buffer decreases as the nutrient load present in the stream water increases. However, in these larger streams with width exceeding approximately 6 m, sufficient light may reach the streambed for plant and algal growth, which in turn would promote instream nutrient processing. At the peak of streambank erosion after planting, predicted total sediment yield (hillslope plus bank sources) was appreciably higher than the hillslope pasture yield, but sediment yield stabilised c. 35-40 years after planting. When planting was extended over 40 years in the model, the sediment yield never exceeded that in pasture before planting. This conceptual modelling exercise shows that riparian tree planting programmes should commence in the headwaters and progress downstream to avoid nutrient yield increases. Significant sediment yield from bank stored sediment of small streams can be expected until the channel reaches the more stable, original forested width, but progressive planting may decrease the peak loads of sediment. (c) 2005 Elsevier B.V. All rights reserved.

587: S. M. Parkyn, J. M. Quinn, T. J. Cox and N. Broekhuizen,. 2005. Pathways of N and C uptake and transfer in stream food webs: an isotope enrichment experiment. Journal of the North American Benthological Society 4(24): 955-975.

Abstract: Landuse change alters the quantity and supply of stream energy resources from allochthonous (catchment-derived) to autochthonous (stream-derived) sources. This alteration has prompted the need for better understanding of C and N pathways through stream food webs. We added stable N-15-NH₄, and C-13-acetate isotopes as tracers to experimental stream channels containing 1 of 4 key basal food resources: autotrophic epilithon, heterotrophic epilithon, fine particulate organic matter (FPOM), and coarse particulate organic matter (CPOM). Our goal was to evaluate the importance of these foods to 2 scrapers (*Deleatidium* sp. [mayfly] and *Potamopyrgus antipodarum* [snail]) and a facultative shredder (*Olinga feredayi* [caddisfly]). A 511, potential food source, new heterotrophic biofilm, grew on all surfaces during the course of the experiment. Isotope levels in the food resources and the invertebrates were measured weekly during the 3-wk isotope addition and for 2 wk after the addition. Changes in nutrient concentrations between the channel inflows and outflows provided measures of instream net uptake. Net uptake of P by autotrophic epilithon (mean = 0.09-0.24 mg dissolved reactive P [DRP] m⁻² h⁻¹) was 3X higher than uptake by other basal resources. Autotrophic epilithon removed substantial quantities of dissolved N, predominantly as NO₃-N (2.1-9.3 mg NO₃-N m⁻² h⁻¹), whereas the other basal resource types removed only NH₄-N at a rate that was 2 orders of magnitude slower (mean = 0.04-0.08 mg NH₄-N m⁻² h⁻¹) than uptake by autotrophic epilithon. NH₄-N and dissolved organic C isotope tracers were taken up predominantly by heterotrophic epilithon and new biofilms. We developed a dynamic mixing model to separate the contribution to the invertebrates of each treatment food source relative to the new heterotrophic biofilm. Mayflies obtained almost 100% of their body C and N from new biofilm except when offered autotrophic epilithon, which contributed > 50% to their diets.

588: C. Pascoal, F. Cassio, A. Marcotegui, B. Sanz and P. Gomes,. 2005. Role of fungi, bacteria, and invertebrates in leaf litter breakdown in a polluted river. *Journal of the North American Benthological Society* 4(24): 784-797.

Abstract: The effects of water-quality degradation caused by urbanization, agricultural, and industrial activities on leaf litter breakdown and associated communities of invertebrates and microorganisms were examined at 1 reference and 2 downstream polluted sites in the Ave River (northwestern Portugal). Conductivity, concentrations of $\text{NH}_4^+\text{-N}$, $\text{NO}_3^-\text{-N}$, and $\text{PO}_4^{3-}\text{-P}$, and density of culturable microorganisms were high at the polluted sites. Rates of leaf breakdown also were high, and the highest value was found at the most-downstream, nutrient-enriched polluted site. However, the other polluted site had low current velocity and sedimentation, and nutrient enrichment did not lead to rapid leaf breakdown. Shredders were scarce or absent at all sampling sites, and low shredder density probably explained the lack of differences in leaf breakdown rates between fine-mesh and coarse-mesh bags. High fungal and bacterial production on leaves supported high leaf breakdown rates. Bacterial production was greater at both polluted sites than at the reference site, but it did not exceed 11% of the total microbial production. Fungal biomass and production were markedly different between polluted sites, with the highest values corresponding to the fastest leaf breakdown. Our findings indicate that fungi were the major decomposers in this polluted river. We encourage further research on the effects of multiple stressors on the activity of fungal decomposers to help us better understand the mechanisms underlying leaf litter breakdown in streams under stress.

589: C. Pascoal, F. Cassio and L. Marvanova,. 2005. Anthropogenic stress may affect aquatic hyphomycete diversity more than leaf decomposition in a low-order stream. Archiv Fur Hydrobiologie 4(162): 481-496.

Abstract: Fungal diversity and microbial decomposition of leaf litter were examined in low-order stream at a reference and an impacted site. The latter, 10 km downstream of the reference site, has high nutrient loads from domestic sewage and agriculture, and increased heavy metal levels in the stream water and sediments. At the polluted site aquatic hyphomycete diversity and sporulation were reduced, whereas fungal biomass and leaf decomposition rate were not. *Articulospora tetracladia* and *Flagellospora* sp. were the dominant species at the reference site, and *Dimorphospora foliicola* was dominant at the polluted site. Biomass of bacteria was higher at the polluted site, but only approached 10% of fungal biomass, indicating that fungi remained the main microbial decomposers. In addition, the results suggest that aquatic hyphomycete communities may respond to stress according to the redundancy model, in which overall function remains stable because increased biomasses of tolerant species compensate for the loss of sensitive species.

590: H. D. Passell, C. N. Dahm and E. J. Bedrick,. 2005. Nutrient and organic carbon trends and patterns in the upper Rio Grande, 1975-1999. Science of the Total Environment 1-3(345): 239-260.

Abstract: Nutrient patterns and trends were analyzed using USGS water quality data collected from 1975 to 1999 along the uppermost 600 km of the Rio Grande in Colorado and New Mexico. Data on discharge, pH, organic carbon (total), N-NH₄⁺⁺organic N (total), NH₄⁺ (dissolved), N-NO₂⁻+N-NO₃⁻ (dissolved), phosphorus (total), and P-orthophosphate (dissolved) came from six USGS stations-Lobatos, Taos Junction, Otowi, San Felipe, Isleta and Bernardo-ranging from the Colorado-New Mexico border to about 80 km below Albuquerque, NM. Kendall's S and Seasonal Kendall's S' were used to measure trend, and ANOVA and Tukey's multiple comparison test were used to analyze spatial differences between stations. Temporal trend analyses show widespread decreases in N and P concentrations at most stations, likely due to improvements in sewage treatment and dilution from increasing discharge. N-NO₂⁻+N-NO₃⁻ (dissolved) and total nitrate load increases at Isleta and Bernardo, likely due to improved nitrification in sewage treatment and to increasing human population. Spatial analyses show large increases for most parameters at Isleta. All parameters show decreases again at Bernardo, about 50 km downstream from Isleta, except for N-NO₂⁻+N-NO₃⁻ (dissolved), which continues to increase. Urbanization in the Albuquerque area significantly impacts downstream river nutrient levels. Published by Elsevier B.V.

591: M. A. Pavao-Zuckerman and D. C. Coleman,. 2005. Decomposition of chestnut oak (*Quercus prinus*) leaves and nitrogen mineralization in an urban environment. *Biology and Fertility of Soils* 5(41): 343-349.

Abstract: We studied soil processes along an urban to rural gradient. To determine the ecosystem response to the urban soil environment, we measured (1) leaf litter decomposition rates using a reference leaf litter, and (2) net N-mineralization and net nitrification rates using paired in situ soil cores. A significant trend toward slower litter decomposition rates toward the urban end of the gradient was observed. In addition, percent ash-free dry mass remaining of the litter was significantly higher during the course of the study but was not statistically significant at the final sampling date. Litter C:N ratio had a complex response with respect to degree of urban land use, and litter % N did not differ between land-use types. Litter decomposition rates were not significantly correlated with observed soil physicochemical and biological characteristics but were influenced by soil moisture and soil organic matter. Net N-mineralization rates were higher in urban soils. Net nitrification rates did not differ with land-use type. Net N-mineralization rates were positively correlated with soil temperature, indicating a response to the urban heat island effect. Net N-mineralization rates were negatively correlated with the numbers of higher trophic level nematodes.

592: R. A. Payn, J. R. Webster, P. J. Mulholland, H. M. Valett and W. K. Dodds,. 2005. Estimation of stream nutrient uptake from nutrient addition experiments. *Limnology and Oceanography-Methods* (3): 174-182.

Abstract: Nutrient uptake in streams is often quantified by determining nutrient uptake length. However, current methods for measuring nutrient uptake length are often impractical, expensive, or demonstrably incorrect. We have developed a new method to estimate ambient nutrient uptake lengths using field experiments involving several levels of nutrient addition. Data analysis involves plotting nutrient addition uptake lengths versus added concentration and extrapolating to the negative ambient concentration. This method is relatively easy, inexpensive, and based on sound theoretical development. It is more accurate than the commonly used method involving a single nutrient addition. The utility of the method is supported by field studies directly comparing our new method with isotopic tracer methods for determining uptake lengths of phosphorus, ammonium, and nitrate. Our method also provides parameters for comparing potential nutrient limitation among streams.

593: D. A. Pearce,. 2005. The structure and stability of the bacterioplankton community in Antarctic freshwater lakes, subject to extremely rapid environmental change. *Fems Microbiology Ecology* 1(53): 61-72.

Abstract: In this study, variation in the bacterioplankton community structure of three Antarctic lakes of different nutrient status, was determined in relation to physical and chemical gradients at depth and at time intervals, across the seasonal transition from winter ice-cover to the summer ice-free period. The three lakes studied were: Moss Lake (low nutrient, with typical nutrient concentrations of 80 $\mu\text{g l}^{-1}$ nitrate and 10 $\mu\text{g l}^{-1}$ dissolved reactive phosphate), Sombre Lake (low nutrient, but becoming progressively enriched, with typical nutrient concentrations of 185 $\mu\text{g l}^{-1}$ nitrate and 7 $\mu\text{g l}^{-1}$ dissolved reactive phosphate) and Heywood Lake (enriched, with typical nutrient concentrations of 1180 $\mu\text{g l}^{-1}$ nitrate and 124 $\mu\text{g l}^{-1}$ dissolved reactive phosphate). Bacterio plankton community structure was determined using a combination of PCR amplification of 16S rRNA gene fragments and denaturing gradient gel electrophoresis (DGGE). Results indicated marked changes in this bacterioplankton community structure, which were particularly associated with the transition period. However, significant changes also occurred during the period of holomixis. Comparison of the results from lakes of different nutrient status suggest that increased levels of nutrient input, and in the timing and duration of ice cover will lead to marked changes in the structure and stability of the bacterioplankton community at existing levels of environmental change. (c) 2005 Federation of European Microbiological Societies. Published by Elsevier B.V. All rights reserved.

594: D. A. Pearce, C. J. van der Gast, K. Woodward and K. K. Newsham,. 2005. Significant changes in the bacterioplankton community structure of a maritime Antarctic freshwater lake following nutrient enrichment. *Microbiology-Sgm* (151): 3237-3248.

Abstract: Nutrient enrichment is known to increase bacterioplankton population density in a variety of Antarctic freshwater lakes. However, relatively little is known about the associated changes in species composition. In this study, the bacterioplankton community composition of one such lake was studied following natural nutrient enrichment to investigate the resistance of the system to environmental change. Heywood Lake is an enriched freshwater maritime Antarctic lake, with nitrogen and phosphorus concentrations significantly higher than its more oligotrophic neighbours (by at least an order of magnitude). This major change in lake chemistry has occurred following large increases in the fur seal population over the last 30 years. Using analysis of 16S rRNA gene fragments, fatty acid methyl ester analysis, denaturing gradient gel electrophoresis and fluorescence in situ hybridization, significant changes are reported in lake microbiology which have resulted in a distinct bacterioplankton community. In comparison to its more oligotrophic neighbours, nutrient-enriched Heywood Lake has a high bacterioplankton population density, reduced species richness and an increasing evenness among key groups. Only 42-3% of the clones found with $\geq 97\%$ similarity to a named genus were also present in adjacent oligotrophic lakes, including three of the dominant groups. Critically, there was an apparent shift in dominance with trophic status (from the beta-Proteobacteria to the Actinobacteria). Other key observations included the absence of a dominant group of Cyanobacteria and the presence of marine bacteria. The significant impact of natural nutrient enrichment on the microbiology of Heywood Lake, therefore, suggests that low-temperature oligotrophic freshwater lake systems might have low resistance to environmental change.

595: G. W. Peck and W. E. Walton,. 2005. Effect of different assemblages of larval foods on *Culex quinquefasciatus* and *Culex tarsalis* (Diptera : Culicidae) growth and whole body stoichiometry. *Environmental Entomology* 4(34): 767-774.

Abstract: We examined how mosquito life history parameters and whole body carbon (C), nitrogen (N), and phosphorus (P) content responded to changing C, N, and P content in food. The southern house mosquito, *Culex quinquefasciatus* Say, and the western encephalitis mosquito, *Cx. tarsalis* Coquillett, were reared in containers with dairy waste water (high food and C, N, and P concentrations) or effluent from a constructed wetland (low food and C, N, and P concentrations). Low food density decreased survivorship and delayed development from hatching to eclosion and reduced adult mass for both species. Adult females were always heavier than adult males, and *Cx. tarsalis* adults were heavier than *Cx. quinquefasciatus* adults. There was little change in C, N, and P content for *Cx. quinquefasciatus* adults across food treatments, whereas *Cx. tarsalis* was more variable in C and P, but there was little change in N. Adult *Cx. quinquefasciatus* had a higher P content (3.0%) than *Cx. tarsalis* (2.0%). Compared with other aquatic and terrestrial taxa, the relatively high percentage of N and P content (11.5 and 2.5%, respectively) of adult mosquitoes suggest an evolutionary trend toward rapid rates of growth, especially for species that use highly enriched habitats as developmental sites.

596: A. P. M. Pegman and J. Ogden,. 2005. Productivity-decomposition dynamics of *Typha orientalis* at Kaitoke Swamp, Great Barrier Island, New Zealand. *New Zealand Journal of Botany* 4(43): 779-789.

Abstract: The productivity and decomposition of *Typha orientalis* at Kaitoke Swamp on Great Barrier Island, New Zealand, were measured to determine the annual dynamics of its biomass. These interactions, including peat accumulation under nutrient-rich conditions, are often poorly understood. Annual productivity and maximum "standing" above-surface and below-surface biomass were measured using sequential harvest plots. Decomposition was determined using recently dead *T. orientalis* leaves in mesh litter bags placed on, above, and below the swamp surface. The annual productivity of *T. orientalis* (c. 3 kg m⁻²) is within world-wide estimates for swamp wetland species. The order of decomposition of leaf litter at Kaitoke Swamp is: below surface > surface > above surface. Litter bag mesh size did not affect decomposition processes, indicating that larger decomposer animals probably do not have a significant influence on biomass loss in the site. Peat accumulation was estimated based on observations and measurements of the entrainment process. *T. orientalis* had low estimated peat accumulation, with 6.5% (0.19 kg m⁻² yr⁻¹) of the annual production remaining after all components had been underground for 5 years. Consequently a large amount of the annual production of biomass is lost from the site. The ratio of maximum biomass to annual productivity was 2.2, also indicating low biomass accumulation.

597: A. P. M. Pegman and G. L. Rapson,. 2005. Plant succession and dune dynamics on actively prograding dunes, Whatipu Beach, northern New Zealand. *New Zealand Journal of Botany* 1(43): 223-244.

Abstract: Whatipu Beach, north Manukau Harbour, Auckland, has prograded episodically over 1.5 centuries. Sand dune vegetation is quantitatively described, and related to successional stage, local environment, and progradation dynamics. Foredunes, with fine, mobile, infertile sand, occupy the most recently prograded areas and are partially vegetated by native species. Instead of a dune slack, a stream which changed course to flow between dune ridges has created wet "sand river" vegetation. Relict foredune and a dune slack persist inland of the sand river, disrupting a lineal spatial sequence, as do rear dune wetlands. Less-mobile grass and shrub communities, derived from *Ammophila arenaria* dunes, occupy surfaces >50 years old. No climax communities are present. In contrast to spatial analogues, the Whatipu dunes demonstrate how rapidly succession proceeds in response to the formation of new habitat, while freshwater movements generate non-seral sand-river communities. Succession is modified by invading exotics and by the absence of many disturbance-intolerant native shrub species. Coaxial progradation rates at Whatipu indicate that shrub land develops within 50 years, suggesting that spatial analogues of dune succession can mis-represent the longevity of early seral stages. These unusual successional patterns on dateable surfaces, and the presence of rare flora and fauna, make Whatipu Beach important for conservation.

598: C. Perna and D. Burrows,. 2005. Improved dissolved oxygen status following removal of exotic weed mats in important fish habitat lagoons of the tropical Burdekin River floodplain, Australia. Marine Pollution Bulletin 1-4(51): 138-148.

Abstract: The Burdekin delta floodplain, north Queensland, is highly modified for agricultural purposes. Riparian condition is very poor and exotic aquatic weeds dominate waterways. Historically, most streams and lagoons were highly seasonal, but those now used for the delivery of irrigation water maintain elevated flows and increased turbidity and nutrient loading. These factors have aided exotic weed growth and many major lagoons are covered by dense water hyacinth (*Eichhornia crassipes*) mats which greatly reduce dissolved oxygen levels, one of the most important water quality variables for aquatic fauna. Mechanical harvesting of water hyacinth from several of these lagoons resulted in rapid and substantial increases in dissolved oxygen saturation, and improved suitability of the habitat to support fish species. Decrease in dissolved oxygen as water passes sequentially through weed-infested lagoons, justified the approach of harvesting upstream lagoons first, however, the channels that connect these lagoons remain weed-infested and are still impacting upon downstream oxygen levels. (c) 2004 Elsevier Ltd. All rights reserved.

599: B. C. Pers,. 2005. Modeling the response of eutrophication control measures in a Swedish lake. Ambio 7(34): 552-558.

Abstract: The response of a biogeochemical lake model (BIOLA) to different eutrophication management actions has been studied in a eutrophic lake. Management actions included in the study were nutrient load reduction, sediment manipulation, biomanipulation, and herbicide application. The model was used to simulate nutrient and biomass concentrations in the lake during the 1990s. During the same period, management scenarios were also simulated. Several ecological parameters were calibrated to better simulate the behavior of the chosen lake, but there were still some difficulties with phosphate. This indicated that further model development is necessary. The most favorable development within the lake was found for scenarios with nutrient load reduction and biomanipulation through planktivorous fish reduction. Reducing both the nitrogen and phosphorus loads had a greater effect on the lake's water quality than simply reducing just one of the nutrients.

600: V. Persic, J. Horvatic and M. Mihaljevic,. 2005. Bioassay method in the trophic evaluation of a wetland area - case study in the Danubian region (1426-1388 r.km). Periodicum Biologorum 3(107): 293-298.

Abstract: Background and Purpose: The primary objective of this investigation was to examine the effects of nutrient enrichment, by using miniaturized algal bioassay, on the growth of the unicellular green alga *Chlorella kessleri* in order to make a comparative evaluation of the trophic level and productivity of aquatic ecosystems of the Danube (1426-1388):r.km) and its wetland areas. Comparative algal growth potential (AGP) of original water samples was done in inoculum concentrations of 400.000 and 800.000 cells/ml of *C. kessleri*. **Materials and Methods:** Water samples were collected on September 12(th) and November 14(th), 2002, and March 27(th), 2003 at 13 localities in the Danubian region. The miniaturized bioassay method was used to establish the algal growth potential of *C. kessleri*. **Results:** The results of AGP and nutrient enrichment bioassay indicate that algal growth was generally limited by nitrogen. Based on the results of chemical analysis, the highest nitrate concentrations were measured at locations of the Danube main-arm and the smallest nitrate concentrations measured at locations of the flood protected area of Kopacki Rit Nature Park and the Stara Drava dead arm. The ratio of total nitrogen to total phosphorus (VIP) varied in September from 3.945 to 18.268, in November from 0.747 to 8.97 and in March from 0.670 to 14.176. According to AGP results (46.566 -100.288 mg/l DW), the waters in the wetland area of the Danube region were oligomesotrophic to mesotrophic and highly productive. **Conclusions:** Bioassay method is more suitable for trophic evaluation with inoculum concentration of 800.000 cell/ml of *Chlorella kessleri* than with inoculum of 400.000 cell/ml. Nitrogen was the limiting nutrient for growth potential of *C. kessleri* in 79% of samples and phosphorus in only 2% of samples, while in 19% of samples there was no significant influence of added nutrients on the growth of *C. kessleri*. A greater trophic level of the investigated localities was established.

601: G. Phillips, A. Kelly, J. A. Pitt, R. Sanderson and E. Taylor,. 2005. The recovery of a very shallow eutrophic lake, 20 years after the control of effluent derived phosphorus. *Freshwater Biology* 10(50): 1628-1638.

Abstract: 1. Monitoring at fortnightly to monthly intervals of a very shallow, lowland lake over 24 years has enabled the time course of recovery from nutrient enrichment to be investigated after high external P loading of the lake ($> 10 \text{ g P m}^{-2} \text{ year}^{-1}$) was reduced between 1977 and 1980. 2. The lake showed a relatively rapid response during the spring and early summer, with a reduction in phytoplankton biomass occurring after 5 years when soluble reactive phosphorus concentration was $< 10 \mu\text{g L}^{-1}$. 3. However, during the later summer the response was delayed for 15 years because of sustained remobilisation of phosphorus from the sediment. The greater water clarity in spring and a gradual shift from planktonic to benthic algal growth may be related to the reduction in internal loading after 15 years. 4. Changes in the phytoplankton community composition were also observed. Centric diatoms became less dominant in the spring, and the summer cyanobacteria populations originally dominated by non-heterocystous species (*Limnothrix*/*Planktothrix* spp.) almost disappeared. Heterocystous species (*Anabaena* spp. and *Aphanizomenon flos-aquae*) were slower to decline, but after 20 years the phytoplankton community was no longer dominated by cyanobacteria. 5. There were no substantial changes in food web structure following re-oligotrophication. Total zooplankton biomass decreased but body size of *Daphnia hyalina*, the largest zooplankton species in the lake, remained unchanged, suggesting that the fish population remained dominated by planktivorous species. 6. Macrophyte growth was still largely absent after 20 years, although during the spring water clarity may have become sufficient for macrophytes to re-establish.

602: C. R. Picard, L. H. Fraser and D. Steer,. 2005. The interacting effects of temperature and plant community type on nutrient removal in wetland microcosms. Bioresource Technology 9(96): 1039-1047.

Abstract: Treatment wetlands can remove nutrients from inflow sources through biogeochemical processes. Plant composition and temperature play important roles in the nutrient removal efficiency of these wetlands, but the interactions between these variables are not well understood. We investigated the seasonal efficiency of wetland macrophytes to reduce soil leachate concentrations of total nitrogen and total phosphorus in experimental microcosms. Each microcosm contained one of six vegetation treatments: unplanted, planted with one of four species (*Carex lacustris*, *Scirpus validus*, *Phalaris arundinacea* and *Typha latifolia*) in monoculture or planted with an equal abundance of all four species. Microcosms were also subjected to two temperature treatments: insulated microcosms and microcosms exposed to environmental conditions. A constant nutrient solution containing 56 mg/l N and 31 mg/l P was added to all microcosms three times a week. Water samples were analyzed monthly for total dissolved nitrogen and total dissolved phosphorous. Microcosms exhibited a typical pattern of seasonal nutrient removal with higher removal rates in the growing season and lower rates in the winter months. In general, planted microcosms outperformed unplanted microcosms. Among the plant treatments, *Carex lacustris* was the least efficient. The four remaining plant treatments removed an equivalent amount of nutrients. Insulated microcosms were more efficient in the winter and early spring months. Although a seasonal pattern of nutrient removal was observed, this variation can be minimized through planting and insulation of wetlands. (C) 2004 Elsevier Ltd. All rights reserved.

603: V. Picard and N. Lair,. 2005. Spatio-temporal investigations on the planktonic organisms of the Middle Loire (France), during the low water period: biodiversity and community dynamics. *Hydrobiologia* (551): 69-86.

Abstract: The objective of this work was to analyse the distribution of the planktonic communities involved in the functioning of a 255-km river stretch and to get a better understanding of the influence of the river morphology on the diversity and dynamics of the micro-organisms. The planktonic communities (phytoplankton, bacterioplankton, proto- and metazooplankton) scarcely considered together in fluvial systems, were analysed at four sites of the Middle Loire during the low water period, in parallel to physical and chemical analyses. Physical and chemical variables such as turbidity, pH, suspended matter and chlorophyll a concentration were high, illustrating the classical, productive summer period. The algae played a major role in the water oxygenation until end-summer, then the algal drop concomitant to the bacterial sustained abundance appeared responsible for oxygen depletion. The downstream site enriched by nutrients inputs of two tributaries, carried the highest algal and bacterial densities. Situated in a meanders zone, the Middle Loire is characterised by a high habitat heterogeneity, the up- and downstream sites were wide and spread of vast standing zones and vegetated islands, whereas the two intermediate ones were narrower and more uniform. This morphological variability strongly impacted the micro-organisms diversity and distribution. Indeed, the algae and zooplankton composition were clearly influenced by the physical habitats of the river, the Cyanophyta were favoured by the lentic conditions and the Bacillariophyta by the turbulent ones, while the young stage of copepod and the large rotifer predators were indicator of a lentic origin. Thereafter, the river heterogeneity interfered with the zooplankton dynamics, the standing conditions enhancing the rotifer predation. In that way, we hypothesise that two opposite patterns characterised the wide sites spread of lentic water and the more uniform channels. In the first case, the zooplankton could prey on the c

604: P. C. Pickhardt, C. L. Folt, C. Y. Chen, B. Klaue and J. D. Blum,. 2005. Impacts of zooplankton composition and algal enrichment on the accumulation of mercury in an experimental freshwater food web. Science of the Total Environment 1-3(339): 89-101.

Abstract: There is a well documented accumulation of mercury in fish to concentrations of concern for human consumption. Variation in fish Hg burden between lakes is often high and may result from differences in Hg transfer through lower levels of the food web where mercury is bioconcentrated to phytoplankton and transferred to herbivorous zooplankton. Prior research derived patterns of mercury accumulation in freshwater invertebrates from field collected animals. This study provides results from controlled mesocosm experiments comparing the effects of zooplankton composition, algal abundance, and the chemical speciation of mercury on the ability of zooplankton to accumulate mercury from phytoplankton and transfer that mercury to planktivores. Experiments were conducted in 550-L mesocosms across a gradient of algal densities manipulated by inorganic nutrient additions. Enriched, stable isotopes of organic ((CH₃HgCl)-Hg-200) and inorganic ((HgCl₂)-Hg-201) mercury were added to mesocosms and their concentrations measured in water, seston, and three common zooplankton species. After 2 weeks, monomethylmercury (MMHg) concentrations were two to three times lower in the two copepod species, *Leptodiaptomus minutus* and *Mesocyclops edax* than in the cladoceran, *Daphnia mendotae*. All three zooplankton species had higher MMHg concentrations in mesocosms with low versus high initial algal abundance. However, despite higher concentrations of inorganic mercury (Hg_i) in seston from low nutrient mesocosms, there were no significant differences in the Hg-I accumulated by zooplankton across nutrient treatments. Bioaccumulation factors for MMHg in the plankton were similar to those calculated for plankton in natural lakes and a four-compartment (aqueous, seston, macrozooplankton, and periphyton/sediments) mass balance model after 21 days accounted for similar to 18% of the (CH₃Hg)-Hg-200 and similar to 33% of the Hg-201 added. Results from our experiments corroborate results from field studies a

605: N. M. Pieterse, H. de Venterink, P. P. Schot and A. W. M. Verkroost,. 2005. Is nutrient contamination of groundwater causing eutrophication of groundwater-fed meadows?. *Landscape Ecology* 6(20): 743-753.

Abstract: There is an ongoing debate as to whether nutrient contamination of groundwater under agricultural fields may cause nutrient-enrichment and subsequent eutrophication in discharge areas. Often, there is only circumstantial evidence to support this supposition (proximity of agricultural fields, direction of water flow, highly productive vegetation). Research on solute transport along a flow path is necessary to evaluate the risk for eutrophication. In this paper we present results of such a study. Two transects were established in a discharge meadow, a few meters downstream from fertilized cornfields. Highly productive vegetation in parts of the meadow suggested nutrient-enrichment caused by inflow of contaminated groundwater. This supposition was supported by an analysis of groundwater flow paths, residence times and chloride as tracer for pollution. However, the fate of nutrients along the flow path indicated otherwise. While we found high concentrations of DIN (dissolved inorganic nitrogen), P and K under the cornfields, DIN and P concentrations drop below detection limit when groundwater enters the meadow. Only K progressed into the meadow but did not enter the root zone. We conclude that (1) polluted groundwater from the cornfields did not cause the nutrient-enrichment, as indicated by the highly productive vegetation. Restoration projects in discharge areas should not focus upon measures in upstream areas if only circumstantial evidence is available. Solute transport should be considered as well. (2) Because K clearly showed to be the most mobile nutrient, its importance for nutrient-enrichment in discharge wetlands merits more attention in future research.

606: Y. Pinchasov, D. Kotliarevsky, Z. Dubinsky, D. C. Mauzerall and J. Feitelson,. 2005. Photoacoustics as a diagnostic tool for probing the physiological status of phytoplankton. Israel Journal of Plant Sciences 1(53): 1-10.

Abstract: In nature, conditions for the growth of phytoplankton rarely support their maximal potential doubling rates. The main rate-limiting factor determining the doubling rates of phytoplankters is photosynthesis. This key process is in turn controlled, and frequently limited, by the available light, by lack of essential nutrients, or by the presence of noxious pollutants. Any decrease in the rates of photosynthesis is associated with a reduction in the efficiency of light utilization in that process. We present here the decreased photosynthetic efficiency of phytoplankton upon depletion of nitrogen, phosphorus, and iron as measured by photoacoustics. Such effects have been documented extensively by other methods, such as fluorescence yield, growth rate, carbon assimilation, and oxygen evolution. However, photoacoustics measures directly the energy efficiency of the photosynthetic process. We determined that efficiency by this method in three phytoplankton species belonging to different taxa. Our results illustrate the power of photoacoustics as a tool in aquatic ecology and in the physiological research of phytoplankton.

607: K. A. Pitt, K. Koop and D. Rissik,. 2005. Contrasting contributions to inorganic nutrient recycling by the co-occurring jellyfishes, *Catostylus mosaicus* and *Phyllorhiza punctata* (Scyphozoa, Rhizostomeae). *Journal of Experimental Marine Biology and Ecology* 1(315): 71-86.

Abstract: The rhizostome jellyfishes, *Catostylus mosaicus* and *Phyllorhiza punctata* abound in estuaries in New South Wales, Australia. *R. punctata* contains symbiotic zooxanthellae but *C. mosaicus* contains few or no zooxanthellae. Our experiment measured the rates at which NH_3 , PO_4 and NO_x were taken up or excreted by each species and in two controls: a "water only" control and a "mucus" control. Rates of uptake or excretion were measured as changes in the nutrient concentration of the water in the containers housing the animals over periods of 6 h. Experiments were repeated twice during the day and twice at night, under both ambient and enriched nutrient conditions. Under ambient nutrient conditions, the flux of NH_3 in the *P. punctata* treatment did not differ from the controls but under enriched conditions *P. punctata* excreted NH_3 during the night ($49 \text{ } \mu\text{g kg}^{-1} \text{ WW h}^{-1}$) and took up NH_3 during the day ($123 \text{ } \mu\text{g kg}^{-1} \text{ WW h}^{-1}$). In contrast, *C. mosaicus* excreted NH_3 at a rate of $1555 \text{ } \mu\text{g kg}^{-1} \text{ WW h}^{-1}$ during the day and $1004 \text{ } \mu\text{g kg}^{-1} \text{ WW h}^{-1}$ during the night under both enriched and ambient nutrient conditions. *R. punctata* neither took up nor excreted PO_4 but *C. mosaicus* excreted PO_4 at a faster rate during the day than night ($173 \text{ } \mu\text{g kg}^{-1} \text{ WW h}^{-1}$ cf. $104 \text{ } \mu\text{g kg}^{-1} \text{ WW h}^{-1}$). Both *C. mosaicus* and *P. punctata* excreted NO_x and, although the rate of excretion for *R. punctata* varied between the two experiments conducted during the day, the rate of excretion was consistently greater than for *C. mosaicus* (52 and $80 \text{ } \mu\text{g kg}^{-1} \text{ WW h}^{-1}$ cf. $26 \text{ } \mu\text{g kg}^{-1} \text{ WW h}^{-1}$). Tubs containing *P. punctata* had a much greater concentration of dissolved oxygen at the end of the experiments conducted during the day (152% saturation) than night (60% saturation) but tubs containing *C. mosaicus* had a greater dissolved oxygen concentration during the night (47% saturation) than day (39%). Overall, *C. mosaicus* appears to recycle more inorganic nutrients to estuaries than *P. punctata*. Calculations

608: S. Pla, A. M. Paterson, J. P. Smol, B. J. Clark and R. Ingram,. 2005. Spatial variability in water quality and surface sediment diatom assemblages in a complex lake basin: Lake of the Woods, Ontario, Canada. *Journal of Great Lakes Research* 3(31): 253-266.

Abstract: Lake of the Woods (LOW) is an international waterbody spanning the Canadian provinces of Ontario and Manitoba, and the U.S. state of Minnesota. In recent years, there has been a perception that water quality has deteriorated in northern regions of the lake, with all increase in the frequency and intensity of toxin-producing cyanobacterial blooms. However, given the lack of long-term data these trends are difficult to verify. As a first step, we examine spatial and seasonal patterns in water quality in this highly complex lake on the Canadian Shield. Further, we examine surface sediment diatom assemblages across multiple sites to determine if they track within-lake differences in environmental conditions. Our results show that there are significant spatial patterns in water quality in LOW. Principal Component Analysis divides the lake into three geographic zones based primarily on algal nutrients (i.e., total phosphorus, TP), with the highest concentrations at sites proximal to Rainy River. This variation is closely tracked by sedimentary diatom assemblages, with [TP] explaining 43% of the variation in diatom assemblages across sites. The close correlation between water quality and the surface sediment diatom record indicate that paleoecological models could be used to provide data on the relative importance of natural and anthropogenic sources of nutrients to the lake.

609: O. S. Pokrovsky, G. S. Pokrovski, A. Gelabert, J. Schott and A. Boudou,. 2005. Speciation of Zn associated with diatoms using X-ray absorption spectroscopy. Environmental Science & Technology 12(39): 4490-4498.

Abstract: The long- and short-term interactions between zinc, an essential but also toxic element, and freshwater and marine diatoms are not well understood partly because of a lack of information on Zn speciation on the surface and inside the cells. In this work, interactions of aqueous Zn^{2+} with marine (*Skeletonema costatum*) and freshwater (*Achnanthes minutissimum*, *Navicula minima*, and *Melosira varians*) diatoms were studied using conventional macroscopic techniques, while the local atomic structure of metal ions adsorbed on their surface or incorporated into the cells was characterized by in-situ Zn K-edge X-ray absorption fine structure (XAFS) spectroscopy on both intact and lyophilized samples. At the cell surface for all diatom species studied, Zn was tetrahedrally coordinated with oxygen at similar to 2.00 ± 0.02 angstrom and monodentately bonded to one or two carboxylate groups; these results are consistent with the surface speciation model developed from macroscopic adsorption experiments. The atomic environment of Zn incorporated into freshwater diatoms during long-term growth in normal nutrient media was distinctly different from that of adsorbed Zn: it was dominated by O (and/or N) neighbors in a tetrahedral arrangement at 1.97 ± 0.02 angstrom in the first atomic shell, with the presence of 1 phosphorus and 2 carbons in the Zn second shell. Contrasting speciation of intracellular zinc was revealed for the marine species *Skeletonema costatum* in which Zn was coordinated to 2 O/N atoms and 2 sulfur groups in the form of cysteine-histidine complexes and/or zinc thiolate clusters. These new structural data strongly suggest: (i) the predominant $>R-COO^-$ ligand binding of Zn at the diatom surface; (ii) the nonspecific storage of Zn in the form of carboxylate/phosphate groups inside the cell of freshwater species; and (iii) the highly specific thiol-ligand coordination of intracellular zinc for marine *S. costatum* species.

610: K. Pope, P. Masuoka, E. Rejmankova, J. Grieco, S. Johnson and D. Roberts,. 2005. Mosquito habitats, land use, and malaria risk in Belize from satellite imagery. *Ecological Applications* 4(15): 1223-1232.

Abstract: Satellite imagery of northern Belize is used to examine the relationship between land use and habitats of the malaria vector, the *Anopheles* mosquito. A land cover classification based on multispectral Systeme Probatoire d'Observation de la Terra (SPOT) and multitemporal Radarsat images identified 11 land cover classes, including agricultural, forest, and marsh types. Two of the land cover types, *Typha domingensis* marsh and flooded forest, are habitats of immature *Anopheles vestitipennis*, and one, *Eleocharis* spp. marsh, is the habitat for immature *Anopheles albimanus*. Geographic information systems (GIS) analyses of land cover demonstrate that the amount of *Typha domingensis* in a marsh is positively correlated with the amount of agricultural land in the adjacent upland and negatively correlated with the amount of adjacent forest. This finding, coupled with field studies documenting higher soil phosphorus in wetlands adjacent to agricultural fields, supports the hypothesis that nutrient runoff is the cause of higher densities of *Typha domingensis* in marshes adjacent to fields in northern Belize. Thus, agricultural activities can potentially increase *Anopheles vestitipennis* habitat and thereby increase malaria risk across a broad region where *Anopheles vestitipennis* is a malaria vector.

611: M. B. Pramparo, S. C. Ballent, O. F. Gallego and J. P. Milana,. 2005. Paleontology of the Lagarcito formation (lower Cretaceous), San Juan Province, Argentina. Ameghiniana 1(42): 93-114.

Abstract: The first paleontological records from the Lagarcito Formation (Albian) in the eastern side of the sierra de Guayaguas (La Yesera Sur section), south-eastern San Juan Province, central-western Argentina, are presented. Although several lake episodes have been detected, only three of them have yielded abundant palynologic and paleontologic remains. Eight chlorophyte algal species, three conchostracan species and eleven non-marine ostracod species, are described and illustrated. The associations indicate a shallow lacustrine environment, that was initially rich in nutrients and with high levels of evaporation, as demonstrated by interstratified gypsum towards the top of each lacustrine episode. Two of the conchostracan species described are new: *Dendrostracus lagarcitoensis* Gallego sp. nov. and *Pseudestherites rivarolai* Gallego sp. nov.

612: M. B. K. Prasad and A. L. Ramanatran,. 2005. Solute sources and processes in the Achankovil River basin, Western Ghats, southern India. Hydrological Sciences Journal-Journal Des Sciences Hydrologiques 2(50): 341-354.

Abstract: A time series survey was carried out in 2002 to understand the hydrogeochemical processes taking place in the Achankovil River of the Western Ghats Range. The water is neutral with pH and EC ranges from 6.32 to 7.56 and 24-54 $\mu\text{S cm}^{-1}$, respectively. Chloride and sodium are the dominant anion and cation in the water respectively. Correlation analysis of the chemical parameters of the water shows that few ions have additional sources. The majority of carbonate is derived from carbonate weathering followed by silicate weathering. Cation concentrations show decreasing trend from upstream to downstream in contrast to the increasing trend in the major world rivers. Dissolved silica in pre-monsoon water is low. The river chemistry is dominated by rock weathering induced by precipitation. Thermodynamic plots show that dolomite, kaolinite, albite and chlorite are in equilibrium with the river water. Chemical weathering is predominant here compared to physical weathering. The overall material transport seems to be lower compared to the other Indian rivers; nevertheless, the solute loads are comparable to certain large rivers such as the River Cauvery in southern India. The solute flux including the nutrient flux is very high among the Western Ghats rivers in relation to its size, which will certainly supplement the productivity of the lake/estuary and the coastal waters. Since this study is restricted to a one-year period, long-term data procurement and analysis along with micro nutrients studies are needed, which are lacking in the present study, to gain insight into the material flux by this river into the Arabian Sea.

613: V. K. Prasad, A. Ortiz, B. Stinner, D. McCartney, J. Parker, D. Hudgins, C. Hoy and R. Moore,. 2005. Exploring the relationship between hydrologic parameters and nutrient loads using digital elevation model and GIS - A case study from Sugarcreek Headwaters, Ohio, USA. Environmental Monitoring and Assessment 1-3(110): 141-169.

Abstract: Ohio is typical among the Midwestern and Eastern United States with high levels of water pollutants, the main sources being from agriculture. In this study, we used a digital elevation model in conjunction with hydrological indices to determine the role of landscape complexity affecting the spatial and temporal variation in pollutant levels, in one of the most impaired headwater streams in Ohio. More than eighty five percent of the study area is dominated by agriculture. Spatial distribution of slope (S), altitude and wetness index along with other watershed parameters such as flow direction, flow accumulation, stream networks, flow stream orders and erosion index were used within a Geographic Information Systems framework to quantify variation in nitrate and phosphate loads to headwater streams. Stream monitoring data for nutrient loads were used to correlate the observed spatial and temporal patterns with hydrological parameters using multiple linear regressions. Results from the wetness index calculated from a digital elevation model suggested a range of 0.10-16.39, with more than 35% having values less than 4.0. A Revised Universal Soil Loss Equation (RUSLE) predicted soil loss in the range of 0.01-4.0 t/ha/yr. Nitrate nitrogen levels in the study area paralleled precipitation patterns over time, with higher nitrate levels corresponding to high precipitation. Atmospheric deposition through precipitation could explain approximately 35% of total nitrate levels observed in streams. Among the different topographic variables and hydrological indices, results from the step-wise multiple regression suggested the following best predictors, (1) elevation range and upstream flow length for nitrate, (2) flow direction and upstream flow length for ammonia-nitrogen and slope, and (3) elevation range for phosphate levels. Differences in the landscape models observed for nitrate, phosphate and ammonia-nitrogen in the surface waters were attributed partly to differences in the

614: V. Prasuhn and U. Sieber,. 2005. Changes in diffuse phosphorus and nitrogen inputs into surface waters in the Rhine watershed in Switzerland. *Aquatic Sciences* 3(67): 363-371.

Abstract: Using the regional scale, nutrient-flow simulation model MODIFFUS, an estimate of phosphorus (P) and nitrogen (N) inputs from diffuse sources into surface waters over the Swiss part of the Rhine watershed downstream of large lakes was performed for the years 1985, 1996 and 2001. The data are required for purposes of national monitoring and for reporting to international panels such as the International Commission for the Protection of the Rhine (ICPR) and the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR). Total diffuse P and N losses, including natural background losses, decreased from 547 tons (t) P and 19 219 t N in 1985, to 423 t P and 17 902 t N in 1996, and 393 t P and 16 610 t N in 2001. Total reductions between 1985 and 2001 of 154 t P and 2 609 t N corresponded to 28% and 14% of the total diffuse, and 38% and 18% of the anthropogenic diffuse losses, respectively. These reductions are mainly attributable due to a decrease in agricultural land and partly to measures in agricultural practice. However, discharges from point sources (wastewater treatment plants and stormwater overflows) also have fallen substantially over the period. Over the Swiss part of the Rhine watershed, the international target of 50% reduction in the total inputs into surface waters of P and N was achieved for P (reduction of 51%), but not for N (reduction of 23%). Comparison of the calculated losses of P and N from all sources with the loads measured in the Rhine near Basel shows the calculations to be realistic.

615: A. L. Pribyl, J. H. McCutchan, W. M. Lewis and J. F. Saunders,. 2005. Whole-system estimation of denitrification in a plains river: a comparison of two methods. Biogeochemistry 3(73): 439-455.

Abstract: Whole-system denitrification in the South Platte River was measured over a 13-month period using an open-channel N₂ method and mass-balance measurements. Concentrations of dissolved N₂ were measured with high precision by membrane-inlet mass spectrometry and estimates of denitrification were based on the mass flux of N₂, after correction for reaeration and groundwater flux. Open-channel estimates of denitrification ranged from 0 to 3.08 g N m⁻² d⁻¹ and the mean annual rate was 1.62 g N m⁻² d⁻¹, which corresponds to removal of approximately 34% of the nitrate transported by the river over a distance of 18.5 km. Over the same period of time, estimates of denitrification based on mass-balance measurements ranged from 0.29 to 5.25 g N m⁻² d⁻¹ and the mean annual rate was 2.11 g N m⁻² d⁻¹. The two methods revealed similar seasonal patterns of denitrification the highest rates were measured from late April to August and the lowest rates were in winter. Both methods provide whole-system estimates of denitrification in running waters; where reaeration rate coefficients are low and flux of groundwater is well quantified, the open-channel method has fewer sources of uncertainty and is easier to implement.

616: C. Prieto and G. Destouni,. 2005. Quantifying hydrological and tidal influences on groundwater discharges into coastal waters. Water Resources Research 12(41): .

Abstract: [1] In coastal aquifers the dynamic mixing zone between intruding seawater and fresh groundwater constitutes a zone of salinity transition that may supply brackish groundwater along with chemical tracers and nutrients to coastal waters. Tidal influence has been proposed as a possible mechanism for enhancement of recirculated seawater, total submarine groundwater discharge (SGD), and associated tracer loading through salinity transition zones into coastal waters. We show that tidal oscillation may, for relatively low SGD cases, considerably increase the average recirculated seawater component of total SGD relative to nontidal conditions. High SGD cases, however, are dominated by and require large fresh groundwater flow components also under tidal conditions; this result is obtained from a wide range of different groundwater simulation scenarios and is supported by direct comparison with field data from different reported high-SGD sites in the world. For cases with hydrologically limited fresh groundwater flow directly into the sea we propose that observed excessive coastal loading of groundwater-derived tracers may be the result of large groundwater flow and transport into unmonitored coastal stream reaches, in addition to SGD.

617: L. J. Puckett and W. B. Hughes,. 2005. Transport and fate of nitrate and pesticides: Hydrogeology and riparian zone processes. Journal of Environmental Quality 6(34): 2278-2292.

Abstract: There is continuing concern over potential impacts of widespread application of nutrients and pesticides on ground- and surface-water quality. Transport and fate of nitrate and pesticides were investigated in a shallow aquifer and adjacent stream, Cow Castle Creek, in Orangeburg County, South Carolina. Pesticide and pesticide degradate concentrations were detected in ground water with greatest frequency and largest concentrations directly beneath and downgradient from the corn (*Zea mays* L.) field where they were applied. In almost all samples in which they were detected, concentrations of pesticide degradates greatly exceeded those of parent compounds, and were still present in ground waters that were recharged during the previous 18 yr. The absence of both parent and degradate compounds in samples collected from deeper in the aquifer suggests that this persistence is limited or that the ground water had recharged before use of the pesticide. Concentrations of NO_3^- in ground water decreased with increasing depth and age, but denitrification was not a dominant controlling factor. Hydrologic and chemical data indicated that ground water discharges to the creek and chemical exchange takes place within the upper 0.7 m of the streambed. Ground water had its greatest influence on surface-water chemistry during low-flow periods, causing a decrease in concentrations of Cl^- , NO_3^- , pesticides, and pesticide degradates. Conversely, shallow subsurface drainage dominates stream chemistry during high-flow periods, increasing stream concentrations of Cl^- , NO_3^- , pesticides, and pesticide degradates. These results point out the importance of understanding the hydrogeologic setting when investigating transport and fate of contaminants in ground water and surface water.

618: S. S. Qian, K. H. Reckhow, J. Zhai and G. McMahon,. 2005. Nonlinear regression modeling of nutrient loads in streams: A Bayesian approach. Water Resources Research 7(41): .

Abstract: [1] A Bayesian nonlinear regression modeling method is introduced and compared with the least squares method for modeling nutrient loads in stream networks. The objective of the study is to better model spatial correlation in river basin hydrology and land use for improving the model as a forecasting tool. The Bayesian modeling approach is introduced in three steps, each with a more complicated model and data error structure. The approach is illustrated using a data set from three large river basins in eastern North Carolina. Results indicate that the Bayesian model better accounts for model and data uncertainties than does the conventional least squares approach. Applications of the Bayesian models for ambient water quality standards compliance and TMDL assessment are discussed.

619: S. Qiu, A. McComb, R. Bell and J. Davis,. 2005. Leaf-litter application to a sandy soil modifies phosphorus leaching over the wet season of southwestern Australia. *Hydrobiologia* (545): 33-43.

Abstract: Nutrient leaching is a critical step in terrestrial litter turnover, and is potentially linked to nutrient cycling in downstream wetlands. Little is known about the leaching behaviour and P loading from terrestrial litter under conditions of winter rainfall in southwestern Australia. In this study, leaf litter of flooded gum (*Eucalyptus rudis* Endl.), a species common in southwestern Australia, was exposed for leaching under winter rainfall. Litter P was leached primarily during the first few weeks of the wet season, and the 'first flush' generating a mean P load of 114.7 mg m⁻² from the litter. Thereafter the P leached decreased progressively with the progress of the wet season. Overall, P leaching was correlated with rain intensity, with 84.1% of litter P leached over the wet season May to November. When litter was applied to a bare, sandy soil and then subjected to rain leaching, more P was leached during the 'first flush' compared with the data from 'litter only' leaching, but a portion of P released from litter and soil appeared to be retained through litter-soil interactions. Litter application to soil surface and via surficial burial reduced leachate P by 25.2-29.5% and 28.6-38.6%, equivalent to a P retention of 75 and 81 mg p m⁻², for surface application (10 cm soil) and surficial burial (5 cm soil), respectively. The P retention was attributed to increased microbial immobilisation, supported by increased nutrient flux from litter.

620: S. Qiu, A. J. McComb, R. W. Bell and J. A. Davis,. 2005. Estimating production of gilvin from catchment leaf litter during seasonal rains. Marine and Freshwater Research 6(56): 843-849.

Abstract: The yellow substance, gilvin, is an important component of water quality in natural waters. Quantitative study of gilvin production is difficult since gilvin is not a well defined substance. In the present study, leaf litter from four common tree species of south- western Australia were exposed to rainy weather for 183 days and leachate properties were monitored. The gilvin leaching from litter was estimated using a ' humic acid (HA) equivalent ' concept, derived by drawing an analogy between the spectrophotometric properties of gilvin and that of humic acid. Gilvin ($g(440), m(-1)$) was leached from litter primarily during the first few weeks after the commencement of the wet season. On average, 13% less gilvin was leached under ' flooded ' conditions compared with ' non- flooded ' conditions. Litter leaching in the presence of soil caused a significant time lag (about a month) for the peak load to occur, and reduced the total gilvin in the leachate through soil-litter interactions. *Banksia menziesii* leaves produced little gilvin, equivalent to 6.6% of that leached from the flooded gum. The *Eucalyptus* species, such as flooded gum and jarrah, common in wooded catchments in the region, appeared to be a major player producing yellow-coloured substances under annual rainfall conditions in south- western Australia.

621: W. C. Qu, R. J. Morrison, R. J. West and C. W. Su,. 2005. Diagenetic stoichiometry and benthic nutrient fluxes at the sediment-water interface of Lake Illawarra, Australia. *Hydrobiologia* (537): 249-264.

Abstract: Benthic flux measurements of O₂, TCO₂ and inorganic nutrients were made at three stations (seagrass beds, shallow bare sand and deep mud) in Lake Illawarra (Australia) to compare the characteristics of diagenesis and benthic biogeochemical processes for different primary producers (seagrass or microphytobenthos, (MPB)) and/or sediment types (sand or mud). Seagrass beds exhibited the highest gross primary productivity while the lowest rates occurred at the deep mud station. At the shallow bare sand station only, the gross primary production (GPP) and respiration (R) were balanced, while at the other two stations, R exceeded GPP by as much as 2 fold, indicating more organic carbon was decomposed than produced at the time of sampling. In general, nutrient fluxes displayed typical diurnal variation. Organic carbon oxidation scenarios, evaluated by either calcium carbonate dissolution or sulfate reduction models, indicated that both models can represent organic matter mineralization. The difference of estimated total carbon oxidized in this lake using the two models was small, ranging from 0.2% at deep mud station to maximum of 21% at seagrass station. In addition, N₂ flux rates (net denitrification), estimated using carbon and nitrogen stoichiometry, were of similar magnitude as the rates estimated using LOICZ budget modeling or measured using the N₂/Ar technique. Finally, a comparison of calculated diffusive fluxes and measured fluxes using incubation cores indicated that the results were of similar magnitude at the deep mud station, but the incubation cores fluxes were much higher than the calculated diffusive fluxes at the other two stations. This may have been caused by bioturbation or bioirrigation.

622: S. Rabouille and M. J. Salençon, 2005. Functional analysis of *Microcystis* vertical migration: a dynamic model as a prospecting tool. II. Influence of mixing, thermal stratification and colony diameter on biomass production. *Aquatic Microbial Ecology* 3(39): 281-292.

Abstract: Yoyo is a deterministic model developed to represent the growth and vertical movement of *Microcystis* sp. colonies in the water column. Migration of colonies is represented in the model through the dynamics of carbon-reserve metabolism during photosynthesis and biosynthesis. It was used to quantify combined impacts of light, temperature and mixing on the growth and migration of colonies with different diameters. These 3 factors characterise a vertically non-homogeneous water column. Although conditions of simulation are schematic, they allow identification of situations in which the ability to regulate buoyancy gives *Microcystis* an advantage over non-mobile phytoplankton. Even if some vertical structures appear unfavourable for the exploitation of light energy, they nevertheless offer some advantages for the access to nutrients. Each diameter has particular benefits, and the increase in diameter observed throughout the year is probably an ecological adaptation to fluctuations in the environment at a seasonal scale.

623: V. C. Radeloff, R. B. Hammer, S. I. Stewart, J. S. Fried, S. S. Holcomb, and J. F. McKeefry,. 2005. THE WILDLAND&URBAN INTERFACE IN THE UNITED STATES. Ecological Applications 3(15): 799&805.

Abstract: The wildland&urban interface (WUI) is the area where houses meet or intermingle with undeveloped wildland vegetation. The WUI is thus a focal area for human& environment conflicts, such as the destruction of homes by wildfires, habitat fragmentation, introduction of exotic species, and biodiversity decline. Our goal was to conduct a spatially detailed assessment of the WUI across the United States to provide a framework for scientific inquiries into housing growth effects on the environment and to inform both national policymakers and local land managers about the WUI and associated issues. The WUI in the conterminous United States covers 719156 km² (9% of land area) and contains 44.8 million housing units (39% of all houses). WUI areas are particularly widespread in the eastern United States, reaching a maximum of 72% of land area in Connecticut. California has the highest number of WUI housing units (5.1 million). The extent of the WUI highlights the need for ecological principles in land-use planning as well as sprawl-limiting policies to adequately address both wildfire threats and conservation problems.

624: J. Rakocevic-Nedovic and H. Hollert,. 2005. Phytoplankton community and chlorophyll a as trophic state indices of Lake Skadar (Montenegro, Balkan). Environmental Science and Pollution Research 3(12): 146-152.

Abstract: Background, Aims and Scope. Phytoplankton, as a first step in trophic cascades of lakes, can be a good indicator of trophic states, considering that every environmental change affects this community and many species of this community are sensitive to changes, and that they response very quickly. In this study, we tried to assess and predict the trophic state of Lake Skadar according to phytoplankton data. Methods. Water samples were collected using Ruttner sampling bottle. Temperature, dissolved oxygen, ph, conductivity and transparency were measured in situ using portable equipment. Nutrients and chlorophyll a were measured using standard spectrophotometric methods. A determination of phytoplankton species was performed using relevant keys and the counting of cells was performed using sedimentation methods. Results and Discussion. The species composition of Lake Skadar revealed 95 taxa, with Chlorophyceae and Bacillariophyceae being represented best. According to an average chlorophyll a concentration of 5.9 $\mu\text{g/l}$, Lake Skadar belongs to the mesotrophic level of the trophic scale. Developed prediction equation for chlorophyll a revealed a good prediction ($R^2=0.71$) and the parameter Secchi depth was primarily correlated with chlorophyll a concentration. Trophic state indices derived from chlorophyll a and transparency, were close together, but both were below the phosphorous index. Values of trophic state indices rank the Lake Skadar as being mesotrophic. This study also showed that indices of diversity based on phytoplankton are weak indicators of trophic status and that they can well characterize only differences between assemblages and associations. According to calculated saprobic indices (ranging from 1.5 to 2.15), Lake Skadar is on betamesosaprobic level of saprobity, which means that it is moderately polluted with organic compounds. Conclusions. Total phosphorus is not the main limiting factor for the phytoplankton community in Lake Skadar. Disagreements be

625: V. S. H. Rao and P. R. S. Rao,. 2005. Mathematical models of the microbial populations and issues concerning stability. Chaos Solitons & Fractals 2(23): 657-670.

Abstract: In this paper we present the latest developments in the chemostat models involving time delays. The article envisages the development of a basic chemostat model into a model that explains the growth in a lake as well. (C) 2004 Elsevier Ltd. All rights reserved.

626: P. Rasmussen and N. J. Anderson,. 2005. Natural and anthropogenic forcing of aquatic macrophyte development in a shallow Danish lake during the last 7000 years. *Journal of Biogeography* 11(32): 1993-2005.

Abstract: Aim To investigate the long-term changes in aquatic vegetation in a lowland, shallow lake, and to assess the relationship between aquatic vegetation and natural and anthropogenic catchment changes. Location Gundsomagle So, Zealand, Denmark: a shallow (mean depth 1.2 m), hypereutrophic lake (mean annual total phosphorus (TP) c. 700 $\mu\text{g TP L}^{-1}$) located in a predominantly agricultural catchment (88% cultivated land). The lake is presently devoid of macrophytes. Methods One hundred and forty-seven contiguous samples from a sediment core (taken in 2000) were analysed for macrofossil remains together with loss-on-ignition and dry weight. From an earlier sediment core (taken in 1992), 67 samples were analysed for pollen and the two cores were correlated using the ignition residue profiles. Core chronology was determined by Pb-210 and Cs-137 dating of the recent lake sediments, while older sediments were dated by pollen-stratigraphical correlation, as C-14 dating proved problematical. Aquatic macrofossil abundance was used to reconstruct past changes in the lake's plant community and water-level. The contemporary catchment land-use change was inferred from sedimentary pollen data, and soil erosion to the lake was deduced from the minerogenic content of the lake sediments. Results The macrofossil record covers the last 7000 years, but aquatic plant remains were scarce prior to c. 1300 bc. After this date the abundance of submerged and emergent macrophyte remains increased dramatically, paralleled by an increase in sediment minerogenic matter and non-arboreal pollen (NAP). Aquatic plant remains were abundant for more than 3000 years until the mid 1900s. Macrofossils of *Linum usitatissimum* (L.) (flax) and high pollen percentages of 'Cannabis type' (hemp) were recorded in periods between c. 1150 bc and 1800 ad. Main conclusions Our study suggests that, between c. 5000 bc and 1300 bc, the submerged plant community was confined to the littoral zone. From 1300 bc onwards, the sub

627: A. Rauter, G. Weigelhofer, J. Waringer and T. J. Battin,. 2005. Transport and metabolic fate of sewage particles in a recipient stream. *Journal of Environmental Quality* 5(34): 1591-1599.

Abstract: Although the implementation of wastewater treatment plants (WWTP) has dramatically increased the quality of surface waters in urbanized areas, WWTPs can still discharge noticeable amounts of solutes and particles to recipient streams. Although the fate of WWTP nutrients has received considerable attention, transport and in-stream transformation of sewage-derived particulate organic matter (SDPOM) have not. To investigate the transport and transformation of SDPOM in recipient streams, we experimentally injected fluorescently labeled SDPOM into a headwater stream and tracked its downstream fate at baselow. Most SDPOM disappeared from the streamwater within a 160-m long reach with an average deposition velocity of 0.14 turn s^{-1} . We further coupled hydrometric measurements of specific water fluxes through the streambed interface with a mixing model to estimate streambed oxygen removal, and found significantly higher oxygen removal in the deposition ($0.75 \pm 0.02 \text{ m}^{-2} \text{ d}^{-1}$) than in the downstream post-deposition ($0.36 \pm 0.02 \text{ m}^{-2} \text{ d}^{-1}$) subreach. Contrary to our expectations, we did not detect any apparent effect of SDPOM deposition on streambed clogging. Our results show the capacity of a recipient stream to retain SDPOM and to reduce its downstream export, and thus contribute to a better understanding of ecosystem services of human-altered streams.

628: K. H. Reckhow, G. B. Arhonditsis, M. A. Kenney, L. Hauser, J. Tribo, C. Wu, K. J. Elcock, L. J. Steinberg, C. A. Stow and S. J. McBride,. 2005. A predictive approach to nutrient criteria. Environmental Science & Technology 9(39): 2913-2919.

Abstract: Violation of a water quality standard triggers the need for a total maximum daily load (TMDL); this should result in actions that improve water quality, but sometimes at significant cost. If the standard is well-conceived, a designated-use statement characterizes societal values, and a criterion provides a measurable surrogate for designated use. This latter provision means that scientists measure the criterion and view violations of the criterion as equivalent to noncompliance with the designated use. However, if a criterion is not a good indicator of designated use, it is apt to result in misallocation of the limited resources for water quality improvement through the TMDL process. This concern provides the basis for our assessment of the national nutrient criteria strategy recently proposed by the U.S. EPA. We acquired data sets for four case studies (Lake Washington, Neuse River Estuary, San Francisco Bay, and Lake Mendota) and then used expert elicitation to quantify designated-use attainment for each case. Applying structural equation modeling, we identified good water quality criteria as the best predictors of the designated use elicited response variable. Further, we used the model to relate the level (concentration) of each criterion to the probability of compliance with the designated use; this provides decision-makers with an estimate of risk associated with the criterion level, facilitating the selection of appropriate water quality criteria.

629: G. N. Rees, P. M. Bowen and G. O. Watson,. 2005. Variability in benthic respiration in three southeastern Australian lowland rivers. *River Research and Applications* 10(21): 1147-1156.

Abstract: Benthic respiration is an important measure of decomposition processes occurring in streams, but our understanding of benthic respiration in lowland rivers is not well developed, particularly the factors that affect benthic respiration. In our study we measured benthic respiration at three sites in three contrasting lowland rivers in southeastern Australia. On most sampling occasions, rates of oxygen consumption in benthic chambers were linear. However, oxygen consumption rates fitted exponential decay curves during periods of highest microbial activity. Benthic community respiration ranged from 289 to 619 mg O₂ m²d⁻¹ in the Broken River, from 178 to 1438 mg O₂m²d⁻¹ in the River Murray and from 127 to 2178 mg O₂ m² d⁻¹ in the Ovens River. Benthic respiration was closely correlated with water temperature, but not with sediment carbon content, sediment particle size, water column nutrients or water column dissolved organic carbon concentrations. Average carbon turnover periods were between 1.7 and 6 years for the three rivers, but were as low as 0.1 year immediately following an event that gave rise to mobilization of in-stream dissolved organic carbon, sufficient to produce coloured water. The latter occurred in the Ovens River as a consequence of a rain event during a period of base-flow. Flow regime as such did not have a major impact on benthic community respiration. Induced changes in respiration, by altering flows, would only occur by altering the quality and timing of carbon inputs, since temperature and carbon quality, rather than quantity, appear more important in determining lowland river benthic respiration. Copyright (c) 2005 John Wiley & Sons, Ltd.

630: M. Reid,. 2005. Diatom-based models for reconstructing past water quality and productivity in New Zealand lakes. *Journal of Paleolimnology* 1(33): 13-38.

Abstract: The trophic status of lakes in New Zealand is, on average, low compared to more densely populated areas of the globe. Despite this, trends of eutrophication are currently widespread due to recent intensification in agriculture. In order to better identify baseline productivity and establish long-term trends in lake trophic status, diatom-based transfer functions for productivity-related parameters were developed. Water quality data and surface sediment diatom assemblages from 53 lakes across the North and South Islands of New Zealand were analysed to determine species responses to the principal environmental gradients in the data set. Repeat sampling of water chemistry over a 12-month period enabled examination of species responses to annual means as well as means calculated for stratified and mixed periods. Variables found to be most strongly correlated with diatom species distributions were chlorophyll a (Chl a), total phosphorus (TP), dissolved reactive phosphorus (DRP), ionic concentration (measured as electrical conductivity (EC)) and pH. These variables were used to develop diatom-based transfer functions using weighted averaging regression and calibration (simple, tolerance down-weighted and with partial least squares algorithm applied). Overall, models derived for stratified means were weaker than those using annual or isothermal means. For specific variables, the models derived for the isothermal mean of EC (WA-tol $r(\text{jack})(2) = 0.79$; RMSEP = 0.15 log(10) $\mu\text{S cm}(-1)$), the annual mean of pH (WA $r(\text{jack})(2) = 0.72$; RMSEP = 0.25 pH units) and the isothermal mean of Chl a (WA $r(\text{jack})(2) = 0.71$; RMSEP = 0.18 log(10) $\text{mg m}(-3)$ Chl a) performed best. The models derived for TP were weak in comparison (for the annual mean of TP: WA $r(\text{jack})(2) = 0.50$; RMSEP = 0.24 log(10) $\text{mg m}(-3)$ TP) and residuals on estimates for this model were correlated with several other water quality variables, suggesting confounding of species responses to TP concentrations. The model derived for

631: N. B. Reid and M. A. Naeth,. 2005. Establishment of a vegetation cover on tundra kimberlite mine tailings: 1. A greenhouse study. *Restoration Ecology* 4(13): 594-601.

Abstract: High erosion potential of dewatered kimberlite mine tailings after diamond extraction has prompted research at the Ekati Diamond Mine in the Canadian subarctic heath tundra ecosystem. Coarse texture, no organic component, lack of available macronutrients, and a serpentine chemistry are the principal limitations of these kimberlite tailings to plant colonization. Structure-improving (peat moss, lake sediment, sewage sludge, Agri-Boost, and composted papermill sludge) and nutrient-providing (fertilizer, calcium carbonate, gypsum, and rock phosphate) amendments were tested in the greenhouse to ameliorate these limitations, thereby facilitating the field establishment of a permanent vegetation cover, which would stabilize the surface materials and promote natural colonization by the surrounding tundra vegetation. Seven native grass species (*Arctagrostis latifolia*, *Calamagrostis canadensis*, *Poa glauca*, *Poa alpina*, *Deschampsia beringensis*, *Deschampsia caespitosa*, and *Festuca rubra*) were used to measure amendment success. With the addition of structure-improving and nutrient-providing amendments, plant growth on kimberlite tailings was significantly enhanced. Tailings properties, including cation exchange capacity, percentage of organic carbon, and macronutrient availability, were also improved by amendment addition.

632: N. B. Reid and M. A. Naeth,. 2005. Establishment of a vegetation cover on tundra kimberlite mine tailings: 2. A field study. Restoration Ecology 4(13): 602-608.

Abstract: High erosion potential of dewatered kimberlite mine tailings after diamond extraction has prompted research at the Ekati Diamond Mine in the Canadian subarctic heath tundra ecosystem. Greenhouse and field studies aimed at establishing a permanent vegetation cover on these dewatered tailings began in spring 2000. Coarse texture, no organic component, lack of available macronutrients, and a serpentine chemistry are the principal limitations of kimberlite tailings to plant colonization. Structure-improving (peat moss, lake sediment, and sewage sludge) and nutrient-providing (fertilizer, rock phosphate, calcium carbonate, and gypsum) amendments were tested to ameliorate these conditions, facilitating the establishment of a permanent vegetation cover, which stabilizes surface materials and promotes natural colonization by the surrounding tundra vegetation. Seven native grass species (*Arctagrostis latifolia*, *Calamagrostis canadensis*, *Poa glauca*, *Poa alpina*, *Deschampsia beringensis*, *Deschampsia caespitosa*, and *Festuca rubra*) were used to measure amendment success. With the addition of structure-improving and nutrient-providing amendments, plant growth on these kimberlite tailings under field conditions was significantly improved over unamended tailings material. Tailings properties, including cation exchange capacity, organic carbon, and macronutrient availability, were also improved with amendment addition.

633: E. G. Reinhardt, M. Little, S. Donato, D. Findlay, A. Krueger, C. Clark and J. Boyce,. 2005. Arcellacean (thecamoebian) evidence of land-use change and eutrophication in Frenchman's Bay, Pickering, Ontario. Environmental Geology 5(47): 729-739.

Abstract: Frenchman's Bay, on the northern shore of Lake Ontario, has been negatively impacted by eutrophication in the last 50 years through urbanization and the use of chemical fertilizers. Eutrophication began with wholesale land clearance and agricultural practises beginning in the mid-nineteenth century and reached a peak with urbanization after World War II. Eutrophication and the effects of land-use changes on the watershed were investigated by a combined analysis of the sediment magnetic properties and arcellacean (thecamoebian) microfauna. Micropaleontological analyses were conducted on two 2-m-long cores (FMB1 and FMB2) every 10 cm (42 samples) and magnetic susceptibility was measured at 2-cm intervals. Both cores showed a distinct correlative transition at 60 cm and 110 cm that was marked by a rapid increase in thecamoebian concentrations (from approx. 10×10^3 to 30×10^3 specimens per cc) and a large increase in *Cucurbitella tricuspidis* (from approx. 10-20% to 40-70%). This transition correlated with a marked increase in magnetic susceptibility ($150-200 \times 10^{-8}$ m³ Kg⁻¹) at the same depth, which was attributed to elevated levels of detrital magnetic minerals derived from land clearance and soil erosion in the watershed. It was indicated by (210) Pb dates indicate that there was a gradual onset of eutrophication in the mid-nineteenth century (AD 1850 +/- 56) and a more rapid rise in the mid-1940s to late 1950s. The initial increase in eutrophication was due to land clearing, agricultural development and increased nutrient loadings. The major eutrophication increase in the 1950s was from urbanization and storm sewer discharge loaded with high yield chemical fertilizers from lawns and gardens. This high concentration of nutrients has led to an unprecedented level of eutrophication within the wetland.

634: M. Reinhardt, R. Gachter, B. Wehrli and B. Muller,. 2005. Phosphorus retention in small constructed wetlands treating agricultural drainage water. Journal of Environmental Quality 4(34): 1251-1259.

Abstract: The construction of artificial wetlands has become a measure increasingly applied to reduce nonpoint-source (NPS) pollution and to contribute to the restoration of eutrophic lakes and coastal waters. In a 2-yr study monitoring fluxes of particulate and dissolved phosphorus (P) in a small artificial wetland for the treatment of agricultural drainage water in Central Switzerland, water residence time was identified as the main factor controlling P retention in the system. Since most of the annual P load (62% as dissolved reactive phosphorus, DRP) was related to high discharge events, it was not average but minimum water residence time during flood events that determined the wetland's P retention. In agreement with a continuous stirred tank reactor (CSTR) model, our investigations suggest a minimum water residence time of 7 d to retain at least 50% of the bioavailable P. The investigated wetland retained only 2% of the bioavailable P, since the water residence time was shorter than 7 d during 61% of time in both years. Settling of phytoplankton rather than DRP uptake into phytoplankton limited the retention of bioavailable P. The overall retention efficiency of 23% total phosphorus (TP), corresponding to a surface related retention of $1.1 \text{ g P m}^{-2} \text{ yr}^{-1}$, was due to the efficient trapping of pedogenic particles.

635: D. Rejas, S. Declerck, J. Auwerkerken, P. Tak and L. De Meester,. 2005. Plankton dynamics in a tropical floodplain lake: fish, nutrients, and the relative importance of bottom-up and top-down control. *Freshwater Biology* 1(50): 52-69.

Abstract: 1. Two enclosure experiments were carried out in Laguna Bufeos, a neotropical varzea lake located in the floodplain of River Ichilo (Bolivia). The experiments aimed (i) to assess the relative importance of bottom-up and top-down control on the plankton community, (ii) to assess the relative impact of direct and indirect effects of planktivorous fish on the zooplankton, and (iii) to attempt to identify the mechanisms responsible for these effects. 2. During the first experiment, bottom-up control seemed to dominate the planktonic food web. Compared with fishless enclosures, oxygen concentrations, chlorophyll a levels and the population densities of all cladoceran zooplankton taxa increased in enclosures with fish. Birth rates of *Moina minuta*, the dominant taxon, were substantially higher in the presence than in the absence of fish, whereas death rates did not differ between treatments. These results are the first to suggest that the positive effects of fish on crustacean zooplankton via effects on nutrient cycling and the enhancement of primary production can compensate for losses because of fish-related mortality. 3. During the second experiment, the direction of control appeared to vary between trophic levels: the phytoplankton appeared to be bottom-up controlled whereas the zooplankton was mainly top-down controlled. Chlorophyll a concentrations were enhanced by both fish and nutrient additions. The majority of the zooplankton taxa were reduced by the presence of fish. Birth rates of most cladoceran taxa did not differ between treatments, whereas death rates were higher in the enclosures with fish than in the fishless enclosures. *Bosminopsis deitersi* reached higher densities in the presence of fish, probably because of a release from predation by *Chaoborus*. 4. We convincingly showed strong deviations from trophic cascade-based expectations, supporting the idea that trophic cascades may be weak in tropical lakes.

636: D. Rejas, K. Muylaert and L. De Meester,. 2005. Nutrient limitation of bacteria and sources of nutrients supporting nutrient-limited bacterial growth in an Amazonian floodplain lake. *Aquatic Microbial Ecology* 1(39): 57-67.

Abstract: Laguna Bufeos is a white-water floodplain lake located in the upper Amazon basin (Ichilo River, Bolivia). To study nutrient limitation of bacteria and to determine the sources supporting nutrient-limited bacterial growth, 5 nutrient deletion/dilution experiments were carried out in Laguna Bufeos. We carried out 3 experiments during 3 consecutive low-water seasons and 2 experiments during 1 high-water season. No evidence of N or P limitation was observed during the 2 experiments in the high-water season. Conversely, bacteria were limited by P in the 3 experiments in the low-water season. Limitation by N occurred only in one of the low-water experiments. Nutrient-limited bacterial growth rates equaled 37 to 86% of nutrient-saturated growth rates. Nutrients recycled by microzooplankton, mainly heterotrophic nanoflagellates and oligotrich ciliates, were the major nutrient source supporting P- or N-limited growth. Our results suggest a strong control of bacterial growth rates by P in Amazonian white-water lakes during the low-water season, while this limitation is alleviated during the high-water season, probably through supply of new nutrients from the river. The strong nutrient limitation of bacteria and the dependence of bacteria on nutrients supplied by their predators can be expected to slow down the decomposition of organic matter in Amazonian floodplain lakes. This may partly explain why these ecosystems are often rich in organic matter.

637: D. Rejas, K. Muylaert and L. De Meester,. 2005. Phytoplankton-bacterioplankton interactions in a neotropical floodplain lake (Laguna Bufeos, Bolivia). *Hydrobiologia* (543): 91-99.

Abstract: Laguna Bufeos is a floodplain lake of the river Ichilo, a tributary of the Amazon basin situated in Bolivia. Nutrient addition assays involving whole water ($< 200 \mu\text{m}$) as well as fractionated water ($< 0.8 \mu\text{m}$) treatments were carried out in incubation tubes to test whether bacterial growth is limited by the availability of inorganic nutrients and to test whether bacteria are able to utilize inorganic nutrients directly or are stimulated by inorganic nutrients through increased production of phytoplankton. The assays were carried out during two extreme hydrological conditions, the high-water and the low-water period. During the high-water period experiment, neither N or P limited bacterial growth rates. During the low-water period, bacterial growth was P limited. Bacterial growth was stimulated in the fractionated as well as in the whole water treatments, indicating that bacterial growth was directly stimulated by P. Bacterial growth corrected for grazing losses (determined by means of dilution experiments) was significantly higher in the fractionated water containing only bacteria when compared to the whole water containing also grazers and phytoplankton. This suggests that bacterial growth was suppressed by competition with phytoplankton rather than stimulated through the production of dissolved organic matter by phytoplankton.

638: D. Rejas, K. Muylaert and L. De Meester,. 2005. Trophic interactions within the microbial food web in a tropical floodplain lake (Laguna Bufeos, Bolivia). *Revista De Biologia Tropical* 1-2(53): 85-96.

Abstract: Whether the primary role of bacterioplankton is to act as "remineralizers" of nutrients or as direct nutritional source for higher trophic levels will depend on factors controlling their production and abundance. In tropical lakes, low nutrient concentration is probably the main factor limiting bacterial growth, while grazing by microzooplankton is generally assumed to be the main loss factor for bacteria. Bottom-up and top-down regulation of microbial abundance was studied in six nutrient limitation and dilution gradient-size fractionation in situ experiments. Bacteria, heterotrophic nanoflagellates (HNF), ciliates and rotifers showed relatively low densities. Predation losses of HNF and ciliates accounted for a major part of their daily production, suggesting a top-down regulation of protistan populations by rotifers. Phosphorus was found to be strongly limiting for bacterial growth, whereas no response to enrichment with Nitrogen or DOC was detected. HNF were the major grazers on bacteria ($g=0.43\text{ d}(-1)$), the grazing coefficient increased when ciliates were added ($g=0.80\text{ d}(-1)$) but decreased when rotifers were added ($g=0.23\text{ d}(-1)$) probably due to nutrient recycling or top-down control of HNF and ciliates by rotifers.

639: E. Rejmankova,. 2005. Nutrient resorption in wetland macrophytes: comparison across several regions of different nutrient status. New Phytologist 2(167): 471-482.

Abstract: (.)This study explored patterns of nutrient resorption in wetland macrophytes to test the prediction that plants from regions with a strong nutrient limitation will show higher resorption of the limiting nutrient. (.)Nitrogen and phosphorus resorption was assessed in macrophytes from marshes of different nutrient status in tropical and temperate regions, and expressed as resorption efficiency (NRE, PRE) and proficiency (NRP, PRP). Macrophytes were grouped into three categories: Typha, graminoids and broadleaved plants. (.)Nitrogen was less limiting than P, consequently N availability varied less than P availability, NRP and NRE were lower, and N resorption was mostly incomplete. NRP was determined more by growth form than by local conditions. The large range of soil P concentrations allowed an exploration of relationships between P availability and resorption along a wide gradient. P-limited macrophytes ($N : P > 16$) had significantly higher PRP and PRE. Resorption proficiency was found to be a more sensitive indicator of changes in nutrient availability than resorption efficiency. (.)The results confirmed that resorption in wetland macrophytes depends on nutrient availability, and is higher at nutrient-limited sites. A particularly strong relationship was found between resorption indicators and P limitation expressed either as live tissue $N : P$ or soil P. (c) New Phytologist (2005).

640: E. Rejmankova and J. Komarkova,. 2005. Response of cyanobacterial mats to nutrient and salinity changes. *Aquatic Botany* 2(83): 87-107.

Abstract: Cyanobacterial mats (CBM), complex assemblages of cyanobacteria, bacteria and algae, are important ecosystem components of oligotrophic marshes in limestone-based regions of the Caribbean. We conducted a mesocosm experiment and evaluated the response of CBM to factorial combinations of low, medium and high phosphorus, nitrogen and salinity. Changes in composition of the main species groups of cyanobacteria and algae, primary production, cellular nutrients and enzymatic activities were recorded as response variables. The redundancy analysis with concentrations of P, N and salinity as explanatory variables showed that the primary production of CBM and the amount of phytoplankton expressed as Chl a were best explained by concentration of P, with less significant positive effect of N and a negative effect of salinity. Abundance of green algae and Chroococcales was positively correlated with increasing concentrations of P and N and reached 27.6% and 21.9%, respectively, in high P and high N treatment at the end of experiment. N-2-fixation averaged 75 and 175 nmol C₂H₄ cm⁽⁻²⁾ min⁽⁻¹⁾, at low nitrogen and medium or high P, respectively, and it was negatively correlated with nitrogen concentration and positively correlated with abundance of a group of heterocytous cyanobacteria from genus Nostoc. At low N concentrations, increasing P concentrations supported higher N-2-fixation. Activity of the alkaline phosphatase, APA, was negatively correlated with P and salinity and positively with N. We also found a significant negative correlation between the APA activity and the P content of the mat. At high P and N concentrations, the mats were impacted by grazing, had a tendency to disintegrate and become shaded out by a massive growth of phytoplankton. We confirmed an overall negative effect of nutrient increase on CBM. (c) 2005 Elsevier B.V. All rights reserved.

641: P. Resende, U. Azeiteiro and M. J. Pereira,. 2005. Diatom ecological preferences in a shallow temperate estuary (Ria de Aveiro, Western Portugal). *Hydrobiologia* (544): 77-88.

Abstract: The study of the diatom ecological preferences was conducted from January 2002 to June 2003 in Canal de Mira, Ria de Aveiro, Western Portugal. Three sampling stations along a salinity gradient were sampled monthly, in new moon, at high and low tide. Salinity, temperature, pH, dissolved oxygen and nutrient contents were measured for each sampling station; chlorophyll a and diatom diversity and abundance were also evaluated. Canonical correspondence analysis was used to identify the environmental variables governing the composition and structure of diatom assemblage. The variation in the species data among the different reaches was strongly determined by the salinity spatial gradient and by the temperature temporal gradient. The lower reaches were dominated by marine species (e.g. *Auliscus sculptus*, *Chaetoceros densus*, *Fallacia forcipata*, *Licmophora flabellata*, *L. grandis*, *Surirella comis*), while in the most upstream station typical freshwater species dominated (e.g. *Caloneis permagna*, *Cyrnatopleura solea*, *Cyrnbella tumida*, *Gomphonema longiceps*, *Pinnularia stommatophora*, *Stauroneis smithii*). Weighted averaging was used to estimate optima and tolerances of some diatom taxa for the most influential variables. It was possible to establish groups of taxa with defined and distinctive salinity and temperature preferences.

642: T. A. Richards, A. A. Vepritskiy, D. E. Gouliamova and S. A. Nierzwicki-Bauer,. 2005. The molecular diversity of freshwater picoeukaryotes from an oligotrophic lake reveals diverse, distinctive and globally dispersed lineages. *Environmental Microbiology* 9(7): 1413-1425.

Abstract: The recent discovery of a diverse phylogenetic assemblage of picoeukaryotes from environments such as oceans, salt marshes and acidic habitats, has expanded the debates about the extent and origin of microbial eukaryotes. However, the diversity of these eukaryote microorganisms, that overlap bacteria in size, and their environmental and biogeographical ubiquity remains poorly understood. Here we survey picoeukaryotes (microbial eukaryotes of 0.2-5 μm in size) from an oligotrophic (nutrient deficient) freshwater habitat using ribosomal RNA gene sequences. Three taxonomic groups the Heterokonta, Cryptomonads and the Alveolata dominated the detected diversity. Most sequences represented previously unsampled species, with several being unassignable to known taxonomic groups and plausibly represent new or unsampled phyla. Many freshwater phylogenetic groups identified in this study appeared unrelated to picoeukaryotic sequences identified in marine ecosystems, suggesting that aspects of eukaryote microbial diversity are specific to certain aquatic environments. Conversely, at least five phylogenetic clusters comprised sequences from freshwater and globally dispersed and often contrasting environments, supporting the concept that a number of picoeukaryotic lineages are widely distributed.

643: J. S. Richardson, R. E. Bilby and C. A. Bondar,. 2005. Organic matter dynamics in small streams of the Pacific Northwest. Journal of the American Water Resources Association 4(41): 921-934.

Abstract: Small streams in forested landscapes are tightly coupled to the vegetation of the surrounding forest, and one of the key drivers of the stream ecosystem is the nature of organic matter supplied to it. This paper is focussed on three questions related to organic matter dynamics in small, forested streams of the conifer dominated Pacific Northwest: (1) How do small streams differ from large streams? (2) How do small streams of the Pacific Northwest differ from those of other regions? and (3) How do forest practices alter organic matter dynamics of small streams in the Pacific Northwest? The organic matter dynamics of small streams in this region differ from temperate deciduous forests in the nature of the organic matter deposited (protective chemicals, hard epidermis, slower loss rates), the timing of inputs (distributed throughout the year), and the transport rates (smaller, hard needles are more easily transported). The large amount and persistence of wood in these streams provides an additional source of organic matter that can be consumed by particular species and contributes to biofilm and fine particulate organic matter (FPOM) production. Logging is commonly practiced in many forests of the region. This practice has been shown to alter the type, amount, and timing of organic matter delivery to small streams and reduce the amount and size of large wood. Changes in channel complexity and water temperature after logging also can contribute to reduced organic matter storage. Many of the processes controlling organic matter dynamics in small streams are well described in other regions. However, the climate, vegetation, and topography of the Pacific Northwest suggest that the rates and nature of some processes affecting stream organic matter may differ considerably from other regions. Further research on small streams of this area will be required to better understand these differences.

644: K. D. Richkus, F. C. Rohwer and M. J. Chamberlain,. 2005. Survival and cause-specific mortality of female northern pintails in southern Saskatchewan. *Journal of Wildlife Management* 2(69): 574-581.

Abstract: Unlike most prairie-nesting ducks, the North American population of northern pintails (*Anas acuta*) has shown limited response to improved wetland conditions on the U.S. and Canadian prairies during the mid to late 1990s. Because adult female survival is a key parameter affecting waterfowl population dynamics, and a large fraction of annual mortality for some dabbling ducks occurs during the nesting season, we used radiotelemetry to estimate nesting season survival and cause-specific mortality of adult female northern pintails that were monitored during an induced renesting study. We conducted our research in a predominantly agricultural landscape in southern Saskatchewan during 1998-2000, an area that is typical of much of the pintail's prairie breeding range. The survival rate of 140 females for a 75-day interval (30 Apr-14 Jul) during the nesting season was 0.806 ± 0.046 . Survival did not vary among years or between ages (second-year, after second-year), nor was it related to female body condition (body mass adjusted for structural size, date, and year of capture). We documented 15 mortalities and found that the 75-day mortality rate due to raptors (0.141 ± 0.040) was greater than that due to red fox (*Vulpes vulpes*; 0.011 ± 0.011), collisions with power lines (0.011 ± 0.011), or unknown factors (0.039 ± 0.027). Our results differ from prior research that indicated red fox was a major predator of female pintails during the nesting season. Raptors were the primary mortality agent for female pintails, perhaps because of limited exposure during incubation in our study, or the use of open habitats by pintails in southern Saskatchewan. Management programs that provide nesting or wetland habitats with overhead concealment, or that reduce perch sites for raptors in areas with high pintail densities, may decrease the risk of avian predation on female pintails.

645: A. Rimmer, Y. Aota, M. Kumagai and W. Eckert,. 2005. Chemical stratification in thermally stratified lakes: A chloride mass balance model. *Limnology and Oceanography* 1(50): 147-157.

Abstract: In thermally stratified lakes, nutrient-enriched hypolimnion and a nutrient-depleted epilimnion is a common feature. Vertical mixing between these layers affects geochemical and biological processes. We used chloride ion as an inert tracer to model the main factors controlling the chemical stratification and to identify lake-wide mixing processes. The stratified lake is treated as two completely mixed reservoirs separated by the thermocline. Based on the long-term records of temperature, hydrochemical, and hydrological data from Lake Kinneret (Israel) and Lake Biwa (Japan), monthly hypolimnetic and epilimnetic chloride concentrations were predicted and tested against measured chloride concentration profiles. Water-volume exchange between the layers during the thermocline deepening was calculated using mass balance. We found that changes in the epilimnetic and hypolimnetic inventories of an inert tracer (chloride) correspond quantitatively to the calculated water mass exchange, and as such, reflect mixing. Our inert-tracer-approach provides a basis for an operational means of quantifying the vertical mixing process in thermally stratified lakes independently from the heat budget.

646: S. Ringuet and F. T. MacKenzie,. 2005. Controls on nutrient and phytoplankton dynamics during normal flow and storm runoff conditions, Southern Kaneohe Bay, Hawaii. *Estuaries* 3(28): 327-337.

Abstract: Fluvial effects on nutrient and phytoplankton dynamics were evaluated in southern Kaneohe Bay, Oahu, Hawaii. Fluvial inputs occurred as small, steady baseflows interrupted by intense pulses of storm runoff. Baseflow river inputs only affected restricted areas around stream mouths, but the five storm events sampled during this study produced transient runoff plumes of much greater spatial extent. Nutrient loading via runoff generally led to an increase of the phytoplankton biomass and gross primary productivity in southern Kaneohe Bay, but the rapid depletion of nutrients resulted in a decline of the algal populations in the relatively short time of days. Under baseline conditions, water column primary productivity in southern Kaneohe Bay is normally nitrogen limited. Following storm events, the high ratio of dissolved inorganic nitrogen to dissolved inorganic phosphorus (DIN:DIP, 25-29) fluxes of runoff nutrients drove bay waters towards phosphorus limitation. A depletion of phosphate relative to DIN in surface waters was observed following all storm events. Due to high flushing rates, recovery times of bay waters from storm perturbations ranged from 3 to 8 d and appeared to be correlated with tidal range. Storm inputs have a significant effect on the water column ecosystem and biogeochemistry in southern Kaneohe Bay. The perturbations were only transient events and the system rapidly recovered to prestorm conditions.

647: W. J. Rip, M. Ouboter, E. H. van Nes and B. Beltman,. 2005. Oscillation of a shallow lake ecosystem upon reduction in external phosphorus load. Archiv Fur Hydrobiologie 3(164): 387-409.

Abstract: A long-term study of eutrophication abatement in the Botshol Nature Reserve, the Netherlands, showed an intriguing response in this shallow lake. Beginning in 1988, the external nutrient load was reduced by hydrological segregation from agricultural areas and by chemical stripping of phosphorus from the water supply. A side effect of the hydrological segregation of Botshol from agricultural areas was an increase in chloride from 500 to 1000 mg l⁻¹. In the first four years after the decrease in nutrient load, reductions were observed in phosphorus and chlorophyll a concentrations, as well as in the density of phytoplankton, zooplankton, and fish. Reduced phytoplankton density resulted in reduced turbidity and increased cover of Characeae from 2 to 80%. Although the objective of re-establishing submerged macrophytes seemed to be attained, the clear water state appeared unstable. From 1993 onwards, the ecosystem alternated between turbid water with minor macrophyte production (1993-1995, 1999-2003) and clear water with abundant growth of aquatic plants (1996-1998). Phosphorus concentrations in Botshol also showed strong related fluctuations, despite a stable external phosphorus load.

648: T. H. Robinson, A. Leydecker, A. A. Keller and J. M. Melack,. 2005. Steps towards modeling nutrient export in coastal Californian streams with a Mediterranean climate. *Agricultural Water Management* 1-3(77): 144-158.

Abstract: Along the southern California coast, near Santa Barbara, California, we are measuring nutrient export from specific land uses and developing relationships to predict nutrient export at a watershed scale. The area is characterized by a Mediterranean-like climate and short steep catchments producing flashy runoff. Land uses include chaparral, avocado orchards, greenhouse agriculture, open-field nurseries, and residential and commercial development. Sampling sites are located on defined drainages or storm drains that collect runoff from relatively homogeneous areas representing each land use. Stream water samples are taken once a week during the rainy season, every two weeks during the dry season and every 1-4 h during storms; samples are analyzed for nitrate, ammonium, and phosphate. We determine discharge from measurements of stage derived from pressure transducers at all sampling sites. This information is then converted to flux at a high temporal resolution. Several parameters are presented in an initial effort to build relationships for simulating nutrient export based on land use, precipitation and antecedent soil moisture conditions. The objective is to create robust relationships, using parameters in a simple and cost efficient manner, which can be extended to other coastal watersheds with similar land uses and climate. The effort focuses on nitrate and soluble reactive phosphorus (SRP). The relationship of volume-weighted mean nutrient concentration and runoff/rainfall ratios shows promise as a means of predicting nutrient export in flashy streams experiencing a Mediterranean climate. (c) 2005 Elsevier B.V. All rights reserved.

649: A. J. Rodusky, B. Sharfstein, K. R. Jin and T. L. East,. 2005. Thermal stratification and the potential for enhanced phosphorus release from the sediments in Lake Okeechobee, USA. Lake and Reservoir Management 3(21): 330-337.

Abstract: We inferred the potential importance of enhanced phosphorus (P) release from the sediments during periods of thermal stratification in Lake Okeechobee USA, a large, shallow, eutrophic lake. This was accomplished by determining the frequency and duration of thermal stratification, using monitoring data collected during 1997 and 1999, with multiparameter sondes, which were positioned at a weather platform in the center of the lake. We also monitored dissolved oxygen, pH, specific conductance, turbidity and redox potential, to assess if any relationships existed between these variables and thermal stratification. Thermal stratification was infrequent, documented for 42 and 74 total hours, and occurred for an extrapolated period of at least one hour on approximately 18 days or 5% of both years. Thermal stratification occurred almost exclusively during the summer (May - September), and was brief, typically lasting for one to six hours per event, although there was one event during 1999, where 49 continuous hours of thermal stratification were documented. Dissolved oxygen (DO) concentrations and redox potential (ORP) measurements collected 0.5 m above the sediment surface suggested that the top of the sediment may not have ever become anoxic and was rarely reducing. Chemical characteristics during periods of thermal stratification, compared to those considered favorable for P release based on previous Lake Okeechobee sediment studies, indicate that thermal stratification is usually insufficiently long for chemical conditions (anoxic or low DO and ORP) to develop above the sediment surface that would enable enhanced P release from the sediments.

650: R. M. Roland and S. L. Douglass,. 2005. Estimating wave tolerance of *Spartina alterniflora* in coastal Alabama. Journal of Coastal Research 3(21): 453-463.

Abstract: The initial establishment and survival of a salt marsh is regulated by a variety of factors, including salinity, sediment type, elevation, nutrient levels, and wave climate. Despite the obvious importance of wave climate on the existence or nonexistence of wetlands along shorelines of water bodies, there are currently few methods for its evaluation at wetland locations. This study used an existing wind-wave hindcast method to estimate wave climate at sites with and without *Spartina alterniflora* along the shoreline in coastal Alabama. The sites with vegetation along the shoreline had lower wave levels than nearby sites without vegetation. Other sites with eroding stands of vegetation had wave levels intermediate between the no-vegetation and vegetation sites. The upper limit of wave energy for (noneroding) salt marsh existence was a median significant wave height of about $H = 0.1$ meter and a corresponding 80 percentile (less than this level 80% of the time) significant wave height of $H = 0.2$ meter. Sites with less wave energy had vegetation along the shoreline. The results indicate that wave height frequency distribution based on wind-wave modeling hindcasts is an appropriate methodology for wave climate evaluation at wetland sites. The results can be used to minimize the size of breakwaters used in constructed wetlands.

651: S. K. Roll, S. Diehl and S. D. Cooper,. 2005. Effects of grazer immigration and nutrient enrichment on an open algae-grazer system. *Oikos* 2(108): 386-400.

Abstract: After disturbance, recovery dynamics of local populations depend on arrival rates of immigrants and local growth conditions. We studied the effects of herbivore immigration rates and nutrient enrichment on the dynamics of grazing insect larvae, benthic microalgae, and filamentous macroalgae recovering from low local densities in an open stream system. The two types of algae approximate a trade-off between capabilities for growing at low resource levels and resisting herbivory. Many microalgae achieve relatively high growth rates at low nutrient levels but are vulnerable to grazers, whereas many macroalgae require high nutrient levels for growth but become increasingly defended with filament growth. We hypothesized that macroalgae should benefit more strongly than microalgae from increasing nutrient levels and decreasing grazer immigration rates, because both conditions increase macroalgal chances to grow into a size refuge from herbivory. We created a gradient of nutrient concentrations and manipulated drift immigration rates of macroinvertebrates. Macro- and microalgal biomass and the relative contribution of macroalgae to total algal biomass increased with increasing nutrient enrichment and decreased with increasing grazer immigration. Grazer densities responded positively to nutrient enrichment. The densities of large baetids responded positively to higher immigration rates of large baetids, whereas small baetids and chironomid larvae showed the opposite response. Per capita emigration of small baetids decreased with increasing algal biomass. The data suggest that large baetids negatively affected algal biomass and that small baetid and chironomid densities tracked resource levels set by nutrient enrichment and large baetids. Our experiments highlight the prospects of integrating disturbance with nutrient supply, immigration rates and local trophic interactions (determining recovery trajectories) into conceptual models of open system dynamics. We suggest that rec

652: A. Rolland, D. F. Bird and A. Giani,. 2005. Seasonal changes in composition of the cyanobacterial community and the occurrence of hepatotoxic blooms in the eastern townships, Quebec, Canada. *Journal of Plankton Research* 7(27): 683-694.

Abstract: Four eutrophic lakes in the eastern townships (Quebec, Canada) were sampled on a biweekly basis between May and October 2001 to examine seasonal changes, and to study the role of taxonomic and environmental factors in cyanobacterial toxin production. Microcystin-LR (MC-LR) equivalent content was determined using a protein phosphatase inhibition assay on extracts of lyophilized plankton. Three of the lakes showed a similar pattern of maximum water column toxicity in late summer, while in the fourth, toxicity was highest in spring and then declined over the year. Variations in water toxicity level could be attributed to the abundance of two potentially toxigenic genera, *Microcystis* and *Anabaena*. A multiple regression model explained 75% of the variation in microcystin (MC) concentration, based on water column total nitrogen concentration (TN) and the biomass of these two genera. *Microcystis* and *Anabaena* genera appeared to be similarly toxic in all lakes. Increased water column stability, higher light extinction coefficient and a lack of dissolved nutrients were all associated with increased total biomass of toxigenic cyanobacterial genera.

653: M. Roman, X. Zhang, C. McGilliard and W. Boicourt,. 2005. Seasonal and annual variability in the spatial patterns of plankton biomass in Chesapeake Bay. *Limnology and Oceanography* 2(50): 480-492.

Abstract: We conducted high-resolution, underway sampling in April, July, and October for 6 yr (1995-2000) in the large estuary, Chesapeake Bay. This period included climatological extremes in freshwater inputs that strongly influenced both the overall stocks and spatial distribution of phytoplankton and zooplankton. Higher biomass of both phytoplankton and zooplankton occurred in springs, when freshwater input into Chesapeake Bay was above the average discharge. While whole-Bay productivity appears to be influenced by freshwater flow variability, mesoscale patterns in plankton biomass are driven by freshwater inputs, circulation, and bathymetry. Persistent maxima in plankton biomass occurred in areas of physical and topographic discontinuities such as the upper-Bay salt front, plume fronts, the hydraulic control region, tidal fronts, and near a topographically induced eddy. Although the contribution of these hot spots to the whole-Bay standing stock of plankton may vary due to changes in the background levels of plankton, controlled in part by freshwater discharge, they nevertheless represent predictable areas of higher forage for planktivorous fish. Enhanced trophic coupling between plankton and fish at these physical discontinuities may be one reason why estuaries have higher fisheries yields in relation to their primary production than lakes and other marine systems.

654: S. Romo, M. J. Villena, M. Sahuquillo, J. M. Soria, M. Gimenez, T. Alfonso, E. Vicente and M. R. Miracle,. 2005. Response of a shallow Mediterranean lake to nutrient diversion: does it follow similar patterns as in northern shallow lakes?. *Freshwater Biology* 10(50): 1706-1717.

Abstract: 1. In view of the paucity of data on the response of warm shallow lakes to reductions in nutrient loading, this paper presents a long-term limnological data set to document changes in the food-web of a shallow Mediterranean lake (Lake Albufera, Valencia, Spain) that has experienced reductions in phosphorus (P) (77%) and nitrogen (N) (24%) loading following sewage diversion. 2. Nine years after sewage diversion, P concentration in the lake was reduced by 30% but remained high (TP = 0.34 mg L⁻¹), although the mean water retention time in the lake was only 0.1 years. Nitrate concentrations did not significantly change, probably because the lake continued to receive untreated effluents from ricefields. 3. Chlorophyll a concentration was reduced by half (annual mean of 180 µg L⁻¹). Cyanobacteria abundance remained high but its composition changed towards smaller species, both filamentous and chroococcal forms. 4. Cladocera abundance increased and reached peaks twice a year (December to March and July to September). After nutrient reduction, short-term clear-water phases (up to 5 weeks) occurred during February to March in several years, concomitant with annual flushing of the lake and lower fish densities. The abundance of Cladocera in winter contrasted with the spring peaks observed in northern restored shallow lakes. The zooplankton to phytoplankton biomass ratio remained lower than in northern temperate shallow lakes, probably because of fish predation on zooplankton. 5. Improvement of the water quality of Lake Albufera remained insufficient to counteract littoral reed regression or improve underwater light allowing submerged plants re-colonise the lake. 6. Sewage diversion from Lake Albufera impacted the food web through the plankton, but higher trophic levels, such as fish and waterfowl, were affected to a lesser degree. Although the fish species present in the lake are mainly omnivorous, long-term data on commercial fish captures indicated that fish communities c

655: S. Romo, M. J. Villena, M. Sahuquillo, J. M. Soria, M. Gimenez, T. Alfonso, E. Vicente and M. R. Miracle,. 2005.
Response of a shallow Mediterranean lake to nutrient diversion: does it follow similar patterns as in northern shallow
lakes? (vol 50, pg 1706, 2005). Freshwater Biology 12(50): 2168-2168.

There is no abstract for this article.

656: R. K. Ross, S. A. Petrie, S. S. Badzinski and A. Mullie,. 2005. Autumn diet of greater scaup, lesser scaup, and long-tailed ducks on eastern Lake Ontario prior to zebra mussel invasion. Wildlife Society Bulletin 1(33): 81-91.

Abstract: Diving ducks staging on the lower Great Lakes have responded to the introduction and subsequent population increase of zebra mussels (*Dreissena polymorpha*) by consuming this readily available food. However, nutritional and contaminant-related implications of recent dietary shifts are hindered by the fact that few studies have documented foods consumed by diving ducks before zebra mussels invaded the Great Lakes in 1988. We examined diets of greater scaup (*Aythya marila*), lesser scaup (*Aythya affinis*), and long-tailed ducks (*Clangula hyemalis*) collected from eastern Lake Ontario during autumn 1986 and 1987 to determine differences among the 3 species. Gastropods were the main food item of greater (92% aggregate dry mass) and lesser scaup (86%), but they consumed relatively small amounts (3% and 7%, respectively) of amphipods. In contrast, amphipods made up 66% of the diets of long-tailed ducks; gastropods were 28% of their diet. Amphipod populations have increased and native gastropods decreased in the presence of zebra mussels in the lower Great Lakes, such that zebra mussel invasion likely has had greater dietary implications for scaup than for long-tailed ducks. Dietary shifts from nonfilter-feeding gastropods to filter-feeding zebra mussels likely contributed to elevated contaminant burdens in lesser and greater scaup on the lower Great Lakes. We encourage further research into the diet-, nutrient-, and contaminant-related implications of zebra mussel induced ecological changes to the Great Lakes.

657: A. Rother and J. Kohler,. 2005. Formation, transport and retention of aggregates in a river-lake system (Spree, Germany). International Review of Hydrobiology 3(90): 241-253.

Abstract: The formation, particle size distribution, structure and retention of aggregates were studied in a river-lake system of the lowland River Spree and factors influencing these processes were evaluated. Samples were taken from the inflow and outflow of a flushed lake, as well as along the adjacent flowing reach of the River Spree, between April 2001 and May 2002. The aim was to record the influence of the seasons and different turbulence intensities on the size, shape, composition, abundance and transport properties of the particles. As additional parameters, the phytoplankton biomass, the concentration of suspended particulate matter, the concentrations of nutrients and the discharge were measured. The abundance of the particles showed a strong seasonality in the investigated period, which closely correlated with the concentrations of suspended particulate matter and particulate organic matter in the water column. The organic carbon content of the suspended matter varied between 37% (dry weight) in summer and about 14% in winter. The concentration of particles ranged between 500 and 2500 particles/ml. The number of particles was significantly lower upstream from the lake than at the downstream transects. The majority of the aggregates in the River Spree were smaller than 500 μm , most of the particles even showing a diameter less than 50 μm . Many particles, above all algae, were washed out of the lake Neuendorfer See into the adjacent flowing reach of the River Spree. Algae influenced the abundance of the particles and contributed to the formation of aggregates with their stickiness. In the river flowing section large particles were formed by turbulence structures, whilst simultaneously the number of smaller particles decreased in the water column caused by aggregation processes. In general, an increasing flow velocity and discharge rate resulted in a larger amount of aggregates in the water column. On the other hand, particle abundance was reduced in the flow direction.

658: A. H. Roy, M. C. Freeman, B. J. Freeman, S. J. Wenger, W. E. Ensign and J. L. Meyer,. 2005. Investigating hydrologic alteration as a mechanism of fish assemblage shifts in urbanizing streams. *Journal of the North American Benthological Society* 3(24): 656-678.

Abstract: Stream biota in urban and suburban settings are thought to be impaired by altered hydrology, however, it is unknown what aspects of the hydrograph alter fish assemblage structure and which fishes are most vulnerable to hydrologic alterations in small streams. We quantified hydrologic variables and fish assemblages in 30 small streams and their subcatchments (area 8-20 km²) in the Etowah River Catchment (Georgia, USA). We stratified streams and their subcatchments into 3 landcover categories based on imperviousness (< 10%, 10-20%, > 20% of subcatchment), and then estimated the degree of hydrologic alteration based on synoptic measurements of baseflow yield. We derived hydrologic variables from stage gauges at each study site for 1 y (January 2003-2004). Increased imperviousness was positively correlated with the frequency of storm events and rates of the rising and falling limb of the hydrograph (i.e., storm "flashiness") during most seasons. Increased duration of low flows associated with imperviousness only occurred during the autumn low-flow period, and this measure corresponded with increased richness of lentic tolerant species. Altered storm flows in summer and autumn were related to decreased richness of endemic, cosmopolitan, and sensitive fish species, and decreased abundance of lentic tolerant species. Species predicted to be sensitive to urbanization, based on specific life-history or habitat requirements, also were related to stormflow variables and % fine bed sediment in riffles. Overall, hydrologic variables explained 22 to 66% of the variation in fish assemblage richness and abundance. Linkages between hydrologic alteration and fish assemblages were potentially complicated by contrasting effects of elevated flows on sediment delivery and scour and mediating effects of high stream gradient on sediment delivery from elevated flows. However, stormwater management practices promoting natural hydrologic regimes are likely to reduce the impacts of catchment

659: M. Rudner,. 2005. Environmental patterns and plant communities of the ephemeral wetland vegetation in two areas of the Southwestern Iberian Peninsula. *Phytocoenologia* 2-3(35): 231-265.

Abstract: In two regions in the Southwestern Iberian Peninsula, the Serra de Monchique (Portugal) and the Campo de Gibraltar (Spain), Isoeto-Nanojuncetea communities constitute the ephemeral wetland vegetation. Macroscale patterns varying with altitude and slope aspect are studied, as well as microscale patterns depending on soil physical properties. In the Serra de Monchique the ephemeral wetland vegetation occurs on gravel cushions above syenite rock. In the Campo de Gibraltar, these communities, interspersed in gaps of *Erica scoparia*-*E. ciliaris*-heathland, are more frequently in contact with perennial meadows or fens. The following communities are represented: *Isoetetum durieui*, *Laurentio michelii*-*Juncetum tingitani*, *Junco capitati*-*Isoetetum histricis*, and *Loto subbiflori*-*Chaetopogonetum fasciculati*. Altitudinal zonation of the communities is clearer in the Campo de Gibraltar than in the Serra de Monchique. In both regions the *junco*-*Isoetetum* shows the largest altitudinal amplitude. Generally the site conditions are characterised by a high amount of available soil moisture and - in the Serra de Monchique - by a high air capacity. The Portuguese samples are clearly distinguishable from the Spanish samples by soil physical properties. Nutrient poor soils prevail in both regions. The habitat of the *Loto*-*Chaetopogonetum* is characterised by a high proportion of micropores. The microscale pattern of the dwarf rush communities on gravel cushions is marked by the soil depth, by the gravel import rate, and by seeping water at the lower margin of gravel cushions. In syenite gravel in the Serra de Monchique, the *Helianthemo guttati*-*Plantaginetum bellardii* (*Helianthemetea*) co-occurs with ephemeral wetland vegetation. Five subassociations, four of them new, can be differentiated: *Helianthemo guttati*-*Plantaginetum bellardii* *typicum*, *Helianthemo*-*Plantaginetum arenarietosum conimbricensis*, *Helianthemo*-*Plantaginetum sedetosum andegavensis*, *Helianthemo*-*Plantaginetum silenetosum scabriflorae*

660: A. Ruggiero, A. G. Solimini and G. Carchini,. 2005. The alternative stable state concept and the management of Apennine mountain ponds. *Aquatic Conservation-Marine and Freshwater Ecosystems* 6(15): 625-634.

Abstract: 1. In mountainous areas of the central Apennines, permanent ponds and small lakes show high concentrations of nutrients causing algal blooms and fish kills. Their degraded condition is at odds with their conservation status since most of them are located within protected areas. Therefore, urgent remedial measures and management of these valuable habitats is required. 2 The concept of alternative equilibria potentially provides a scientific framework for management actions in shallow freshwater ecosystems. However, little is known regarding how this concept applies to Apennine ponds. 3. This paper examines nutrient, phytoplankton biomass, transparency and macrophyte data from 30 Apennine ponds and shallow lakes. Patterns of soluble reactive phosphorus, dissolved inorganic nitrogen, chlorophyll a and water transparency are consistent with the existence of alternative stable states. The extent of macrophyte cover plays a key role in stabilizing one of the alternative stable states. 4. Reducing nutrient inputs from the catchment, adopting measures to increase and/or restore macrophyte beds, and manipulating fish assemblages are potentially promising strategies for the restoration and conservation of Apennine ponds. Copyright (c) 2005 John Wiley & Sons, Ltd.

661: K. Ruhland and J. P. Smol,. 2005. Diatom shifts as evidence for recent Subarctic warming in a remote tundra lake, NWT, Canada. *Palaeogeography Palaeoclimatology Palaeoecology* 1-2(226): 1-16.

Abstract: Changes in diatom assemblage composition were examined from the sediments of Slipper Lake, an isolated tundra lake located similar to 50 km north of current treeline in Canada's Northwest Territories. Diatom shifts over the last ca. 5600 years were related to the response of this ecosystem to climatic and environmental change during the late Holocene, with particular emphasis on the last few hundred years. To date, a detailed diatom analysis for this recent time frame has not been undertaken for the central Canadian Subarctic. The first ca. 5400 years of the sediment record was marked by modest shifts between benthic, alkaliphilous diatom taxa (e.g., *Fragilaria*, *Achnanthes*, and *Navicula* species) and heavily silicified, tychoplanktonic *Aulacoseira* species. In the 19th century, abrupt changes were delineated by a marked shift to a diatom assemblage characteristic of more planktonic habitats consisting of the *Cyclotella stelligera* complex (*C. stelligera*, *C. pseudostelligera*), which was absent in earlier sediments. Several possible mechanisms for these recent changes are examined, including atmospheric deposition of acidifying compounds and anthropogenically derived nutrient enrichment, however we conclude that climatically induced limnological changes associated with shorter duration of ice cover and a longer growing season can best explain the direction and magnitude of changes in our diatom record. (c) 2005 Elsevier B.V. All rights reserved.

662: A. G. Rusanov and V. M. Khromov,. 2005. Seasonal succession of lotic epiphyton: Effects of macrophyte cover and grazing by chironomid larvae. Zhurnal Obshchei Biologii 1(66): 55-67.

Abstract: The epiphyton is a community of periphyton on the aquatic plants. The seasonal dynamics of biomass, production and community structure of epiphytic algae on *Potamogeton perfoliatus* was studied at the Moscow River reach with low flow velocity from May to October 2000. The relative importance of physical-chemical environmental variables and herbivorous pressure in structuring the epiphyton community was accessed using multivariate redundancy analysis. Algal composition was mainly determined by the macrophyte cover, suggestion the overriding importance of the underwater light availability in seasonal development of epiphyton. There was a significant positive relationship between biomass of attached diatom *Cocconeis placentula* and abundance of chironomid larvae ($r = 0.57$; $p < 0.01$). This indicates that increase in herbivorous pressure caused the shift in epiphyton community structure. However, the intensity of herbivorous impact on epiphyton was ultimately determined by light availability in macrophyte stands. At low irradiance level and consequent slow growth of algae the upper layer of epiphyton was seriously destroyed by chironomids that resulted in dominance of *C. placentula*. As irradiance level and epiphyton productivity increased chironomids were unable to prevent biomass accumulation of the upper layer thus inhibiting the growth of *C. placentula*. The high concentrations of nutrients and relatively stable discharge determined the crucial role of light regime in the regulation of trophic interactions between epiphyton and chironomid larvae.

663: K. C. Ruttenberg and S. T. Dyhrman,. 2005. Temporal and spatial variability of dissolved organic and inorganic phosphorus, and metrics of phosphorus bioavailability in an upwelling-dominated coastal system. Journal of Geophysical Research-Oceans C10(110): .

Abstract: High-frequency temporal and spatial shifts in the various dissolved P pools (total, inorganic, and organic) are linked to upwelling/relaxation events and to phytoplankton bloom dynamics in the upwelling-dominated Oregon coastal system. The presence and regulation of alkaline phosphatase activity (APA) is apparent in the bulk phytoplankton population and in studies of cell-specific APA using Enzyme Labeled Fluorescence (ELF 1). Spatial and temporal variability are also evident in phytoplankton community composition and in APA. The spatial pattern of dissolved phosphorus and APA variability can be explained by bottom-controlled patterns of upwelling, and flushing times of different regions within the study area. The presence of APA in eukaryotic taxa indicates that dissolved organic phosphorus (DOP) may contribute to phytoplankton P nutrition in this system, highlighting the need for a more complete understanding of P cycling and bioavailability in the coastal ocean.

664: M. A. H. Saad, M. A. Abdel-Moati and A. A. Abdel-Wahed,. 2005. Effects of surface microlayer and sediment water interface layer on the distribution of nutrient species in the polluted Abu-Kir Bay, Egypt. Journal of Coastal Research : 394-399.

Abstract: Abu-Kir Bay, a shallow semicircular basin east of Alexandria Egypt, has an area of 360 km² and an average depth of 12 m. It receives contaminated brackish water from Lake Edku and heavily polluted wastewater from Tabia Pumping Station UPS). Water samples were collected seasonally from this bay at four stations and at seven depths from the surface microlayer (SML) to the sediment water interface layer (SWIL) for investigating the effects of SML and SWIL on the distribution of nutrient species in the rest of the water column; middle water layer (MWL). Contrary to dissolved organic nitrogen (DON), particulate nitrogen (PN) and dissolved organic phosphorus (DOP), the annual means of nitrate, nitrite ammonium, reactive phosphate, particulate phosphorus (PP) and reactive silicon in the SML were higher than the corresponding means in the SWIL, confirming that contribution of these nutrient species from the SML to the MWL was more than that from the SWIL to the MWL, which gave intermediate annual means. These data suggest that most of the nutrient species in the bay originated from the allochthonous (land-based) sources; brackish Lake Edku water and TPS wastewater floating over the surface bay water rather than from the autochthonous sources; decomposition of organic remains and release from the bay sediments.

665: S. Sabater, V. Acuna, A. Giorgi, E. Guerra, I. Munoz and A. M. Romani,. 2005. Effects of nutrient inputs in a forested Mediterranean stream under moderate light availability. Archiv Fur Hydrobiologie 4(163): 479-496.

Abstract: Nutrients were artificially increased in an oligotrophic, forested stream by adding nitrogen (as nitrate and ammonia) and phosphorus (as reactive phosphate) continuously for 44 days. This addition increased the nutrient concentrations by 10 (phosphorus), 6 (ammonia) and 4 times (nitrates) with respect to basal concentrations. The effect of the enrichment on the structure and metabolism in benthic habitats (rocks, sand and leaf litter) was studied during a period of moderate light availability (maximum light at the streambed ranged between 20-120 $\mu\text{E m}^{-2} \text{s}^{-1}$), prior to leaf occurrence in the riparian vegetation. A BACI design was used to determine the significance of the addition by comparing an upstream non-enriched (control) reach with a downstream enriched one (impacted). Nutrient addition caused a 3-fold increase in chlorophyll density on rocks and sand, and a remarkable increase in algal cell density, but did not cause changes in the community composition of the algal community. The increase in algal biomass was not reflected in higher net community metabolism (NCM) when this was measured as oxygen production, but higher carbon incorporation was detected at the end of the experiment. Nutrient addition did not significantly alter bacterial cell density on rocks, sand and leaf litter substrata. Accordingly, no substantial increase in community respiration (CR) was detected. Neither did heterotrophic activity (extracellular enzymes) change significantly because of addition, except for a decrease (although weak) in phosphatase in sand. Enrichment did not cause a general increase in macroinvertebrate density or biomass, but some taxa increased in the enriched reach. Scrapers (*Ancylus fluviatilis*) and detritivores (*Oligochaeta*, *Lumbriculidae*) significantly augmented their density or biomass on certain substrata. Overall, enhanced nutrient availability was able to cause a remarkable biomass increase in the autotrophic component of the stream, in spite of the moderate

666: L. Sabetta, A. Fiocca, L. Margheriti, F. Vignes, A. Basset, O. Mangoni, G. C. Carrada, N. Ruggieri and C. Ianni,. 2005. Body size-abundance distributions of nano- and micro-phytoplankton guilds in coastal marine ecosystems. *Estuarine Coastal and Shelf Science* 4(63): 645-663.

Abstract: This study focuses on body size-abundance distributions of nano- and micro-phytoplankton guilds in coastal marine areas of the Southern Adriatic-Ionian region. The aim of the study was to evaluate the occurrence of common patterns of body size-abundance distributions in relation to physical, chemical and biological environmental forcing factors and to taxonomic composition of phytoplankton guilds. This paper is based on data collected during four oceanographic cruises carried out seasonally along the Southern Apulian coast (Adriatic and Ionian Seas, SE Italy) as a part of the INTERREG II Italy-Greece Program. The study was performed at 21 stations located on 7 transects perpendicular to the coastline, with 3 stations per transect at a distance of 3, 9 and 15 NM from the coastline. At each station, profiles of the major physical features of the water were determined and water samples were collected for phytoplankton and nutrient analysis. Overall, 320 nano- and micro-phytoplankton taxa were identified, 76% of which at species level, with phytoplankton cells ranging in size from 0.008 to 4697.54 ng. Body size-abundance distributions showed some common features: they were relatively invariant (average similarity 65%) with respect to taxonomic composition (average similarity 32%), right skewed (90%), leptokurtic (77%) and log normal (76%). Moreover, abiotic, biotic and spatial ecosystem components accounted for up to 75% of body size-abundance distribution variation. The results of this study suggest that body size-abundance distributions are an intrinsic property of marine phytoplankton communities, emphasising functional dependence on ecological constraints related to trophic factors and intra-guild coexistence relationships. (c) 2005 Elsevier Ltd. All rights reserved.

667: A. Sachse, R. Henrion, J. Gelbrecht and C. E. W. Steinberg,. 2005. Classification of dissolved organic carbon (DOC) in river systems: Influence of catchment characteristics and autochthonous processes. *Organic Geochemistry* 6(36): 923-935.

Abstract: Dissolved organic carbon (DOC) in surface waters is influenced by natural and anthropogenic allochthonous sources in the catchment and by autochthonous production and degradation processes. An objective differentiation procedure, a principal component analysis, has been used to answer the question: Is it possible to classify different water types using only DOC-patterns, and how do seasonal variations influence such a classification? Organic compounds from various sources and river systems were analyzed by means of automated size-exclusion chromatography. Four different DOC fractions (humic substances, polysaccharides, low molecular weight acids and low weight substances) were separated on the basis of their molecular weight characteristics and quantified on the basis of their UV absorbance. Significant differences in the quality and quantity of organic compounds were found. These were related to the character of the catchment area and to autochthonous processes. It was possible to classify peat-influenced ditch waters, peat-influenced surface waters, mineral soil-influenced and anthropogenically-influenced surface waters, and waters from small and large lake-river systems. The characterization of DOC patterns combined with principal component analysis is a powerful tool for analyzing allochthonous and autochthonous DOC sources in surface waters, especially if seasonal variations are taken into account. (c) 2005 Elsevier Ltd. All rights reserved.

668: N. Saenger, P. K. Kitanidis and R. L. Street,. 2005. A numerical study of surface-subsurface exchange processes at a riffle-pool pair in the Lahn River, Germany. Water Resources Research 12(41): .

Abstract: [1] Hyporheic exchange is an ecologically important process, controlling the nutrient supply in the upper sediments and thus benthic habitat quality. Hydraulic exchange at a riffle-pool sequence in the Lahn River, Germany, was analyzed using HEC-RAS to simulate the surface water flow as a boundary for the subsurface flow and MODFLOW, MODPATH, and MT3DMS to reproduce the transport in the subsurface. Solute transport and residence times of surface water in the subsurface were simulated after calibrating sediment properties to fit simulated hydraulic head to measured subsurface head from the riffle-pool pair. Three surface water flow rates were considered. Results indicated that exchange increases with increasing surface water flow. However, the hydraulic conductivity of the riverbed sediments influences the mass transfer more than the surface water flow. The ratio of the infiltration rate to the surface water flow is of the same order of magnitude for all the considered flow conditions. Residence times of surface water in the subsurface varied inversely with the flow rates in the river.

669: K. L. Sahrawat,. 2005. Fertility and organic matter in submerged rice soils. Current Science 5(88): 735-739.

Abstract: Wetland rice systems in Asia make a major contribution to global rice supply. The system is also able to maintain soil fertility on a sustainable basis. The essential components of wetland rice culture comprise cultivation of land in the wet or flooded state (puddling), transplanting of rice seedlings into puddled rice paddies, and growing the rice crop under flooding. The land is dry or flood-fallowed during the turnaround period between two crops. Following these cultural practices, two or three crops of rice or rice with upland crops in sequence are grown. However, in the present context of increasing freshwater scarcity, there is a case to shift from the traditional way of growing rice to ways that are water-wise. In this context, it is crucial that the benefits of the wetland rice system on soil fertility and productivity are considered. This article examines the benefits of growing rice in flooded conditions on soil fertility and its maintenance. Research has shown that the wetland rice system (growing rice in submerged soils) has a great ameliorative effect on chemical fertility: largely by bringing pH in the neutral range, resulting in. better availability of plant nutrients and accumulation of organic matter. The article concludes that the benefits of growing rice using submerged conditions must be considered and weighed in the context of a likely shift to growing rice with water-management practices that are water-wise.

670: T. Sakai, K. Minoura, M. Soma, Y. Tani, A. Tanaka, F. Nara, N. Itoh and T. Kawai,. 2005. Influence of climate fluctuation on clay formation in the Baikal drainage basin. *Journal of Paleolimnology* 1(33): 105-121.

Abstract: Sedimentary cores BDP 96 and 98 and VER 96-2 St. 3 from Academician Ridge in Lake Baikal were investigated to investigate the effect of climatic fluctuations on rock weathering and clay formation in the Baikal drainage basin. Illite, smectite, vermiculite, and kaolinite were identified as the major clay minerals in the sediments by X-ray diffraction analysis. Biotite in gravels in alluvial soils of the Baikal drainage area weathers through illite to vermiculite, smectite, and finally to kaolinite. To investigate the relationship between weathering and climate, we measured the clay content and the concentration of biogenic silica in the sediments. High surface productivity (increased biogenic silica) and high chemical weathering (decreased clay content) occurred simultaneously, showing that crustal weathering and soil formation were enhanced under warm climatic conditions. Clay formation was enhanced in the watershed from the Late Miocene to the Middle Pliocene, and mechanical weathering of rocks increased during glacial intervals after the climate began to cool in Late Pliocene time. This change in the weathering mode in the watershed reduced the nutrient flux and aquatic productivity of Lake Baikal.

671: N. Salmaso, 2005. Effects of climatic fluctuations and vertical mixing on the interannual trophic variability of Lake Garda, Italy. *Limnology and Oceanography* 2(50): 553-565.

Abstract: A linked chain of causal factors-namely, winter air temperature, spring lake temperature, extent of the spring take overturn, and extent of surface nutrient enrichment-had significant effects on the annual development of phytoplankton structure and biomass in Lake Garda, a large ($49 \times 10^9 \text{ m}^3$), deep (350 m) lake located south of the Alps. The relationship between the winter climate and the North Atlantic Oscillation (NAO) was unclear, probably because of the location of the lake, which was on the border between different centers of action of the NAO (the Mediterranean region and central and northern Europe). Soon after the major enrichment episodes, conjugatophytes and large diatoms developed with higher biovolumes during April, whereas from midsummer to midautumn, the cyanobacteria and, more irregularly, the conjugatophytes were more important. In two other deep southern subalpine lakes (Iseo and Lugano), the interannual variations in the extent of spring vertical mixing, nutrient replenishment, and phytoplankton development were closely related because of the common effects of winter climate on the subalpine region. The effect was proportionally more evident in the two meromictic and more eutrophic lakes, Iseo and Lugano, because of the higher nutrient content in their hypolimnia.

672: M. Salvia-Castellvi, J. F. Iffly, P. V. Borght and L. Hoffmann,. 2005. Dissolved and particulate nutrient export from rural catchments: A case study from Luxembourg. Science of the Total Environment 1-3(344): 51-65.

Abstract: Nutrient enrichment of freshwaters continues to be one of the most serious problems facing the management of surface waters. Effective remediation/conservation measures require accurate qualitative and quantitative knowledge of nutrient sources, transport, mechanisms, transformations and annual dynamics of different nitrogen (N) and phosphorus (P) forms. In this paper, nitrate ($\text{NO}_3\text{-N}$), soluble reactive phosphorus (SRP) and total phosphorus (TP) concentrations, and loads are presented for two adjacent rural basins of 306 km^2 and 424 km^2 and for five sub-basins differing in size (between 1 km^2 and 33 km^2), land use (extent of forest cover between 20% and 93%) and household pressure (from 0 to 40 people/ km^2) with the aim of studying the influence of land use and catchment size on nutrient exports. The studied catchments are all situated on Devonian schistous substrates in the Ardennes region (Belgium-Luxembourg), and therefore have similar hydrological regimes. As the study period could not be the same for all basins, annual export coefficients were corrected with the 25 years normalized discharge of the monthly runoff were used to Sure River: two regression analyses (for dry and humid periods) relating monthly nutrient loads to 0 determine correction factors to be applied to each parameter and each basin. This procedure allows for the comparing annual export coefficients from basins sampled in different years. Results show a marked seasonal response and a large variability of $\text{NO}_3\text{-N}$ export loads between forested (4 $\text{kg N ha}^{-1} \text{ year}^{-1}$), agricultural, (27-33 $\text{kg N ha}^{-1} \text{ year}^{-1}$) and mixed catchments (1722 $\text{kg N ha}^{-1} \text{ year}^{-1}$). For SRP and TP, no significant agricultural impact was found. Land and bank erosion control the total P massflow in the studied catchments (0.4-1.3 $\text{kg P ha}^{-1} \text{ year}^{-1}$), which is mostly in a particulate form, detached and transported during storm events. Soluble reactive P fluxes ranged between 10% and 30% of the TP mass, depending on

673: K. Sand-Jensen, J. Borum and T. Binzer,. 2005. Oxygen stress and reduced growth of *Lobelia dortmanna* in sandy lake sediments subject to organic enrichment. *Freshwater Biology* 6(50): 1034-1048.

Abstract: 1. *Lobelia dortmanna* is a common representative of the small isoetid plants dominating the vegetation in nutrient-poor lakes in Europe and North America. Because of large permeable root surfaces and continuous air lacunae *Lobelia* exchanges the majority of O₂ and CO₂ during photosynthesis across the roots. This leads to profound diel pulses of O₂ and CO₂ in sandy sediments with low microbial O₂ consumption rates. The ready radial root loss of O₂ may, however, make *Lobelia* very susceptible to more reducing sediments. Therefore, we grew *Lobelia* for 6 months on natural and organically enriched sandy sediments to test how: (i) root oxygenation influenced degradation of organic matter and depth profiles of N and C; (ii) *Lobelia* and microbial O₂ consumption rates influenced pool size and depth penetration of O₂ in the sediments; and (iii) sediment enrichment influenced growth and mineral nutrition of *Lobelia*. 2. Naturally low-organic sediments (0.32% DW) accumulated organic C and N during the experiment as a result of growth of *Lobelia* and surface micro-algae. In contrast, surface layers of enriched sediments (0.58, 0.87 and 2.46% DW) lost organic C and N because of enhanced mineralisation rates because of oxygen availability. In deeper layers of enriched sediments no significant differences in organic C and N pools were found between plant-covered and plant-free sediments probably because faster organic degradation because of root oxygenation was balanced by release of organic matter from the plants and because short roots with dense Fe-Mn coatings in the most enriched sediments constrained O₂ release. 3. Depth-integrated O₂ pools were much higher in light than darkness, higher in plant-covered than plant-free sediments and higher in sandy than in organically enriched sediments. All sediments had a primary O₂ maximum 1-2 mm below the sediment surface in light because of photosynthesis of micro-algae. Plant-covered sediments of low organic content (0.32 and 0.58%

674: K. Sand-Jensen and N. L. Pedersen,. 2005. Differences in temperature, organic carbon and oxygen consumption among lowland streams. *Freshwater Biology* 12(50): 1927-1937.

Abstract: 1. Temperature, organic carbon and oxygen consumption were measured over a year at 13 sites in four lowlands streams within the same region in North Zealand, Denmark with the objectives of determining: (i) spatial and seasonal differences between open streams, forest streams and streams with or without lakes, (ii) factors influencing the temperature dependence of oxygen consumption rate, (iii) consequences of higher temperature and organic content in lake outlets on oxygen consumption rate, and (iv) possible consequences of forecasted global warming on degradation of organic matter. 2. High concentrations of easily degradable dissolved (DOC) and particulate organic carbon (POC) were found in open streams downstream of plankton-rich lakes, while high concentrations of recalcitrant DOC were found in a forest brook draining a forest swamp. Concentrations of predominantly recalcitrant POC and DOC were low in a groundwater-fed forest spring. Overall, DOC concentration was two to 18 times higher than POC concentrations. 3. Oxygen consumption rate at 20 degrees C was higher during summer than winter, higher in open than shaded streams and higher in lake outlets than inlets. Rate was closely related to concentrations of chlorophyll and POC but not to DOC. The ratio of oxygen consumption rate to total organic concentrations (DOC + POC), serving as a measure of organic degradability, was highest downstream of lakes, intermediate in open streams and lowest in forest streams. 4. Temperature coefficients describing the exponential increase of oxygen consumption rate between 4 and 20 degrees C averaged 0.121 degrees C⁻¹ (Q(10) of 3.35) in 70 measurements and showed no significant variations between seasons and stream sites or correlations with ambient temperature and organic content. 5. Oxygen consumption rate was enhanced downstream of lakes during summer because of higher temperature and, more significantly, greater concentrations of degradable organic carbon. Oxygen consumptio

675: K. Sand-Jensen, O. Pedersen, T. Binzer and J. Borum,. 2005. Contrasting oxygen dynamics in the freshwater isoetid *Lobelia dortmanna* and the marine seagrass *Zostera marina*. *Annals of Botany* 4(96): 613-623.

Abstract: Background and Aims Submerged plants possess well-developed aerenchyma facilitating intra-plant gas-phase diffusion of O₂ to below-ground tissues, which are usually buried in anoxic sediments. However, aquatic habitats differ in terms of O₂ fluctuations in the water column and in O₂ consumption of the sediment, and aquatic plants differ in aerenchymal volume and resistance to O₂ diffusion through the plant and across leaf and root surfaces. The hypothesis that the freshwater isoetid *Lobelia dortmanna* and the marine seagrass *Zostera marina* should display pronounced contrasts in intra-plant O₂ dynamics because of differences in morphology/anatomy, physiology and growth habitat was tested. **Methods** In order to determine the O₂ dynamics and relate this to the anatomy and morphology of the two species, O₂ microelectrodes were inserted in the aerenchyma of leaves and roots, the sediment pore-water, and the water column in the field. Manipulation of water column O₂ in the laboratory was also carried out. **Key Results** It was found that intra-plant transport of O₂ between leaf and root tips takes place more readily in *L. dortmanna* than in *Z. marina* due to shorter distances and greater cross-sections of the aerenchyma. The major exchange of O₂ across roots of *L. dortmanna* can be accounted for by small intra-plant resistances to diffusion, larger root than leaf surfaces, and greater radial diffusive resistance of leaves than roots. In contrast, the major O₂ exchange across leaves than roots of *Z. marina* can be accounted for by the opposite anatomical-morphological features. The larger aerenchymal volume and the smaller metabolic rates of *L. dortmanna* compared to *Z. marina* imply that turnover of O₂ is slower in the aerenchyma of *L. dortmanna* and O₂ fluctuations are more dampened following changes in irradiance. Also, O₂ accumulated in the aerenchyma can theoretically support dark respiration for a few hours in *L. dortmanna* but for only a few minutes in *Z. marina*. **Co**

676: D. Sarkar, S. K. Pandey, A. Chanemougasoundharam and K. C. Sud,. 2005. The role of calcium nutrition in potato (*Solanum tuberosum*) microplants in relation to minimal growth over prolonged storage in vitro. *Plant Cell Tissue and Organ Culture* 2(81): 221-227.

Abstract: The present study investigated the effect of different levels of Ca-[ext] (0.3, 3.0, 5.0, 7.0, 9.0 and 11.0 mM) on potato over minimal growth in vitro in relation to varying water stress levels and moisture vapour transmission regimes using ^{45}Ca as an isotopic tracer. Ca nutrition was substantially limited when the microplants were grown at enhanced water stress level (MS + 40 g l⁻¹ sucrose + 20 g l⁻¹ mannitol) under minimal growth. Ca-[ext] in excess of standard level (3.0 mM), however, resulted in a significant increase in Ca content in microplants. The differential Ca uptake in microplants in relation to water stress and moisture vapour transmission has been discussed in terms of transpiration stream and root pressure water flow under minimal growth. The study showed that poor microplant quality at standard Ca-[ext] over prolonged storage under minimal growth was due to limiting Ca nutrition, and this could be improved by using Ca-[ext]-enriched (5.0-7.0 mM) minimal growth medium for conservation of potato microplants. The role of high Ca-[ext] in reducing the phenotypic abnormalities such as vitrification, acidity, hyperhydricity, etc. in potato microplants over extended storage under minimal growth has also been discussed.

677: O. Sarnelle and R. A. Knapp,. 2005. Nutrient recycling by fish versus zooplankton grazing as drivers of the trophic cascade in alpine lakes. *Limnology and Oceanography* 6(50): 2032-2042.

Abstract: In a multilake experiment, we found little effect of nutrient excretion by zooplanktivorous fish, but a large effect of herbivorous zooplankton, on phytoplankton biomass and phosphorus (P) limitation. Whole-lake removal of fish from small alpine lakes resulted in little change in phytoplankton biomass or the intensity of P limitation during 1-6 postremoval years, over which herbivorous zooplankton did not change. In contrast, significant decreases in phytoplankton biomass and the intensity of phytoplankton P limitation were observed after *Daphnia* became reestablished. Fish removal also caused large increases in the biomass of benthic macroinvertebrates, but the timing of these increases suggested that P recycling by the benthos did not confound our attempt to measure the effects of P recycling by fish. Estimates of the amount of P recycled by fish and zooplankton and estimates of P demand by the phytoplankton also supported the conclusion that fish recycling was not a major source of P to the phytoplankton in these lakes. Relative to *Daphnia* grazing, fish recycling of P appears to be relatively unimportant as a driver of trophic cascades in these alpine lakes.

678: O. Sarnelle and A. E. Wilson,. 2005. Local adaptation of *Daphnia pulicaria* to toxic cyanobacteria. *Limnology and Oceanography* 5(50): 1565-1570.

Abstract: We quantified within-species variation in the tolerance of the large, lake-dwelling daphnid, *Daphnia pulicaria*, to toxic cyanobacteria in the diet. Juvenile growth rates on diets consisting of 100% *Ankistrodesmus falcatus* (a nutritious green alga) or 100% *Microcystis aeruginosa* (toxic) were compared for *D. pulicaria* clones isolated from lakes expected to have low and high levels of bloom-forming cyanobacteria during summer. Growth rates of clones isolated from high-nutrient lakes (range of total phosphorus, 31-235 $\mu\text{g L}^{-1}$) were higher, and showed less relative inhibition, on the cyanobacterial diet compared to clones isolated from low-nutrient lakes (range of total phosphorus, 9-13 $\mu\text{g L}^{-1}$). Our results suggest that *D. pulicaria* populations exposed to high cyanobacterial levels over long periods of time can adapt to being more tolerant of toxic cyanobacteria in the diet.

679: J. E. Saros, S. J. Interlandi, S. Doyle, T. J. Michel and C. E. Williamson,. 2005. Are the deep chlorophyll maxima in alpine lakes primarily induced by nutrient availability, not UV avoidance?. Arctic Antarctic and Alpine Research 4(37): 557-563.

Abstract: Alpine lakes are often highly transparent to ultraviolet (UV) wavelengths, which has led to the Suggestion that it deep chlorophyll maximum (DCM) results in these systems from UV avoidance by phytoplankton. However, ail alternative explanation is that the formation of the DCM is primarily driven by greater nutrient availability below the thermocline in these oligotrophic systems. We investigated the location of the chlorophyll maximum over spatial and temporal scales in it set of high-elevation lakes in the Beartooth Mountains (Montana/Wyoming). The position of the DCM was compared to a suite of physical and chemical variables across systems. Chlorophyll was strongly correlated to it suite of nitrogen variables, whereas correlations with UV parameters were not consistently observed. We also conducted an experiment with the natural phytoplankton assemblage from the DCM in Beartooth Lake; both UV exposure and nutrient additions were tested in it factorial design. The UV-exposed treatment and the control had the same final total phytoplankton biovolume, while the nutrient addition treatment had a final biovolume tell times as great. These results Suggest that, its in other oligotrophic aquatic systems, greater nutrient availability in the hypolimnion leads to the development of the DCM in alpine lakes.

680: J. E. Saros, T. J. Michel, S. J. Interlandi and A. P. Wolfe,. 2005. Resource requirements of *Asterionella formosa* and *Fragilaria crotonensis* in oligotrophic alpine lakes: implications for recent phytoplankton community reorganizations. *Canadian Journal of Fisheries and Aquatic Sciences* 7(62): 1681-1689.

Abstract: A widespread increase in the relative abundances of *Asterionella formosa* and *Fragilaria crotonensis* has occurred in oligotrophic alpine lakes across the western United States. Previous investigations have suggested that enhanced atmospheric nitrogen (N) deposition is driving these shifts in diatom community structure; however, little information is available on N requirements of these taxa. We examined the distributions of these two taxa in relation to a variety of physicochemical parameters in a suite of lakes situated in the Beartooth Mountain Range (Montana-Wyoming, USA). We also conducted a series of nutrient enrichment experiments to assess the response of these taxa to changes in N, phosphorus (P), and silica (Si) supply. The distributions of both taxa were positively correlated with C:P, N:P, and Si:P seston ratios, revealing that these taxa are abundant when P availability is very low and the supply of N and Si are moderate to high. In the enrichment experiments, both taxa responded strongly to N additions, whereas P or Si enrichment alone had no effect. While these two taxa are indicative of P enrichment in temperate lakes, our results indicate that in these oligotrophic alpine lakes, N enrichment is driving their recent increase.

681: A. Sasaki, A. Ito, J. Aizawa and T. Umita,. 2005. Influence of water and sediment quality on benthic biota in an acidified river. Water Research 12(39): 2517-2526.

Abstract: Water and sediment quality and benthic biota were investigated in all seasons during three years in the River Akagawa that receives the effluent from a mine drainage treatment plant at its upstream site. The upper reaches kept the low pH, the comparatively high concentrations of metals and a large amount of iron deposited on the riverbed. The predominant macroinvertebrates were *Protonemura* sp., *Capnidae*, *Nemoura* sp. and *Chironomidae* in the upper and middle reaches. In the lowest reaches, the community structure of the macroinvertebrate changed into *Chironomidae*, *Trichoptera* (*Hydropsychidae*) and *Ephemeroptera* (*Baetis* sp.) as the pH was increased. From the results of multivariate analyses, it was found that the restoration of pH and attached algae and the increase in the concentrations of nutrients and organic matter promoted the inhabitation of *Chironomidae* and *Hydropsychidae*, whereas the dissolved metals in the river water inhibited the inhabitation of these families. Moreover, the sedimentation of metals would cause a severe damage to the inhabitation of *Hydropsychidae* compared with that of *Chironomidae*. (c) 2005 Elsevier Ltd. All rights reserved.

682: J. D. Schade, J. R. Welter, E. Marti and N. B. Grimm,. 2005. Hydrologic exchange and N uptake by riparian vegetation in an arid-land stream. Journal of the North American Benthological Society 1(24): 19-28.

Abstract: Riparian zones can strongly influence the exchange of nutrients between streams and their watersheds. Most riparian studies have been done in mesic watersheds, which differ significantly from arid-land watersheds hydrologically. The goals of our work were to determine the strength and direction of hydrologic linkages between stream and riparian zone, and to estimate the extent of uptake of streamwater N by riparian trees in Sycamore Creek, a Sonoran Desert stream. Br and (NH₄-)-N-15 were added simultaneously to the surface stream to trace water and N from stream to riparian zone. Br concentrations in riparian wells installed downstream of the release point increased during the addition, demonstrating a strong hydrologic linkage from stream to riparian zone. Percentage stream water in wells increased in a downstream direction, Suggesting little or no input of water laterally from uplands or vertically from deep groundwater. Leaf and wood samples collected from willow trees downstream of the addition point became significantly labeled with N-15 during the addition, indicating uptake of streamwater N. Other tree species did not become labeled, most likely because they were located farther from the stream channel than the willows. Results from our study provide evidence of strong hydrologic linkage between stream and riparian zone and suggest that N demand by riparian vegetation is a potentially significant sink for streamwater N.

683: B. Schaffelke, J. Mellors and N. C. Duke,. 2005. Water quality in the Great Barrier Reef region: responses of mangrove, seagrass and macroalgal communities. Marine Pollution Bulletin 1-4(51): 279-296.

Abstract: Marine plants colonise several interconnected ecosystems in the Great Barrier Reef region including tidal wetlands, seagrass meadows and coral reefs. Water quality in some coastal areas is declining from human activities. Losses of mangrove and other tidal wetland communities are mostly the result of reclamation for coastal development of estuaries, e.g. for residential use, port infrastructure or marina development, and result in river bank destabilisation, deterioration of water clarity and loss of key coastal marine habitat. Coastal seagrass meadows are characterized by small ephemeral species. They are disturbed by increased turbidity after extreme flood events, but generally recover. There is no evidence of an overall seagrass decline or expansion. High nutrient and substrate availability and low grazing pressure on nearshore reefs have lead to changed benthic communities with high macroalgal abundance. Conservation and management of GBR macrophytes and their ecosystems is hampered by scarce ecological knowledge across macrophyte community types. (c) 2004 Elsevier Ltd. All rights reserved.

684: C. L. Schelske, E. F. Lowe, L. E. Battoe, M. Brenner, M. F. Coveney and W. F. Kenney,. 2005. Abrupt biological response to hydrologic and land-use changes in Lake Apopka, Florida, USA. *Ambio* 3(34): 192-198.

Abstract: Lake Apopka is a shallow, hypereutrophic lake in north-central Florida that experienced an abrupt shift in primary producer community structure (PPCS) in 1947. The PPCS shift was so abrupt anecdotal accounts report that dominant, submersed aquatic vegetation was uprooted by a hurricane in 1947 and replaced by phytoplankton within weeks. Here we propose two hypotheses to explain the sudden shift to phytoplankton. First, hydrologic modification of the drainage basin in the late 1800s lowered the lake level ca. 1.0 m, allowing the ecosystem to accommodate moderate, anthropogenic nutrient enrichment through enhanced production in the macrophyte community. Second, additional hydrologic changes and large-scale agricultural development of floodplain wetlands began in 1942 and altered the pattern and scale of phosphorus loading to the lake that triggered the rapid shift to phytoplankton dominance in 1947. Historic land-use changes and paleolimnological data on biological

685: D. E. Schindler, P. R. Leavitt, C. S. Brock, S. P. Johnson and P. D. Quay,. 2005. Marine-derived nutrients, commercial fisheries, and production of salmon and lake algae in Alaska. *Ecology* 12(86): 3225-3231.

Abstract: For decades ecologists have recognized the potential importance of marine-derived nutrients (MDN) deposited in freshwater ecosystems by spawning anadromous salmon. Previous studies have shown that some MDN are retained in freshwater ecosystems. A popular hypothesis linking MDN to salmon population productivity posits that MDN provided by post-spawning mortality of salmon are critical for salmon population dynamics because they enhance prey populations in the freshwater ecosystems used as nursery habitats. We tested this hypothesis by reconstructing historical sockeye salmon populations for the last 300 years in Bristol Bay, Alaska. Stable nitrogen isotope chronologies in lake sediments and sockeye catch and escapement histories show that commercial fisheries intercepted about two-thirds of MDN bound for freshwater spawning grounds since about 1900. Reconstruction of lake algal production using, fossil pigments shows that this loss of MDN has reduced lake algal productivity to about one-third of its level before commercial fishing. However, contrary to expectation, recent sockeye population sizes (sum of spawning escapement and fishery catch) in the last century were equivalent to those before the advent of commercial fishing. These data demonstrate that the MDN subsidy is important for the productivity of coastal lakes but that some sockeye salmon populations are limited by other features of ecosystems such as the amount of suitable spawning habitat.

686: D. Scholefield, T. Le Goff, J. Braven, L. Ebdon, T. Long and M. Butler,. 2005. Concerted diurnal patterns in riverine nutrient concentrations and physical conditions. Science of the Total Environment 1-3(344): 201-210.

Abstract: Several long-term sets of hourly nitrate. concentration data were obtained through deployment of a nitrate sensor in an upper reach of the River Taw, a small moorland-fed river in the South West of the UK. Examination of the data. obtained during periods of low flow and the absence of rainfall in the catchment revealed the presence of marked diurnal cycles, which were in conceit and negatively correlated with diurnal cycles in water temperature. After verifying that these cycles were natural, an intensive 90-h field monitoring campaign was conducted, in which river water was sampled hourly and immediately analysed in the laboratory for molybdate-reactive phosphorus (P), nitrate, nitrite' ammonium,, and. pH. Coincident measurements of water temperature, river discharge and solar energy were also taken at, or close to, the site. All measurement's revealed diurnal patterns and all patterns were concerted. The cycles of P, nitrate, nitrite, and discharge had two maxima and minima per 24 h, while. the cycle of water temperature had one, with a maximum at 20.00 and a minimum at 08.00. The amplitudes of the cycles of P and nitrate were each about 30% of the mean values, while the amplitude,of the nitrite cycle was as great as 80% of the mean value on occasions. Both biological and physical mechanisms for the cycling could operate through water temperature and/or incident radiation to account for the observed phenomenon, but there remains, uncertainty of which is the more important. The observations have important implications for both the accuracy of pollution assessment in rivers and the physiological rhythms of riverine organisms. (c) 2005 Elsevier B.V. All rights reserved.

687: M. Scholz,. 2005. Hydraulics, water quality and vegetation characteristics of groundwater-fed open ditches. Water and Environment Journal 1(19): 8-16.

Abstract: A novel peatland management strategy to utilise the high nutrient-retention potential of degenerated peatlands has been implemented in Northern Germany. The effect of raised water levels and extensive land-use management on hydraulic properties, water quality and vegetation characteristics of heavily vegetated and groundwater-fed open ditches, was investigated at the River Eider Valley - a notionally important wetland case study. A better understanding of the effect of vegetation on the temporal flow patterns and the hydraulic retention times is of high scientific interest, especially for improving nutrient standards in lowland rivers. Within-ditch vegetation and other hydraulic obstructions, including accumulated silt and organic debris, increase the hydraulic retention time and lead to an improvement of the water quality along the open ditch. Lower parts of the open ditches were flooded by the River Eider, due to the absence of a mowing scheme during late summer.

688: J. D. Schomberg, G. Host, L. B. Johnson and C. Richards,. 2005. Evaluating the influence of landform, surficial geology, and land use on streams using hydrologic simulation modeling. *Aquatic Sciences* 4(67): 528-540.

Abstract: Land use and geology are two important extrinsic factors regulating the structure and function of stream ecosystems. The interactions among these two landscape-scale factors on streams are, however, poorly understood. To determine the effects of these factors on stream flow, sediment, and nutrients, we analyzed 72 ungaged, agricultural watersheds in Minnesota and Michigan using the hydrologic model SWAT (the Soil Water Assessment Tool). The watersheds differed in surficial geology (landform) and land use, but were of similar size, with streams ranging from 2(nd) to 3(rd) stop order. SWAT was developed for use on ungaged basins, but to improve the outputs we used US Geological Survey discharge data from sites near our study watersheds for calibration. We found seasonal and annual differences in flow and nutrient and sediment loading across different land forms and land use types. Watersheds with greater amounts of row-crop agriculture and watersheds dominated by morainal landforms were associated with more sediment and nutrients and greater flow volumes and flashiness. Multivariate analyses identified at least nine landscape variables which were related to nutrients, sediment, and flow, although the responses varied between Minnesota and Michigan. Results also indicated the possibility of a threshold effect for row crop agricultural. Increases in this land use had little additional effect on nutrients or flow when percent row crop exceeds the threshold value. At moderate to high levels of row crop agriculture, watersheds appeared to show greater sensitivity to differences in landform.

689: J. E. Schoonover, K. W. J. Williard, J. J. Zaczek, J. C. Mangun and A. D. Carver,. 2005. Nutrient attenuation in agricultural surface runoff by riparian buffer zones in southern Illinois, USA. *Agroforestry Systems* 2(64): 169-180.

Abstract: Nutrients in overland flow from agricultural areas are a common cause of stream and lake water quality impairment. One method of reducing excess nutrient runoff from non-point sources is to restore or enhance existing riparian areas as vegetative buffers. A field scale study was conducted to assess the ability of remnant giant cane (*Arundinaria gigantea* (Walt.) Muhl.) and forest riparian buffer zones to attenuate nutrients in agricultural surface runoff from natural precipitation events. Two adjacent, 10.0 m wide riparian buffers were instrumented with 16 overland flow collectors to monitor surface runoff for nitrate, ammonium, and orthophosphate. Measurements were taken at 3.3 m increments within each buffer. The forest buffer significantly reduced incoming dissolved nitrate-N, dissolved ammonium-N, total ammonium-N, and total orthophosphate masses in surface runoff by 97, 74, 68, and 78 , respectively within the 10.0 m riparian buffer. Nutrient reductions within the cane buffer were 100 for all three nutrients due to relatively high infiltration rates. Significant reductions of total ammonium- N and total orthophosphate were detected by 3.3 m in the cane buffer and at 6.6 m in the forest buffer. Results suggest that both giant cane and forest vegetation are good candidates to incorporate into riparian buffer restoration designs for southern Illinois as well as in other regions within their native range with similar climatic and physiographic conditions.

690: H. K. Schroder, H. E. Andersen and K. Kiehl,. 2005. Rejecting the mean: Estimating the response of fen plant species to environmental factors by non-linear quantile regression. *Journal of Vegetation Science* 4(16): 373-382.

Abstract: Question: Is quantile regression an appropriate statistical approach to estimate the response of fen species to single environmental factors? Background: Data sets in vegetation field studies are often characterized by a large number of zeros and they are generally incomplete in respect to the factors which possibly influence plant species distribution. Thus, it is problematic to relate plant species abundance to single environmental factors by the ordinary least squares regression technique of the conditional mean. Location: Riparian herbaceous fen in central Jutland (Denmark). Methods: Semi-parametric quantile regression was used to estimate the response of 18 plant species to six environmental factors, 95% regression quantiles were chosen to reduce the impact of multiple unmeasured factors on the regression analyses. Results of 95% quantile regression and ordinary least squares regression were compared. Results: The standard regression of the conditional mean underestimated the rates of change of species cover due to the selected factor in comparison to 95% regression quantiles. The fitted response curves indicated a general broad tolerance of the studied fen species to different flooding durations but a narrower range concerning groundwater amplitude. The cover of all species was related to soil exchangeable phosphate and base-richness. A relationship between soil exchangeable potassium and species cover was only found for 11 species. Conclusion: Considering the characteristics of data sets in vegetation science, non-linear quantile regression is a useful method for gradient analyses.

691: H. M. Schulz, A. Bechtel and R. F. Sachsenhofer,. 2005. The birth of the Paratethys during the Early Oligocene: From Tethys to an ancient Black Sea analogue?. *Global and Planetary Change* 3-4(49): 163-176.

Abstract: Deeper water black shales, overlain by coccolith-bearing marlstones representing the incipient Paratethys (example: Early Oligocene; Austrian Molasse Basin), have sedimentary characteristics similar to those of the Holocene Black Sea since 7500 years bp. Framboid pyrite size, biomarker and C-N-isotope data additionally indicate that isolation of the Paratethys resulted in Black Sea-type characteristics during nannoplankton zone NP 23. In contrast to the estuarine circulation across the Bosphorus since 7500 years bp, marine conditions prevailed in the incipient Paratethys during NP 21/22. Nitrogen was fixed and low organic carbon accumulation rates prevailed. In both settings a vertical density water-column stratification was accompanied by photic zone anoxia, and by anaerobic methane oxidation in the Paratethys. In the Paratethys increased run off, starting in NP 22, led to estuarine circulation during NP 23. During this period cyclic blooms of calcareous nannoplankton resulted in high calcite accumulation rates which diluted the coeval clay sedimentation. Similar sedimentary features in the Black Sea and the Paratethys during the earliest Oligocene are result from opposite paleoceanographic developments, both leading to estuarine circulation patterns. In the Black Sea, permanent photic zone anoxic conditions were established 7500 years bp in response to the first invasion of saline Mediterranean waters into the former freshwater lake. In contrast, brackish surface water in the Paratethys resulted from nutrient-rich freshwater diluting the marine water body. (c) 2005 Elsevier B.V. All rights reserved.

692: M. Schulz and B. Gucker,. 2005. Macrophytes increase spatial patchiness of fluvial sedimentary records and effect temporal particulate nutrient storage. Aquatic Geochemistry 1(11): 89-107.

Abstract: Previous studies on fluvial substrates often lack high spatial resolutions for sedimentary characteristics in relation to biotic structures, such as the aquatic vegetation. A sedimentological survey was therefore performed in a section of the Lower River Spree, in order to analyse the riverbed substrates for small-scale changes in grain size and nutrient parameters, indicative of the impact of submerged macrophytes on sediment composition and particulate nutrient retention. We cored the riverine substrate using a systematic grid of 3 m width and 10 m length, and mapped the aquatic vegetation. Sedimentary records were characterised according to facies, grain size and carbon, nitrogen and phosphorus analyses. Facies description and statistics for the sedimentary parameters provided evidence for a significant riverbed patchiness, which was related to the occurrence of macrophytes. In vegetated areas, stable fine sands were covered by an organic layer, a facies significantly different from that of non-vegetated areas, which comprised coarse sandy to gravely sediments. Distinct facies alternated in short distances across the river, partly due to the effects of macrophytes on the flow regime. Mean particulate nutrient concentrations were two orders of magnitude higher in vegetated (TOC 5.16, TN: 0.50 and TP: 0.24 of dry matter (DM)) than in non-vegetated sediments (TOC: 0.27, TN: 0.03 and TP: 0.06 DM). Therefore, the organic layer contained nearly the entire nutrient pool of the surface sediments, and thus significantly contributed to a temporary retention of particulate nutrients (at maximum 80 g nitrogen m⁻² month⁻¹) and 38 g phosphorus m⁻² month⁻¹) during vegetation period. Submerged macrophytes were found to effect a considerable spatial heterogeneity in riverbeds, and to cause high seasonality in particulate nutrient retention, a result amending previous geological facies analyses.

693: M. J. Schulz and M. N. Thormann,. 2005. Functional and taxonomic diversity of saprobic filamentous fungi from *Typha latifolia* from central Alberta, Canada. *Wetlands* 3(25): 675-684.

Abstract: The fate of vascular plant detritus and the microbial communities and processes involved during the decomposition of litter are important aspects in elucidating energy flow and nutrient cycling in wetlands. Therefore, we collected and identified conspicuous fungal sporocarps in situ and isolated microfungi from living and dead *Typha latifolia* (cattail) leaf tissues. Cattail is a dominant plant species in southern boreal and temperate marshes and abundant in the Low Boreal Mixedwood ecoregion in central Alberta, Canada. Following two successive field collections in early and late summer 2001, 45 different fungal taxa were identified. There were 26 ascomycetes, five basidiomycetes, and 14 anamorphic taxa, most of them with putative ascomycetous affinities. Twenty-four taxa represented new records for *T. latifolia*, 12 were new to Canada, and seven were new to North America. Also, five taxa were new reports outside of the country of the type locality. To elucidate their roles in the decomposition of *T. latifolia* leaves, we examined 33 taxa for their ability to use cellulose, gelatin, starch, tannic acid, and lignin as carbon sources (based on calorimetric tests), as well as to cause mass losses of sterile *T. latifolia* leaves. The number of fungi using cellulose and gelatin as carbon sources was significantly greater than those using starch, tannic acid, or lignin. Mass losses of *T. latifolia* leaf tissues by ascomycetes and basidiomycetes ranged from 1.3 to 54.6% and -0.4 to 52.1%, respectively. There was a positive relationship between mass loss of *T. latifolia* leaves and cellulose degradation but not between mass loss and any of the other carbon sources. Our data showed that a taxonomically diverse suite of fungi effectively degrades this plant material; however, additional studies examining the decomposer communities of other dominant wetland plants are necessary to gain a better understanding of nutrient and energy dynamics in wetlands at the ecosystem level.

694: R. Schumann, A. Hammer, S. Gors and H. Schubert,. 2005. Winter and spring phytoplankton composition and production in a shallow eutrophic Baltic lagoon. *Estuarine Coastal and Shelf Science* 1-2(62): 169-181.

Abstract: Taxonomic composition and productivity of winter and spring phytoplankton in a eutrophic estuary have been investigated in order to elucidate the carbon flux under conditions of limitation by physical factors - light and temperature. In spite of the important differences in nutrients, solar radiation and water temperature between winter and spring season. mean concentrations of particulate organic carbon were equal to 13.2 and 13.0 mgC l⁻¹, respectively. Chlorophyll a averaged at 79 µgChl l⁻¹ in winter. that is 69% of spring. Although community respiration accounted for only 6-26% of light saturated photosynthesis, integrated net primary production of the 1.2 m deep water column was negative until April. High attenuation of the water body ($K = 2.9 \text{ m}^{-1}$) lead to a negative carbon balance (net heterotrophy) below 35 cm for all sampling dates. Thus, the high winter POC and phytoplankton values can only originate from summer or autumn primary production. This assumption was supported by a carbon loss rate of just 3% of total organic carbon per day for the whole water column. The composition of phytoplankton was very constant through both seasons: 39% Chlorophyceae, 33% Cyanobacteria and 25% Bacillariophyceae. As expected. phytoplankton was low light acclimated, having high α values (slope of light limited photosynthesis), but moderate maximum photosynthesis rates at saturating irradiances, which were heavily affected by temperature. Calculation of net carbon flux yet showed net heterotrophy of the Bodden waters in winter and early spring were caused by external physical limitation (low surface irradiance and low temperature) in combination with a high light attenuation of the water body. (C) 2004 Elsevier Ltd. All rights reserved.

695: K. D. Schuyt,. 2005. Economic consequences of wetland degradation for local populations in Africa. Ecological Economics 2(53): 177-190.

Abstract: Wetlands in Africa are an important source of water and nutrients necessary for biological productivity and often sheer survival of people. Sustainable management of wetlands is therefore critical to the long-term health, safety and welfare of many African communities. Despite their importance, wetlands are being modified or reclaimed, often driven by economic and financial motives. Wetlands, however, contain numerous goods and services that have an economic value not only to local populations but also to people living outside the periphery of the wetland. These values can be made more explicit through economic valuation studies. The goal of this paper is to highlight the importance of wetlands for local populations in Africa and the economic consequences for these people if wetlands are degraded. After explaining the characteristics, distribution and status of wetlands in Africa, the economic values of African wetlands will be highlighted through a discussion of several economic valuation studies carried out for different African wetlands. Recommendations are made as to how economic values may be used in decision-making on wetlands to allow more sustainable management of African wetlands. (c) 2004 Elsevier B.V. All rights reserved.

696: D. Schwarz, R. Grosch, W. Gross and S. Hoffmann-Hergarten,. 2005. Water quality assessment of different reservoir types in relation to nutrient solution use in hydroponics. *Agricultural Water Management* 2(71): 145-166.

Abstract: Hydroponics requires good quality water. For this purpose, water quality is based on concentrations of specific ions and phytotoxic substances as well as the presence of organisms and substances that can clog irrigation systems. Here, four irrigation reservoirs. i.e. two rainwater ponds, a peat ditch. and a natural lake, were analyzed to determine whether or not they conform to water quality guidelines. Based on our data, the four reservoirs could be divided into two categories in respect to their water quality. The two rainwater ponds belong to the category characterized by low input of ionic strength (480 $\mu\text{mol m}^{-1}$), low concentration of unwanted ions. such as SO_4^{2-} (63 $\mu\text{mol l}^{-1}$) and Zn^{2+} (3.9 $\mu\text{mol l}^{-1}$), a moderate bacterial population ($\lg 4.9 \text{ CFU m}^{-1}$), and moderate algae density ($\lg 6.0 \text{ cells ml}^{-1}$). The rainwater ponds were found to contain a good diversity in bacteria (45 species from 25 genera), and a poor diversity of algae (15 species from 4 groups). The other category, to which the peat ditch and natural lake belong, is characterized by a high ionic strength (12,200 $\mu\text{mol l}^{-1}$), high concentrations of alkali ions (Mg^{2+} : 890 $\mu\text{mol l}^{-1}$; Ca^{2+} : 3.260 $\mu\text{mol l}^{-1}$; K^{+} : 470 $\mu\text{mol l}^{-1}$). a moderate bacterial ($\lg 4.7 \text{ CFU ml}^{-1}$), but low algae density ($\lg 5.0 \text{ cells ml}^{-1}$). In comparison to the first category, the diversity of the bacteria was poor (seven species from three genera). However, in sharp contrast was the rich algal community detected in the peat ditch, for which 32 species from six groups were found, whereas in the natural lake, only one group with seven species was identified. In all reservoirs, species of the genera *Paenibacillus* and *Bacillus* were detected, and small green algae, e.g. *Scenedesmus* spp., also dominated in each case. Overall, the bacterial and algal densities showed wide fluctuations between water sources, and neither caused filter clogging as observed in investigations of others. The quality of the rainwater investigat

697: L. Schwendenmann and E. Veldkamp,. 2005. The role of dissolved organic carbon, dissolved organic nitrogen, and dissolved inorganic nitrogen in a tropical wet forest ecosystem. *Ecosystems* 4(8): 339-351.

Abstract: Although tropical wet forests play an important role in the global carbon (C) and nitrogen (N) cycles, little is known about the origin, composition, and fate of dissolved organic C (DOC) and N (DON) in these ecosystems. We quantified and characterized fluxes of DOC, DON, and dissolved inorganic N (DIN) in throughfall, litter leachate, and soil solution of an old-growth tropical wet forest to assess their contribution to C stabilization (DOC) and to N export (DON and DIN) from this ecosystem. We found that the forest canopy was a major source of DOC (232 kg C ha⁻¹ y⁻¹). Dissolved organic C fluxes decreased with soil depth from 277 kg C ha⁻¹ y⁻¹ below the litter layer to around 50 kg C kg C ha⁻¹ y⁻¹ between 0.75 and 3.5m depth. Laboratory experiments to quantify biodegradable DOC and DON and to estimate the DOC sorption capacity of the soil, combined with chemical analyses of DOC, revealed that sorption was the dominant process controlling the observed DOC profiles in the soil. This sorption of DOC by the soil matrix has probably led to large soil organic C stores, especially below the rooting zone. Dissolved N fluxes in all strata were dominated by mineral N (mainly NO₃⁻). The dominance of NO₃⁻ relative to the total amount nitrate of N leaching from the soil shows that NO₃⁻ is dominant not only in forest ecosystems receiving large anthropogenic nitrogen inputs but also in this old-growth forest ecosystem, which is not N-limited.

698: J. T. Scott, R. D. Doyle and C. T. Filstrup,. 2005. Periphyton nutrient limitation and nitrogen fixation potential along a wetland nutrient-depletion gradient. *Wetlands* 2(25): 439-448.

Abstract: While intensified nutrient limitation of periphyton has been reported along wetland nutrient-depletion gradients, changes to the specific nutrient that limits periphyton growth are not documented. In this study, we used artificial nutrient-diffusing substrata to determine nutrient limitation status of periphyton along a nitrogen- and phosphorus-depletion gradient in a freshwater marsh during the growing season of 2003. We also characterized water-column nutrient content, N:P ratio of dissolved nutrients, and periphytic N₂ fixation potential along the gradient. Dissolved inorganic nitrogen concentrations consistently decreased (60% - 95%) from inflow to outflow during all bioassays, while soluble reactive phosphorus concentrations decreased during the April (49%) and September (39%) bioassays but increased in the July bioassay (51%). Unequal N and P retention resulted in a general decrease in DIN:SRP mass ratio from 20.2 +/- 5.0 to 3.8 +/- 1.6 between inflow and outflow, respectively. Periphyton at the wetland inflow never responded to N additions alone, while periphyton at the outflow always responded to N enrichment. Periphyton at the inflow were either not limited by nutrients (September) or co-limited by N+P (April and July). At the outflow, periphyton were either N-limited (April and September) or strongly co-limited by N+P (July). A significant increase in N₂ fixation potential ($p < 0.05$) from inflow to outflow locations was noted for all measured events. Our results suggest that, in addition to the severity of nutrient limitation, some wetlands may display spatial heterogeneity in the specific nutrient that limits periphyton growth. Further, these shifts influence the structure and function of wetland periphyton assemblages.

699: B. C. Sekadende, T. J. Lyimo and R. Kurmayer,. 2005. Microcystin production by cyanobacteria in the Mwanza Gulf (Lake Victoria, Tanzania). *Hydrobiologia* (543): 299-304.

Abstract: In order to investigate the potential for microcystin (MC) production by cyanobacteria in the Mwanza Gulf (Lake Victoria, Tanzania), nutrients, phytoplankton and microcystins were sampled inshore (3 m depth) and offshore (18 m depth) from May to August 2002. Significant differences in soluble reactive phosphorus (SRP) and nitrate concentrations between offshore and inshore indicated eutrophication via terrestrial runoff. Though the concentrations of SRP and nitrate ranged between 36-127 and 35-726 $\mu\text{g l}^{-1}$ each, the phytoplankton biovolume was generally low. The phytoplankton community was dominated by diatoms (*Nitzschia acicularis*), a number of cyanobacterial species (*Aphanocapsa* sp., *Anabaena* sp., *Planktolyngbya* spp., *Microcystis* sp.) and cryptomonads. The water column was completely mixed and *Nitzschia* peaked in abundance during July. All cyanobacteria were low in abundance during the entire study period (0.1-1.6 $\text{mm}^3 \text{l}^{-1}$). Microcystins were analysed using high performance liquid chromatography coupled with diode array detection High Performance Liquid Chromatography with Diode Array Detection (HPLC-DAD) and in most samples no microcystins were detected. The highest concentration of [Asp(3)]-MC-RR was found in open water at the surface on July 2nd, 2002 (1 $\mu\text{g l}^{-1}$). MC concentrations did not pose a potential health risk in the Mwanza Gulf during the study period, however, it is possible that the period of higher cyanobacterial biovolumes has been missed during the sampling period of this study.

700: U. Selig and K. Fischer,. 2005. Phosphorus accumulation in lake sediments during the last 14,000 years: Description by fractionation techniques and X-ray micro-analysis. Journal of Freshwater Ecology 2(20): 347-359.

Abstract: Surface sediment and deep cores from three lakes in northern Germany, representing deposition during the last 4,000 to 14,000 years, were analyzed. Concentrations of organic carbon, phosphorus, iron, manganese, and aluminium were determined to reflect nutrient accumulation. Sequential chemical extraction and scanning electron microscopy with X-ray micro-analysis enabled exact determination of phosphorus binding in the sediment layers. The highest phosphorus concentrations recorded in deeper, anoxic sediments. The dominance of major P-forms varied in the different horizons in the sediment profile and also among the three lakes. No conformity was found among these three lakes and the nutrient and metal concentration.

701: R. G. Semkin, G. Mierle and R. J. Neureuther,. 2005. Hydrochemistry and mercury cycling in a High Arctic watershed. Science of the Total Environment 1-3(342): 199-221.

Abstract: Mass budgets for total mercury, major ions and nutrients were calculated for Amituk Lake, located on Cornwallis Island, Nunavut, Canada. Total mercury in two distinct snowpacks averaged 1.25 and 4.21 ng L⁻¹; the discharge-weighted concentration of influent streams averaged 0.76 ng L⁻¹. The recent and pre-industrial Hg-T fluxes in atmospheric deposition to the catchment were estimated to be 0.57 and 0.23 $\mu\text{g m}^{-2}$ but through retention within the catchment and/or re-volatilization from the melting snowpack, these decreased by 69% in the lake inflow. The spring freshet was the prime conduit for transporting Hg-T into Amituk Lake. Because of limited mixing of surface runoff with the lake water column during snowmelt, 59% of the Hg-T input was directly discharged through the outflow, 16% entered the lake water column where concentrations increased from 0.23 to 0.33 ng L⁻¹ from June to August and 25% was deposited to the bottom sediments producing a sediment Hg-T flux of 3.1 $\mu\text{g m}^{-2}$ © 2005 Elsevier B.V. All rights reserved.

702: M. Serena and V. Pettigrove,. 2005. Relationship of sediment toxicants and water quality to the distribution of platypus populations in urban streams. Journal of the North American Benthological Society 3(24): 679-689.

Abstract: Live-trapping surveys recorded populations of the platypus, *Ornithorhynchus anatinus*, in 73% of 45 reaches in the Dandenong Creek and Werribee, Yarra, Maribyrnong, Bunyip, and Lang Lang River catchments near Melbourne, Victoria; however, many populations occurred at low density. Our study investigated the relationship between population status and water and sediment quality along 28 stream reaches, including 17 reaches supporting a population of *O. anatinus* and 11 reaches lacking a resident population. Stream attributes included surface water-quality variables (summer concentrations of dissolved O₂, total P [TP], NO_x, total Kjeldahl N [TKN], dissolved organic N, NH₄-N, and 50(th), 75(th), and 90(th) percentiles of suspended solids [SS]), concentrations of sediment toxicants (Zn, Pb, Cd, As, Cr, Cu, Hg, Ni), extent of catchment urbanization (as indicated by % imperviousness), and daily discharge. Reaches supporting a medium-density population (mean number of ≥ 0.5 adults or subadults captured per pair of nets set overnight) were characterized by significantly lower concentrations of streamwater TP, TKN, and SS (90(th) percentile), significantly lower Cd, Pb, and Zn in sediments, and significantly lower catchment imperviousness than reaches lacking resident animals. The maximum imperviousness associated with a population of *O. anatinus* was 11%, suggesting that this species is sensitive to urban-related change. Capture rate was not significantly correlated with median summer discharge, but was inversely correlated with streamwater TP and TKN. Further studies are needed to determine if pollutants may limit urban *O. anatinus* populations through direct toxicity or indirectly by pollutants reducing their benthic macroinvertebrate food resource.

703: S. Sestanovic, M. Solic, N. Krstulovic, D. Segvic and I. Ciglenceki,. 2005. Vertical structure of microbial community in an eutrophic meromictic Saline Lake. Fresenius Environmental Bulletin 8(14): 668-675.

Abstract: Vertical variations of autotrophic picoplankton, heterotrophic bacteria, pigmented (PNAN) and non-pigmented (HNAN) nanoflagellates, and their activity were studied in a small-eutrophicated meromictic saline lake (eastern Adriatic Sea). The variations of heterotrophic filamentous cells exhibited similar patterns to that of HNAN, pointing out the ecological importance of the elongated cells. High concentrations of DOC and SAS in the chemocline stimulated the heterotrophic bacteria to increase their abundance and activity. Bacterial community in the chemocline layer was represented by higher proportions of high DNA-content cells, but with a rather low bacterial production per cell. In the surface layers, bacteria were less abundant, but had a very high production per cell. The large differences in the percentage of active cells between aerobic and anaerobic layers imply the possibility that different mechanisms structure the bacterial communities in these layers.

704: A. Sferratore, G. Billen, J. Garnier and S. Thery,. 2005. Modeling nutrient (N, P, Si) budget in the Seine watershed: Application of the Riverstrahler model using data from local to global scale resolution. Global Biogeochemical Cycles 4(19):

Abstract: [1] The deterministic Riverstrahler model that simulates nutrient transfer from landbased sources to the sea through the drainage network has been successfully applied to a number of large watersheds ranging from 20,000 to 800,000 km². In order to assess the feasibility of upscaling such a model in view of its worldwide application based on global databases of hydrology, climate, population, land use, and lithology, a sensitivity analysis has been carried out. The response of the model to differing scales of input data, both high-resolution local data and low-resolution global data, is examined, applying the model to the well-documented Seine River basin. The results show that the evaluation of the overall annual fluxes of nutrients delivered at the outlet of a basin can be correctly predicted even from low resolution input data, provided that (1) the total discharge and seasonal hydrological regime are correctly simulated; (2) the drainage network description does not neglect tributaries that drain more than approximately 4000 km² watershed area; and (3) the total point sources of nutrients as well as their distribution between the different stream orders are estimated (phosphorus being the most sensitive among the considered nutrients to point sources distribution). Diffuse sources of nutrients can be assessed from low-resolution land use and lithological data. As a result of this study, the capacity of statistical/empirical formulas to assess annual fluxes of nutrient delivery appears comparable to that of deterministic drainage network models, but the latter are particularly suited to predict seasonal variations of riverine nutrient delivery and its elemental ratios.

705: M. Sharifi and M. Ghafori,. 2005. Effects of added nutrients on dry mass, AFDM, chlorophyll a and biovolume of periphyton algae in artificial streams. Iranian Journal of Science and Technology Transaction a-Science A1(29): 29-38.

Abstract: We studied the role of nutrients on various aspects of the periphyton community in artificial streams. Dry mass, ash-free dry mass, chlorophyll a and biovolume of the periphyton community were measured under 3 different nutrient regimes, including one from natural streams as a control and two which were enriched with N and N+P. Results of this experiment indicate that the standing crop of the periphyton community in the artificial streams increased with increasing the amount of the nutrient. Also, we showed that diatom diversity was affected by increasing the nutrients concentrations. The periphyton dry mass following 23 days of experiment was 0.96, 1.4 and 3.52 mg/cm² for control, N and N+P artificial streams, respectively. Ash-free dry mass (AFDM) of the periphyton community for control, N and N+P treatment were 0.2, 0.98 and 1.04 mg/cm², respectively. The experiment also depicted that the periphyton chlorophyll a increased with increasing the nutrient content in the artificial streams (for control, N and N+P enriched artificial streams, the chlorophyll a content was 2.11, 2.20 and 6.36 mg/m² respectively). The total diatom biovolume as a measure of standing crop in the periphyton community was 6x10⁶, 8x10⁶ and 48x10⁶ μ m³/cm² for control, N and N+P enriched artificial streams, respectively. Results of this experiment demonstrated that adding nutrient increases the relative abundance of Navicula, Achnanthes, Nitzschia and Cocconies in artificial streams.

706: A. Shilton, S. Pratt, A. Drizo, B. Mahmood, S. Banker, L. Billings, S. Glenny and D. Luo,. 2005. 'Active' filters for upgrading phosphorus removal from pond systems. Water Science and Technology 12(51): 111-116.

Abstract: This paper investigates limestone and iron slag filters as an upgrade option for phosphorus removal from wastewater treatment ponds. A review of 'active' filter technology and the results from laboratory and field research using packed columns of the different media is presented. It is shown that both limestone and iron slag can remove phosphorus but highlights that different types of limestone give markedly different performance. Filter performance appears to be improved by increasing temperature and by the presence of algae, presumably because of its tendency to elevate pH. Performance is related to hydraulic retention time (HRT), but this relationship is not linear, particularly at low HRTs. Importantly for future research, the results from field-testing with pond effluent show significant differences compared to those obtained when using a synthetic feed in the laboratory. For the iron slag filter, higher performance was observed in the field (72% in field vs. 27% in laboratory, at a 12 hour-HRT), while the opposite was observed for the limestone (64% in laboratory vs. 18% in field, at a 12-hour HRT).

707: M. Shimoda,. 2005. Emerged shore vegetation of irrigation ponds in western Japan. *Phytocoenologia* 2-3(35): 305-325.

Abstract: Artificial ponds were constructed for rice field irrigation all over Japan. Particularly, numerous ponds were constructed in the Seto Inland Sea District of western Japan because of the area's limited rainfall and the difficulty of taking water from rivers. Pond water level is low during the rice-growing season, and reaches the lowest level in the late summer and early autumn. In ponds with large water level fluctuations the vegetation is composed mainly of small annuals that develop on the emerged shores and bottoms at low water levels, or only in drought years. In ponds surrounded by cultivated lands, bare shores and bottoms are colonized by weedy annuals, which are also common in artificial sites. Emerged shore communities of ponds surrounded by woods were described as the *Deinostemato-Eriocaulum hondoensis* and the *Eriocaulion hondoensis*. The *Eriocaulion* communities are characterized by annuals such as *Eriocaulon* spp. and *Deinostema violaceum*, which are non-aquatic plants, but very tolerant to submersion. Constituent species also contain amphibious perennials such as *Myriophyllum ussuriense* and *Scirpus lineolatus*. Some terrestrial wetland plants including *Utricularia* are also members of these communities. The *Eriocaulion* communities occupy an intermediate position between aquatic and terrestrial ones in space and in species composition. The optimal habitats of the alliance are nutrient-poor ponds with gently-sloping shores and water level fluctuations. Some of the *Eriocaulion* constituent species are threatened in Japan. Local communities have carried out the maintenance and management of ponds for hundreds of years. Recently traditional communal activities are getting difficult because of rapid social changes such as farm depopulation, advanced age of farmers, and urbanization. The rural changes have produced several negative effects on the pond environment and vegetation.

708: O. Silapajarn and C. E. Boyd,. 2005. Effects of channel catfish farming on water quality and flow in an Alabama stream. Reviews in Fisheries Science 2(13): 109-140.

Abstract: Big Prairie Creek, Hate County, Alabama, receives overflow and draining effluent from about 5,000 ha of channel catfish, *Ictalurus punctatus*, ponds. Tributary streams receiving effluent directly from ponds were higher in concentrations of suspended solids, turbidity nutrients, and biochemical oxygen demand than Big Prairie Creek, and these variables increased from upstream to downstream stations in Big Prairie Creek. Nevertheless, water quality in Big Prairie Creek was good at the last downstream station, and concentrations Of variables did not exceed water quality criteria required by the stream classification system. Six reference streams in the same eco-region as Big Prairie Creek, but without channel catfish farms on their watersheds, had concentrations of most water quality variables similar to those found in the downstream reaches of Big Prairie Creek. Findings suggest that channel catfish farming has not had a great impact oil water quality in Big Prairie Creek. Although catfish farms occupy 7.5% of the area of the Big Prairie Creek watershed, stream flow has not decreased as a result of impoundment of runoff by ponds. Use of best management practices (BMPs) to reduce the volume and improve the quality of pond overflow and draining effluents should be adequate to prevent negative downstream water quality impacts in catfish farming areas of Alabama.

709: M. Silberbush, J. Ben-Asher and J. E. Ephrath,. 2005. A model for nutrient and water flow and their uptake by plants grown in a soilless culture. Plant and Soil 1-2(271): 309-319.

Abstract: The objective of this study was to develop a sensitive means of control to optimize nutrient concentrations in the root zone of a soilless system, considering plant water and nutrient uptake, and solution circulation rates. A model is proposed to simulate ornamental plants' growth in a channel with a non-interacting soilless substrate, irrigated by point sources with constant discharge rates, spaced uniformly along the channel. The model accounts for compensation for transpiration water losses and consequent salinity buildup, and its interactions with plant growth and nutrient uptake. The added water may contain given concentrations of nutrients and/or toxic (saline) compounds, which would cause salinity buildup. Uptake of each solute is specific, according to a Michaelis-Menten kinetics mechanism, but passive uptake by the transpiration stream is also accounted for. Plant growth is affected by time/age and ionic balance in the solution. The model was calibrated with lettuce (*Lactuca sativa* L.) plants grown in volcanic ash. Simulation of potassium concentration change as a result of discharge rate and emitter spacing revealed that the two parameters could compensate one for the other, once a target lower limit is set. Potassium appeared to be most sensitive to sodium accumulation in the growth medium; this accumulation changed ionic concentration balance, which affected pH and bicarbonate concentration. Passive uptake of calcium by the transpiration stream is highly affected by the root fraction involved. but its calculated contribution is below published values is highly affected by the root fraction involved. but its calculated contribution is below published values.

710: N. Silvan, T. Sallantausta, H. Vasander and J. Laine,. 2005. Hydraulic nutrient transport in a restored peatland buffer. Boreal Environment Research 3(10): 203-210.

Abstract: The aim of this study was to investigate the hydraulic transport of nitrate (NO_3^-) and phosphate (PO_4^{3-}) in a restored peatland buffer by quantifying the nitrate and phosphate input-output balance and nutrient transport in the buffer. The area of the buffer was ca. 0.5 ha, and it amounted to ca. 15%-25% of the water catchment area above. Nitrate and phosphate were added continuously during June-July in 1999, applying $\text{Ca}(\text{NO}_3)_2$ (110 kg Ca, 90 kg N ha^{-1}) and K_3PO_4 (38 kg K, 30 kg P ha^{-1}) water solution in the experimental area. Nutrient transport and retention in the buffer were monitored in the site in 1998-2001. Only ca. 0.5% of added nitrate and ca. 7% of added phosphate was leached through the buffer during the period 1999-2001. Especially added nitrate was retained in a relatively small area in the upper experimental area, ca. 0.2 ha, whereas added phosphate spread out to a much larger area. The results obtained indicate that the buffer is capable of removing effectively especially nitrate but also phosphate from throughflowing water, if the buffer area is large enough, and if the slope of the buffer is suitable.

711: N. Silvan, E. S. Tuittila, V. Kitunen, H. Vasander and J. Laine,. 2005. Nitrate uptake by *Eriophorum vaginatum* controls N₂O production in a restored peatland. *Soil Biology & Biochemistry* 8(37): 1519-1526.

Abstract: The clear dependence of N₂O production through denitrification on available nitrate (NO₃) in soil has been shown in many studies. Since N availability similarly limits the growth of plants, the resource competition with vegetation limits the activity of denitrifying microbes and may consequently moderate the N₂O emissions from peatlands. We used NO₃ uptake by *Eriophorum vaginatum* L. as a vegetation competition factor for microbes. The species was selected for the experiment because it has high nutrient use efficiency in low-nutrient conditions and high nutrient uptake efficiency in luxuriant nutrient conditions. We measured gaseous N flux as N₂O (end product of denitrifier activity) in a restored peatland in central Finland with acetylene inhibition technique over a growing season from sample plots with varying NO₃ addition levels and *E. vaginatum* cover. The resource competition effects were analysed with a model that used exponential decay dependence of N₂O flux on the leaf area of *E. vaginatum*, and saturating response of N₂O flux to NO₃ addition level. The model explained the variation in N₂O fluxes well ($R^2=0.86$). The model simulation showed that the increasing nutrient uptake of *E. vaginatum* decreased the N₂O fluxes exponentially. Simultaneously, denitrification appeared to saturate even in conditions with high availability of NO₃ and low level of competition by vegetation. Thus, *E. vaginatum* is an effective competitor for NO₃ in sedge-dominated peatlands that controls the availability of NO₃- for denitrification, and consequently moderates the N₂O emissions from peatlands. (c) 2005 Elsevier Ltd. All rights reserved.

712: T. Sime-Ngando and A. S. P. Ram,. 2005. Grazer effects on prokaryotes and viruses in a freshwater microcosm experiment. *Aquatic Microbial Ecology* 2(41): 115-124.

Abstract: We conducted a short-term course experiment using a size-fractionation approach to manipulate grazers and test for their effects on viral and prokaryotic standing stocks and activities and on prokaryotic community composition, as assessed by the FISH (fluorescence in situ hybridisation) method. Experimental samples were collected in the Sep Reservoir during severe P-limiting conditions. The presence of grazers in microcosms appeared to be a stimulating factor for prokaryotic growth and viral proliferation, likely through the related nutrient and substrate enrichments. About 60% of the total prokaryote abundance was detected by FISH, with a dominance of Eubacteria and beta-Proteobacteria throughout the experiment, i.e. in the presence and in the absence of grazers. The relative abundances of the minor phylotypes remained unchanged in the absence of grazers, but significantly increased with time when grazers were present, indicating a grazer-mediated reduction in resource competition in prokaryotic assemblages. However, grazer effects resulted in an apparently greater alteration of the bacterial size structure (i.e. the occurrence of large, grazing - resistant cells) than of the relative abundances of the phylotypes analysed. The main findings suggest that, at least on a short-term scale (i.e. ≤ 1 prokaryotic net generation time): (1) There is a synergy between grazer, prokaryotic and viral activities in oligotrophic conditions, through a cascading effect from grazer-mediated resource enrichment, with (2) a higher impact on the prokaryotic size structure than on the relative abundances of the major phylotypes, and (3) a significant acquisition of competitive advantages by the less abundant phylotypes. These findings are discussed in light of the recent 'phage kills winner' theory.

713: S. G. H. Simis, M. Tijdens, H. L. Hoogveld and H. J. Gons,. 2005. Optical changes associated with cyanobacterial bloom termination by viral lysis. *Journal of Plankton Research* 9(27): 937-949.

Abstract: Optical changes that accompanied a collapse of the population of filamentous cyanobacteria from a shallow, eutrophic lake were studied in laboratory-scale enclosures (LSEs). The experimental conditions are known, from previous work on these systems, to cause a dramatic collapse of the dominant algal or cyanobacterial species, which in turn can be associated with viral activity. Within 2 weeks of continuous addition of nutrient-rich growth medium, near-complete collapse of the dominant population occurred over the span of a few days. The collapse was repeatedly and reproducibly observed and was primarily characterized by a marked increase in water transparency. Scattering of light decreased by similar to 80%, absorption decreased by 20-80%. There was high similarity in optical changes between several experiments, carried out in different seasons. An increase of dissolved material and submicron-sized particles (SMP) that showed chlorophyll a (Chl a) absorption was observed during the collapse. The phycocyanin (PC): Chl a ratio and phaeopigment : Chl a ratio proved to be good indicators of the observed collapse. Reflectance spectra that were modelled using a constant volume-scattering function indicated that mass mortality of this magnitude can be detected in natural systems using current remote sensors.

714: K. S. Simon, C. R. Townsend, B. J. F. Biggs and W. B. Bowden,. 2005. Temporal variation of N and P uptake in 2 New Zealand streams. Journal of the North American Benthological Society 1(24): 1-18.

Abstract: Temporal variation of nutrient uptake in streams may be large because nutrient uptake is driven by many factors that vary substantially over time. Although many studies have compared nutrient uptake among streams, the range and variation of nutrient uptake within streams is known only for a few streams and a few nutrients. We investigated the monthly variation of NH_4^+ , NO_3 , and PO_4^{3-} uptake in 2 New Zealand streams over 1 y. To measure uptake, each nutrient was added individually along with a conservative tracer (Cl) into each stream on 3 Successive days in each month. Ambient nutrient concentrations were low and nutrients were efficiently removed from the water column, with maximum uptake velocities ($v(f)$) of 71, 12, and 11 nm/min for NH_4^+ , NO_3 , and PO_4^{3-} , respectively. Nutrient uptake varied considerably during the year (CV - 37-109%), with shortest nutrient uptake lengths (S-w) and highest $v(f)$ generally in spring and summer months. The range of $v(f)$ occurring within the streams spanned 25 to 89% of the range of $v(f)$ among other streams. The range of uptake rates (U) within the streams was lower, accounting for 2 to 40% of the range among other streams. Variation in S-w was largely explained by changes in velocity and effective depth. Physical factors (temperature, transient storage) and chlorophyll a were generally poor predictors of $v(f)$ and U There was little correlation in uptake among nutrients, suggesting different factors were responsible for uptake of each nutrient. Our results show that the range and variation of nutrient uptake within some streams can be large. Within-stream variation should be considered when comparing among streams and may be useful for understanding what factors drive nutrient uptake in streams.

715: S. Simonit and C. Perrings,. 2005. Indirect economic indicators in bio-economic fishery models: agricultural price indicators and fish stocks in Lake Victoria. *Ices Journal of Marine Science* 3(62): 483-492.

Abstract: We consider the potential for using prices as leading indicators of changes in stocks and yields in the freshwater capture fishery in Lake Victoria. Fertilizer run-off from agricultural land is a major cause of nutrient loading, along with soil erosion, atmospheric deposition, and point pollution from industrial and domestic affluent. The interactions between fertilizer applications, water quality, fish stocks, and yields are modelled in order to predict the effect of changes in the price of fertilizers on the fishery. The fishery model includes a measure of Chl a concentration (a proxy for phytoplankton density). The consequences of changes in Chl a concentration for fish stocks are modelled using Ecopath. We show that fertilizer prices are effective leading indicators of changes in fish biomass and yield. (c) 2005 International Council for the Exploration of the Sea. Published by Elsevier Ltd. All rights reserved.

716: F. H. Sklar, M. J. Chimney, S. Newman, P. McCormick, D. Gawlik, S. L. Miao, C. McVoy, W. Said, J. Newman, C. Coronado, G. Crozier, M. Korvela and K. Rutchey,. 2005. The ecological-societal underpinnings of Everglades restoration. *Frontiers in Ecology and the Environment* 3(3): 161-169.

Abstract: The biotic integrity of the Florida Everglades, a wetland of immense international importance, is threatened as a result of decades of human manipulation for drainage and development. Past management of the system only exacerbated the problems associated with nutrient enrichment and disruption of regional hydrology. The Comprehensive Everglades Restoration Plan (CERP) now being implemented by Federal and State governments is an attempt to strike a balance between the needs of the environment with the complex management of water and the seemingly unbridled economic growth of southern Florida. CERP is expected to reverse negative environmental trends by "getting the water right", but successful Everglades restoration will require both geochemical and hydrologic intervention on a massive scale. This will produce ecological trade-offs and will require new and innovative scientific measures to (1) reduce total phosphorus concentrations within the remaining marsh to 10 $\mu\text{g/L}$ or lower; (2) quantify and link ecological benefits to the restoration of depths, hydroperiods, and flow velocities; and (3) compensate for ecological, economic, and hydrologic uncertainties in the CERP through adaptive management.

717: A. S. Slak, T. G. Bulc and D. Vrhovsek,. 2005. Comparison of nutrient cycling in a surface-flow constructed wetland and in a facultative pond treating secondary effluent. Water Science and Technology 12(51): 291-298.

Abstract: There is a growing interest in the possibilities offered by combinations of waste stabilisation ponds (WSP) and constructed wetlands (CW). The purpose of our study Was to compare treatment performances and nutrient cycling in a surface-flow wetland (SFW) and in a WSP treating secondary effluent. In the period between 2000 and 2003, a pilot SFW and a pilot WSP were constructed at the outlet of the wastewater treatment plant and their performance monitored while both were active under the same conditions. The SFW was planted with *Phragmites australis* and *Eichhornia crassipes*, while in the WSP development of algae was spontaneous. Performance efficiency was monitored by means of evaluation of physical and chemical parameters in water, by measurement of plant productivity and by analysis of N and P contents in biomass. The SFW with macrophytes proved more efficient in decreasing the suspended solids (64.6%), settleable solids (91.8%), organic N (59.3%), total N (38%), COD (67.2%) and BOD5 (72.1%) than the,WSP. The WSP with algae was more efficient in treatment of ammonia nitrogen (48.9%) and ortho-phosphate (43.9%). The results of this study provide data that are of help in optimising combinations of SFW and WSP.

718: M. G. Slocum, I. A. Mendelssohn and N. L. Kuhn,. 2005. Effects of sediment slurry enrichment on salt marsh rehabilitation: Plant and soil responses over seven years. *Estuaries* 4(28): 519-528.

Abstract: In deltaic marshes, mineral sediment promotes positive elevation change and counters subsidence and sea level rise. In many such marshes sediment deficits result in wetland loss. One new way to address sediment deficiency is to supply marshes with sediments in a slurry that deposits the sediment in a thin layer over a large area. The long-term effects of this strategy are poorly understood. In a rapidly submerging, *Spartina alterniflora* salt marsh, we tested how different amounts of sediment ameliorated the effects of sea level rise and subsidence over 7 yr (1992-1998). Sediment slurry enrichment likely affected plants and soils by two mechanisms. It increased elevation and soil bulk density, leading to increased plant vigor and soil condition. These effects were long lasting, such that by 1998 areas receiving moderate amounts of sediment (5-12 cm relative elevation) had better plant vigor and soil condition compared to areas not receiving sediment (55% cover versus 20%; bulk densities of 0.4-1.0 g cm⁻³ versus 0.2 g cm⁻³; 0 mM hydrogen sulfide versus > 1.0 mM). The sediment slurry also had high nutrient content, which resulted in a pulse of growth, especially in areas receiving the most sediment (areas > 12 cm relative elevation initially had > 90% cover and canopy heights > 1.6 m). This nutrient-induced growth spurt was short lived and faded after 3 yr, at which point the long lasting effects of increased elevation probably became the dominant factor promoting plant vigor and soil condition. Moderate levels of sediment generated the most beneficial and long lasting effects to the vegetation and soils. This degree of sediment slurry addition countered the effects of subsidence and sea level rise, but not so much as to surpass the intertidal position to which *S. alterniflora* is best adapted.

719: H. Smal, R. Kornijow and S. Ligeza,. 2005. The effect of catchment on water quality and eutrophication risk of five shallow lakes (Polesie Region, Eastern Poland). Polish Journal of Ecology 3(53): 313-327.

Abstract: The nutrient loads from the terrestrial catchments, (based on the distribution of soils and their use) were estimated, compared with that deriving from the atmosphere, and analysed from the view point of the present lake water quality (pH, transparency, electrical conductivity, total suspended solids, concentrations of TN, TP, Ca, Mg, K and Na). Five shallow (mean depth 0.9-3.4 m) and small (area < 100 ha) lakes were selected in Leczna-Wlodawa Lakeland, a part of Polesie region (Eastern Poland). The contribution of the atmospheric deposition of N and P to the total loads (both from air and the land) varied greatly between the lakes (2-48% and 1-40%, respectively) while that of other elements did not exceed 16%. The lake catchments differed substantially in the percentage of soil types and their use. The most fertile soils were used as arable fields and the least fertile were afforested. The load of N and P in g m^{-2} of a lake surface per year ranged from 2.1 to 55.5 and 0.05-1.33, respectively. Average (May-October) concentrations of TN and TP in the lake waters varied from 0.92 to 1.70 mg dm^{-3} and 27.1-238.9 $\mu\text{g dm}^{-3}$, respectively. There was a strong linear correlation between the percentage of particular soil types, nutrient inputs to the lakes and their concentrations in the lake waters, especially for the TN and TP. In addition, the physical and chemical properties of lake water depended significantly upon ratio between lake surface and catchment area, as well as on lake morphometry. The eutrophication hazard of the lakes, evaluated according to Vollenweider's criteria, was the highest for the lakes where the forests and grasslands occurred in the smallest proportions in the catchments, and the contribution of the fertile, cultivated soils was the highest.

720: R. M. S. Smith, D. J. Evans and H. S. Wheater,. 2005. Evaluation of two hybrid metric-conceptual models, for simulating phosphorus transfer from agricultural land in the river enborne, a lowland UK catchment. Journal of Hydrology 1-4(304): 366-380.

Abstract: Across Europe, elevated phosphorus (P) concentrations in lowland rivers have made them particularly susceptible to eutrophication. This is compounded in southern and central UK by increasing pressures on water resources, which may be further enhanced by the potential effects of climate change. The EU Water Framework Directive requires an integrated approach to water resources management at the catchment scale and highlights the need for modelling tools that can distinguish relative contributions from multiple nutrient sources and are consistent with the information content of the available data. Two such models are introduced and evaluated within a stochastic framework using daily flow and total phosphorus concentrations recorded in a clay catchment typical of many areas of the lowland UK. Both models disaggregate empirical annual load estimates, derived from land use data, as a function of surface/near surface runoff, generated using a simple conceptual rainfall-runoff model. Estimates of the daily load from agricultural land, together with those from baseflow and point sources, feed into an in-stream routing algorithm. The first model assumes constant concentrations in runoff via surface/near surface pathways and incorporates an additional P store in the river-bed sediments, depleted above a critical discharge, to explicitly simulate resuspension. The second model, which is simpler, simulates P concentrations as a function of surface/near surface runoff, thus emphasising the influence of non-point source loads during flow peaks and mixing of baseflow and point sources during low flows. The temporal consistency of parameter estimates and thus the suitability of each approach is assessed dynamically following a new approach based on Monte-Carlo analysis. (c) 2004 Elsevier B.V. All rights reserved.

721: S. V. Smith, D. P. Swaney, R. W. Buddemeier, M. R. Scarsbrook, M. A. Weatherhead, C. Humborg, H. Eriksson and F. Hannerz,. 2005. River nutrient loads and catchment size. *Biogeochemistry* 1(75): 83-107.

Abstract: We have used a total of 496 sample sites to calibrate a simple regression model for calculating dissolved inorganic nutrient fluxes via runoff to the ocean. The regression uses the logarithms of runoff and human population as the independent variables and estimates the logarithms of dissolved inorganic nitrogen and phosphorus loading with R-2 values near 0.8. This predictive capability is about the same as has been derived for total nutrient loading with process-based models requiring more detailed information on independent variables. We conclude that population and runoff are robust proxies for the more detailed application, landscape modification, and in-stream processing estimated by more process-based models. The regression model has then been applied to a demonstration data set of 1353 river catchments draining to the sea from the North American continent south of the Canadian border. The geographic extents of these basins were extracted from a 1-km digital elevation model for North America, and both runoff and population were estimated for each basin. Most of the basins (72% of the total) are smaller than 10(3) km(2), and both runoff and population density are higher and more variable among small basins than among larger ones. While total load to the ocean can probably be adequately estimated from large systems only, analysis of the geographic distribution of nutrient loading requires consideration of the small basins, which can exhibit significant hydrologic and demographic heterogeneity between systems over their range even within the same geographic region. High-resolution regional and local analysis is necessary for environmental assessment and management.

722: E. B. Snyder and G. W. Minshall,. 2005. An energy budget for the Kootenai River, Idaho (USA), with application for management of the Kootenai white sturgeon, *Acipenser transmontanus*. *Aquatic Sciences* 4(67): 472-485.

Abstract: An energy budget provides a useful tool for examining the exchange of energy between trophic levels. In this study we examined the potential for autotrophic productivity and organic material to support higher trophic levels in three distinct geomorphic segments of the Kootenai River, USA. This approach is particularly important given that several species of fish, including the endangered Kootenai white sturgeon (*Acipenser transmontanus*), have been in decline since the installation of a large hydropower and flood control dam on the river. Previous research indicated that (i) the reservoir formed by Libby Dam was retaining significant quantities of nutrients and organic material and (ii) phosphorus was limiting periphyton accrual downstream from the reservoir. Thus food limitation was a likely mechanism contributing to the decline in fish populations. Net daily metabolism (NDM) was positive during only 30% of the growing seasons from 1993 to 1995 indicating that autochthonous production was rarely sufficient to support higher trophic levels. All reaches were generally exporting transported organic matter (TOM). Results of an energy budget indicated that macroinvertebrate standing crop was generally lower than that which could be sustained by the relatively short bursts of positive NDM. Estimated fish biomass was higher than that sustained by positive NDM or stored TOM at energetic conversion efficiencies (C.E.) of 10% at average and maximum estimated active metabolic rate. Autotrophic and detrital sources were generally insufficient to support the estimated fish biomass. This study combines detailed analyses of both the autotrophic and detrital energy pathways and thereby suggests a mechanistic explanation for the decline in fish abundance ultimately caused by impoundment.

723: M. N. Snyder, S.J. Goetz, and R.K. Wright,. 2005. Stream health rankings predicted by satellite derived land cover metrics. Journal of the American Water Resources Association 3(41): 659-677.

There is no abstract for this article.

724: L. Somlyódy and M. Honti, 2005. The case of Lake Balaton: how can we exercise precaution?. Water Science and Technology 6(52): 195-203.

Abstract: Balaton is the largest shallow lake in Central Europe and the most important recreational area in Hungary. Water balance of the lake is positive, while natural water level fluctuation has been significant. In 2000, an extreme drought period started. Until 2003, water level dropped about 70 cm (about 20% of the average depth). Public concern grew and the idea of water transfer from the Rába River was raised. To examine possible impacts a comprehensive study was prepared. The main question was whether water transfer was really needed and what criterion should be applied. For developing the methodology, three pillars were used: the potential climate change, the precautionary principle and the EU Water Framework Directive. The study covered impacts of the planned water transfer on the Rába-Balaton system in terms of changes of the water regime, water demands and quality, nutrient loads and ecosystems. The Thomas-Fiering ARMA model was used for characterizing monthly change of the natural water resources of the lake. A Monte Carlo generator was developed to analyze the occurrence of extreme events, uncertainties, possible climate change impacts and water level control strategies.

725: H. K. Son, B. A. Striebig and R. W. Regan,. 2005. Nutrient limitations during the biofiltration of methyl isoamyl ketone. Environmental Progress 1(24): 75-81.

Abstract: With biofiltration, both organic and inorganic compounds that are toxic to humans and volatile organic compounds from a variety of industrial and public sector sources have been effectively removed. During the initial stage of the acclimation period, the removal capacity of the biofilter is primarily attributed to the adsorption capacity of the media. The adsorption capacity of different types of biofilter media was studied. MIAK (methyl isoamyl ketone), which is one of the major air pollutants in painting operations, was used as the target air pollutant for the biofiltration experiments. All the materials tested exhibited very poor adsorption capacity for MIAK. The effect of nutrient limitation was also evaluated. A gradual decrease of removal capacity was observed under the nutrient-limited environment. When nutrient was provided to the biofilter, the removal capacity increased from 55 to 93% in 3 days. A nutrient ratio of chemical oxygen demand (COD):N:P = 200:4:1 was sufficient for the removal of volatile organic compounds from the polluted air stream.

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726: M. Sondergaard, J. P. Jensen and E. Jeppesen,. 2005. Seasonal response of nutrients to reduced phosphorus loading in 12 Danish lakes. *Freshwater Biology* 10(50): 1605-1615.

Abstract: 1. Concentrations of phosphorus, nitrogen and silica and alkalinity were monitored in eight shallow and four deep Danish lakes for 13 years following a phosphorus loading reduction. The aim was to elucidate the seasonal changes in nutrient concentrations during recovery. Samples were taken biweekly during summer and monthly during winter. 2. Overall, the most substantive changes in lake water concentrations were seen in the early phase of recovery. However, phosphorus continued to decline during summer as long as 10 years after the loading reduction, indicating a significant, albeit slow, decline in internal loading. 3. Shallow and deep lakes responded differently to reduced loading. In shallow lakes the internal phosphorus release declined significantly in spring, early summer and autumn, and only non-significantly so in July and August. In contrast, in deep lakes the largest reduction occurred from May to August. This difference may reflect the much stronger benthic pelagic-coupling and the lack of stratification in shallow lakes. 4. Nitrogen only showed minor changes during the recovery period, while alkalinity increased in late summer, probably conditioned by the reduced primary production, as also indicated by the lower pH. Silica tended to decline in winter and spring during the study period, probably reflecting a reduced release of silica from the sediment because of enhanced uptake by benthic diatoms following the improved water transparency. 5. These results clearly indicate that internal loading of phosphorus can delay lake recovery for many years after phosphorus loading reduction, and that lake morphometry (i.e. deep versus shallow basins) influences the patterns of change in nutrient concentrations on both a seasonal and interannual basis.

727: M. Sondergaard, E. Jeppesen and J. P. Jensen,. 2005. Pond or lake: does it make any difference?. Archiv Fur Hydrobiologie 2(162): 143-165.

Abstract: To investigate the importance of lake size, we analysed the chemical and biological characteristics of nearly 800 Danish lakes ranging from 0.01 to 4200 ha. Most of the lakes were shallow (median depth = 1.5 m) and eutrophic (lake water mean total phosphorus = 0.26 mg P1(-1) and mean chlorophyll-a = 60 μ g l(-1)). Phosphorus and nitrogen concentrations were unaffected by lake size, but positively related to agricultural exploitation. Lakes < 1 ha showed a higher variability in phosphorus concentrations, but had a lower chlorophyll yield per unit of both nitrogen and phosphorus, which is indicative of less importance of nutrients in small lakes. Fish were absent in most lakes smaller than 0.1 ha and mean fish biomass was markedly lower in lakes < 1 ha than in lakes > 1 ha. The absence of fish did, however, not result in higher abundance of Daphnia, suggesting a higher impact by invertebrate predators in small lakes. Taxon richness of both zoo- and phytoplankton was weakly related to lake size, whereas the number of submerged macrophyte and fish species increased steadily with lake size. Also species richness of macrophytes increased with increasing alkalinity. The low impact of lake size on the species richness of several taxonomic groups suggests that ponds and small lakes are important biodiversity components in the agricultural landscape.

728: P. W. Sorensen and K. A. Hobson,. 2005. Stable isotope analysis of amphidromous Hawaiian gobies suggests their larvae spend a substantial period of time in freshwater river plumes. *Environmental Biology of Fishes* 1(74): 31-42.

Abstract: We employed stable isotope analysis ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) to evaluate the sources of nutrients used by amphidromous gobiid fishes (*Lentipes concolor*, *Sicyopterus stimpsoni*, *Awaous guamensis*) caught migrating into and living in Hakalau Stream, Hawaii. Although considerable variation amongst the stable isotope values of stream items was noted across all 4 years of our study, the relationships between the fishes were relatively constant. Stable isotope values of recruiting gobies were consistently closer to those of both inshore plankton and freshwater adults than those of offshore plankton, suggesting that the larvae of these species derive much of their nutrition from inshore environments influenced by fresh water. Small differences between the stable values of these species further suggested that their larvae come from different inshore locations. After entering fresh water all species appear to swim rapidly upstream without feeding. Finally, once well upstream, adult *L. concolor* and *A. guamensis* appear to assume an omnivorous diet while adult *S. stimpsoni* rely upon autochthonous production within streams. We propose that freshwater food webs play an integral yet complex role in the lives of both larval and adult amphidromous Hawaiian fishes.

729: B. Spanhoff, C. Kock, A. Meyer and E. I. Meyer,. 2005. The effect of food supply and larval cannibalism on adult size and biomass of the grazing caddis-fly *Melampophylax mucoreus* (Limnephilidae). *Ecological Entomology* 2(30): 138-145.

Abstract: 1. Larvae of the grazing caddis-fly *Melampophylax mucoreus* were reared in a laboratory experiment investigating the effect of food availability on different substrates and cannibalism on the size and biomass of emergent adults. All experiments were performed in stream-water filled, aerated aquaria under controlled temperature and light conditions. Larvae (fourth and fifth instar) were reared in aquaria (50 larvae in each) with three substrate scenarios: (i) limestone (LS), (ii) limestone and leaf litter (LS + L), and (iii) silicate stone (SS). 2. Cannibalism among the larvae in the LS scenario led to the highest adult dry masses (male = 5.13 +/- 0.25 mg, female = 7.64 +/- 0.63 mg) and to the highest mortality rate (88.7%). The SS scenario displayed the most unfavourable condition for larval growth indicated by the lowest adult dry masses (males = 3.12 +/- 0.15 mg, females = 4.69 +/- 0.25 mg) and a high mortality rate (81.7%). The limestone supplemented with leaf litter (ii) offered the most balanced nutrients to complete larval development and enough shelter to avoid excessive encounter rates of larvae within the aquaria, indicated by the lowest mortality rate (43.6%). Adults from the LS + L scenario showed biomasses (male = 3.94 +/- 0.12 mg, female = 6.48 +/- 0.24 mg) intermediate between the two other scenarios. 3. The results implied that cannibalism among larvae can lead to higher adult biomasses and therefore to increased fitness, if cannibalism supplements larval feeding requirements. Larvae developing under insufficient food availability can not compensate for this by cannibalism. Additionally, leaf litter not only provided a complementary food source for developing larvae, but also provided shelter, which reduced encounter rates. 4. Increased stress induced by high larval encounter rates (resulting in enhanced cannibalism) in the LS scenario and low food availability in the SS scenario could be indicated by premature emergence times compared with the LS + L

730: D. F. Spencer and G. G. Ksander,. 2005. Root size and depth distributions for three species of submersed aquatic plants grown alone or in mixtures: Evidence for nutrient competition. *Journal of Freshwater Ecology* 1(20): 109-116.

Abstract: We hypothesized that if aquatic plants were competing for nutrients then the spatial distribution and sizes of roots should change when competitors were present. *Stuckenia pectinatus*, *Potamogeton nodosus*, and *Hydrilla verticillata* (monoecious type) were grown in either monocultures or mixtures in polyvinylchloride containers. Four 5 cm diameter minirhizotrons were mounted horizontally across the containers so that they were 2.5, 12.5, 22.5, or 32.5 cm below the surface of the sediment, and we inserted a specialized video camera in each minirhizotron tube and recorded root images at 21 locations in each tube. For two of three cases, adding plants of another species changed the root depth distribution and increased the volume of soil occupied by roots compared to monocultures. Additionally, smaller diameter roots were more abundant when competitors were present. This implies that the plants adjusted to the presence of competitors by producing more roots capable of nutrient uptake. These results imply that competition for sediment-based nutrients occurred in these systems.

731: D. F. Spencer, G. G. Ksander and L. C. Whitehand,. 2005. Spatial and temporal variation in RGR and leaf quality of a clonal riparian plant: *Arundo donax*. *Aquatic Botany* 1(81): 27-36.

Abstract: *Arundo donax* L. is a tall perennial reed classified as an emergent aquatic plant. In California, it has invaded riparian zones, where it acts as a transformer species. Because plant growth and leaf quality influence the effectiveness of management techniques, we sought to determine if these characters varied temporally and spatially in a northern California population of *A. donax*. Tissue C and N content and C:N ratio varied during the growing season. Leaf N was higher in spring and in plants that were closer to a stream. It was significantly negatively related to the clump's distance from the stream but not related to its elevation relative to the stream. Plants near the stream produced taller stems with more leaves per stem than those more distant from the stream. RGR differed across time and space. It was highest in spring prior to the appearance of flowers on a few stems that were > 1 year old within the clumps. Decline in RGR as the growing season progressed coincided with the appearance of branches and flowers on stems < 1 year old on a few plants within the studied population. RGR was significantly related to the N content and C:N ratio of leaves on mature stems (> 1 year old). This implies that the decrease in stem growth reflected changes in nutrient availability within the entire *A. donax* clump and not just in the growing stems (< 1 year old). These findings have implications for timing of management techniques. Published by Elsevier B.V.

732: D. Spitale, M. Tardio and M. Cantonati,. 2005. Competition between a planktonic diatom and a dinoflagellate during enclosure experiments in a mountain lake. *Phycologia* 3(44): 320-327.

Abstract: Lake Tovel (Trentino, Brenta Dolomites, NE Italy) was renowned for red blooms due to the dinoflagellate *Glenodinium songaineum*. These blooms suddenly ceased in 1964. Responses of the summer phytoplankton communities to nutrient enrichments, analysed experimentally in enclosures, identified phosphorus as the factor limiting both *G. sanguineum* and a dominant *Fragilaria tenera*. Competitive interactions suggested that the dinoflagellates were favoured by higher temperatures, whereas the diatoms were limited by silica reduction. The ratio between the biovolumes of the two algae was an important parameter for predicting which species would benefit from the phosphorus additions and outcompete the other one under the experimental condition.

733: M. Spoljar, I. Habdija, B. Primc-Habdija and L. Sipos,. 2005. Impact of environmental variables and food availability on rotifer assemblage in the karstic barrage Lake Visovac (Krka River, Croatia). International Review of Hydrobiology 5-6(90): 555-579.

Abstract: We evaluated the impact of 18 environmental variables (physico-chemical, nutrients, food resources) on rotifer assemblage in the sub-Mediterranean karstic barrage Lake Visovac. In terms of the spacetime distribution the highest density of rotifers was noted in the summer period (average 386 ind/l, relative annual abundance 62%), and in the epilimnetic layer (average 309 ind/l, relative annual abundance 58%). A total of 41 rotifer taxa belonging to 22 genera and 14 families were identified. Three rotifer species: *Gastropus stylifer*, *Synchaeta tremula* and *Trichocerca birostris* were dominant and perennial during the annual investigation. Pearson's product-moment correlations and canonical correlation analysis suggest that temperature, pH values, alkalinity, chemical oxygen demand and chlorophyll a concentration significantly influenced rotifer density. According to rotifer food collection and selection, in Visovac Lake macrofilter-feeders predominated, and microfilter-feeders were in a minority.

734: L. A. Sprague,. 2005. Drought effects on water quality in the South Platte River Basin, Colorado. Journal of the American Water Resources Association 1(41): 11-24.

Abstract: Twenty-three stream sites representing a range of forested, agricultural, and urban land uses were sampled in the South Platte River Basin of Colorado from July through September 2002 to characterize water quality during drought conditions. With a few exceptions, dissolved ammonia, Kjeldahl nitrogen, total phosphorus, and dissolved orthophosphate concentrations were similar to seasonal historical levels in all land use areas during the drought. At some agricultural sites, decreased dilution of irrigation return flow may have contributed to higher concentrations of some nutrient species, increased primary productivity, and higher dissolved oxygen concentrations. At some urban sites, decreased dilution of base flow and wastewater treatment plant effluent may have contributed to higher dissolved nitrite-plus-nitrate concentrations, increased primary productivity, and higher dissolved oxygen concentrations. Total pesticide concentrations in urban and agricultural areas were not consistently higher or lower during the drought. At most forested sites, decreased dilution of ground water-derived calcium bicarbonate type base flow likely led to elevated pH and specific-conductance values. Water temperatures at many of the forested sites also were higher, contributing to lower dissolved oxygen concentrations during the drought.

735: J. M. St Jacques, M. S. V. Douglas, N. Price, N. Drakulic and C. P. Gubala,. 2005. The effect of fish introductions on the diatom and cladoceran communities of Lake Opeongo, Ontario, Canada. *Hydrobiologia* (549): 99-113.

Abstract: Fish introductions are one of the most widespread anthropogenic perturbations to aquatic ecosystems. Paradoxically, the effects of these introductions on aquatic ecosystems are typically poorly documented. This project studied the effect of fish introductions on Lake Opeongo, an oligotrophic lake in Algonquin Provincial Park, Ontario, Canada (45 degrees 42' N, 78 degrees 22' W), using the remains of algae (diatoms) and zooplankton (cladocerans) preserved in the sediments. It was hypothesized that the introduction of cisco or lake herring (*Coregonus artedii* Lesueur) in 1948, which filled the underutilized pelagic forage fish niche, should have altered nutrient availability for phytoplankton. Prior to cisco introduction, the diatom community of Lake Opeongo reflected a relatively stable oligotrophic state established before European settlement, and consisted of the *Cyclotella stelligera* complex with subdominants *Tabellaria flocculosa* IIIp and the *Aulacoseira distans* complex. No marked changes occurred until ca. 1962 when the diatom community shifted to an assemblage with increased total phosphorus preferences, consisting of *Asterionella formosa* and lesser amounts of *Cyclotella bodanica* var *lemanica*, the *C. stelligera* complex, *Fragilaria crotonensis* and *T. flocculosa* IIIp. The dominant cladoceran *Bosmina longirostris* increased significantly in relative abundance since the introduction of cisco. The most likely cause of this shift was increased nutrient recycling and/or trophic level changes caused by human manipulation of the fish community of the lake.

736: P. J. Stabeno, D. G. Kachel, N. B. Kachel and M. E. Sullivan,. 2005. Observations from moorings in the Aleutian Passes: temperature, salinity and transport. Fisheries Oceanography (14): 39-54.

Abstract: Between May 2001 and September 2003, a series of moorings were deployed in four of the Aleutian Passes - Tanaga Pass (12 months of data), Akutan Pass and Seguam Pass (18 months), and Amukta Pass (36 months). Instruments on each mooring measured temperature, salinity and current velocity. Tidal currents dominated the flow in each pass, including a strong fortnightly component in the three deeper passes (Tanaga, Seguam, and Amukta). Net transport in each of the passes was northward, varying from $0.1 \times 10^6 \text{ m}^3 \text{ s}^{-1}$ in Akutan Pass and $0.4 \times 10^6 \text{ m}^3 \text{ s}^{-1}$ in Seguam to $> 4.0 \times 10^6 \text{ m}^3 \text{ s}^{-1}$ in Amukta Pass. The transport in Amukta Pass, calculated from current meters, was approximately five times as large as previously estimated from hydrographic surveys. At monthly and longer periods, the variability in transport in Amukta Pass was related to the position and strength of the Alaskan Stream southeast of the pass. Vertical mixing was examined in Akutan and Seguam Passes. Strong tidal currents mix the water column top-to-bottom over the shallow sills in the passes, a depth of 80 m in Akutan and 140 m in Seguam Pass, providing a critical source of nutrients to the Bering Sea ecosystem.

737: J. Stamenkovic, M. S. Gustin and K. E. Dennett,. 2005. Net methyl mercury production versus water quality improvement in constructed wetlands: Trade-offs in pollution control. Wetlands 3(25): 748-757.

Abstract: In a system with mercury contamination, there are trade-offs between beneficial functions of a wetland and environmental risk of methyl mercury (MeHg) production. This project used five wetland mesocosms with three different experimental designs to assess the potential for nutrient, sediment, and total mercury (THg) removal and MeHg production associated with a proposed a large-scale wetland system. The latter was suggested for the mouth of Steamboat Creek (Nevada, USA) at the confluence with the Truckee River. Steamboat Creek has been documented to have high mercury concentrations and is a major source of nutrients to the river. Mesocosms that had creek sediments as the base and creek water as inflows resulted in decreasing THg concentration by 72-82%. Average percent nitrogen and phosphorus and suspended solids removal were 43%, 30%, and 70%, respectively. Net MeHg production was observed during spring, summer, and fall months; however, in the winter, these mesocosms acted as a sink. One wetland mesocosm with sediments low in mercury and creek water showed similar trends. Mesocosms with creek sediments and water low in mercury were a source of MeHg year round, with outflow concentrations 10 to 200 times that in the inflow. Based on the developed data, the environmental risk of the proposed large-scale wetland would be an increase of methyl mercury concentration in creek water that reaches the Truckee River by as much as 20 to 75%. However, the wetland would also be a significant sink for nutrients, suspended solids, and total mercury, decreasing the amount of mercury available for methylation downstream.

738: J. L. Starr, A. M. Sadeghi and Y. A. Pachepsky,. 2005. Monitoring and modeling lateral transport through a large in situ chamber. Soil Science Society of America Journal 6(69): 1871-1880.

Abstract: Accurate characterization of lateral transport components is an important step toward a more quantitative assessment of the fate and transport of nutrients and the functionality of riparian/wetland systems. Our specific objectives were: (i) to design an in situ chamber for studying lateral flow under shallow watertable and riparian zone conditions; (ii) to monitor predominantly horizontal transport of nonconservative (NO_3) and conservative (Br) tracers in shallow saturated zone of the soil monolith; and (iii) to obtain reaction and transport parameters, and additional insights about the flow and transport inside the soil monolith. HYDRUS-2D model was used to simulate flow and transport of Br and NO_3 , and to evaluate the applicability of this model to the observed flow and transport. Advective-dispersive equation (ADE) and mobile-immobile zone model (MIM) options were tested using the Br data. The breakthrough curves (BTCs) of NO_3 and Br were similar while the concentrations rose, then became distinctly different with NO_3 concentrations decreasing much faster. The calibrated denitrification rate of $0.713 \pm 0.211 \text{ d}^{-1}$ was about an order and a half of magnitude larger in the loam layer (25-35 cm) than in the overlaying sandy loam layer (0-25 cm) and in the sandy clay loam layer (35-65 cm) below. Up to 60% of the introduced NO_3 was lost to denitrification. The methodology presented here allowed the in situ estimation reaction and transport needed for modeling; and it showed a potential to provide detailed information critical for the interpretation of the modeling outcomes performed at field and watershed levels.

739: K. Stefaniak, M. Kokocinski, M. Rurek, A. Romanowska, H. Augustyniak and L. Burchardt,. 2005. The polymorphic psa and rbc loci in populations of *Planktothrix agardhii* in Polish hypertrophic lakes. *Biologia* 3(60): 313-317.

Abstract: The *Planktothrix agardhii* isolates obtained from four lowland, shallow Polish hypertrophic lakes during water bloom events were investigated. In order to define what genetic type the investigated isolates belong to, the sequencing of the intergenic spacer (IGS) of the psaAB and the rbcLX genes was carried out. Additionally, the comparison of the investigated isolates with three strains from the NIVA Culture Collection was performed. Our results of genetic structure of *P. agardhii* populations in hypertrophic shallow lakes in Poland showed similarity to those obtained from the lakes of western and northern Europe. The analyses of 8 isolates of the psa loci and the analyses of 5 isolates of the rbc loci revealed sequence homogeneity among the investigated isolates. The new polymorphic sites in the IGS of the psa loci (substitution and deletion) may represent another type of *P. agardhii* strain, characteristic of nutrient-rich and shallow lakes.

740: M. B. Stefansdottir and S. R. Gislason,. 2005. The erosion and suspended matter/seawater interaction during and after the 1996 outburst flood from the Vatnajokull Glacier, Iceland. Earth and Planetary Science Letters 3-4(237): 433-452.

Abstract: The Gjalp subglacial eruption 1996 within the Vatnajokull Glacier, Iceland triggered a catastrophic outburst flood, bringing at least 180 million tonnes of suspended solids to the sea in only 42 h. This amounts to 1% of the total annual global river suspended flux to the oceans. The specific BET-surface area of the suspended solids was measured to be 11.8-18.9 m²/g, translating to the average total BET-surface area of 2.8 x 10⁹ km², providing enormous potential for adsorption/desorption and precipitation/dissolution fluxes at the suspended solids-ocean water interface. Altered basalt glass was the major constituent of the suspended matter (80%), secondary minerals such as zeolites and calcite amounted to 11%, but only 5% was fresh volcanic glass. The suspended grains were generally rounded. The glass carried by the flood is different in chemical composition from the glass produced by the Gjalp eruption. The Gjalp material has higher FeO_{total}/TiO₂ and TiO₂/P₂O₅ ratios than the suspended glass in the flood waters. The majority of the flood samples match the composition of the volcanic system, down stream from the eruption site. The large amount of altered material in the flood and its chemical composition suggests erosion conforming to a 2 m deep, 1000 m wide and 50000 m long channel in less than 42 h. The behaviour of 28 elements on the surface of the suspended solids exposed to seawater was quantified by experiments in the laboratory. The altered basaltic glass dissolved in seawater, as recorded by the Si release from the glass. The dissolved concentrations of Na, Ca, Si, Ba, Cd, Co, Cu, Hg, Mn, Ni, and total dissolved inorganic N increased considerably when the suspended solids come into contact with the seawater, but the concentrations of Mg, K, S, Sr, Fe, Pb and Zn decreased. The experimental seawater solutions were supersaturated with respect to calcite, Mg-montmorillonite and amorphous iron-hydroxide. The rate of release (mol/m²/s) of Si, Mn, Ba, Co, Ni

741: T. E. Steissberg, S. J. Hook and S. G. Schladow,. 2005. Characterizing partial upwellings and surface circulation at Lake Tahoe, California-Nevada, USA with thermal infrared images. Remote Sensing of Environment 1-2(99): 2-15.

Abstract: Thermal infrared data from recently launched satellite instruments provide an opportunity to address key scientific questions and develop new applications, which could not be addressed or developed with data from earlier instruments. The satellite instruments that provide these data include ASTER, Landsat ETM+, and MODIS, and this study demonstrates how data from them can be used to map upwelling and circulation associated with the transport of heat, solutes, and particles in lakes. Upwelling in a density-stratified water body such as a lake or reservoir results from a surface wind stress being balanced by a horizontal pressure gradient, causing denser water to rise at the upwind lake boundary. Upwellings are considered partial when intermediate-depth water reaches the surface and total when bottom water surfaces. Upwellings are an important part of ecosystem functioning, since they transport nutrients from deeper in the lake, where they accumulate, to the surface layer, where they facilitate phytoplankton growth. Thermal infrared images acquired by ASTER, ETM+, and MODIS can be used to observe partial upwelling events in lakes and provide insight into their spatial variability and horizontal distribution, information totally lacking from conventional in situ measurements. At Lake Tahoe, partial upwellings were found to occur every few days throughout the spring and summer, transporting water from 10-30 m below the surface to the surface layer. They commonly display a jet-like appearance, traveling from the upwind to the downwind side of the lake, with current speeds of 12-17 cm/s. Partial upwellings were found to generally decrease lake clarity, although deeper upwelling events can increase clarity. Sinking zones, other convergence areas, and divergence areas were also observed. The temperature variability associated with upwelling, which could be clearly mapped in the thermal infrared satellite images, illustrates the advantage of synoptic thermal infrared satell

742: J. Stockner, A. Langston, D. Sebastian and G. Wilson,. 2005. The limnology of Williston Reservoir: British Columbia's largest lacustrine ecosystem. Water Quality Research Journal of Canada 1(40): 28-50.

Abstract: In surface area, Williston Reservoir is British Columbia's largest lacustrine ecosystem. The reservoir shows remarkably little spatiotemporal variance among its three major reaches (Finlay, Parsnip and Peace), despite the immensity and biogeoclimatic diversity of its drainage basins. Williston is ultra-oligotrophic with average concentrations of total dissolved phosphorus (TDP) ranging from 3 to 5 μ g/L and nitrate-nitrogen (NO₃-N) from 60 to 65 μ g/L. The pelagic plankton community of Williston Reservoir is dominated by bacteria, pico-cyanobacteria, nano-flagellates and small diatoms, and the zooplankton community is comprised largely of copepods in spring and small cladocerans in summer and fall. Primary production rates are very low and most carbon is produced by the pico- and nano-sized plankters that appear to be primarily light limited due to high turbidity and frequent wind-mixing episodes, i.e., shallow light compensation depth and deep epilimnetic depth. Microbial food webs are predominant in Williston through much of the growing season, with free-living bacteria and pico-cyanobacteria as the primary carbon template, and nano-flagellates, ciliates and micro-zooplankton as the principal grazers. Loading models indicate that after impoundment in 1968, Williston was initially a moderately productive ecosystem, but the system has progressively lost nutrients, namely P, through sedimentation and outflow, but also by the scarcity of littoral carbon production due to severe water level fluctuations (drawdown) and winter ice-scouring. Hence, within the past 2 to 3 decades the ecosystem has gradually lost biogenic productive capacity and now lies within the ultra-oligotrophic trophic status and supports a low level of fish production. Daily rates of carbon production are presently at levels more typical of British Columbia fast-flushing, ultra-oligotrophic coastal ecosystems than large, interior-type oligo- and mesotrophic British Columbia lakes. Based on aver

743: M. L. Stone, M. R. Whiles, J. A. Webber, K. W. J. Williard and J. D. Reeve,. 2005. Macroinvertebrate communities in agriculturally impacted southern Illinois streams: Patterns with riparian vegetation, water quality, and in-stream habitat quality. *Journal of Environmental Quality* 3(34): 907-917.

Abstract: Relationships between riparian land cover, in-stream habitat, water chemistry, and macro invertebrates were examined in headwater streams draining an agricultural region of Illinois. Macroinvertebrates and organic matter were collected monthly for one year from three intensively monitored streams with a gradient of riparian forest cover (6, 22, and 31% of riparian area). Bioassessments and physical habitat analyses were also performed in these three streams and 12 other nearby headwater streams. The intensively monitored site with the least riparian forest cover had significantly greater percent silt substrates than the sites with medium and high forest cover, and significantly higher very fine organics in substrates than the medium and high forested sites. Macroinvertebrates were abundant in all streams, but communities reflected degraded conditions; noninsect groups, mostly oligochaetes and copepods, dominated density and oligochaetes and mollusks, mostly *Sphaerium* and *Physella*, dominated biomass. Of insects, dipterans, mostly Chironomidae, dominated density and dipterans and coleopterans were important contributors to biomass. Collector-gatherers dominated functional structure in all three intensively monitored sites, indicating that functional structure metrics may not be appropriate for assessing these systems. The intensively monitored site with lowest riparian forest cover had significantly greater macroinvertebrate density and biomass, but lowest insect density and biomass. Density and biomass of active collector-filterers (mostly *Sphaerium*) decreased with increasing riparian forest. Hilsenhoff scores from all 15 sites were significantly correlated with in-stream habitat scores, percent riparian forest, and orthophosphate concentrations, and multiple regression indicated that in-stream habitat was the primary factor influencing biotic integrity. Our results show that these "drainage ditches" harbor abundant macroinvertebrates that are typical of degraded con

744: V. Straskrabova, L. R. Izmet'syeva, E. A. Maksimova, S. Fietz, J. Nedoma, J. Borovec, G. I. Kobanova, E. V. Shchetinina and E. V. Pislegina,. 2005. Primary production and microbial activity in the euphotic zone of Lake Baikal (Southern Basin) during late winter. *Global and Planetary Change* 1-4(46): 57-73.

Abstract: Three years of regular weekly/biweekly monitoring of seasonal changes in temperature, transparency, chlorophyll a (CHL) and bacteria [erythrosine-stained microscopic counts and cultivable colony forming units (CFUs)] at the vertical profile in the South basin of Lake Baikal (51 degrees 54 ' 195 " N, 105 degrees 04 ' 235 " E, depth 800 in) were evaluated. In more detail, the structure and function of phytoplankton and the microbial loop in the euphotic layer at the same site were investigated during the late-winter-early-spring period under the ice. The depth of euphotic zone (up to 1% of surface irradiation) was 35 to 40 in. Primary production was measured three times a week with the C-14 method in 2, 10, 20, 30 and 40 in. Maximum production was found in 10 in, with lower values towards the surface (light inhibition) and towards the lower layers. The total production in cells larger than 1 μm in the column (0-40 m) was 204-240 $\text{mg C d}^{-1} \text{m}^{-2}$, 30-40% of it being in cells 1-3 μm (mostly picocyanobacteria), which represented roughly 9% of the total chlorophyll a (estimated from pigment analyses). A major part of phytoplankton biomass was formed by diatoms (*Synedra acus* Hust., *Asterionella formosa* Hass. and *Stephanodiscus meyerii* Genkal & Popovskaya). Total production (including extracellular, dissolved organic matter) was 235-387 $\text{mg C day}^{-1} \text{m}^{-2}$, and the exudates were readily used by bacteria (particles 0.2-1 μm). This part amounted to 1-5% of cellular production in 2 to 20 in and 11-77% of cellular production in 20-40 in, i.e., in light-limited layers. From 0 to 30 in, chlorophyll a concentration was 0.8 to 1.3 $\mu\text{g l}^{-1}$, wherefrom it decreased rapidly to 0.1 $\mu\text{g l}^{-1}$ towards the depth of 40 in. Bacteria (DAPI-stained microscopic counts) reached 0.5-1.4 $\times 10^6 \text{ ml}^{-1}$; their cell volumes measured via image analysis were small (average 0.05 μm^3), often not well countable when erythrosine stain was used. Bacterial biomasses were in the range of 6-21

745: V. Stravinskiene and I. Stasytyte,. 2005. Dynamics of annual radial increment of Scots pine (*Pinus sylvestris* L.) growing in forest ecosystems on the shores of lakes. *Ekologia-Bratislava* 2(24): 138-146.

Abstract: The dendrochronological research of Scots pine (*Pinus sylvestris* L.) growing in the vicinity to kettle lakes Kreivasis (closed lake) and Duobulis (flowing lake) was carried out in 2000-2002. The study is aimed to estimate the influence of water level fluctuations to the formation of radial increment of trees and to create series of radial increment of *Pinus sylvestris* L. trees growing on the shorelines and in control stands. It was estimated that annual radial increment of pines growing on the shorelines of lake Kreivasis slightly negatively correlates ($r = -0.21$; $P = 0.95$) with the increase in water level. During the humid period, when water level remains high for quite a long time, many pine trees growing in the lakeshore zone die. The increase of radial increment of pines on the shorelines of Kreivasis is typical during the periods with small amount of precipitation (in 1932, 1937-1939, 1964-1977, 1997-2002). The annual radial increment of the control stand of lake Kreivasis, the stand on the shorelines of lake Duobulis and its control stand have decreased in the periods with small amount of precipitation as well. There are plenty of nutrient substances (various sediments came into it together with the water and most of them settle down in the lake from higher waters) on the shores of the open lake Duobulis. Meanwhile on the shores of the flowing water lake Kreivasis only the remains of water plants are accumulated.

746: J. S. Strock, G. R. Sands, D. J. Krebs and C. Surprenant,. 2005. Design and testing of a paired drainage channel research facility. *Applied Engineering in Agriculture* 1(21): 63-69.

Abstract: In watersheds where artificial drainage is practiced, surface and subsurface runoff from agricultural lands is often carried by a network of open ditches that function as headwater streams. Open-channel ecosystems receive direct surface and subsurface inflow from agricultural land and act as potential conduits of considerable loads of nutrients, sediment, pathogens, and pesticides to small streams and larger rivers. Our objective was to design, build, and evaluate a drainage channel research facility for examining water quality impacts of water management in open-channel. An open-channel research facility incorporating a paired design was constructed during 2002 near Lumberton, Minnesota. A 200-m reach of existing drainage channel was converted into a system of four parallel channels. The facility was equipped with water level control devices and instrumentation for flow monitoring and water sample collection on upstream and downstream ends of the system. Flow hydrographs were created by simulating flow generated by pumping water from an adjacent pond. Channel morphology was described by measuring longitudinal channel bottom elevation and cross-sectional channel profiles. Hydrographs from simulated flow events during year one indicated that the paired open channels responded similarly to changes in inflow. Variability in hydrologic response between the open-channels was attributed to differences in open-ditch channel bottom elevation and vegetation density. Research facility system performance exceeded expectations. Potential future benefits of this research include improved biological diversity and integrity of open-channel ecosystems, reduced flood peaks and increased flow during critical low-flow periods, improved and more efficient nitrogen retention within the open-channel ecosystem, and decreased maintenance cost associated with reduced frequency of channel maintenance.

747: E. Struyf, S. Van Damme, B. Gribsholt and P. Meire,. 2005. Freshwater marshes as dissolved silica recyclers in an estuarine environment (Schelde estuary, Belgium). *Hydrobiologia* (540): 69-77.

Abstract: Compared to knowledge about N and P processing in the aquatic continuum of lakes, wetlands and estuaries, knowledge concerning transport and cycling of Si is only fragmentary. Furthermore, Si research in estuaries has mainly been focused on subtidal benthic sediments and uptake and recycling by diatom communities. The biogeochemical cycling of Si in tidal wetlands, which can contain large amounts of Si, has thus far been neglected. We have conducted several whole ecosystem Si mass-balances on a freshwater marsh located in the Schelde estuary (6 tidal cycles, 2 with BSi included). Our measurements show that the freshwater marsh acts as an important source of dissolved Si to the main river (1-18% more export than import, on average 0.114 g m^{-2}). This export is compensated by import of amorphous silica into the marsh (19-55% more import than export). The marsh was shown to act as silica recycler, resupplying biologically available dissolved Si to the estuarine ecosystem. Extrapolations show that during summer and spring months, when dissolved silica is depleted due to diatom growth, almost half of the total dissolved silica load in the main river channel could result from marsh recycling.

748: P. F. Sullivan and J. M. Welker,. 2005. Warming chambers stimulate early season growth of an arctic sedge: results of a minirhizotron field study. *Oecologia* 4(142): 616-626.

Abstract: We examined the effects of passive open-top warming chambers on *Eriophorum vaginatum* production near Toolik Lake, Alaska, USA. During the 2002 growing season, chamber warming was consistent with the magnitude and seasonality observed in recent decades throughout northwestern North America. Leaf-growth rates were higher in late May and early June; maximum growth rates in each leaf cohort occurred earlier and peak biomass was observed 20 days earlier within the chambers. Consequently, plants within the chambers maintained more live leaf biomass during the period of highest photosynthetically active radiation. Annual leaf production within the chambers (21 +/- 2 mg tiller) was not significantly different than under ambient conditions (17 +/- 2 mg tiller) ($P = 0.2256$) despite higher early-season growth rates. Root growth began earlier; growth rates were higher in late May and early June, and maximum growth rates occurred earlier within the chambers. Therefore, plants within the chambers maintained greater root biomass during what earlier studies have identified as a period of relatively high nutrient availability. Annual root production within the chambers (191 +/- 42 g m⁻²) was not significantly different than under ambient conditions (119 +/- 48 g m⁻²) ($P = 0.1979$), although there was a trend toward higher production within the chambers. The tendency toward higher root production within the chambers is consistent with previous laboratory experiments and with the predictions of biomass allocation theory.

749: I. Sundh, D. Bastviken and L. J. Tranvik,. 2005. Abundance, activity, and community structure of pelagic methane-oxidizing bacteria in temperate lakes. *Applied and Environmental Microbiology* 11(71): 6746-6752.

Abstract: The abundance and activity of methane-oxidizing bacteria (MOB) in the water column were investigated in three lakes with different contents of nutrients and humic substances. The abundance of MOB was determined by analysis of group-specific phospholipid fatty acids from type I and type 11 MOB, and in situ activity was measured with a $^{14}\text{CH}_4$ transformation method. The fatty acid analyses indicated that type I MOB most similar to species of *Methylobionas*, *Methylobionium*, and *Methylosarcina* made a substantial contribution (up to 41%) to the total bacterial biomass, whereas fatty acids from type 11 MOB generally had very low concentrations. The MOB biomass and oxidation activity were positively correlated and were highest in the hypo- and metalimnion during summer stratification, whereas under ice during winter, maxima occurred close to the sediments. The methanotroph biomass-specific oxidation rate (V) ranged from 0.001 to 2.77 mg $\text{CH}_4\text{-C mg}^{-1}\text{C day}^{-1}$ and was positively correlated with methane concentration, suggesting that methane supply largely determined the activity and biomass distribution of MOB. Our results demonstrate that type I MOB often are a large component of pelagic bacterial communities in temperate lakes. They represent a potentially important pathway for reentry of carbon and energy into pelagic food webs that would otherwise be lost as evasion of CH_4 .

750: J. Suomela, V. Gran, H. Helminen, A. Lagus, J. Lehtoranta and J. Sipura,. 2005. Effects of sediment and nutrient enrichment on water quality in the Archipelago Sea, northern Baltic: An enclosure experiment in shallow water. *Estuarine Coastal and Shelf Science* 1-2(65): 337-350.

Abstract: The effects of bottom sediment and nutrient enrichment on water quality were studied in an enclosure experiment in the Archipelago Sea, northern Baltic. The three-week experiment was conducted in a small and shallow bay, where the organic content of the sediment is low. The enclosures were large (diameter 3.6 m, depth 3.5 m), and reached from the surface to the bottom. Some of the enclosures included the natural sediment, some had a plastic bottom without contact with the sediment. Concentrations of nutrients and chlorophyll a and physical variables in the water column, concentrations of inorganic nutrients in the pore water of the sediment, and numbers and biomasses of the benthic macrofauna were measured. Both the presence of sediment and nutrient enrichment significantly increased the concentrations of total nitrogen, total phosphorus and chlorophyll a in the water column. The concentration of chlorophyll a doubled in the sediment-bottomed enclosures without nutrient enrichment; the increase was similar to that in the plastic-bottomed enclosures with nutrient enrichment ($7.2 \mu\text{M NH}_4^+$ and $0.46 \mu\text{M PO}_4^{3-}$ during the three-week study). The concentration of silica doubled or tripled in the sediment-bottomed enclosures. No shortage of oxygen was found in the water column during the experiment. The results show that sediment with a low content of organic matter may serve as an important source of nutrients in shallow and littoral oxic waters and may be important in sustaining their eutrophic state during the productive season. It is suggested that an important part of the nutrients released from this erosion bottom had originated from the surface layer of the sediment, which had been sedimented and transported to the area quite recently. The results indicate that it is important to include sediment in mesocosm studies dealing with nutrient dynamics, especially in shallow waters. (c) 2005 Elsevier Ltd. All rights reserved.

751: A. M. Suren and S. McMurtrie,. 2005. Assessing the effectiveness of enhancement activities in urban streams: II. Responses of invertebrate communities. River Research and Applications 4(21): 439-453.

Abstract: The effects of habitat enhancement on the invertebrate communities in five urban streams in Christchurch, New Zealand, were investigated. All streams underwent riparian planting, while extensive channel modifications were made at two streams, where a concrete dish channel and a wooden timber-lined stream were removed and natural banks reinstated. Benthic invertebrates were collected before enhancement and 5 years after from the same locations. Invertebrates were also collected from control sites in each stream in 2001. Desired goals of enhancement activities included increasing the densities of mayflies and caddisflies, and decreasing densities of oligochaetes, snails and midges. Enhancement activities changed riparian vegetation and bank conditions, as well as substrate composition, instream organic matter and variability of instream velocities. Invertebrate communities prior to enhancement were typical of those in urban environments, and dominated by snails (*Potamopyrgus*, Physa), the amphipod *Paracalliope*, the hydroptilid caddisfly *Oxyethira*, oligochaetes and chironomids. Stream enhancement caused only small changes to the invertebrate community, with subtle shifts in overall abundance, species evenness, diversity, and ordination scores. Lack of a consistent strong response by invertebrates to enhancement activities, and continued absence of caddisflies and mayflies from enhanced sites may reflect lack of sufficient change to instream conditions as a result of stream enhancement, colonization bottlenecks for aerial stages of these animals, and the inability of individuals outside the urban watershed to perceive these enhanced 'islands' of good habitat. Alternatively, contamination of streambed sediments, excess sedimentation and reduced base flows may be limiting factors precluding successful invertebrate colonization in enhanced sites. These results highlight the importance of setting clear goals and objectives necessary to meet these goals.

Enhancement of ripar

752: A. M. Suren, T. Riis, B. J. F. Biggs, S. McMurtrie and R. Barker,. 2005. Assessing the effectiveness of enhancement activities in urban streams: I. Habitat responses. River Research and Applications 4(21): 381-401.

Abstract: Effects of stream enhancement on habitat conditions in five spring-fed urban streams in Christchurch, New Zealand, were investigated. Stream enhancement consisted of riparian planting at three sites, and riparian planting and channel modifications at two sites. where a concrete dish channel and a timber-lined channel were removed, and natural banks reinstated. Sited, were surveyed prior to enhancement activities and 5 years after, and changes in riparian conditions (composition, horizontal and vertical cover), instream conditions (bank modifications, inorganic and organic material on the streambed), and hydraulic conditions (wetted perimeter, cross-sectional area, depths and velocities) quantified. Enhanced sites generally had higher marginal vegetation cover, as well as increased overhanging riparian vegetation, reflecting planting of *Carex* sedges close to the water. Bed sediments changed at some sites, with the greatest change being replacement of a concrete channel with gravel and cobble substrate. Bryophyte cover declined at this site, reflecting loss of stable habitat where these plants grew. Bed sediments changed less at other sites, and cover of fine sediments increased in some enhanced sites, presumably from sediment runoff from nearby residential development. Filamentous algal cover decreased at one stream where shade increased, but increased in another stream where the removal of timber-lined banks and creation of a large pond decreased shade. Stream enhancement increased variability in velocity at three of the five sites, but overall changes to stream hydraulics were small. Although enhancement activities altered the physical conditions of the streams, major changes occurred only to riparian vegetation and bank conditions. Lack of other major changes to instream physical conditions most likely reflected the limited range of channel morphology alterations undertaken. Moreover, the flat topography of Christchurch and naturally low stream discharge further c

753: S. Sylvestre and R. C. Bailey,. 2005. Ecology of leaf pack macroinvertebrate communities in streams of the Fraser River Basin, British Columbia. *Freshwater Biology* 6(50): 1094-1104.

Abstract: 1. To characterise geographic and small scale variation in the structure of macroinvertebrate communities in stream leaf packs, we collected one to three natural leaf pack communities from 119 reference streams in the Fraser River Basin and quantified their variability and correlation with aspects of the stream environment at several scales. We also sampled leaf packs in 19 test streams in the same geographic area exposed to stressors (nine logged, seven farmed, three mined catchments) to evaluate the leaf pack community as a tool for bioassessment. 2. There was substantial variation in the composition of invertebrate communities in leaf packs among reference streams of the Fraser River Basin. *Capnia* and *Zapada* (stoneflies), *Baetis* and *Ephemerella* (mayflies) and *Tvetnia* (midge) were the most common taxa found in the leaf packs. There were three types of assemblages identified by non-metric multidimensional scaling; *Capnia*, *Baetis* and *Ephemerella* communities. 3. Leaf pack communities from the 19 test streams were plotted on a non-metric multidimensional scaling ordination of the reference communities, and 14 of 19 sites fell outside the 80% confidence ellipse of the reference sites, including eight of nine logged, four of seven farmed and one of three mined catchments. Most of these streams plotted on the ordination near the *Ephemerella* reference communities. Reference stream communities had a similar number of genera per leaf pack (12.0) and genera per site (18.7) as the test streams (12.6 genera per leaf pack and 18.7 genera per site). Among the test sites, the farmed catchments had higher genera per leaf pack (17.8) and genera per site (21.9) than either the logged (11.5 genera per leaf pack; 19.9 genera per site) or mined (3.4 genera per leaf pack; 7.7 genera per site) catchments. 4. Heterogeneity of leaf pack communities within a site decreased as the number of genera found at the site increased. This was determined by allometric regression of the number of gene

754: N. Syversen,. 2005. Effect and design of buffer zones in the Nordic climate: The influence of width, amount of surface runoff, seasonal variation and vegetation type on retention efficiency for nutrient and particle runoff. Ecological Engineering 5(24): 483-490.

Abstract: Loss of nutrients and sediments from agricultural runoff causes eutrophication in surface water. Vegetated buffer zones adjacent to a stream can effectively remove and retain nutrients and sediments. It is, therefore, important to study design criteria which optimise the effect of buffer zones (BZ). This paper describes the influence of four criteria: (i) buffer zone width, (ii) amount of surface runoff water entering the BZ, (iii) seasonal variation and (iv) vegetation type. These parameters were studied after simulated and natural runoff at four different sites in Southern Norway with cold temperate climate. Surface runoff was collected before entering and after passing the BZs. The simulation experiments were short-term experiments carried out over a few days in 1992 and 1993. In the natural runoff experiments, volume proportional mixed samples were collected after each runoff period during 1992-1999. The results show significantly higher removal efficiency (in %) from 10 m wide BZs compared to 5 m widths, however, the specific retention (per m²) is higher in 5 m BZ. Buffer zones can receive particle runoff over several days without a significant decrease in their removal level. Retention efficiency between summer and autumn varied depending on the measured parameter (phosphorus, particles and nitrogen), and there were no significant differences in removal efficiency between summer and winter. -The results show no significant differences between forest buffer zones (FBZ) and grass buffer zones (GBZ) regarding their retention efficiency for nitrogen and phosphorus. There was significantly higher retention efficiency in FBZ for particles. Average removal efficiencies from both simulated and natural runoff experiments varied from 60-89%, 37-81 % and 81-91 % for phosphorus, nitrogen and particles, respectively. (c) 2005 Elsevier B.V. All rights reserved.

755: R. D. Tadonleke, D. Planas and A. Lucotte,. 2005. Microbial food webs in boreal humic lakes and reservoirs: Ciliates as a major factor related to the dynamics of the most active bacteria. *Microbial Ecology* 2(49): 325-341.

Abstract: In order to assess the factors that determine the dynamics of bacteria with high nucleic acid content in aquatic systems, we (i) conducted 24-h in situ dialysis experiments, involving different fractions of plankton and unfiltered water and (ii) examined empirical relationships between bacteria and both abiotic factors and protists, in boreal humic freshwaters (reservoir and lakes) in the James Bay region (Quebec, Canada). Bacteria were subdivided into two subgroups on the basis of their nucleic acid content assessed by flow cytometry. The abundance of bacteria with the highest nucleic acid content and high light scatter (HNA-hs) was significantly correlated, across sites, to bacterial production, whereas bacteria with lower nucleic acid content (LNA) and total bacteria were not. In addition, HNA-hs growth was higher and more variable than LNA growth, indicating that HNA-hs were the most dynamic bacteria. Heterotrophic nanoflagellate and ciliate biomass represented, on average, 5 and 13% of bacterial biomass, respectively. Both in ambient waters and in experiments, ciliates were significantly and negatively correlated with bacteria, whereas heterotrophic nanoflagellates, likely under the grazing pressure from ciliates and metazooplankton, were not. Among ciliates, *Cyclidium glaucoma* appeared to play an important role. Its growth was significantly and negatively correlated to that of HNA-hs but not to that of LNA. In ambient waters, the abundance of this species explained 56% of the variations in HNA-hs abundance and only 27% of those for LNA. The abundances of total bacteria and LNA significantly increased with chlorophyll a, whereas those of HNA-hs did not. In addition, during the experiments, the estimated potential losses of HNAhs significantly increased with the initial abundance of *C. glaucoma*. These results suggest selective removal of the most dynamic bacteria by *C. glaucoma* and indicate that ciliates may play an important role in the dynamics of active bacter

756: J. F. Talling, H. J. Spencer and H. R. Morison,. 2005. The 'shock period': dynamics of phytoplankton during the spring-summer transition of a stratifying English lake. *Hydrobiologia* (533): 15-28.

Abstract: The spring to summer transition in a productive English lake is considered with respect to phytoplankton and its environmental conditions. Salient environmental changes include the onset of temperature/density stratification that is usually accompanied by a clear-water phase associated with a maximum of grazing *Daphnia* and a minimum of phytoplankton in the 0-5 m zone. Below this zone, as thermal stratification progresses, a deep maximum of phytoplankton can develop under strong thermal/density gradients and enhanced light penetration. Examples are resolved by estimations of chlorophyll-a, beam attenuation in situ and cell counts. Attributed origins are by sedimentation of diatoms, migration of flagellates, and depth-adjusted buoyancy of a gas-vacuolate cyanophyte. The transition period involves a decline of spring-associated diatom populations and a rise of summer-associated species. The generally low algal abundance within the transition phase has at least four origins - prior nutrient (Si) depletion, sedimentation, grazing, and low 'inoculum' levels of successor species. It can be augmented by the re-growth of species abundant in spring, by early extensions of normally summer species, by seasonally characteristic colonial chrysophytes, and by other phytoflagellates of small size that are seasonally less specific ('opportunistic') and probably critical for *Daphnia* grazing with consequent generation of the clear-water phase.

757: H. Tammert, V. Kisand and T. Noges,. 2005. Bacterioplankton abundance and activity in a small hypertrophic stratified lake. *Hydrobiologia* (547): 83-90.

Abstract: Bacterioplankton abundance and production were followed during one decade (1991-2001) in the hypertrophic and steeply stratified small Lake Verevi (Estonia). The lake is generally dimictic. However, a partly meromictic status could be formed in specific meteorological conditions as occurred in springs of 2000 and 2001. The abundance of bacteria in Lake Verevi is highly variable (0.70 to 22×10^6 cells ml^{-1}) and generally the highest in anoxic hypolimnetic water. In 2000-2001, the bacterial abundance in the hypolimnion increased probably due to meromixis. During a productive season, heterotrophic bacteria were able to consume about 10-40% of primary production in the epilimnion. Our study showed that bacterioplankton in the epilimnion was top-down controlled by predators, while in metalimnion bacteria were dependent on energy and carbon sources (bottom-up regulated). Below the thermocline hypolimnetic bacteria mineralized organic matter what led to the depletion of oxygen and created anoxic hypolimnion where rich mineral nutrient and sulphide concentrations coexisted with high bacterial numbers.

758: Z. Tang, B. A. Engel, B. C. Pijanowski and K. J. Lim,. 2005. Forecasting land use change and its environmental impact at a watershed scale. Journal of Environmental Management 1(76): 35-45.

Abstract: Urban expansion is a major driving force altering local and regional hydrology and increasing non-point source (NPS) pollution. To explore these environmental consequences of urbanization, land use change was forecast, and long-term runoff and NPS pollution were assessed in the Muskegon River watershed, located on the eastern coast of Lake Michigan. A land use change model, LTM, and a web-based environmental impact model, L-THIA, were used in this study. The outcomes indicated the watershed would likely be subjected to impacts from urbanization on runoff and some types of NPS pollution. Urbanization will slightly or considerably increase runoff volume, depending on the development rate. Urbanization will slightly increase nutrient losses in runoff, but significantly increase losses of oil and grease and certain heavy metals in runoff. The spatial variation of urbanization and its impact were also evaluated at the subwatershed scale and showed subwatersheds along the coast of the lake and close to cities would have runoff and nitrogen impact. The results of this study have significant implications for urban planning and decision making in an effort to protect and remediate water and habitat quality of Muskegon Lake, which is one of Lake Michigan's Areas of Concern (AOC) and the techniques described here can be used in other areas. (c) 2005 Elsevier Ltd. All rights reserved.

759: S. E. Tank, M. A. Xenopoulos and L. L. Hendzel,. 2005. Effect of ultraviolet radiation on alkaline phosphatase activity and planktonic phosphorus acquisition in Canadian boreal shield lakes. *Limnology and Oceanography* 5(50): 1345-1351.

Abstract: We examined how ultraviolet radiation (UVR) affects the activity of alkaline phosphatase (APase), a common extracellular enzyme. APase activity declined up to 57% under UVR exposure and decreased more often under ultraviolet A than ultraviolet B exposure, indicating that most of the observed decrease did not occur through direct enzyme inactivation. Enzyme activity in the particulate fraction ($> 0.22 \mu\text{m}$) was less susceptible to UVR than activity in the total or dissolved fractions, suggesting that attachment to the cell surface may convey some protection against UVR-induced inactivation. Samples that were $0.22\text{-}\mu\text{m}$ filtered before being subjected to radiation treatments often showed increased enzyme activity, especially in the photosynthetically active radiation-only treatment, indicating reactivation of APase in the absence of de novo production of the enzyme. Decreases in APase can be severe near the lake surface, suggesting that UVR-induced variations in APase activity might contribute to microscale variations in nutrient availability and community composition.

760: C. C. Tanner, R. J. Craggs, J. P. S. Sukias and J. B. K. Park,. 2005. Comparison of maturation ponds and constructed wetlands as the final stage of an advanced pond system. *Water Science and Technology* 12(51): 307-314.

Abstract: The treatment performance of a maturation pond (MP), the typical final polishing stage of an Advanced Pond System (APS), is compared with that of a surface-flow constructed wetland (CW) over 19 months. Both received similar to 67 mm d(-1) of wastewater after passage through upstream stages of the APS. The MP, with greater sunlight exposure, had higher algal biomass (and associated suspended solids) than the CW, showed higher dissolved oxygen (DO) concentrations and greater diurnal variation in DO and pH. Neither polishing stages reduced nutrients markedly, with the CW exporting slightly more NH₃-N and DRP, and less NO₃-N than the MP. Disinfection was more efficient in the MP (geometric mean 1 log load removal, 12 MPN (100 ml)(-1)) compared to the CW (0.47 log load removal, 53 MPN (100 ml)(-1)). Incorporation of a final rock filter (28% of area) reduced median solids levels to < 10g m(-3) in both the MP and CW. A hybrid between MPs and CWs with alternating zones of open-water (for enhanced disinfection and zooplankton grazing of algal solids) and wetland vegetation (promoting sedimentation and denitrification, and providing refugia for zooplankton) may provide more consistent effluent quality than either stage alone.

761: C. C. Tanner, M. L. Nguyen and J. P. S. Sukias,. 2005. Nutrient removal by a constructed wetland treating subsurface drainage from grazed dairy pasture. Agriculture Ecosystems & Environment 1-2(105): 145-162.

Abstract: Nitrogen and phosphorus budgets over two annual periods are presented for an establishing surface-flow constructed wetland treating subsurface drainage from rain-fed, dairy cattle grazed pasture in the North Island of New Zealand. Drainage flows to the wetland (occupying similar to 1% of the catchment area) were highly pulsed, associated with rainfall and soil water status, and differed between years (305 and 197 mm drainage). Flow-proportional sampling of inflow and outflow concentrations were combined with continuous flow records to calculate mass balances for the wetlands. Influent nitrate concentrations were high (median 11 g m⁻³) in both years, but transient loads of organic N were also an important form of N in the first year. Mass removal of total nitrogen (TN) and its main constituent forms nitrate/nitrite and organic N was recorded for all seasons over both annual periods studied. TN mass removal efficiency of 79% (841 g m⁻²) per year in the first year, declined to 21% (40 g m⁻²) per year in the second year, associated with changes in the magnitude, speciation and seasonal pattern of N export from the catchment. Ammoniacal N (NH₄-N), which comprised <0.5% of TN loadings to the wetland, was generated in small amounts during passage through the wetland in both years. Total phosphorus (TP) in the drainage waters occurred at median concentrations of 0.1-0.2 g m⁻³, mainly in dissolved reactive forms (DRP 92% by mass). TP export rose by 101% (5.0 g m⁻²) per year after passage through the wetland in the first year, but decreased by 12% (0.2 g m⁻²) per year in the second year. The results show that constructed wetlands comprising similar to 1% of catchment area can markedly reduce N export via pastoral drainage. but may be net sources of NH₄-N, DRP and TP during establishment. Performance of the wetland appeared to be affected by both establishment/maturation factors and year-to-year climatic variations. Longer-term studies, supplemented by process-based

762: M. Tarvainen, A. M. Ventela, H. Helminen and J. Sarvala,. 2005. Nutrient release and resuspension generated by ruffe (*Gymnocephalus cernuus*) and chironomids. *Freshwater Biology* 3(50): 447-458.

Abstract: 1. Benthivorous fish may play an important role in internal nutrient loading. Ruffe are highly specialised, feeding exclusively on bottom animals; thus all nutrients released via their feeding are derived from the bottom and are new to the water column. The fish can also release nutrients from the sediment through resuspension while searching for food. 2. The aim of this study was to estimate experimentally in the laboratory the effect on water quality of resuspension and nutrient release by ruffe and bottom animals (chironomids). 3. Ruffe released nutrients during 8 h experiments as follows: total P 1.4, dissolved PO₄ 0.6, total N 24.0 and NH₄-N 15.9 $\mu\text{g g}^{-1} \text{ WW h}^{-1}$. A decreasing trend in mass-specific release was observed over time, probably because of starvation. The mass-specific release of total N and NH₄-N decreased as the mean weight of fish increased. The mean ratio of excreted N : P was 32. 4. In 26 h experiments with sediment and both ruffe and chironomids, ruffe increased nutrient concentrations and turbidity values significantly but chironomids had an effect only on turbidity. Neither ruffe nor chironomids affected the ratio of inorganic N : P concentrations. An interaction between ruffe and chironomids was found for turbidity. 5. According to these results, benthivorous fish may increase nutrient concentrations in the water column and need to be taken into account when estimating internal loading.

763: I. Tatrai, K. Matyas, J. Korponai, G. Szabo, P. Pomogyi and J. Heri,. 2005. Response of nutrients, plankton communities and macrophytes to fish manipulation in a small eutrophic wetland lake. International Review of Hydrobiology 5-6(90): 511-522.

Abstract: A food web manipulation experiment was started in 1999 in a small shallow eutrophic (Major Lake as a part of the wetland area, the Kis-Balaton Water Protection System, KBWPS). The development of submerged macrophytes, the structure and biomass of phytoplankton and crustacean plankton responded rapidly to the removal of 60% of omnivorous cyprinid fish. An increase in transparency and a decrease in the concentrations of chlorophyll-a, phytoplankton and phosphorus occurred simultaneously with the increased presence of submerged macrophytes, which covered 45% of the lake area compared with < 10% during the premanipulation period. The success of fish manipulation demonstrated the potential of this measure as a short-term management strategy. Our data also indicated that the clear water state was not stable in the long term. As long as phosphorus level is high, there is a risk that macrophytes will not successfully establish for longer period.

764: W. K. Taulbee, S. D. Cooper and J. M. Melack,. 2005. Effects of nutrient enrichment on algal biomass across a natural light gradient. Archiv Fur Hydrobiologie 4(164): 449-464.

Abstract: Algae are limited by light and nutrients, and the combined effects of light and nutrients on algae are often more important than their independent effects. To investigate the interactive effects of light and nutrients on benthic algae, we measured the effects of nutrient enrichment on chlorophyll-a concentrations across a natural light gradient in a Sierra Nevada subalpine stream using nutrient diffusing substrata (NDS) bioassays during the summer of 1999. Algal chlorophylla concentrations were nitrogen limited across the entire light gradient. Chlorophyll-a concentrations increased with increasing light levels for algae growing on substrata to which nitrogen was added, whereas chlorophyll-a concentrations decreased with increasing light levels for algae growing on substrata receiving phosphorus or no nutrient additions. These results demonstrate that for essential resources such as light and nutrients, the magnitude of the response to enrichment by one resource depends on the relative availability of the other resource.

765: R. Tavera and V. Martinez-Almeida,. 2005. Atelomixis as a possible driving force in the phytoplankton composition of Zirahuen, a warm-monomictic tropical lake. *Hydrobiologia* (533): 199-208.

Abstract: The present work reviews our current understanding of the limnology of Lake Zirahuen and extends this knowledge through an analysis of the phytoplankton, illustrating phenomena that typify monomictic tropical lakes. The analysis reinforces the postulate that atelomixis determines the variation in phytoplankton composition of deep tropical lakes with a monomictic mixing regime. Similarly, it is proposed that an incomplete or partial atelomixis, generating a highly dynamic mixing layer, is a force that possibly drives the selection of algal groups, like the Desmidiaceae, with a high surface area to volume ratio. These organisms, characteristic of tropical lakes, though found in the deep epilimnetic layer, receive sufficient irradiance to support their high photosynthetic rate; their high population density survive thanks to a constant supply of nutrients. Lake Zirahuen is a particularly relevant case for Mexico, since the low calcium concentration and the trophic level of the lake provide an explanation for the otherwise uncommon presence of desmids in other Mexican lakes, even in lakes that exhibit atelomictic phenomena.

766: J. Temnerud and K. Bishop,. 2005. Spatial variation of streamwater chemistry in two Swedish boreal catchments: Implications for environmental assessment. Environmental Science & Technology 6(39): 1463-1469.

Abstract: To evaluate the scale-dependent spatial variability of water chemistry within two Swedish boreal catchments (subcatchment areas 0.01-78 km²), samples were taken at every junction in the stream network during June 2000 and August 2002. The values of most chemical constituents spanned more than an order of magnitude, and the range was similar to that found in all of Northern Sweden by the national stream survey in 2000. According to the official assessment tools used in Sweden, the entire range of environmental status (for pH, absorbance, alkalinity, dissolved organic carbon (DOC)) and human acidification influence existed within these two study catchments. The water chemistry parameters were relatively stable at catchment areas greater than 15 km². Sampling at that scale maybe adequate if generalized values for the landscape are desired. However the chemistry of headwaters, where much of the stream length and aquatic ecosystem is found would not be characterized. Map parameters correlated to the variability in a key chemical parameter, DOC, but the best predictive map parameters differed markedly between catchments. This study highlights the importance of accounting for headwater spatial variability in environmental assessments of running waters, even in relatively pristine areas. The nature of drainage networks with many headwaters and progressively fewer downstream watercourses makes this a considerable challenge.

767: C. Teodoru and B. Wehrli,. 2005. Retention of sediments and nutrients in the Iron Gate I Reservoir on the Danube River. Biogeochemistry 3(76): 539-565.

Abstract: This work addresses an intensively debated question in biogeochemical research: "Are large dams affecting global nutrient cycles?" It has been postulated that the largest impoundments on the Lower Danube River, the Iron Gates Reservoirs, act as a major sink for silica (Si) in the form of settling diatoms, for phosphorus (P) and to a lesser extent for nitrogen (N). This retention of P and N in the reservoir would represent a positive contribution to the nutrient reduction in the Danube River. Based on a 9-month monitoring scheme in 2001, we quantified the nutrient and the sediment retention capacity of the Iron Gate I Reservoir. The sediment accumulation corresponded to 5% TN (total nitrogen), 12% TP (total phosphorus) and 55% TSS (total suspended solids) of the incoming loading. A mass balance revealed that more N and P are leaving the reservoir than entering via the inflow. Based on these current results, the reservoir was temporarily acting as a small nutrient source. The nutrient accumulation in the sediments of the Iron Gate I Reservoir represents only 1% of the "missing" load of $10(6)$ t N and $1.3 \times 10(5)$ t P defined as the difference between the estimated nutrient export from the Danube Basin and the measured flux entering the Black Sea. This result disproves the hypothesis that the largest impoundment on the Danube River, the Iron Gates Reservoir, plays a major role in N and P elimination.

768: I. Ternjej and M. Tomec,. 2005. Plankton community and related environmental factors in the oligotrophic Lake Vrana. Periodicum Biologorum 3(107): 321-328.

Abstract: Background and Purpose: The study aimed to determine abiotic and biotic factors and their influence on plankton community of the lake. Materials and Methods: Data on some relevant environmental variables and phytoplankton and crustacean zooplankton of oligotrophic Lake Vrana (Cres Island), were analyzed using Canonical Correspondence Analysis (CCA). Results and Conclusions: The portion of total variance described by, the multivariate analysis was relatively high: the model explained 69.94% variance of phytoplankton and environmental data, 90.30% crustacean zooplankton and environmental data, and 58.44% of phytoplankton vs. crustacean zooplankton data. According to multivariate analysis, temperature and nutrient supply appear to be the main driving factors for phytoplankton dynamics. The dinoflagellate *Ceratium hirundinella* was the dominant-species in the phytoplankton community, and showed the greatest correlation with copepod *Cyclops abyssorum* abundance. Three cladoceran species *Daphnia longispina* O. F. Muller 1785, *Diaphanosoma brachyurum* (Lievin 1848), *Bosmina longirostris* (O. F. Müller 1785) were present in the lake. Their dynamics was influenced by the food supply, i.e. the appearance of certain phytoplankton species. *B. longirostris* showed the greatest correlation with *Aphanizomenon flos-aque* Ralps, *Cosmarium abbreviatum* Racib., *Cosmarium* sp., *G. brebisonii* and *Mougeotia* sp. *Daphnia longispina* correlated with species *S. quadricauda*, *Closterium aciculare* T. West, *Oocystis lacustris*. Chod., *Peridinium aciculiferum*, *P. willei*; *Cyclotella kuetzingiana* and *Cyclotella comta* (E.) Kiitz. *Diaphanosoma brachyurum* correlated with phytoplankton species of genus *Staurastrum*, *Cyclotella pseudostelligera*, *Pediastrum simplex*, *Oocystis marssonii*, *Chroococcus limneticus*, *Fragilaria crotonensis* Kitt. and *Melosira granulata*.

769: R. K. Thiet, R. E. J. Boerner, M. Nagy and R. Jardine,. 2005. The effect of biological soil crusts on throughput of rainwater and N into Lake Michigan sand dune soils. *Plant and Soil* 1-2(278): 235-251.

Abstract: Biological soil crusts composed of cyanobacteria, green algae, bryophytes, and lichens colonize soils in and and semiarid ecosystems worldwide and are responsible for significant N input to the soils of these ecosystems. Soil crusts also colonize active sand dunes in more humid regions, but studies of structure and function of such sand dune crusts are lacking. We identified the cyanobacterial, algal, and bryophytic constituents and N production and leachates of biological soil crusts that colonize beach dunes at the Indiana Dunes National Lakeshore along southern Lake Michigan in Indiana, USA. To determine the role of these crusts in this system, we conducted a greenhouse experiment in which intact soil cores with biological crusts were subjected to artificial rainfall over a full growing season. The volume and N content of leachate from the cores were quantified in relation to degree of crust development, taxonomic composition, rainfall volume and intensity, light intensity, and the presence of plant litter. Net N throughput significantly exceeded N inputs to cores in rainwater. Net N outputs from crusts to subsurface soil ranged from 0.01 to 0.19 g $\text{NH}_4^+-\text{N m}^{-2} \text{ yr}^{-1}$ and 0.01 to 0.61 g $\text{NO}_3 \text{ m}^{-2} \text{ yr}^{-1}$ stop. Thus, total inorganic N inputs associated with biological soil crusts ranged from 0.02 g N m^{-2} stop yr^{-1} stop to 0.8 g N m^{-2} stop yr^{-1} stop. High volume (≥ 2 cm) rainfall resulted in more N leaching than low volume events, and plant litter added over the surface of crusted soil cores significantly increased the amount of N in leachate. Exploratory path analysis revealed direct and indirect linkages among environmental factors, crust development, and crust composition in regulating the throughput of H_2O and N from these intact soil cores. Biological soil crusts at this site, combined with other properties of the soil surface, substantially increase N inputs to this water- and nutrient-limited sand dune ecosystem.

770: J. S. Thullen, J. J. Sartoris and S. M. Nelson,. 2005. Managing vegetation in surface-flow wastewater-treatment wetlands for optimal treatment performance. Ecological Engineering 5(25): 583-593.

Abstract: Constructed wetlands that mimic natural marshes have been used as low-cost alternatives to conventional secondary or tertiary wastewater treatment in the U.S. for at least 30 years. However, the general level of understanding of internal treatment processes and their relation to vegetation and habitat quality has not grown in proportion to the popularity of these systems. We have studied internal processes in surface-flow constructed wastewater-treatment wetlands throughout the southwestern U.S. since 1990. At any given time, the water quality, hydraulics, water temperature, soil chemistry, available oxygen, microbial communities, macroinvertebrates, and vegetation each greatly affect the treatment capabilities of the wetland. Inside the wetland, each of these components plays a functional role and the treatment outcome depends upon how the various components interact. Vegetation plays a uniquely important role in water treatment due to the large number of functions it supports, particularly with regard to nitrogen transformations. However, it has been our experience that vegetation management is critical for achieving and sustaining optimal treatment function. Effective water treatment function and good wildlife quality within a surface-flow constructed wetland depend upon the health and sustainability of the vegetation. We suggest that an effective tool to manage and sustain healthy vegetation is the use of hummocks, which are shallow emergent plant beds within the wetland, positioned perpendicular to the water flow path and surrounded by water sufficiently deep to limit further emergent vegetation expansion. In this paper, we describe the use of a hummock configuration, in conjunction with seasonal water level fluctuations, to manage the vegetation and maintain the treatment function of wastewater-treatment wetlands on a sustainable basis. Published by Elsevier B.V.

771: T. M. Tibbets and M. C. Molles,. 2005. C : N : P stoichiometry of dominant riparian trees and arthropods along the Middle Rio Grande. *Freshwater Biology* 11(50): 1882-1894.

Abstract: 1. We examined the role of flooding on the leaf nutrient content of riparian trees by comparing the carbon : nitrogen : phosphorus (C : N : P) ratio of leaves and litter of Rio Grande cottonwood (*Populus deltoides* ssp. *wislizenii*) in flood and non-flood sites along the Middle Rio Grande, NM, U.S.A. The leaf C : N : P ratio was also examined for two non-native trees, saltcedar (*Tamarix chinensis*) and Russian olive (*Elaeagnus angustifolia*), and six species of dominant riparian arthropods. 2. Living leaves and leaf litter of cottonwoods at flood sites had a significantly lower leaf N : P ratio and higher %P compared with leaves and litter at non-flood sites. A non-flood site downstream from wastewater effluent had a significantly lower litter C : N ratio than all other sites, suggesting N fertilisation through ground water. The non-native trees, saltcedar and Russian olive, had higher mean leaf N content, N : P ratio, and lower C : N ratio compared with cottonwoods across study sites. 3. Riparian arthropods ranged from 5.2 to 7.1 for C : N ratio, 56-216 for C : P ratio, and 8.9-34 for N : P ratio. C content ranged from 25 to 52% of dry mass, N content from 4.7 to 10.8%, and P content from 0.59 to 1.2%. Differences in stoichiometry between high C : nutrient leaf litter and low C : nutrient invertebrates suggests possible food-quality constraints for detritivores. 4. These results suggest that spatial and temporal variation in the C : N : P ratio of cottonwood leaves and leaf litter is influenced by surface and subsurface hydrologic connection within the floodplain. Reach-scale variation in the elemental composition of riparian organic matter inputs may have important implications for decomposition, nutrient cycling, and food webs in river floodplain systems.

772: A. A. Tikku, R. E. Bell, M. Studinger, G. K. C. Clarke, I. Tabacco and F. Ferraccioli,. 2005. Influx of meltwater subglacial Lake Concordia, East Antarctica. Journal of Glaciology 172(51): 96-104.

Abstract: We present evidence for melting at the base of the ice that overlies Lake Concordia, an 800 km² subglacial lake near Dome Concordia, East Antarctica, via a combination of glaciohydraulic melting (associated with the tilted ice ceiling and its influence on lake circulation/melting temperature) and melting by extreme strain heating (where the ice sheet is grounded). An influx of water is necessary to provide nutrients, material and biota to support subglacial lake ecosystems but has not been detected previously. Freezing is the dominant observed basal process at over 60% of the surface area above the lake. The total volume of accreted ice above the lake surface is estimated as 50-60 km³, roughly 25-30% of the 200 +/- 40 km³ estimated lake volume. Estimated rates of melting and freezing are very similar, +/- 2-6 mm a⁻¹. The apparent net freezing may reflect the present-day response of Lake Concordia to cooling associated with the Last Glacial Maximum, or a large influx of water either via a subglacial hydrological system or from additional melting of the ice sheet. Lake Concordia is an excellent candidate for subglacial exploration given active basal processes, proximity to the Dome Concordia ice core and traverse resupply route.

773: R. W. Tiner, 2005. Assessing cumulative loss of wetland functions in the Nanticoke River watershed using enhanced National Wetlands Inventory data. *Wetlands* 2(25): 405-419.

Abstract: The coterminous U.S. has lost more than 50% of its wetlands since colonial times. Today, wetlands are highly valued for many functions including temporary storage of surface water, streamflow maintenance, nutrient transformation, sediment retention, shoreline stabilization, and provision of fish and wildlife habitat. Government agencies and other organizations are actively developing plans to help protect, conserve, and restore wetlands in watersheds. The U.S. Fish and Wildlife Service's National Wetlands Inventory Program (NWI) has produced wetland maps, digital geospatial data, and wetland trends data to aid these and other conservation efforts. Most recently, the NWI has developed procedures to expand the amount of information contained within its digital databases to characterize wetlands better. It has also developed techniques to use these data to predict wetland functions at the watershed level. Working with the states of Delaware and Maryland, the NWI applied these techniques to the Nanticoke River watershed to aid those states in developing a watershed-wide wetland conservation strategy. Wetland databases for pre-settlement and contemporary conditions were prepared. An assessment of wetland functions was conducted for both time periods and comparisons made. Before European settlement, the Nanticoke watershed had an estimated 93,000 ha of wetlands covering 45% of the watershed. By 1998, the wetland area had been reduced to 62% of its original extent. Sea-level rise and wetland conversion to farmland were the principal causes of wetland loss. From the functional standpoint, the watershed lost over 60% of its original capacity for streamflow maintenance and over 35% for four other functions (surface-water detention, nutrient transformation, sediment and particulate retention, and provision of other wildlife habitat). This study demonstrated the value of enhanced NWI data and its use for providing watershed-level information on wetland functions and for assessi

774: R. Toddington, M. Pankhania and E. C. Clark,. 2005. Advanced leachate treatment at the Stewartby landfill site. Water and Environment Journal 3(19): 264-271.

Abstract: Landfill liquor (leachate) is produced by complex microbial processes within a landfill site. The long retention period, typically in excess of many years, ensures that easily-biodegradable materials disappear rapidly, whereas intractable (hard) Chemical Oxygen Demand (COD) substances decay slowly. The resultant liquor is often difficult to treat biologically due to high concentrations of Ammoniacal N (amm. N) and low concentrations of nutrient Phosphorus (P) and Biochemical Oxygen Demand (BOD). The advanced treatment process adopted at the Stewartby landfill site has been based on extensive laboratory trials by WRG Ltd (formerly Shanks Ltd), with technical input from Birse Process Engineering Ltd. This has significantly reduced the risks involved in plant scale-up. The particular choice of treatment process reflects the stringent discharge consent and the wide variety of waste received at the site, in particular, the presence of hazardous waste producing a leachate which is especially difficult to treat. Treatment is based on the activated sludge process, assisted by Powdered Activated Carbon (PAC) dosing. The leachate is heated to improve oxidation of amm. N and the process stream also includes Dissolved Air Flotation (DAF) and Sand Filtration to remove suspended solids (SS) and P. Odour control is provided by a two-stage activated carbon unit. Results from the full-scale treatment plant have been excellent, averaging 70% COD removal and almost 100% amm.N removal and fully satisfying the sewer discharge consents imposed by Anglian Water and the Environment Agency. This paper describes the laboratory trials, process design and commissioning of the leachate treatment plant at the Stewartby landfill site.

775: S. G. Todorova, D. I. Siegel and A. M. Costello,. 2005. Microbial Fe(III) reduction in a minerotrophic wetland - geochemical controls and involvement in organic matter decomposition. Applied Geochemistry 6(20): 1120-1130.

Abstract: This paper presents the results of a study on the geochemistry of Fe in a minerotrophic wetland in Central New York. Fine-scale geochemical trends in the peat and peat porewater were investigated to evaluate detailed vertical profiles of Fe in solution. Two sites within the wetland were examined: one site adjacent to an agricultural field receiving nutrient inputs and another (pristine) site in the middle of the wetland. Results revealed that Fe(II) was produced in situ in the wetland, most probably as a result of microbial Fe(III) reduction. Iron(II) concentration profiles suggested the existence of Fe(III) reduction in the zone adjacent to the agricultural field, whereas no significant evidence for Fe(III) reduction occurred in the pristine zone. Theoretical equilibrium modeling predicted that the difference in soluble Fe concentrations between the two zones was probably caused by abiotic reactions, such as pyrite precipitation. Geochemically, a correlation between Fe(II) and bulk density showed the importance of Fe reduction in the decomposition of organic matter in the organic rich peat and demonstrated the importance of the mineralogical composition for the reduction of Fe(III). Finally, a unique reversal of Fe and SO₄²⁻ reduction was discovered in the zone adjacent to the agricultural field. (c) 2005 Elsevier Ltd. All rights reserved.

776: S. Toet, M. Bouwman, A. Cevaál and J. T. A. Verhoeven,. 2005. Nutrient removal through autumn harvest of *Phragmites australis* and *Typha latifolia* shoots in relation to nutrient loading in a wetland system used for polishing sewage treatment plant effluent. *Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering* 6-7(40): 1133-1156.

Abstract: The efficacy and feasibility of annual harvesting of *Phragmites australis* and *Typha latifolia* shoots in autumn for nutrient removal was evaluated in a wetland system used for polishing sewage treatment plant (STP) effluent. Aboveground biomass and nutrient dynamics nutrient removal through harvest were studied in parallel ditches with stands of *Phragmites* or *Typha* that were mown in October during two successive years. The inflow rate of STP effluent to the ditches was experimentally varied, resulting in pairs of ditches with mean hydraulic retention times (HRT) of 0.3, 0.8, 2.3, and 9.3 days, corresponding to N and P mass loading rates of 122-4190 g N m⁽⁻²⁾ yr⁽⁻¹⁾ and 28.3-994 g P m⁽⁻²⁾ yr⁽⁻¹⁾. Nitrogen and P removal efficiency by harvest of *Phragmites* and *Typha* shoots in October increased with increasing HRT, despite the opposite HRT effect on N and P standing stocks. This removal through harvest appeared to be useful in treatment wetlands with N and P mass loading rates lower than approximately 120 g N m⁽⁻²⁾ yr⁽⁻¹⁾ and 30 g P m⁽⁻²⁾ yr⁽⁻¹⁾, corresponding to a HRT of roughly 9 days in the ditches of this wetland system. At the HRT of 9.3 days, the annual mass input to the ditches was reduced through the harvest by 7.0-11% and 4.5-9.2% for N and P, respectively. At the higher nutrient mass loading rates, the nutrient removal through harvest was insignificant compared to the mass inputs. The vitality of *Phragmites* and *Typha*, measured as maximum aboveground biomass, was not affected by the annual cutting of the shoots in autumn over two years. The *Typha* stands yielded higher N and P removal efficiencies through shoot harvest than the *Phragmites* stands, which was largely the result of lower decreases in N and P standing stocks between August and October. This difference in nutrient standing stocks between the two species was caused by a combined effect of greater decreases in nutrient concentrations largely due to higher nutrient retranslocation efficiencies of *Phragmit*

777: S. Toet, R. S. P. Van Logtestijn, R. Kampf, M. Schreijer and J. T. A. Verhoeven,. 2005. The effect of hydraulic retention time on the removal of pollutants from sewage treatment plant effluent in a surface-flow wetland system. *Wetlands* 2(25): 375-391.

Abstract: We evaluated the effect of four hydraulic retention times (HRT, 0.3, 0.8, 2.3, and 9.3 days) on pollutant removal in a surface-flow wetland system for polishing tertiary effluent from a sewage treatment plant (STP). The removal efficiency of pollutants at these HRTs was based on mass budgets of the water inputs and outputs in parallel ditches, which together with a presettling basin, made up the wetland system. Fecal coliform and N-removal efficiencies in the ditches were enhanced by increasing the HRT, with only little removal of fecal coliforms during spring-summer at a HRT of 0.3 days. A HRT of 4 days turned out to be required to meet the desired bathing water standard for fecal coliforms ($10(3)$ cfu $100\text{ ml}(-1)$) and the future standard of ammonium ($1\text{ mg N l}(-1)$) all year. An annual N-removal efficiency of approximately 45% can be accomplished in the ditches at this HRT, corresponding to an annual N mass loading rate of $150\text{ g N m}(-2)\text{ yr}(-1)$. Annual P removal was not improved by increasing the HRT even up to 9.3 days, largely because of the still high P mass loading rate ($14\text{ g P m}(-2)\text{ yr}(-1)$) in combination with relatively low P input concentrations. Substantial P removal can probably only be achieved at HRTs longer than 15 days, which will not be feasible for the situation investigated because of the large land area that would be required to reach such long HRTs. The future P standard ($1\text{ mg P l}(-1)$) can therefore only be met by additional chemical P removal. In a densely populated country such as the Netherlands, adequate polishing of tertiary STP effluent in surface-flow wetlands with similar goals as for this wetland is restricted to small and medium-sized STPs. The simultaneous use of these treatment wetlands for other functions, such as nature conservation, recreation, and flood control, however, would permit the use of relatively larger land areas.

778: S. Toet, R. S. P. Van Logtestijn, M. Schreijer, R. Kampf and J. T. A. Verhoeven,. 2005. The functioning of a wetland system used for polishing effluent from a sewage treatment plant. *Ecological Engineering* 1(25): 101-124.

Abstract: A surface-flow wetland system designed for polishing effluent from a sewage treatment plant (STP) on the island of Texel, The Netherlands, was studied between April 1996 and March 1997. The wetland system was composed of a sequence of several units with different water depth, hydraulic retention time and vegetation. The system had a relatively short hydraulic retention time of 2.4 days (hydraulic loading rate 25 cm day⁻¹). The wetland system showed 92% removal of faecal coliforms (3.7 x 10¹⁰ Cfu m⁻² yr⁻¹), a 26% reduction of nitrogen (126 gN m⁻² yr⁻¹) and less than 5% reduction of phosphorus (5 g p m⁻² yr⁻¹). The oxygen concentration, which was less than 3 mg l⁻¹ in the STP effluent, showed a strong increase during passage through the wetland all year with a clear diurnal shift between 1 and 12 mg l⁻¹ in summer. Turbidity of the surface water doubled, but the suspended solids changed from sewage sludge particles at the beginning of the system to microscopic biota characteristic for a wetland at the end. A presettling basin produced substantial reductions of faecal coliforms (11 x 10¹⁰ cfu m⁻² yr⁻¹) and also intercepted incidental peaks in organic N and P load. N removal was highest in the shallow front sections of the subsequent parallel ditches (240 gN m⁻² yr⁻¹), largely owing to denitrification. These ditch sections contained *Phragmites australis* or *Typha latifolia*. The increase of the oxygen dynamics predominantly occurred in the rear, deeper sections of the parallel ditches, due to the presence of submerged macrophytes, macro-algae and periphyton. The treatment of the wetland resulted in water with acceptable faecal coliform concentrations that closely resembled the quality of the receiving surface water. However, the removal of nutrients was insufficient to meet the criteria for good ecological quality, probably due to the short hydraulic retention time. (C) 2005 Elsevier B.V. All rights reserved.

779: K. T. Tolonen, I. J. Holopainen, H. Hamalainen, M. Rahkola-Sorsa, P. Ylostalo, K. Mikkonen and J. Karjalainen,. 2005. Littoral species diversity and biomass: concordance among organismal groups and the effects of environmental variables. Biodiversity and Conservation 4(14): 961-980.

Abstract: Biomass and species diversity (richness and evenness) of littoral organisms were explored in 27 sites in three basins of the large Lake Saimaa system in eastern Finland. The basins differed in degree of nutrient loading and trophic status. Six organismal groups, i.e., phytoplankton, periphyton, macrophytes, crustacean zooplankton, benthic macroinvertebrates and fish were studied. Factors affecting the biomass and diversity of these groups were explored by multiple stepwise regression analysis. The biomass of different groups was explained by the same variables, mainly nutrients, while diversity was associated with different environmental factors among the studied groups. The biomass of periphyton, phytoplankton, zooplankton, and fish correlated significantly with each other. There was also an apparent association between the biomass of macrophytes and that of benthic invertebrates. However, no significant correlations were found among the diversity of the studied groups. In accordance with previous studies, our results did not support the existence of species-rich hotspots or the possibility of using any surrogate taxon to reveal overall biodiversity. Thus, for conservation planning, biological surveys should include extensive collection of taxonomic groups and organisms at all trophic levels.

780: K. S. Tonderski, B. Arheimer and C. B. Pers,. 2005. Modeling the impact of potential wetlands on phosphorus retention in a Swedish catchment. *Ambio* 7(34): 544-551.

Abstract: In southern Sweden, wetlands are constructed to remove nitrogen (N) in agricultural catchments. The possible effects of such wetlands on riverine phosphorus (P) were also estimated using input-output data from three well-monitored wetlands. This was done to formulate a simple model for removal of P that is dependent on inflow characteristics. Next, the N- and P-reducing effects of wetlands were modeled on a catchment scale (1900 km²) using the HBV-NP model and various assumptions about the wetland area and location. All three wetlands functioned as sinks for total P (tot-P) and for total suspended solids (TSS) with a removal of 10% to 31% and 28% to 50%, respectively. Mean P-removal rates of 17-49 kg ha⁻¹ yr⁻¹ were well simulated with the model. Catchment scale simulations indicated that wetlands were more efficient (in percentage of load) as traps for P than for N and that this may motivate the construction of wetlands for P removal far upstream from the catchment outlet.

781: Y. Tong, G. F. Lin, X. Ke, F. P. Liu, G. W. Zhu, G. Gao and J. H. Shen,, 2005. Comparison of microbial community between two shallow freshwater lakes in middle Yangtze basin, East China. Chemosphere 1(60): 85-92.

Abstract: In order to investigate the role of the microbial community in aquatic ecology and nutrient transformations in the development of eutrophication in large shallow freshwater lakes along Yangtze River, the microbial community in the depth-related sediment in Lake Chaohu and Lake Longganhu were compared. Lake Chaohu is one of the three most polluted lakes in China. However, the neighboring Lake Longganhu, a mesotrophic lake, is relatively pristine. The total phosphorous (TP) and total nitrogen (TN) concentration in water was detected at 0.193 mg l⁻¹ and 3.035 mg l⁻¹ for Lake Chaohu, 0.051 mg l⁻¹ and 0.774 mg l⁻¹ for Lake Longganhu, respectively. The population of the microorganisms with various ecological nutrient transforming functions (e.g. phosphate solubilizing, denitrifying and cellulose decomposing) and a batch of environmental parameters concerning the nutrient accumulating and transforming (e.g. total organic carbon, total nitrogen, and total phosphorous concentrations) were assayed in the depth-related sediment samples from several defined points in both lakes. The sediment samples from Lake Chaohu showed higher density of actinomycetes ($P < 0.05$) and phosphate-solubilizing bacteria ($P < 0.001$) and less profusion of denitrifying bacteria ($P < 0.05$) and cellulolytic microbes ($P < 0.001$), compared with those of Lake Longganhu. The data suggested that the current microbial community in the sediment of Lake Chaohu is in favor of sustaining or further accelerating the process of the lake eutrophication. A possible positive feedback loop which consists of sustained growth of microorganisms and gradual decline of lake eutrophic status is worth further discussing. (c) 2005 Elsevier Ltd. All rights reserved.

782: N. J. Torrecilla, J. P. Galve, L. G. Zaera, J. F. Retarnar and A. N. A. Alvarez,. 2005. Nutrient sources and dynamics in a mediterranean fluvial regime (Ebro river, NE Spain) and their implications for water management. Journal of Hydrology 1-4(304): 166-182.

Abstract: Nonpoint source and point source nutrient loads (N, PO₄-P, COD) to the Ebro River in its central sector were estimated using hydrogeological and socioeconomical data. Their impacts on eutrophication and nutrient dynamics in the river were analyzed through a review of the public administration's historical data and the interpretation of two sampling profiles in September 02 (low flows season) and April 03 (high flows season). A marked seasonality was found in nutrient concentrations, nutrient loads and eutrophication indicators (O₂, Turbidity), appearing symptoms of eutrophication during the summer related to both NPS and PS Nutrient loads within the study area. Agricultural NPS account for 64% of NO₃ loads generated within the study area while urban and industrial PS are responsible of 88% PO₄-P and 71% COD loads. Biological reactions within the river ecosystem (including denitrification in the most eutrophic branches) were found to be a key factor in nutrient content and dynamics. Improvements in urban and industrial wastewater treatment facilities, land use planning and restoration of river-side wetlands, seem to be adequate policies for the improvement of the nutrient water quality in the studied sector of the Ebro River. Flow and temperature seasonality related to Mediterranean fluvial regime imposes significant limitations to nutrient PS in order to accomplish the combined approach proposed in European Water Framework Directive (WFD), based upon Emission Limit Values (ELV) and Environmental Quality Standards (EQS). (c) 2004 Elsevier B.V. All rights reserved.

783: S. A. Townsend and P. A. Gell,. 2005. The role of substrate type on benthic diatom assemblages in the Daly and Roper Rivers of the Australian wet/dry tropics. *Hydrobiologia* (548): 101-115.

Abstract: The selection of one or more river substrata for the collection of benthic diatoms is fundamental to any monitoring or research programme because it can potentially bias the diatom data set. In the wet/dry tropics of Australia, where the use of benthic diatoms for river health assessment is in its infancy, the comparability of diatom assemblages on river substrata has been assessed. Benthic diatoms were sampled from seven river sites, with a range of ionic chemistries (conductivities 27-6500 $\mu\text{S cm}^{-1}$) but low nutrient concentrations. At each site, triplicate samples were collected from 3 to 6 substrata. The diatom assemblages sampled were: epilithon (assemblages on rock), epiphytes on macroalgae and macrophytes, epidendron (assemblages on wood), epipsammon (assemblages on sand), epipelon (assemblages on mud) and bacterial slime. The variability between substrate assemblages, at each site, were assessed according to the following: (1) a multivariate analysis of diatom assemblages, (2) ANOVA tests of species richness, (3) ANOVA tests of the relative abundance of common species (defined by an abundance of at least 10% in any one sample), and (4) a comparison of the number of species unique to a substrate. A total of 198 taxa were identified, with some taxa common to temperate Australia. Common species were found on all substrata, with sometimes statistically significantly different relative abundances. Taxa unique to a substrate had low relative abundances (0.1-2 %), were most often found on only one replicate, and are unlikely to be substrate specific because many are known to occur on other substrata. The assemblages on hard substrata, epilithon and epidendron, were found to be most similar. Diatom assemblages on macroalgal and macrophyte substrata, compared to other substrata, were highly variable. This is attributed to the loss of diatoms from grazing and sloughing, followed by recolonisation of newly exposed substrate. Other assemblages, notably epipsammon, were

784: S. A. Townsend and A. V. Padovan,. 2005. The seasonal accrual and loss of benthic algae (Spirogyra) in the Daly River, an oligotrophic river in tropical Australia. Marine and Freshwater Research 3(56): 317-327.

Abstract: The hierarchy of factors that control the growth and biomass of Spirogyra sp. was examined for an 18-km reach of the Daly River in the wet/dry tropics of northern Australia. On an annual temporal scale, hydrological disturbances control Spirogyra. Over the wet season (typically December-April), frequent runoff events prevent the colonisation and growth of Spirogyra in the Daly River. This is followed, however, by a lengthy period (typically May-November) without hydrological disturbances and river velocities that favour benthic algal growth. In 2001, Spirogyra became visible in mid-May, then grew to reach a maximum biomass in early August of 28 mg m⁻² of chlorophyll a. The standing crop of Spirogyra was primarily determined by the availability of gravel substrate and the velocity and shear stress at the river-bed. Photosynthetically available radiation (200-800 $\mu\text{m}^2 \text{m}^{-2} \text{s}^{-1}$) reaching the river-bed should not have limited algal growth, though self shading within the Spirogyra mats may have been important. Although the growth rate of Spirogyra was probably limited by nutrients, the maximum biomass was constrained by autogenic sloughing. The biomass of Spirogyra steadily declined to half its maximum in early October despite favourable river velocities, most likely a result of nutrient limitation. Spirogyra was then removed from the river by the first major runoff event of the wet season in late October. The hierarchy of factors that control benthic algal biomass in the Daly River are the same as in lower latitudes, though the long period of favourable river velocities when smaller scale, proximate factors (e. g. nutrients, shear stress) control biomass should be noted.

785: B. H. Traut,. 2005. Effects of nitrogen addition and salt grass (*Distichlis spicata*) upon high salt marsh vegetation in northern California, USA. *Estuaries* 2(28): 286-295.

Abstract: In the salt marshes of Tomales Bay, California, where grazing by cattle increases the input of nitrogen to the marsh (either directly or indirectly as runoff from within the salt marsh watershed), high salt marsh vegetation is dominated by *Distichlis spicata* and is less diverse than marshes without excess nutrients. Using a field experiment, I investigated the role of soil fertility on the plant community of the high salt marsh. I hypothesized that when soil fertility is increased by nitrogen addition plant productivity will increase, as indicated by height, biomass, and cover, and competitive exclusion, by *D. spicata*, will lead to a reduction in species richness and evenness, especially where the initial density of *Distichlis* is high (from transplanting). After two growing seasons, biweekly nitrogen addition to the high salt marsh led to increased plant biomass and cover. Diversity was not reduced, and space preemption by *Distichlis*-transplants did not confer a competitive advantage. Although the dominant species thrived (e.g., *Salicornia virginica*, *D. spicata*, *Triglochin concinna*), they did not displace subdominant species and decrease diversity. The vegetation response in this high salt marsh system does not support the hypothesis that as biomass and cover (indicators of productivity) increase in response to increased nitrogen, competitive exclusion will occur and diversity will decrease.

786: A. C. Travieso-Bello, P. Moreno-Casasola and A. Campos,. 2005. Impact produced by different cattle ranching practices on soil and vegetation from wetlands turned into pastures. *Interciencia* 1(30): 12-+.

Abstract: Cattle ranching has a negative impact on wetlands, as it generally gives way to modifications of the hydroperiod, introduction of non native species and large amounts of cattle. Ranching is the most important economic activity in the state of Veracruz, in the Gulf of Mexico. This paper presents the results of studying the impact on soil and vegetation (hidrology alteration, introduction of non-native grasses and cattle) caused by different management practices as well as by abandonment of fields which were transformed from herbaceous freshwater wetlands into inundated pasture lands, in Veracruz, Mexico. Soil variables such as phi, organic C, total N, extractable P, concentrations of ionic K, Na, Ca and Mg, and moisture soil retention capacity were analyzed during the do, season. Three times a year, during the dry season, the wet season, and the cold winter months, aerial and subterranean biomass was quantified. Species richness and wetland species turnover were also evaluated. Management practices change species composition and decrease species richness. Excluding cattle increases richness during the initial years but later on numbers of species decrease; wetland species are not retained. Hydrological alterations reduce the period of time the inundation lasts, increases pH, change nutrient availability and reduce the ability of wetlands soils to retain humidity It also changes biomass subterranean assignation. Introduction of non-native species also modifies nutrient availability and species richness. On the other hand, high numbers of heads of cattle reduce retention of soil humidity and modify the chemical composition of the soil. Different management practices produce a loss of the wetland attributes. These aspects should be taken into account before implementing cattle management practices that can alter the functioning of freshwater wetlands.

787: T. G. Troxler Gann, D. L. Childers and D. N. Rondeau,. 2005. Ecosystem structure, nutrient dynamics, and hydrologic relationships in tree islands of the southern Everglades, Florida, USA. *Forest Ecology and Management* 1-3(214): 11-27.

Abstract: Tree islands are an important structural component of many graminoid-dominated wetlands because they increase ecological complexity in the landscape. Tree island area has been drastically reduced with hydrologic modifications within the Everglades ecosystem, yet still little is known about the ecosystem ecology of Everglades tree islands. As part of an ongoing study to investigate the effects of hydrologic restoration on short hydroperiod marshes of the southern Everglades, we report an ecosystem characterization of seasonally flooded tree islands relative to locations described by variation in freshwater flow (i.e. locally enhanced freshwater flow by levee removal). We quantified: (1) forest structure, litterfall production, nutrient utilization, soil dynamics, and hydrologic properties of six tree islands and (2) soil and surface water physico-chemical properties of adjacent marshes. Tree islands efficiently utilized both phosphorus and nitrogen, but indices of nutrient-use efficiency indicated stronger P than N limitation. Tree islands were distinct in structure and biogeochemical properties from the surrounding marsh, maintaining higher organically bound P and N, but lower inorganic N. Annual variation resulting in increased hydroperiod and lower wet season water levels not only increased nitrogen use by tree species and decreased N:P values of the dominant plant species (*Chrysobalanus icaco*), but also increased soil pH and decreased soil temperature. When compared with other forested wetlands, these Everglades tree islands were among the most nutrient efficient, likely a function of nutrient immobilization in soils and the calcium carbonate bedrock. Tree islands of our study area are defined by: (1) unique biogeochemical properties when compared with adjacent short hydroperiod marshes and other forested wetlands and (2) an intricate relationship with marsh hydrology. As such, they may play an important and disproportionate role in nutrient and carbon cycling in

788: T. Tsuji, A. Mambo, L. K. Phiri, R. Msoni, S. B. Sokotela and O. A. Yerokun,. 2005. Studies on nutrient distribution in some Zambian soils with special reference to sulphur using GIS (geographic information systems) - I. Total sulphur distribution in major Zambian soils. Soil Science and Plant Nutrition 7(51): 935-942.

Abstract: Total sulphur content of some benchmark soils was evaluated by correlating with the contents of soil organic C and amorphous oxides (Al and Fe), and the particle size distribution. An equation model to calculate the content of total soil sulphur was first obtained by regression analysis. Introducing these chemical and physical data of all the map units except for the wetlands into the equation model, the sulphur level on a national scale was estimated for each soil mapping unit in the exploratory soil map of Zambia. Second, the total sulphur content was rated into 3 classes based on the frequency distribution of the total sulphur content in the benchmark soils. Finally, the rated total sulphur content was incorporated into the national soil map database of GIS to produce a map with the total sulphur content of Zambian soils. The extent of each class was calculated and the distribution of the areas was examined in relation to rainfall and soil formation.

789: C. S. Tucker, J. A. Hargreaves and S. K. Kingsbury,. 2005. Dietary phosphorus modifications in practical feeds do not affect waterborne phosphorus concentrations and phytoplankton abundance in channel catfish ponds. North American Journal of Aquaculture 2(67): 114-121.

Abstract: We measured concentrations of soluble reactive phosphorus, total phosphorus, and chlorophyll a in 0.04-ha ponds containing channel catfish *Ictalurus punctatus* during three feeding trials to evaluate the effect of dietary phosphorus modifications on water quality and the potential discharge of phosphorus and organic matter in pond effluents. In experiment 1, a basal diet with 0.20% available phosphorus was compared with diets supplemented with 0.5% or 1.0% dicalcium phosphate to provide 0.27% or 0.35% available phosphorus. In experiment 2, fish were fed diets supplemented with either dicalcium phosphate or defluorinated rock phosphate to contain 0.40% available phosphorus. In experiment 3, fish were fed one of three diets containing 250 or 500 phytase units of phytase per kilogram (0.27% available phosphorus) or 0.75% dicalcium phosphate (0.39% available phosphorus). Husbandry practices in all three experiments were typical of commercial culture conditions. Quantitative and qualitative modifications of dietary phosphorus did not affect waterborne phosphorus concentrations or phytoplankton abundance and, therefore, will not reduce phosphorus or organic matter mass loading in pond effluents. Lack of effectiveness results from high baseline nutrient loading from phosphorus contained in practical feed ingredients combined with high internal phosphorus loading (recycling) within ponds. These factors overwhelm any effect of small changes in external phosphorus loading associated with diet modification. Therefore, the source and level of dietary phosphorus in channel catfish feeds should be based on nutritional and economic considerations rather than potential environmental impact.

790: S. Tucker and P. Pollard,. 2005. Identification of cyanophage Ma-LBP and infection of the cyanobacterium *Microcystis aeruginosa* from an Australian subtropical lake by the virus. *Applied and Environmental Microbiology* 2(71): 629-635.

Abstract: Viruses can control the structure of bacterial communities in aquatic environments. The aim of this project was to determine if cyanophages (viruses specific to cyanobacteria) could exert a controlling influence on the abundance of the potentially toxic cyanobacterium *Microcystis aeruginosa* (host). *M. aeruginosa* was isolated, cultured, and characterized from a subtropical monomictic lake-Lake Baroon, Sunshine Coast, Queensland, Australia. The viral communities in the lake were separated from cyanobacterial grazers by filtration and chloroform washing. The natural lake viral cocktail was incubated with the *M. aeruginosa* host growing under optimal light and nutrient conditions. The specific growth rate of the host was 0.023 h^{-1} ; generation time, 30.2 h. Within 6 days, the host abundance decreased by 95%. The density of the cyanophage was positively correlated with the rate of *M. aeruginosa* cell lysis ($r^2 = 0.95$). The cyanophage replication time was 11.2 h, with an average burst size of 28 viral particles per host cell. However, in 3 weeks, the cultured host community recovered, possibly because the host developed resistance (immunity) to the cyanophage. The multiplicity of infection was determined to be 2,890 virus-like particles/cultured host cell, using an undiluted lake viral population. Transmission electron microscopy showed that two types of virus were likely controlling the host cyanobacterial abundance. Both viruses displayed T7-like morphology and belonged to the Podoviridae group (short tails) of viruses that we called cyanophage Ma-LBP. In Lake Baroon, the number of the cyanophage Ma-LBP was 5.6×10^4 cyanophage - ml^{-1} , representing 0.23% of the natural viral population of 2.46×10^7 - ml^{-1} . Our results showed that this cyanophage could be a major natural control mechanism of *M. aeruginosa* abundance in aquatic ecosystems like Lake Baroon. Future studies of potentially toxic cyanobacterial blooms need to consider factors that influence cyanophage

791: B. L. Turner and S. Newman,. 2005. Phosphorus cycling in wetland soils: The importance of phosphate diesters. Journal of Environmental Quality 5(34): 1921-1929.

Abstract: Productivity in P limited peatlands is regulated in part by the turnover of organic phosphates, which is influenced by the chemical nature of the compounds involved. We used solution P-31 nuclear magnetic resonance (NMR) spectroscopy to quantify organic and inorganic phosphates in benthic floc (a mixture of plant detritus and algae) and underlying soil from sites along P gradients in hard water and soft water areas of the northern Florida Everglades, USA. Phosphorus-enriched sites were dominated by cattail (*Typha* spp.), while unenriched sites included sawgrass (*Cladium jamaicense* Crantz) ridges and open-water sloughs. Phosphorus extracted in a solution containing 0.25 M NaOH and 50 mM EDTA (ethylenediaminetetraacetate) included phosphate, phosphate monoesters, DNA, and pyrophosphate. Signals from phosphate monoesters were consistent with those from alkaline hydrolysis products of RNA and phospholipids formed during extraction and analysis, whereas phytic acid (myoinositol hexakisphosphate), the most abundant organic phosphate in most soils, was not detected. Phosphorus composition was similar among sites, although neither DNA nor pyrophosphate were detected in extracts of benthic floc from a calcareous slough. DNA was a greater proportion of the P extracted from soil compared to benthic floc, while the opposite was true for pyrophosphate. Research on the cycling of organic phosphates in wetlands focuses conventionally on the turnover of phosphate monoesters, but our results suggest strongly that greater emphasis should be given to understanding the role of phosphate diesters and phosphodiesterase activity.

792: M. A. Turner, D. B. Huebert, D. L. Findlay, L. L. Hendzel, W. A. Jansen, R. A. Bodaly, L. M. Armstrong and S. E. M. Kasian,. 2005. Divergent impacts of experimental lake-level drawdown on planktonic and benthic plant communities in a boreal forest lake. *Canadian Journal of Fisheries and Aquatic Sciences* 5(62): 991-1003.

Abstract: Water-surface elevation in lake 226 (L226) of the Experimental Lakes Area in northwestern Ontario, Canada, was lowered experimentally by 2-3 m during each of three successive winters, and increased naturally but incompletely during the ensuing summers. Our objective was to compare the responses of the littoral and pelagic plant communities to this physical disturbance. Water-chemistry changes were muted, and neither nitrogen nor phosphorus concentration changed. Phytoplankton biomass, species assemblages, productivity, and nutrient status were largely unaffected except for small changes in species diversity and relative abundance of cyanobacteria and cryptophytes. Despite possible transient changes in functional and structural properties, the principal disruption for benthic algae was loss of colonizable surfaces. Floating-leaved and submersed macrophytes (hydrophytes) responded initially with large decreases in biomass and cover. The subsequent response of hydrophytes to drawdown varied: relative frequency of isoetids such as *Eriocaulon septangulare* decreased, while that of pondweeds such as *Potamogeton spirillus* increased. The trophic impacts of declining lake levels, whether due to hydroelectric reservoir manipulations or climate change, are likely to be much greater in the littoral zone than in the pelagic zone if major nutrients are unaltered.

793: R. R. Twilley and V. H. Rivera-Monroy,. 2005. Developing performance measures of mangrove wetlands using simulation models of hydrology, nutrient biogeochemistry, and community dynamics. *Journal of Coastal Research* : 79-93.

Abstract: The goal of mangrove restoration projects should be to improve community structure and ecosystem function of degraded coastal landscapes. This requires the ability to forecast how mangrove structure and function will respond to prescribed changes in site conditions including hydrology, topography, and geophysical energies. There are global, regional, and local factors that can explain gradients of regulators (e.g., salinity, sulfides), resources (nutrients, light, water), and hydroperiod (frequency, duration of flooding) that collectively account for stressors that result in diverse patterns of mangrove properties across a variety of environmental settings. Simulation models of hydrology, nutrient biogeochemistry, and vegetation dynamics have been developed to forecast patterns in mangroves in the Florida Coastal Everglades. These models provide insight to mangrove response to specific restoration alternatives, testing causal mechanisms of system degradation. We propose that these models can also assist in selecting performance measures for monitoring programs that evaluate project effectiveness. This selection process in turn improves model development and calibration for forecasting mangrove response to restoration alternatives. Hydrologic performance measures include soil regulators, particularly soil salinity, surface topography of mangrove landscape, and hydroperiod, including both the frequency and duration of flooding. Estuarine performance measures should include salinity of the bay, tidal amplitude, and conditions of fresh water discharge (included in the salinity value). The most important performance measures from the mangrove biogeochemistry model should include soil resources (bulk density, total nitrogen, and phosphorus) and soil accretion. Mangrove ecology performance measures should include forest dimension analysis (transects and/or plots), sapling recruitment, leaf area index, and faunal relationships. Estuarine ecology performance measures should

794: E. Tylova-Munzarova, B. Lorenzen, H. Brix and O. Votrubova,. 2005. The effects of NH_4^+ and NO_3^- on growth, resource allocation and nitrogen uptake kinetics of *Phragmites australis* and *Glyceria maxima*. *Aquatic Botany* 4(81): 326-342.

Abstract: The effects of NH_4^+ or NO_3^- on growth, resource allocation and nitrogen (N) uptake kinetics of two common helophytes *Phragmites australis* (Cav.) Trin. ex Steudel and *Glyceria maxima* (Hartm.) Holmb. were studied in semi steady-state hydroponic cultures. At a steady-state nitrogen availability of 34 μM the growth rate of *Phragmites* was not affected by the N form (mean RGR = 35.4 $\text{mg g}^{-1} \text{d}^{-1}$), whereas the growth rate of *Glyceria* was 16% higher in NH_4^+ -N cultures than in NO_3^- -N cultures (mean = 66.7 and 57.4 $\text{mg g}^{-1} \text{d}^{-1}$ of NH_4^+ and NO_3^- treated plants, respectively). *Phragmites* and *Glyceria* had higher S/R ratio in NH_4^+ cultures than in NO_3^- cultures, 123.5 and 129.7%, respectively. Species differed in the nitrogen utilisation. In *Glyceria*, the relative tissue N content was higher than in *Phragmites* and was increased in NH_4^+ treated plants by 16%. The tissue NH_4^+ concentration (mean = 1.6 $\mu\text{mol g fresh wt}^{-1}$) was not affected by N treatment, whereas NO_3^- contents were higher in NO_3^- (mean = 1.5 $\mu\text{mol g fresh wt}^{-1}$) than in NH_4^+ (mean = 0.4 $\mu\text{mol g fresh wt}^{-1}$) treated plants. In *Phragmites*, NH_4^+ (mean = 1.6 $\mu\text{mol g fresh wt}^{-1}$) and NO_3^- (mean = 0.2 $\mu\text{mol g fresh wt}^{-1}$) contents were not affected by the N regime. Species did not differ in NH_4^+ (mean = 56.5 $\mu\text{mol g}^{-1} \text{root dry wt h}^{-1}$) and NO_3^- (mean = 34.5 $\mu\text{mol g}^{-1} \text{root dry wt h}^{-1}$) maximum uptake rates (V_{max}), and V for NH_4^+ uptake was not affected by N treatment. The uptake rate of NO_3^- was low in NH_4^+ treated plants, and an induction phase for NO_3^- was observed in NH_4^+ treated *Phragmites* but not in *Glyceria*. *Phragmites* had low K (mean = 4.5 μM) and high affinity (10.31 $\text{g}^{-1} \text{root dry wt h}^{-1}$) for both ions compared to *Glyceria* (K_{m} = 6.3 μM , affinity = 8.01 $\text{g}^{-1} \text{root dry wt h}^{-1}$). The results showed different plasticity of *Phragmites* and *Glyceria* toward N source. The positive response to NH_4^+ -N source may participate in the observed success of *Glyceria* at NH_4^+ rich sites, although other f

795: W. N. Tzeng, K. P. Severin, C. H. Wang and H. Wickstrom,. 2005. Elemental composition of otoliths as a discriminator of life stage and growth habitat of the European eel, *Anguilla anguilla*. Marine and Freshwater Research 5(56): 629-635.

Abstract: The hypothesis that elemental composition of otoliths of the eel (*Anguilla* spp.) changes with life stage and growth habitat was tested in the present study. The minor elements Cl, Na, K, Mg, Ca, Sr and P in otoliths of European eels (*Anguilla anguilla*) were examined by using an Electron Probe Microanalyser (EPMA) equipped with wavelength dispersive spectrometers (Cameca SX-50). Yellow-stage eels were collected from coastal waters and lakes of Sweden in 1987, 1988, 1991, and 1994, with ages ranging from 5 to 18 years old. Strontium maps and profiles of Sr : Ca ratio, as well as the elver check in otoliths, were used to classify life history stages of the eels as leptocephalus, and freshwater- and seawater-resident yellow eels. Canonical score plots of the otolith elemental compositions of the freshwater- resident yellow eel were completely separated from those of leptocephalus and seawater-resident yellow eel, but the latter two partially overlapped. Strontium is the primary component in determining the discrimination, but the nutrient-related (S and P), and the physiologically controlled elements (Na and Cl), may also play an important role in the discrimination. These results indicate that multiple-elemental information can provide additional insight into the migratory environmental history of diadromous fishes.

796: S. Ueda, K. Kondo and Y. Chikuchi,. 2005. Effects of the halocline on water quality and phytoplankton composition in a shallow brackish lake (Lake Obuchi, Japan). *Limnology* 3(6): 149-160.

Abstract: The relationships of the halocline to both water quality and phytoplankton composition in Lake Obuchi, a shallow brackish lake in northern Japan, were investigated from April 2001 to December 2004. The halocline in this lake became stronger in summer (July-September, mean maximum density gradient 4.3-5.8 $\rho(t)m(-1)$) but weaker in spring, fall, and winter (1.9-3.3 $\rho(t)m(-1)$). Although the difference in water quality between the upper and lower layers separated by the halocline was high in summer, nutrients ($PO_4^{3-}-P$ and NH_4^+-N) were eluted from the bottom sediment as levels of dissolved oxygen decreased in the bottom layer because of the strong stratification caused by the halocline formed over the long term. Moreover, phytoplankton taxa composition also differed between the upper and lower layers in summer, but was similar in other seasons. The dominant phytoplankton taxa in the upper layer in summer were *Skeletonema costatum* and *Cyclotella* spp., whereas in the lower layer, *Gymnodinium* spp. (Dinophyceae) and Chlorophyceae, which prefer eutrophic and low dissolved oxygen conditions, dominated. This suggests that the halocline was related to differentiations in both water quality and ecosystem components between the upper and lower layers in the brackish lake water.

797: U. Uehlinger and J. T. Brock,. 2005. Periphyton metabolism along a nutrient gradient in a desert river (Truckee River, Nevada, USA). *Aquatic Sciences* 4(67): 507-516.

Abstract: Periphyton metabolism was studied at five sites along a 70 km unshaded stretch of the Truckee River below the City of Reno, Nevada (USA). Sites differed with respect to concentrations of soluble reactive phosphorus and total dissolved inorganic nitrogen because a water pollution control facility discharged its treated wastewater through a small tributary into the river downstream of site 1 (most upstream located site). Unglazed tiles were incubated at each site from late June to August (summer) and from September to November (autumn) 1986. At the end of each incubation period, oxygen metabolism of the periphyton communities growing on tiles was measured in transparent flow-through respiration chambers for 24 h under near natural light and temperature conditions. In August, when biomass and metabolism were positively correlated with nitrogen and phosphorus, mean chlorophyll a ranged from 53 (site 1) to 290 mg chl a m⁻² (site 2, 3 km downstream of the wastewater input). Periphyton gross primary production varied between 3.3 +/- 0.8 (site 1) and 9.1 +/- 1.4 g O₂ m⁻²d⁻¹ (site 2), and respiration between 2.1 +/- 0.4 and 10.1 +/- 1.3 g O₂ m⁻²d⁻¹. P/R ratios ranged from 0.9 at site 2 to 1.8 about 65 km downstream from the wastewater input. In November, chlorophyll a was significantly higher (99 +/- 29 to 509 +/- 155 mg chl a m⁻²) and gross primary production and respiration on average 50 and 65% lower, respectively, than in August. Hence, colder temperatures appeared to reduce respiration more than primary production and significantly increased P/R. Neither gross primary production nor respiration were correlated with autumn nutrient concentrations.

798: A. J. Ulseth and A. E. Hershfy,. 2005. Natural abundances of stable isotopes trace anthropogenic N and C in an urban stream. *Journal of the North American Benthological Society* 2(24): 270-289.

Abstract: Important ecological services of low-order streams are greatly affected by urbanization. North Buffalo Creek, in the headwaters of the Cape Fear River basin in Greensboro, North Carolina, receives point- and nonpoint-source pollutants. Natural abundances of the stable isotopes of C (C-13) and N (N-15) were used to determine the influence of anthropogenic nutrients on seston $\delta(15)\text{N}$, nutrient concentrations, C/N ratios, and patterns of $\delta(13)\text{C}$ and $\delta(15)\text{N}$ in foodweb components in North Buffalo Creek during different hydrological conditions. Baseflow seston $\delta(15)\text{N}$ varied significantly among sampling sites. Baseflow seston $\delta(15)\text{N}$ ranged from 3.7 parts per thousand to 4.6 parts per thousand at forested sites and was slightly enriched at open sites, and probably reflected nonpoint sources of N in North Buffalo Creek. Seston $\delta(15)\text{N}$ also reflected point sources of N in North Buffalo Creek. The most enriched seston $\delta(15)\text{N}$ values (8.4 parts per thousand) were found directly downstream of the Waste Water Treatment Plant (WWTP). Seston $\delta(15)\text{N}$ values at the Rankin Mill Road (Rankin) site, several km downstream of the WWTP, also were strongly influenced by effluent from the WWTP. The Summit Avenue site (Summit) received textile effluent until June 2001. Before June 2001, seston N-15 at Summit was depleted compared to seston N-15 at sites upstream of the plant, probably because the textile effluent was depleted in N-15. During storms, seston $\delta(15)\text{N}$ was negatively correlated with nutrient concentrations upstream of the WWTP. However, at Rankin Mill Road, seston $\delta(15)\text{N}$ was positively correlated with NO_3^- flux, which explained 54% of the variation in seston $\delta(15)\text{N}$. $\delta(15)\text{N}$ was not correlated with NH_4^+ and PO_4^{3-} fluxes at Rankin Mill Road. During storms, seston $\delta(15)\text{N}$ was influenced partially by nonpoint sources of N, a pattern consistent with observed C/N ratios. $\delta(13)\text{C}$ values for most foodweb components and $\delta(15)\text{N}$ values for a

799: B. R. Urbonas and J. T. Doerfer,. 2005. Master planning for stream protection in urban watersheds. Water Science and Technology 2(51): 239-247.

Abstract: Urbanization results in great changes to the landscape and the water environment simply because stormwater runoff differs in quantity and quality from the pre-urbanization state. Streams, rivers, lakes, estuaries and other receiving water bodies experience the changes to runoff frequencies and volumes and react accordingly. The forces behind the observed changes in the receiving waters are discussed in this paper and suggestions are made on how to plan to deal with them. Urban watershed and waterway master planning can help to mitigate, in large part, the impacts imposed on these waters by land-use changes. Although each watershed is unique, some general principles are suggested to deal with these emergent problems.

800: G. Vacca, H. Wand, M. Nikolausz, P. Kuschik and M. Kastner,. 2005. Effect of plants and filter materials on bacteria removal in pilot-scale constructed wetlands. Water Research 7(39): 1361-1373.

Abstract: Due to the lack of testing units or appropriate experimental approaches, only little is known about the removal of bacteria in constructed wetlands. However, improved performance in terms of water sanitation requires a detailed understanding of the ongoing processes. Therefore, we analyzed the microbial diversity and the survival of Enterobacteriaceae in six pilot-scale constructed wetland systems treating domestic wastewater: two vertical sand filters, two vertical expanded clay filters and two horizontal sand filters (each planted and unplanted). Samples were taken from the in- and outflow, from the rhizosphere, and from the bulk soil at various depths. Colony-forming units of heterotrophic bacteria and coliforms were analyzed and the removal of bacteria between the in- and outflow was determined to within 1.5-2.5 orders of magnitude. To access the taxon-specific biodiversity of potential pathogens in the filters and to reduce the complexity of the analysis, specific primers for Enterobacteriaceae were developed. While performing PCR-SSCP analyses, a pronounced decrease in diversity from the inflow to the outflow of treated wastewater was observed. No differences were observed between the bulk soil of planted and unplanted vertical filters. Some bands appeared in the rhizosphere that were not present in the bulk soil, indicating the development of specific communities stimulated by the plants. The fingerprinting of the rhizosphere of plants grown on sand or expanded clay exhibited many differences, which show that different microbial communities exist depending on the soil type of the filters. The use of the taxon-specific primers enabled us to evaluate the fate of the Enterobacteriaceae entering the wetlands and to localize harboring in the rhizosphere. The most abundant bands of the profiles were sequenced: *Pantoea agglomerans* was found in nearly all samples from the soil but not in the effluent, whereas *Citrobacter* sp. could not be removed by the horizontal unp

801: Y. Vadeboncoeur, K. S. McCann, M. J. VanderZanden and J. B. Rasmussen,. 2005. Effects of multi-chain omnivory on the strength of trophic control in lakes. *Ecosystems* 6(8): 682-693.

Abstract: Omnivory has been implicated in both diffusing and intensifying the effects of consumer control in food chains. Some have postulated that the strong, community level, top-down control apparent in lakes is not expressed in terrestrial systems because terrestrial food webs are reticulate, with high degrees of omnivory and diverse plant communities. In contrast, lake food webs are depicted as simple linear chains based on phytoplankton-derived energy. Here, we explore the dynamic implications of recent evidence showing that attached algal (periphyton) carbon contributes substantially to lake primary and secondary productivity, including fish production. Periphyton production represents a cryptic energy source in oligotrophic and mesotrophic lakes that is overlooked by previous theoretical treatment of trophic control in lakes. Literature data demonstrate that many fish are multi-chain omnivores, exploiting food chains based on both littoral and pelagic primary producers. Using consumer-resource models, we examine how multiple food chains affect fourth-level trophic control across nutrient gradients in lakes. The models predict that the stabilizing effects of linked food chains are strongest in lakes where both phytoplankton and periphyton contribute substantially to production of higher trophic levels. This stabilization enables a strong and persistent top down control on the pelagic food chain in mesotrophic lakes. The extension of classical trophic cascade theory to incorporate more complex food web structures driven by multi-chain predators provides a conceptual framework for analysis of reticulate food webs in ecosystems.

802: A. V. Vahatalo, R. G. Wetzel and H. W. Paerl,. 2005. Light absorption by phytoplankton and chromophoric dissolved organic matter in the drainage basin and estuary of the Neuse River, North Carolina (USA). *Freshwater Biology* 3(50): 477-493.

Abstract: 1. We examined the absorption of solar radiation by phytoplankton and chromophoric dissolved organic matter (CDOM) taking into account riparian shading in the rivers, reservoirs, swamps of the Neuse River Estuary and its drainage basin. 2. In the streams, CDOM typically absorbed 55 and 64% of photons in the spectral range of 400-700 nm (photosynthetically active radiation, PAR) and 500-600 nm, respectively. The large proportion of photons absorbed by CDOM indicates high potential for abiotic photochemical reactions in the 500-600 nm region. 3. Despite the high concentration of nutrients, phytoplankton contributed little (2%) to the total absorption of PAR in the streams. Small (<30 m wide) streams typically received only 7% of incident PAR that impinged onto the more exposed reservoirs and estuary. Riparian shading and the low contribution of phytoplankton to the total absorption resulted in conditions where phytoplankton absorbed nearly two orders of magnitude less PAR in the streams than in the estuary and reservoirs. 4. The results indicated that riparian shading and non-algal absorbing components can significantly restrict phytoplankton production in nutrient-rich streams with a high concentration of CDOM flowing throughout forested catchments.

803: A. V. Vahatalo and R. G. Zepp,. 2005. Photochemical mineralization of dissolved organic nitrogen to ammonium in the Baltic Sea. Environmental Science & Technology 18(39): 6985-6992.

Abstract: Solar-radiation-induced photochemistry can be considered as a new source of nutrients when photochemical reactions release bioavailable nitrogen from biologically nonreactive dissolved organic nitrogen (DON). Pretreatments of Baltic Sea waters in the dark indicated that > 72% of DON was recalcitrant to biological mineralization. When this DON (16-21.5 μM) was exposed to simulated solar radiation, the concentration of NH_4^+ increased 0.5-2.5 μM more in irradiated waters than in the dark controls. The photochemical production of NH_4^+ and the dose of absorbed photons were used to calculate the apparent quantum yield spectrum for photoammonification [$\text{mol NH}_4^+ (\text{mol photons})^{-1} \text{nm}^{-1}$] at wavelengths (λ) of 290-700 nm ($\phi_{\text{NH}_4, \lambda}$). The modeled mean rates of photoammonification based on $\phi_{\text{NH}_4, \lambda}$ were 143 and 53 $\mu\text{mol NH}_4^+ \text{m}^{-2} \text{d}^{-1}$ at the surface and in the whole water column, respectively, of Baltic Sea stations during summer. The results of this study indicate that the rate of photoammonification approximately equals and periodically exceeds the rate of atmospheric deposition of reactive inorganic nitrogen to the northern Baltic Sea. For these stratified surface waters beyond riverine input of labile nitrogen, photoammonification can periodically be the largest source of new bioavailable nitrogen.

804: H. M. Valett, M. A. Baker, J. A. Morrice, C. S. Crawford, M. C. Molles, C. N. Dahm, D. L. Moyer, J. R. Thibault and L. M. Ellis,. 2005. Biogeochemical and metabolic responses to the flood pulse in a semiarid floodplain. *Ecology* 1(86): 220-234.

Abstract: Flood pulse inundation of riparian forests alters rates of nutrient retention and organic matter processing in the aquatic ecosystems formed in the forest interior. Along the Middle Rio Grande (New Mexico, USA), impoundment and levee construction have created riparian forests that differ in their inter-flood intervals (IFIs) because some floodplains are still regularly inundated by the flood pulse (i.e., connected), while other floodplains remain isolated from flooding (i.e., disconnected). This research investigates how ecosystem responses to the flood pulse relate to forest IFI by quantifying nutrient and organic matter dynamics in the Rio Grande floodplain during three years of experimental flooding of the disconnected floodplain and during a single year of natural flooding of the connected floodplain. Surface and subsurface conditions in paired sites (control, flood) established in the two floodplain types were monitored to address metabolic and biogeochemical responses. Compared to dry controls, rates of respiration in the flooded sites increased by up to three orders of magnitude during the flood pulse. In the disconnected forest, month-long experimental floods produced widespread anoxia of four-week duration during each of the three years of flooding. In contrast, water in the connected floodplain remained well oxygenated (3-8 ppm). Material budgets for experimental floods showed the disconnected floodplain to be a sink for inorganic nitrogen and suspended solids, but a potential source of dissolved organic carbon (DOC). Compared to the main stem of the Rio Grande, floodwater on the connected floodplain contained less nitrate, but comparable concentrations of DOC, phosphate-phosphorus, and ammonium-nitrogen. Results suggest that floodplain IFI drives metabolic and biogeochemical responses during the flood pulse. Impoundment and fragmentation have altered floodplains from a mosaic of patches with variable IFI to a bimodal distribution. Relatively predictable f

805: M. Valiranta, S. Kultti, M. Nyman and K. Sarmaja-Korjonen,. 2005. Holocene development of aquatic vegetation in shallow Lake Njargajavri, Finnish Lapland, with evidence of water-level fluctuations and drying. *Journal of Paleolimnology* 2(34): 203-215.

Abstract: Holocene development of aquatic plant communities in subarctic Lake Njargajavri, Finnish Lapland, was studied using plant macrofossil analysis. Sediment lithology, grain size, and C/N ratios showed distinct lithological phases, indicating past water-level fluctuations. The colonization of limnophytes took place right after the formation of the lake (after ca. 11,500 cal. BP). The earliest plant macrofossil assemblages indicate nutrient-rich conditions and a warmer climate than at present. After this primary succession phase, aquatic vascular plants were replaced by aquatic bryophytes (before ca. 10,200 cal. BP). Together with lithological evidence, we interpret this as being related to the lowering water table. According to palynological, chronological, and sedimentological evidence, Njargajavri underwent a very shallow phase between ca. 10,000 and 9500 cal. BP and dried out for an unknown period of time between ca. 8000 and 5000 cal. BP. After the dry phase, the water level started to rise and sedimentation at the coring point began again. Despite re-establishment of the lacustrine habitat, late-Holocene plant macrofossil data show no marked recolonization of either vascular limnophytes or bryophytes. The reason for all limnophytes being presently absent from the lake remains speculative. The lack of nutrients and/or the cooling climate (especially shortening of the open-water season) during the latter part of the Holocene may explain why limnophytes failed to recolonize the lake.

806: K. Valta-Hulkkonen, A. Kanninen, R. Iivonen and J. Leka,. 2005. Assessment of aerial photography as a method for monitoring aquatic vegetation in lakes of varying trophic status. Boreal Environment Research 1(10): 57-66.

Abstract: Implementation of the EU Framework Directive for Water Policy requires assessment of the ecological quality of surface waters using reliable, repeatable, quantitative and cost-effective monitoring methods. Digital colour infrared (CIR) aerial photographs representing 16 lakes of varying trophic status in the Vuoksi drainage basin, Finland, were used here to study the usefulness of remote sensing as a method for monitoring aquatic vegetation. The accuracy of the photo-interpretation method was assessed, and its ability to detect differences in the abundance of aquatic vegetation in lakes of varying trophic status was studied. Two measures of vegetation abundance based on the interpretation of aerial photographs, a colonization degree and, a relative long-term change in the area of helophytes and nymphaeids, were used: The results indicated that CIR aerial photographs were suitable for mapping helophytic and nymphaeid vegetation and that the colonization degree of helophytes and nymphaeids was consistent with the nutrient content (total phosphorus and total nitrogen) of the lakes as well as with a measure of abundance based on field data.

807: P. M. Van Bodegom, R. Broekman, J. Van Dijk, C. Bakker and R. Aerts,. 2005. Ferrous iron stimulates phenol oxidase activity and organic matter decomposition in waterlogged wetlands. *Biogeochemistry* 1(76): 69-83.

Abstract: Soil organic matter decomposition is limited at waterlogged conditions by the low activity of extracellular enzymes like phenol oxidases. In this paper, we show that ferrous iron (Fe^{2+}), which is abundant in waterlogged soils, significantly stimulates phenol oxidase activity both in pure enzyme assays and in waterlogged soil slurries from nutrient-poor dune slacks. However, the effects in soil slurries were less strong than in enzyme assays. Both the addition of Fe^{2+} and the initial presence of Fe^{2+} stimulated phenol oxidase activity at the microaerophilic conditions tested. This stimulation is attributed to the catalysis of additional OH radical production, promoting the oxidation of phenolics. Subsequently, the presence of Fe^{2+} strongly increased total decomposition rates of soil organic matter, measured as CO_2 production and Cotton strip Tensile Strength Loss. There is circumstantial evidence that this stimulation by Fe^{2+} could be important for decomposition in wetlands at field conditions, but its relevance compared to the effects of other compounds still needs to be elucidated. These results emphasise the crucial role of water quality in determining extracellular enzyme activity and decomposition in waterlogged wetlands.

808: K. Van der Gucht, T. Vandekerckhove, N. Vloemans, S. Cousin, K. Muylaert, K. Sabbe, M. Gillis, S. Declerk, L. De Meester and W. Vyverman,. 2005. Characterization of bacterial communities in four freshwater lakes differing in nutrient load and food web structure. *Fems Microbiology Ecology* 2(53): 205-220.

Abstract: The phylogenetic composition of bacterioplankton communities in the water column of four shallow eutrophic lakes was analyzed by partially sequencing cloned 16S rRNA genes and by PCR-DGGE analysis. The four lakes differed in nutrient load and food web structure: two were in a clearwater state and had dense stands of submerged macrophytes, while two others were in a turbid state characterized by the occurrence of phytoplankton blooms. One turbid and one clearwater lake had very high nutrient levels (total phosphorus > 100 $\mu\text{g/l}$), while the other lakes were less nutrient rich (total phosphorus < 100 $\mu\text{g/l}$). Cluster analysis, multidimensional scaling and ANOSIM (analysis of similarity) were used to investigate differences among the bacterial community composition in the four lakes. Our results show that each lake has its own distinct bacterio plankton community. The samples of lake Blankaart differed substantially from those of the other lakes; this pattern was consistent throughout the year of study. The bacterioplankton community composition in lake Blankaart seems to be less diverse and less stable than in the other three lakes. Clone library results reveal that Actinobacteria strongly dominated the bacterial community in lake Blankaart. The relative abundance of Betaproteobacteria was low, whereas this group was dominant in the other three lakes. Turbid lakes had a higher representation of Cyanobacteria, while clearwater lakes were characterized by more representatives of the Bacteroidetes. Correlating our DGGE data with environmental parameters, using the BIOENV procedure, suggests that differences are partly related to the equilibrium state of the lake. (c) 2004 Federation of European Microbiological Societies. Published by Elsevier B.V. All rights reserved.

809: E. M. van Voorthuizen, A. Zwijnenburg and M. Wessling,. 2005. Nutrient removal by NF and RO membranes in a decentralized sanitation system. Water Research 15(39): 3657-3667.

Abstract: Decentralized treatment of domestic wastewater offers the possibility of water and nutrient reuse. In a decentralized sanitation system the household wastewater streams are separated in a large diluted stream (gray water) and a small and concentrated stream (black water) containing important nutrients like ammonium and phosphate. Nanofiltration (NF) and reverse osmosis (RO) membranes might be used to recover the nutrients from anaerobically treated black water. The permeate might be used in a water reuse scheme. In case of water reuse the produced permeate should meet guidelines for potable water or meet new guidelines which might be applied in the future for intermediate quality of water, for example toilet flushwater; when this is not possible the permeate should meet guidelines for discharge. The most stringent guidelines apply for ammonium and phosphate. The focus of this paper is to test commercially available NF and RO membranes to remove nutrients from anaerobically treated black water in order to meet the Dutch guidelines. A large number of commercial tubular, capillary and flat sheet NF and RO membranes was tested on laboratory scale on their performance to meet the Dutch guidelines for ammonium and phosphate. The ammonium and phosphate concentrations used were based on the effluent composition of anaerobically treated black water. Ammonium and phosphate rejection were both measured in synthetic single salt and multi-ion mixtures and in anaerobic effluent. The rejection for ammonium (30-95%) is neither sufficient for discharge nor potable water use. The rejection of phosphate (74-99%) is in most cases almost sufficient to meet the standards for potable water. (c) 2005 Elsevier Ltd. All rights reserved.

810: J. VanArman, G. A. Graves and D. Fike,. 2005. Loxahatchee watershed conceptual ecological model. Wetlands 4(25): 926-942.

Abstract: Historically, the Loxahatchee River watershed included an area of more than 560 km². The drainage basin was comprised primarily of pine flatwoods interspersed with cypress sloughs, hardwood swamps, marshes, and wet prairies. Rain falling on the basin was directed through natural topography into wetlands, treated by natural biological and chemical action, and slowly released to the receiving water bodies, the Loxahatchee River and Estuary and the Indian River Lagoon. Today, approximately 434 km² of the original watershed drain to the Atlantic Ocean through Jupiter Inlet. The watershed still includes substantial amounts of upland, freshwater wetland, riverine, and estuarine habitats, but large areas have been developed for urban and agricultural land uses. Development in the watershed, stabilization of the inlet, and dredging of the estuary and river have resulted in saltwater intrusion in the river, destruction of riverine cypress forest along the river, and upstream migration of seagrasses and mangroves. A conceptual ecological model, in the risk assessment framework, was developed for the Loxahatchee system to characterize the wetland, riverine, and estuarine components of this complex and diverse system. This model was developed as a means to build understanding and consensus among scientists and managers regarding the linkages between ecological stressors and attributes in the Loxahatchee river system. These relationships lead to development of a set of working hypotheses that explain how observed shifts in the distribution of riverine floodplain plant communities, oysters, seagrasses and other key species are related to increases in salinity in the river and estuary that have occurred during the past century in response to changing land use, climate change and water management practices. Basic and applied research is needed to address questions related to ecosystem structure and mechanisms that control the abundance and distribution of plants and animals in th

811: J. A. Vandenberg, M. C. Ryan, D. D. Nuell and A. Chu,. 2005. Field evaluation of mixing length and attenuation of nutrients and fecal coliform in a wastewater effluent plume. Environmental Monitoring and Assessment 1-3(107): 45-57.

Abstract: We present an alternative method to dye tracer studies for mapping wastewater effluent plumes in rivers. A case study of a wastewater treatment effluent plume that was mapped in two different months (October and April) showed good resolution in determining where the plume reached the opposite river bank, the degree of mixing in a given river reach, and where the river was fully mixed with respect to the plume. Both electrical conductivity and chloride were useful in mapping domestic wastewater effluent plume mixing. Mixing lengths obtained by field mapping were consistent with previous studies. Electrical conductivity field readings facilitated real-time plume delineation and sampling locations, and identified a non-point source plume during the mapping exercise. The apparent difference in dispersion of the plume between the two mapping dates (despite similar upstream river discharge) suggests that the calibration of a water quality model based on a single dye test may be inadequate. The river distributions of effluent nutrients and fecal coliform were also mapped. Nutrient attenuation rates were faster than that of the chloride tracer, indicating processes other than mixing occur. Substantial differences were observed in nutrient and fecal coliform distributions between the two mapping dates.

812: V. Vandenberghe, A. van Griensven, W. Bauwens and P. A. Vanrolleghem,. 2005. Propagation of uncertainty in diffuse pollution into water quality predictions: application to the River Derder in Flanders, Belgium. Water Science and Technology 3-4(51): 347-354.

Abstract: The uncertainty of water quality predictions caused by uncertainty in the inputs related to emissions of diffuse pollution is analysed. An uncertainty analysis of the effects of diffuse pollution is essential to compare the cost and benefits of measures to lower those emissions. We focus on diffuse nitrate pollution due to fertiliser use. Using an efficient Monte Carlo method and Latin Hypercube sampling, the contribution to the overall uncertainty by each of the inputs is calculated. The modelling environment is ESWAT, an extension of SWAT, which allows for integral modelling of the water quantity and quality processes in river basins. The diffuse pollution sources are assessed by considering crop and soil processes. The crop simulations include growth, uptake of water and nutrients and several land management practices. The in-stream water quality model is based on QUAL2E. The spatial variability of the terrain strongly affects the non-point source pollution processes. The methodology is applied to the Dender basin in Belgium. Eight inputs have significant influence on the time that the nitrate content in the river is higher than 3 mg/l. The uncertainty analysis indicated wide uncertainty bounds (95% percentile bounds differ up to +/- 50% from the average NO₃ predictions).

813: M. J. Vander Zanden, T. E. Essington and Y. Vadeboncoeur,. 2005. Is pelagic top-down control in lakes augmented by benthic energy pathways?. Canadian Journal of Fisheries and Aquatic Sciences 6(62): 1422-1431.

Abstract: Modern food web studies are typically conducted from a trophic dynamic perspective that focuses on combined roles of top-down and bottom-up forces in regulating food web structure. Recognition of spatial food web subsidies in diverse ecosystems highlights the importance of energy flow as a foundation for understanding trophic dynamics. Here, we consider how different energy flow configurations might affect trophic dynamics in north-temperate lakes. A literature review revealed that littoral piscivores exert top-down control on prey fishes. In contrast, analysis of littoral predator diets indicated extensive omnivory and heavy reliance on zoobenthic prey. We explored this uncoupling between trophic dynamics (piscivores regulate prey fish) and energy flow (zoobenthos in piscivore diets) using a biomass dynamic model. This model compared top-down impacts of a piscivore on prey fishes under two scenarios: consumption of prey fish only and consumption of prey fish plus zoobenthos. The model predicted that elimination of zoobenthivory leads to a 50% reduction in piscivore standing stock and concomitant 2.5-fold increase in prey fish abundance (i.e., zoobenthivory plays a key role in mediating pelagic top-down control). These results highlight the role of benthic-pelagic linkages in regulating trophic dynamics and underscore the value of whole-ecosystem approaches to the study of food webs.

814: M. J. Vander Zanden, Y. Vadeboncoeur, M. W. Diebel and E. Jeppesen,. 2005. Primary consumer stable nitrogen isotones as indicators of nutrient source. Environmental Science & Technology 19(39): 7509-7515.

Abstract: Non-point source loading of nitrogen and phosphorus is a primary cause of eutrophication of inland waters, although the diffuse and variable nature of nutrient inputs makes it difficult to trace and identify nutrient pathways. Stable nitrogen isotope values ($\delta^{15}\text{N}$) in aquatic biota are thought to reflect anthropogenic nutrient inputs, and they may be a promising tool for tracing nutrient sources in watersheds. We measured $\delta^{15}\text{N}$ of aquatic consumers from a suite of 27 Danish lakes spanning a range of trophic states (oligotrophic to eutrophic) and land uses (forest, urban, agriculture). Primary consumer $\delta^{15}\text{N}$ values ($\text{PC}\delta^{15}\text{N}$) varied more than 14‰ among lakes. Models Of $\text{PC}\delta^{15}\text{N}$ were developed from limnological, nitrogen loading, and nitrogen source variables using an information-theoretic approach (Akaike's Information Criteria, AIC). Models based on land use/land cover performed best, indicating that elevated $\delta^{15}\text{N}$ is not only associated with high nitrogen loading, but is also reflective of nitrogen source. Urban and agricultural land use in the watershed, and particularly within the riparian buffer areas, was quantitatively linked to elevated biotic $\delta^{15}\text{N}$.

815: M. B. Vanotti, J. M. Rice, A. Q. Ellison, P. G. Hunt, F. J. Humenik and C. L. Baird,. 2005. Solid-liquid separation of swine manure with polymer treatment and sand filtration. Transactions of the Asae 4(48): 1567-1574.

Abstract: Small particles typical of liquid swine manure often clog sand filter beds and fine filters. We evaluated the effectiveness of polymer flocculants to improve drainage and filtration performance of sand filter beds by increasing the particle size of manure. A pilot separation unit was evaluated at the Swine Unit of the NCSU Lake Wheeler Road Laboratory in Raleigh, North Carolina, in 40 consecutive cycles during a 20-month period. The unit consisted of a homogenization tank that mixed the flushed swine manure, an in-line polymer mixer, and two sand filter beds (29.7 m²) designed to receive 30.5 cm (1 ft) depth of the polymer-treated effluent. Flocculation treatment using polyacrylamide (PAM) polymer improved drainage characteristics of the sand filter by preventing clogging and surface sealing. The combination of flocculation and filtration treatment removed 97% of total suspended solids (TSS) and volatile suspended solids (VSS), 85% of biochemical oxygen demand (BODS), and 83% of chemical oxygen demand (COD) from the flushed manure. Along with the solids, treatment resulted in capture of 61% total Kjeldahl nitrogen (TKN) and 72% total phosphorus (TP). Most of the nutrients removed in the solids were organic forms. Drying time to produce removable cakes varied significantly with the loading rate of solids applied to the sand filter bed. A load of < 2 kg TSS m⁻² per drying cycle allowed completion of the drying cycle in about 8 days, which is desirable to reduce potential fly problems. Our results indicate that PAM flocculation enhances performance of dewatering sand filter beds for swine manure applications.

816: S. Vanucci, V. Bruni and G. Pulicano,. 2005. Spatial and temporal distribution of virioplankton and bacterioplankton in a Brackish Environment (Lake of Ganzirri, Italy). *Hydrobiologia* (539): 83-92.

Abstract: Temporal and spatial changes of viral and bacterial abundance were examined in relation to environmental factors and hydrography at five stations between May 2000 and July 2001 in the brackish lake of Ganzirri (Sicily, Italy). Virioplankton abundance ranged from 5.26×10^4 to 7.54×10^8 VLP ml⁻¹ (on average 1.38×10^8 particles ml⁻¹) and was significantly higher at the three eutrophic stations located in the lake of Ganzirri (Stations 1, 2, and 3) than in the channel connecting the lake with the Straits of Messina. The virus-to-bacterium abundance ratio (VBR range, 0.4-117; average: 14) showed the highest values in channel connecting the lake of Ganzirri with the meromictic lake of Faro. VBR values < 1.0 were found in summer 2000 in relation with peculiar hydrographic constraints. Virioplankton distribution was dependent on salinity, and on dilution of the oligotrophic waters flowing from the Straits. Virioplankton was closely related with bacterioplankton indicating a close coupling between viruses and host cell abundance.

817: D. A. Vasseur, U. Gaedke and K. S. McCann,. 2005. A seasonal alternation of coherent and compensatory dynamics occurs in phytoplankton. *Oikos* 3(110): 507-514.

Abstract: Functional groups with diverse responses to environmental factors sum to produce communities with less temporal variability in their biomass than those lacking this diversity. The detection of these compensatory dynamics can be complicated by a spatio-temporal alternation in the environmental factors limiting growth (both abiotic and biotic), which restricts the occurrence of compensatory dynamics to certain periods or locations. Hence, resolving the spatio-temporal scale may uncover important spatial and/or temporal components in community variability. Using long-term data from Lake Constance (Bodensee), we find that a reduction in grazing pressure and relaxed competition for nutrients during winter and spring generates coherent dynamics among edible and less edible phytoplankton. During summer and fall, when both grazing pressure and nutrient limitation are present, edible and less edible phytoplankton exhibit compensatory dynamics. This study supports recent work suggesting that both abiotic and biotic interactions promote compensatory dynamics and to our knowledge, this is the first example of a system where compensatory and coherent dynamics seasonally alternate.

818: A. Vassiljev and P. Stainacke,. 2005. Statistical modelling of riverine nutrient sources and retention in the Lake Peipsi drainage basin. Water Science and Technology 3-4(51): 309-317.

Abstract: Implementation of the Water Framework Directive calls for methodologies and tools to quantify nutrient losses from diffuse sources at a river basin district scale. Here, we examine the possibility of using a statistical model for source apportionment and retention of nutrients in a large transboundary drainage basin (44,000 km²). The model approach uses non-linear regression for simultaneous estimation of e.g. source strength, i.e. export coefficients to surface waters, for the different specified land-use or soil categories and retention coefficients for pollutants in a drainage basin. The model was tested on data from water quality stations with corresponding sub-basin data, i.e., land cover, point sources and atmospheric deposition, from the Estonian part of the Lake Peipsi drainage basin. The model showed that it was statistically possible to derive reliable export coefficients (i.e. unit-area loads) for nitrogen on agricultural land and forests. Moreover, it was shown with simple empirical functions that lake retention was approximately 30-35% for both nitrogen and phosphorus and that the riverine retention was low for both nitrogen and phosphorus (approx. 10%). Results show that the MESAW model is a simple and powerful tool for simultaneous estimation of sources and retention of nutrient loads in a river basin.

819: G. Vazquez, S. Jimenez, M. E. Favila and A. Martinez,. 2005. Seasonal dynamics of the phytoplankton community and cyanobacterial dominance in a eutrophic crater lake in Los Tuxtlas, Mexico. *Ecoscience* 4(12): 485-493.

Abstract: In Los Tuxtlas, Mexico, there are numerous deep crater lakes in varying trophic states. In a warm eutrophic monomictic lake of the region we analyzed changes in the phytoplankton community and how they relate to water quality. During the periods of circulation, early and late stratification, there was an increase in species diversity marked by an increase in the abundance of many species of diatoms and chlorophytes. These periods were characterized by low transparency, high specific conductance, and high concentrations of ammonium and dissolved silica. *Microcystis aeruginosa* dominated during the entire stratification period, when both diversity and succession rates were low. Stratification was characterized by high temperatures (> 30 degrees C), low transparency, high pH, and high concentrations of soluble reactive phosphorus and nitrate. Thus, in Lake Chalchoapan, physical changes associated with stratification, circulation, and tropical seasonality determine the succession dynamics of the phytoplankton community.

820: A. H. M. Veeken, W. J. Blok, F. Curci, G. C. M. Coenen, A. J. Termorshuizen and H. V. M. Hamelers,. 2005. Improving quality of composted biowaste to enhance disease suppressiveness of compost-amended, peat-based potting mixes. *Soil Biology & Biochemistry* 11(37): 2131-2140.

Abstract: Biowaste can be converted into compost by composting or by a combination of anaerobic digestion and composting. Currently, waste management systems are primarily focused on the increase of the turnover rate of waste streams whereas optimisation of product quality receives less attention. This results in low quality composts that can only be sold on bulk markets at low prices. A new market for quality compost could be potting mixes for horticultural container-grown crops to partially replace non-renewable peat and increase the disease suppressiveness of potting mixes. We report here on the effect of wetsieving biowaste prior to composting on compost quality and on disease suppressiveness against the plant pathogen *Pythium ultimum* of peat mixes amended with this compost. The increased organic matter and decreased salt content of the compost allow for significantly higher substitution rates of peat by compost. In this study up to 60% v/v compost peat replacement did not affect cucumber growth. However, disease suppressiveness of the potting mixes strongly increased from 31 to 94% when the compost amendment rate was increased from 20 to 60%. It was shown that general disease suppression for *P. ultimum* can only be effective when the basal respiration rate is sufficiently high to support microbial activity. In addition, organic matter of the compost should reach a sufficient stability level to turn from disease conducive to disease suppressive. Increasing the compost addition from 20 to 60% did not significantly affect plant yield, yield variation were due to differences in nutrient levels. It can be concluded that compost from wetsieved biowaste has high potential to replace peat in growing media for the professional market. (c) 2005 Elsevier Ltd. All rights reserved.

821: M. I. Velez, H. Hooghiemstra and S. Metcalfe,. 2005. Fossil and modern diatom assemblages from the Savanna lake El Pinal, Colombia: An environmental reconstruction. *Diatom Research* 2(20): 387-407.

Abstract: In this paper we present an environmental reconstruction for the north-eastern part of Colombia known as the Llanos Orientales (4 degrees 8'N, 70 degrees 23'W) based on diatom and sediment analyses of a core drilled in Lake El Pinal and complementing published information from pollen analysis carried out for the same core. The diatom record obtained from the core was interpreted using modern diatom samples from El Pinal and surrounding lakes. The dominant diatom assemblage in the core is composed of several species of *Aulacoseira* including *A. species I* that could not be identified and could be a new species. The environmental reconstruction indicates that between 18,290 and 9020 C-14 yr BP the lake was part of a river system where periods of fluvial sediment accumulation alternated with periods of erosion. The pollen record shows dry savanna conditions for this time, with a slight change towards wetter conditions after 10,690 C-14 yr BP. Between 9020 and c. 1260 C-14 yr BP incipient lake conditions are indicated, but the presence of at least one hiatus indicates that the river was still present, It is possible that these conditions correspond to an incipient stage of an oxbow lake. The lake was shallow, with acidic water, low in nutrient concentration. Savanna herbs dominated the surroundings. Between c. 1260 and 1065 C-14 yr BP the lake finally became isolated from the river and conditions similar to those of today were established. Savanna is still the dominant vegetation. The last 1065 C-14 yr BP are missing from the record. The diatom analysis provided additional information to pollen-based reconstructions and gave a clearer picture of the hydrological evolution of the area, for instance, the decrease in *Isoetes* and increase in *Cabomba* was interpreted as indicating higher lake levels, whereas diatoms suggest quasi-lacustrine conditions caused by the isolation of the lake from the river and not an increase in water level. This has potential bearing on regional mult

822: M. I. Velez, M. Wille, H. Hooghiemstra and S. Metcalfe,. 2005. Integrated diatom-pollen based Holocene environmental reconstruction of lake Las Margaritas, eastern savannas of Colombia. *Holocene* 8(15): 1184-1198.

Abstract: A multiproxy analysis that includes diatoms, pollen, element geochemistry, carbon content analysis, and radiocarbon dates was carried out on a core from Las Margaritas (3 degrees 23'N, 73 degrees 26'W) in order to reconstruct environmental and climatic change. This lake is hydrologically closed and is located in the transitional area between the Amazonian rainforest and the savannas of the eastern part of Colombia. It therefore offers an excellent opportunity to study climatic change as expressed by competition between the biomes and changes in lake level caused by changes in water balance. Dry conditions, with a landscape covered by savanna and an incipient lake still influenced by the river system, characterized the period between 11 150 and 9100 cal. yr BP (11 190-8130 C-14 yr BP). More humid conditions prevailed between 9100 and 7330 cal. yr BP (8130-6470 C-14 yr BP), during which the forest advanced over the savanna and a swampy, isolated lake was formed. From 7330 to 1870 cal. yr BP, generally humid conditions prevailed, except for two dry periods between 5700-5200 cal. yr BP (4990-4620 C-14 yr BP) and 2750-1870 cal. yr BP (2640-1920 C-14 yr BP) that caused a marked decrease in lake level. A period of frequent shifts between drier and wetter periods occurred between 4180 and 2750 cal. yr BP (3810-2640 C-14 yr BP) and caused dynamic competition between the savanna and the forest and frequent oscillations in lake level. During dry periods lake level dropped and the water had higher conductivity and was richer in nutrients. Swamps with palms (Arecaceae) were formed. During humid periods, the lake had high water levels, the water was acidic, of low conductivity and poor in nutrients; *Mauritia* swamps surrounded the lake. Modern climates and limnological conditions have been established since 1870 cal. yr BP. The change to more consistently humid conditions observed after 9100 cal. yr BP and comparison with other environmental and climatic reconstructions from north

823: J. J. Venkiteswaran and S. L. Schiff,. 2005. Methane oxidation: isotopic enrichment factors in freshwater boreal reservoirs. *Applied Geochemistry* 4(20): 683-690.

Abstract: Methane oxidation plays a vital role in controlling the flux of CH₄ from many ecosystems. Release of the green house gas CH₄ to the atmosphere during creation and operation of hydroelectric reservoirs is of concern because of the dramatic changes in C and nutrient cycling that result from flooding. Experimentally flooded reservoirs in the boreal forest at the Experimental Lakes Area, northwestern Ontario, Canada, have been under study for a decade. In these large-scale ecosystem experiments, stable C isotopic ratios are used to determine the importance of CH₄ oxidation but quantification requires knowledge of the C isotope enrichment factor associated with CH₄ oxidation under the appropriate environmental conditions. Laboratory incubations were used to assess the CH₄ oxidation enrichment factors in 3 experimental boreal reservoirs with different soil and vegetation, and flood histories. As a result of flooding, new flooded surfaces were created with different temperature and hydrologic regimes and the importance of CH₄ oxidation in controlling the flux of CH₄ to the atmosphere changed significantly. However, isotopic ratio data from different systems could not be compared directly because the enrichment factor changed between systems. The enrichment factor in a flooded boreal wetland ecosystem (ELARP) decreased with temperature and the rate of CH₄ oxidation increased with temperature. This was in contrast with two flooded upland boreal forest reservoirs (Flooded Upland Dynamics Experiment) where the enrichment factor was smaller than in ELARP and there was little or no temperature effect on the enrichment factors or rates of CH₄ oxidation. (c) 2004 Elsevier Ltd. All rights reserved.

824: M. Venohr, H. Behrendt and W. Kluge,. 2005. The effects of different input data and their spatial resolution on the results obtained from a conceptual nutrient emissions model: the River Stor case study. *Hydrological Processes* 18(19): 3501-3515.

Abstract: This paper focuses on the influences of different data sources, and the variation in spatial resolution of input data and analysis, on the calculated nutrient emissions using the conceptual model MONERIS. MONERIS calculates both nitrogen and phosphorus emissions from point and diffuse sources and the riverine nutrient retention. By subtracting the retention from the emissions, a riverine nutrient load was estimated and compared with the observed nutrient river load. All calculations were conducted for the period from 1991 to 1993. The River Stor, with a catchment area of 1135 km², located in a postglacial lowland landscape in northern Germany, was chosen as a case study area. Two different data sets (e.g. land use, soil type or wastewater treatment plant inventory) were used: a commonly available standard data set (German or European maps) and a more detailed set with a higher spatial resolution derived from several studies at the Ecosystem Research Centre in Kiel. Initially, both data sets were used to apply MONERIS to the total catchment. The results were compared to adapt some of the free model-parameters to the conditions in the relatively small lowland river catchment. Using the standard data set, total nutrient emissions of 2320 tons year⁻¹ of nitrogen and 96 tons year⁻¹ phosphorus were calculated. The detailed data set yielded slightly higher emissions for nitrogen (2420 tons year⁻¹) and for phosphorus (102 tons year⁻¹). According to the spatial resolution, the proportion of the area of tile drainages and sandy soils derived from the different data sets varies considerably. This causes great differences in the total nutrient emissions estimated by the two approaches. Comparing the observed and the calculated nutrient loads, reliable results for catchments larger than 50 km², or third-order streams, could be shown. Copyright (c) 2005 John Wiley & Sons, Ltd.

825: M. Venohr, I. Donohue, S. Fogelberg, B. Arheimer, K. Irvine and H. Behrendt,. 2005. Nitrogen retention in a river system and the effects of river morphology and lakes. Water Science and Technology 3-4(51): 19-29.

Abstract: The mean annual transfer (loss and retention) of nitrogen in a river system was estimated using a conceptual approach based on water surface area and runoff. Two different approaches for the calculation of water surface area were applied to determine riverine nitrogen retention in four European catchments, ranging between 860-14,000 km² in area, and differing considerably in the proportion and distribution of surface waters, specific runoff and specific nutrient emissions. The transfer rate was estimated sequentially as either the mean value for the total catchment, on a sub-catchment scale, or considering the distribution of water surface area within a sub-catchment. For the latter measure, nitrogen retention in larger lakes was calculated separately. Nitrogen emissions modelled with MONERIS and HBV-N were used to calculate nitrogen river loads and compare those with observed loads. Inclusion of the proportion of water area within a sub-catchment improved modelled results in catchment with large lakes in sub-catchments, but not where there was a homogenous distribution of surface waters among sub-catchments.

826: C. Vernescu, J. Coulas and P. Ryser,. 2005. Leaf mass loss in wetland graminoids during senescence. *Oikos* 1(109): 187-195.

Abstract: Mass loss of senescing leaves is an important part of plant biomass turnover and has consequences for assessment of ecosystem productivity, ecosystem nutrient use efficiency, and plant nutrient resorption efficiency. Data, however, on mass loss are scarce, and often based on leaf area as the reference base. This leads to an underestimation of the mass loss, as leaf area itself shrinks during senescence. Furthermore, the few existing studies have almost exclusively used woody species. The purpose of the present study was twofold: i) to assess leaf mass loss during senescence in herbaceous species, with the example of five wetland graminoids and, ii) to compare two different methods of mass loss assessment (two species). Assuming that leaf length does not change during senescence, we assessed leaf mass per leaf length prior to and after senescence. We also estimated pre-senescence leaf mass nondestructively based on leaf length, width and thickness. For *Typha latifolia* and *Carex stricta*, two species with graminoid type leaves but contrasting leaf structure, both methods delivered almost identical results. After the first assessment of leaf mass on July 7th, *T. latifolia* leaf mass initially increased by 13%, and then decreased to be 12% below the original mass after senescence. *C. stricta* leaf mass remained stable until senescence, but decreased then by 33%. In a second experiment, the mass of 100 mm pieces of leaves was measured before and after senescence. *Calamagrostis canadensis*, *Carex rostrata* and *C. stricta* lost 23-57% of their leaf mass during senescence, whereas *Glyceria canadensis* did not show any mass loss. We conclude that mass loss of senescing leaves of herbaceous plants can be considerable and should not be neglected in studies of productivity, nutrient use efficiency or nutrient resorption. For species with no shrinking leaf length during senescence, mass loss can be measured with leaf length as the base whereas for others, pre-senescent mass can be esti

827: J. Viers, G. Barroux, M. Pinelli, P. Seyler, P. Oliva, B. Dupre and G. R. Boaventura,. 2005. The influence of the Amazonian floodplain ecosystems on the trace element dynamics of the Amazon River mainstem (Brazil). Science of the Total Environment 1-3(339): 219-232.

Abstract: The purpose of this paper is to forecast the role of riverine wetlands in the transfer of trace elements. One of the largest riverine wetlands in the world is the floodplain (varzea) of the Amazon River and its tributaries (Junk and Piedade, 1997). The central Amazon wetlands are constituted by a complex network of lakes and floodplains, named varzeas, that extend over more than 300,000 km² (Junk, W.J., The Amazon floodplain- a sink or source for organic carbon? In Transport of Carbon and Minerals in Major World Rivers, edited by E.T. Degens, S. Kempe, R. Herrera, SCOPE/UNEP; 267-283, 1985.) and are among the most productive ecosystems in the world due to the regular enrichment in nutrients by river waters. In order to understand if the adjacent floodplain of Amazon River have a significant influence on the trace element concentrations and fluxes of the mainstem, the concentrations of selected elements (i.e., Al, Mn, Fe, Co, Cu, Mo, Rb, Sr, Ba, and U) have been measured in the Amazon River water (Manacapuru Station, Amazonas State, Brazil) and in lake waters and plants (leaves) from a varzea (Ilha de Marchantaria, Amazonas State, Brazil) during different periods of the hydrological cycle. Four plant species (two perennial species: *Pseudobombax munguba* and *Salix humboldtiana*, and two annual herbaceous plants: *Echinochloa polystachya* and *Eichhornia crassipes*) were selected to represent the ecological functioning of the site. Time series obtained for dissolved Mn and Cu (< 0.20 µM) in Amazon River water could not be explained by tributary mixing or instream processes only. Therefore, the contribution of the waters transiting the floodplains should be considered. These results suggest that the chemical composition of the waters draining these floodplains is controlled by reactions occurring at sediment-water and plant-water interfaces. Trace elements concentrations in the plants (leaves) vary strongly with hydrological seasonality. Based on the concentration data and

828: A. Vinck, M. Terlouw, W. R. Pestman, E. P. Martens, A. F. Ram, C. van den Hondel and H. A. B. Wosten,. 2005. Hyphal differentiation in the exploring mycelium of *Aspergillus niger*. *Molecular Microbiology* 3(58): 693-699.

Abstract: Mycelial fungi play a central role in element cycling in nature by degrading dead organic material such as wood. Fungal colonization of a substrate starts with the invasion of exploring hyphae. These hyphae secrete enzymes that convert the organic material into small molecules that can be taken up by the fungus to serve as nutrients. Using green fluorescent protein (GFP) as a reporter, we show for the first time that exploring hyphae of *Aspergillus niger* differentiate with respect to enzyme secretion; some strongly express the glucoamylase gene *glaA*, while others hardly express it at all. When a cytoplasmic GFP was used, 27% of the exploring hyphae of a 5-day-old colony belonged to the low expressing hyphae. By fusing GFP to glucoamylase and by introducing an ER retention signal, this number increased to 50%. This difference is due to cytoplasmic streaming of the reporter in the former case, as was shown by using a photo-activatable GFP. Our findings indicate that a fungal mycelium is highly differentiated, especially when taking into account that hyphae in the exploration zone were exposed to the same nutritional conditions.

829: N. J. Voelz, R. E. Zuellig, S. H. Shieh and J. V. Ward,. 2005. The effects of urban areas on benthic macroinvertebrates in two Colorado plains rivers. Environmental Monitoring and Assessment 1-3(101): 175-202.

Abstract: Water demands in and and semi-arid areas, coupled with increased human populations and concomitant changes in land use, can greatly alter aquatic ecosystems. A good example of this type of system occurs along the eastern slope of the Colorado Rocky Mountains, U.S.A. Long-term macroinvertebrate metric data from the Big Thompson and Cache la Poudre Rivers, Colorado, were collected at one site above, and three sites in and downstream from urban areas. These data were compared both with regional reference and single reference sites in the respective rivers. Using the surrogate variables of potential urban impact (population and housing units), and the environmental gradient represented primarily by chemical factors, it was determined that there was an effect of urban land use that was reflected in the macroinvertebrate assemblages in both rivers. The most robust results were usually seen when regional reference data were used. However, even using only the upstream reference site in either river indicated some negative impacts from the urban areas. The long-term data, particularly in the Cache la Poudre River, showed that water quality has not been getting worse and there is some evidence of a slight improvement in downstream reaches, even with increased urban development.

830: A. T. Vos and J. C. Roos,. 2005. Causes and consequences of algal blooms in Loch Logan, an urban impoundment. Water Sa 3(31): 385-392.

Abstract: Loch Logan is situated at the "Waterfront" in the city centre of Bloemfontein. During the rainy season it collects stormwater from the surrounding catchment areas as well as other urban runoff water. During summer, Loch Logan frequently experiences algal blooms. The system can be classified as eutrophic due to high dissolved reactive phosphate (PO₄-P) and chlorophyll-a (Chl-a) concentrations. Nitrogen is probably the limiting factor to algal growth. The consequences of the eutrophication are algal blooms, oxygen depletion, fish kills, excessive macrophyte growth, odour problems and extreme oscillations occur in physical and chemical parameters.

831: K. Vrede,. 2005. Nutrient and temperature limitation of bacterioplankton growth in temperate lakes. Microbial Ecology 2(49): 245-256.

Abstract: Limitation of bacterioplankton production by nutrients and temperature was investigated in eight temperate lakes in summer. Six of the lakes were resampled in autumn. The lakes differ in nutrient content, water color, and concentration of dissolved organic carbon. Nutrients (phosphorus, nitrogen, and organic carbon) were added alone and in all possible combinations to filtered lake water inoculated with bacteria from the lake. After incubation for 36-40 h at in situ temperatures (ranging from 7 to 20 degrees C), the response in bacterioplankton production was determined. The effect of increased temperature on bacterioplankton growth was also tested. Bacterioplankton production was often limited by phosphorus alone, organic carbon alone, or the two in combination. Phosphorus limitation of bacterioplankton production was more common in the summer, whereas limitation by organic carbon was more frequently observed in the autumn. There was a close balance between limitation by phosphorus and organic carbon in the epilimnion in the summer. In the hypolimnion in the summer, bacterioplankton growth was primarily phosphorus-limited. The effect of phosphorus additions decreased with increasing phosphorus concentrations in the lakes. However, there were no correlations between the effect of added organic carbon and water color, dissolved organic carbon concentration, or phosphorus concentration. When temperature was low (in the hypolimnion in the summer, and throughout the water column in the autumn) temperature also limited bacterioplankton production. Thus, temperature and inorganic nutrients or organic compounds can limit bacterioplankton growth both alone and simultaneously. However, at low temperatures, temperature is the most important factor influencing bacterioplankton growth.

832: T. Vrede and K. Vrede,. 2005. Contrasting 'top-down' effects of crustacean zooplankton grazing on bacteria and phytoflagellates. *Aquatic Ecology* 3(39): 283-293.

Abstract: The combined effects of grazing and nutrient regeneration by *Daphnia* and *Eudiaptomus* on the growth of *Rhodomonas* and heterotrophic bacteria was assessed experimentally. The responses of *Rhodomonas* and bacteria to the grazers were measured as net specific growth rate over the entire experimental periods, as well as production and specific production at the end of the experiments. Both zooplankton species had a negative effect on *Rhodomonas* net specific growth rate due to grazing and a positive effect on specific primary production due to nutrient regeneration. *Daphnia* had no effect on bacterial net specific growth rate, bacterial production or specific bacterial production in one of two experiments. In the other experiment, however, both bacterial growth rate and production decreased as a result of grazing. Furthermore, *Daphnia* had a negative effect on specific bacterial production, but *Eudiaptomus* had a positive effect on all bacterial parameters due to nutrient regeneration, probably of phosphorus. Positive effects of copepods on bacterial growth has previously been attributed to trophic cascades via protozoa. However, the present experiments show that regeneration of nutrients, especially phosphorus, may account for a large part of the stimulation of bacterial growth.

833: K. Vuorio, A. Lagus, J. M. Lehtimäki, J. Suomela and H. Helminen,. 2005. Phytoplankton community responses to nutrient and iron enrichment under different nitrogen to phosphorus ratios in the northern Baltic Sea. *Journal of Experimental Marine Biology and Ecology* 1(322): 39-52.

Abstract: The impact of nutrient enrichment on the phytoplankton community structure, and particularly cyanobacteria, was studied in a 3-week mesocosm experiment conducted in August 2001 in the Archipelago Sea, a part of the northern Baltic Sea. The factorial design experiment included daily additions of nitrogen (N) and phosphorus (P) at two mass ratios, 1N:1P and 7N:1P, respectively, additions of iron (Fe) and a synthetic chelator, ethylenediaminetetraacetic acid (EDTA). The floating enclosures (400 l) were sampled for analyses of phytoplankton biomass and community structure, phytoplankton primary production, chlorophyll a, nutrients, and hepatotoxins. Chlorophyll a concentration, phytoplankton biomass and primary production increased most in the 7N:1P treatment. The increase was mainly due to an abundant growth of chlorophytes (*Dictyosphaerium subsolitarium*, *Kirchneriella* spp., *Monoraphidium contortum*, and *Oocystis* spp.), pennate diatoms (especially *Nitzschia* spp.), dinophytes and the chroococcalean cyanobacterium *Synechococcus* sp. The nutrient enrichments had no effect on the total biomass of N-2-fixing cyanobacteria. Nevertheless, the biomass of *Anabaena* spp. was highest in the enrichments with a low N/P ratio. Chlorophyll a concentration and total phytoplankton biomass were not affected by Fe or EDTA, but Fe alone had a positive effect on the chlorophyte *Kirchneriella* sp. The N-2-fixing cyanobacteria *Aphanizomenon* sp. responded positively to Fe alone and to both Fe and EDTA added together. The hepatotoxin concentration increased during the experiment, but no clear responses to nutrient enrichments were found. Our study showed species-specific responses to nutrient enrichments among the N-2-fixing cyanobacteria. Although the total phytoplankton production was not Fe-limited; the availability of Fe clearly affected the phytoplankton community structure. (c) 2005 Elsevier B.V. All rights reserved.

834: J. Vymazal,. 2005. Horizontal sub-surface flow and hybrid constructed wetlands systems for wastewater treatment. Ecological Engineering 5(25): 478-490.

Abstract: The first experiments using wetland macrophytes for wastewater treatment were carried by out by Kathe Seidel in Germany in early 1950s. The horizontal sub-surface flow constructed wetlands (HF CWs) were initiated by Seidel in the early 1960s and improved by Reinhold Kickuth under the name Root Zone Method in late 1960s and early 1970s and spread throughout Europe in 1980s and 1990s. However, cohesive soils proposed by Kickuth got clogged very quickly because of low hydraulic permeability and were replaced by more porous media such as gravel in late 1980s in the United Kingdom and this design feature is still used. In fact, the use of porous media with high hydraulic conductivity was originally proposed by Seidel. HF CWs provide high removal of organics and suspended solids but removal of nutrients is low. Removal of nitrogen is limited by anoxic/anaerobic conditions in filtration beds which do not allow for ammonia nitrification. Phosphorus removal is restricted by the use of filter materials (pea gravel, crushed rock) with low sorption capacity. Various types of constructed wetlands may be combined in order to achieve higher treatment effect, especially for nitrogen. However, hybrid systems are comprised most frequently of vertical flow (VF) and HF systems arranged in a staged manner. HF systems cannot provide nitrification because of their limited oxygen transfer capacity. VF systems, on the other hand, do provide a good conditions for nitrification but no denitrification occurs in these systems. In hybrid systems (also sometimes called combined systems) the advantages of the HF and VF systems can be combined to complement processes in each system to produce an effluent low in BOD, which is fully nitrified and partly denitrified and hence has a much lower total-N outflow concentrations. (c) 2005 Elsevier B.V. All rights reserved.

835: J. Vymazal, . 2005. Removal of heavy metals in a horizontal sub-surface flow constructed wetland. Journal of Environmental Science and Health Part a-Toxic/Hazardous Substances & Environmental Engineering 6-7(40): 1369-1379.

Abstract: Constructed wetlands with horizontal sub-surface flow designed for the treatment of municipal sewage. have been monitored extensively with respect to removal of organics (BOD₅, COD), suspended solids, nutrients (N, P) and microbial pollution. However, the information on the removal and distribution of heavy and other metals in these systems are very limited because heavy metals do not constitute a major problem in wastewater from small villages with no industry. The measurements were carried out in a constructed wetland with sub-surface flow at Morina near Prague. Removal of metals in constructed wetland at Morina near Prague varied widely among studied metals. The highest removal was recorded for aluminium (> 98.9%), zinc (94.1%) and chromium (92.8%). Iron and manganese increased their concentration in the outflow suggesting that these metals are actually washed out of the system. This phenomenon is attributed to the fact that in the absence of dissolved oxygen and nitrate manganic Mn and then ferric Fe are used by microorganisms as the terminal electron acceptors during respiration. It has been shown that substantial amounts of metals were retained in pretreatment units.

836: J. Vymazal and L. Kropfelova,. 2005. Growth of *Phragmites australis* and *Phalaris arundinacea* in constructed wetlands for wastewater treatment in the Czech Republic. *Ecological Engineering* 5(25): 606-621.

Abstract: Common reed (*Phragmites australis*) and reed canarygrass (*Phalaris arundinacea*) are two most commonly used plant species in constructed wetlands for wastewater treatment in the Czech Republic. Growth characteristics of both plants (biomass, stem count, and length) have been measured in 13 horizontal sub-surface flow constructed wetlands since 1992. The results revealed that while *Phalaris* usually reaches its maximum biomass as early as during the second growing season, *Phragmites* usually reaches its maximum only after three to four growing seasons. The maximum biomass of both species varies widely among systems and the highest measured values (5070 g m⁻²) for *Phragmites* and 1900 gm⁻²) for *Phalaris*) are similar to those found in eutrophic natural stands. The shoot count of *Phragmites* decreases after the second growing season while length and weight of individual shoots increases over time due to self-thinning process. Number of *Phalaris* shoots is the highest during the second season and then the shoot count remains about the same. Also the shoot length remains steady over years of constructed wetland operation. (c) 2005 Elsevier B.V. All rights reserved.

837: A. J. Wade, C. Neal, P. G. Whitehead and N. J. Flynn,. 2005. Modelling nitrogen fluxes from the land to the coastal zone in European systems: a perspective from the INCA project. Journal of Hydrology 1-4(304): 413-429.

Abstract: This paper describes the results and conclusions of the INCA (Integrated Nitrogen Model for European CAatchments) project and sets the findings in the context of the ELOISE (European Land-Ocean Interaction Studies) programme. The INCA project was concerned with the development of a generic model of the major factors and processes controlling nitrogen dynamics in European river systems, thereby providing a tool (a) to aid the scientific understanding of nitrogen transport and retention in catchments and (b) for river-basin management and policy-making. The findings of the study highlight the heterogeneity of the factors and processes controlling nitrogen dynamics in freshwater systems. Nonetheless, the INCA model was able to simulate the in-stream nitrogen concentrations and fluxes observed at annual and seasonal timescales in Arctic, Continental and Maritime-Temperate regimes. This result suggests that the data requirements and structural complexity of the INCA model are appropriate to simulate nitrogen fluxes across a wide range of European freshwater environments. This is a major requirement for the production of coupled river-estuary-coastal shelf models for the management of our aquatic environment. With regard to river-basin management, to achieve an efficient reduction in nutrient fluxes from the land to the estuarine and coastal zone, the model simulations suggest that management options must be adaptable to the prevailing environmental and socio-economic factors in individual catchments: 'Blanket approaches' to environmental policy appear too simple. (c) 2004 Elsevier B.V. All rights reserved.

838: F. H. Wagner and C. Beisser,. 2005. Does carbon enrichment affect hyporheic invertebrates in a gravel stream?.
Hydrobiologia (544): 189-200.

Abstract: For a period of one year we injected a solution of stream water enriched with glucose and inorganic nitrogen and phosphorus at two experimental sites into the hyporheic sediments of the Oberer Seebach, Austria. The biofilm reacted with a quantitative increase after two weeks. The hyporheic invertebrates were sampled with the Cage Pipe Trap method, where the number of trapped animals is determined by the spatial density and the activity of the invertebrates. Within two and six weeks, the hyporheic invertebrates exhibited a reaction indicating an utilization of the new food resources. Over a longer period of one year, three different reaction patterns appeared. The number of nematods and ostracods increased extensively, presumably caused by the modification of the spatial structure of the environment due to biofilm growth. The number of the small sized invertebrates decreased, reflecting the reduced feeding effort. And the number of the large insect larvae increased indicating that these group is mainly limited by space. The hyporheic zone is described as a 'self-cleaning DOC filter', an attribute that is particularly assigned to the ecotone between the riparian soil zone and the stream hyporheic zone.

839: C. H. A. Wahren, M. D. Walker and M. S. Bret-Harte,. 2005. Vegetation responses in Alaskan arctic tundra after 8 years of a summer warming and winter snow manipulation experiment. *Global Change Biology* 4(11): 537-552.

Abstract: We used snow fences and small (1 m²) open-topped fiberglass chambers (OTCs) to study the effects of changes in winter snow cover and summer air temperatures on arctic tundra. In 1994, two 60 m long, 2.8 m high snow fences, one in moist and the other in dry tundra, were erected at Toolik Lake, Alaska. OTCs paired with unwarmed plots, were placed along each experimental snow gradient and in control areas adjacent to the snowdrifts. After 8 years, the vegetation of the two sites, including that in control plots, had changed significantly. At both sites, the cover of shrubs, live vegetation, and litter, together with canopy height, had all increased, while lichen cover and diversity had decreased. At the moist site, bryophytes decreased in cover, while an increase in graminoids was almost entirely because of the response of the sedge *Eriophorum vaginatum*. These community changes were consistent with results found in studies of responses to warming and increased nutrient availability in the Arctic. However, during the time period of the experiment, summer temperature did not increase, but summer precipitation increased by 28%. The snow addition treatment affected species abundance, canopy height, and diversity, whereas the summer warming treatment had few measurable effects on vegetation. The interannual temperature fluctuation was considerably larger than the temperature increases within OTCs (< 2 degrees C), however. Snow addition also had a greater effect on microclimate by insulating vegetation from winter wind and temperature extremes, modifying winter soil temperatures, and increasing spring run-off. Most increases in shrub cover and canopy height occurred in the medium snow-depth zone (0.5-2 m) of the moist site, and the medium to deep snow-depth zone (2-3 m) of the dry site. At the moist tundra site, deciduous shrubs, particularly *Betula nana*, increased in cover, while evergreen shrubs decreased. These differential responses were likely because of the larger pr

840: A. E. Wakefield, N. J. Gotelli, S. E. Wittman and A. M. Ellison,. 2005. Prey addition alters nutrient stoichiometry of the carnivorous plant *Sarracenia purpurea*. *Ecology* 7(86): 1737-1743.

Abstract: The carnivorous pitcher plant *Sarracenia purpurea* receives nutrients from both captured prey and atmospheric deposition, making it a good subject for the study of ecological stoichiometry and nutrient limitation. We added prey in a manipulative field experiment and measured nutrient accumulation in pitcher-plant tissue and pitcher liquid, as well as changes in plant morphology, growth, and photosynthetic rate. Prey addition had no effect on traditional measures of nutrient limitation (leaf morphology, growth, or photosynthetic rate). However, stoichiometric measures of nutrient limitation were affected, as the concentration of both N and P in the leaf tissue increased with the addition of prey. Pitcher fluid pH and nitrate concentration did not vary among treatments, although dissolved oxygen levels decreased and ammonia levels increased with prey addition. Ratios of N:P, N:K, and K:P in pitcher-plant tissues suggest that prey additions shifted these carnivorous plants from P limitation under ambient conditions to N limitation with the addition of prey.

841: L. G. Wall, J. L. Tank, T. V. Royer and M. J. Bernot,. 2005. Spatial and temporal variability in sediment denitrification within an agriculturally influenced reservoir. *Biogeochemistry* 1(76): 85-111.

Abstract: Reservoirs are intrinsically linked to the rivers that feed them, creating a river - reservoir continuum in which water and sediment inputs are a function of the surrounding watershed land use. We examined the spatial and temporal variability of sediment denitrification rates by sampling longitudinally along an agriculturally influenced river - reservoir continuum monthly for 13 months. Sediment denitrification rates ranged from 0 to 63 $\mu\text{g N}_2\text{O g ash free dry mass of sediments (AFDM)}^{-1} \text{ h}^{-1}$ or 0 - 2.7 $\mu\text{g N}_2\text{O g dry mass of sediments (DM)}^{-1} \text{ h}^{-1}$ at reservoir sites, vs. 0 - 12 $\mu\text{g N}_2\text{O gAFDM}^{-1} \text{ h}^{-1}$ or 0 - 0.27 $\mu\text{g N}_2\text{O gDM}^{-1} \text{ h}^{-1}$ at riverine sites. Temporally, highest denitrification activity traveled through the reservoir from upper reservoir sites to the dam, following the load of high nitrate (NO_3^- -N) water associated with spring runoff. Annual mean sediment denitri. cation rates at different reservoir sites were consistently higher than at riverine sites, yet significant relationships among these sites differed when denitrification rates were expressed per gDM vs. per gAFDM. There was a significant positive relationship between sediment denitri. cation rates and NO_3^- -N concentration up to a threshold of 0.88 $\text{mg NO}_3^- \text{ N l}^{-1}$, above which it appeared NO_3^- -N was no longer limiting. Denitrification assays were amended seasonally with NO_3^- -N and an organic carbon source (glucose) to determine nutrient limitation of sediment denitri. cation. While organic carbon never limited sediment denitrification, all sites were significantly limited by NO_3^- -N during fall and winter when ambient NO_3^- -N was low.

842: D. E. Walling,. 2005. Tracing suspended sediment sources in catchments and river systems. Science of the Total Environment 1-3(344): 159-184.

Abstract: Recent years have seen a growing awareness of the wider environmental significance of the,suspended sediment loads transported by rivers and streams. This includes the importance of fine sediment in the transport of nutrients and contaminants, including phosphorus (P). Sediment source exerts a key control on. the physical and geochemical properties, of suspended sediment, including its P content, and will also influence the potential for implementing effective. sediment and diffuse source pollution control strategies. Information on suspended sediment source, defined in terms of,both source type and spatial origin, is therefore increasingly needed. Such information is difficult to obtain using traditional monitoring techniques, but source tracing or fingerprinting techniques afford a valuable and effective alternative approach to establish the relative importance of potential sediment sources. This contribution reviews the development of source fingerprinting techniques, presents several examples of their application in UK catchments and discusses the need for future development of the approach and the potential for extending its application. (c) 2005 Elsevier B.V. All rights reserved.

843: R. L. Walls, D. H. Wardrop and R. P. Brooks,. 2005. The impact of experimental sedimentation and flooding on the growth and germination of floodplain trees. *Plant Ecology* 2(176): 203-213.

Abstract: Land-use changes in a forested floodplain's watershed can lead to incremental changes in the hydrology and sedimentation rates of the floodplain. The impacts of these changes can be difficult to measure due to the slow response time of mature trees. Seedlings and saplings, on the other hand, may show an immediate response. Responses during these early life history stages can have major consequences for regeneration of floodplain forests and ultimately result in community alteration. This study tested the importance of changes in hydrology and sedimentation on the germination and growth rates of three common floodplain tree species: *Acer rubrum*, *Fraxinus pennsylvanica* and *Quercus palustris*. Two-year-old saplings were grown in a greenhouse under two hydrologic regimes, with or without the addition of sediment. Neither periodic flooding with or without sediment nor static flooding on its own affected the growth of the seedlings. With the addition of sediment, static flooding for two weeks lead to a significant decrease in sapling growth. There was a significant species x treatment interaction, suggesting that each species responded differently to the application of flooding and sediment. The timing of germination and the total percent germination for *F pennsylvanica* and *Q. palustris* seeds were tested under the same conditions. Flooding and sediment acted in an additive manner to delay the germination of both *E pennsylvanica* and *Q. palustris* and to reduce the total germination rate of *Q. palustris*. There was no difference in the total germination rate of *F pennsylvanica* seeds under any treatment. During the growth trials, adventitious roots sprouted on saplings grown under sedimentation. Adventitious roots growing into sediment rather than floodwater should be able to utilize the sediment's nutrients and may compensate for some of the stress of flooding. The results of this study suggest that sediment tolerances will vary among species, but will not necessarily correlat

844: C. J. Walsh, T. D. Fletcher and A. R. Ladson,. 2005. Stream restoration in urban catchments through redesigning stormwater systems: looking to the catchment to save the stream. Journal of the North American Benthological Society 3(24): 690-705.

Abstract: Restoration of streams degraded by urbanization has usually been attempted by enhancement of instream habitat or riparian zones. Such restoration approaches are unlikely to substantially improve instream ecological condition because they do not match the scale of the degrading process. Recent studies of urban impacts on streams in Melbourne, Australia, on water chemistry, algal biomass and assemblage composition of diatoms and invertebrates, suggested that the primary degrading process to streams in many urban areas is effective imperviousness (EI), the proportion of a catchment covered by impervious surfaces directly connected to the stream by stormwater drainage pipes. The direct connection of impervious surfaces to streams means that even small rainfall events can produce sufficient surface runoff to cause frequent disturbance through regular delivery of water and pollutants; where impervious surfaces are not directly connected to streams, small rainfall events are intercepted and infiltrated. We, therefore, identified use of alternative drainage methods, which maintain a near-natural frequency of surface runoff from the catchment, as the best approach to stream restoration in urban catchments and then used models of relationships between 14 ecological indicators and EI to determine restoration objectives. Ecological condition, as indicated by concentrations of water-quality variables, algal biomass, and several measures of diatom and macroinvertebrate assemblage composition, declined with increasing EI until a threshold was reached ($EI = 0.01-0.14$), beyond which no further degradation was observed. We showed, in a sample catchment, that it is possible to redesign the drainage system to reduce EI to a level at which the models predict detectable improvement in most ecological indicators. Distributed, low-impact design measures are required that intercept rainfall from small events and then facilitate its infiltration, evaporation, transpiration, or storage for I

845: C. J. Walsh, A. H. Roy, J. W. Feminella, P. D. Cottingham, P. M. Groffman and R. P. Morgan,. 2005. The urban stream syndrome: current knowledge and the search for a cure. *Journal of the North American Benthological Society* 3(24): 706-723.

Abstract: The term "urban stream syndrome" describes the consistently observed ecological degradation of streams draining urban land. This paper reviews recent literature to describe symptoms of the syndrome, explores mechanisms driving the syndrome, and identifies appropriate goals and methods for ecological restoration of urban streams. Symptoms of the urban stream syndrome include a flashier hydrograph, elevated concentrations of nutrients and contaminants, altered channel morphology, and reduced biotic richness, with increased dominance of tolerant species. More research is needed before generalizations can be made about urban effects on stream ecosystem processes, but reduced nutrient uptake has been consistently reported. The mechanisms driving the syndrome are complex and interactive, but most impacts can be ascribed to a few major large-scale sources, primarily urban stormwater runoff delivered to streams by hydraulically efficient drainage systems. Other stressors, such as combined or sanitary sewer overflows, wastewater treatment plant effluents, and legacy pollutants (long-lived pollutants from earlier land uses) can obscure the effects of stormwater runoff. Most research on urban impacts to streams has concentrated on correlations between instream ecological metrics and total catchment imperviousness. Recent research shows that some of the variance in such relationships can be explained by the distance between the stream reach and urban land, or by the hydraulic efficiency of stormwater drainage. The mechanisms behind such patterns require experimentation at the catchment scale to identify the best management approaches to conservation and restoration of streams in urban catchments. Remediation of stormwater impacts is most likely to be achieved through widespread application of innovative approaches to drainage design. Because humans dominate urban ecosystems, research on urban stream ecology will require a broadening of stream ecological research to integrate w

846: G. J. Wan, J. A. Chen, F. C. Wu, S. Q. Xu, Z. G. Bai, E. Y. Wan, C. S. Wang, R. G. Huang, K. M. Yeager and P. H. Santschi,. 2005. Coupling between Pb-210(ex) and organic matter in sediments of a nutrient-enriched lake: An example from Lake Chenghai, China. *Chemical Geology* 4(224): 223-236.

Abstract: Sediment cores were collected from deep-water areas of Lake Chenghai, China in June 1997. The vertical profile of (CS)-C-137 activity gives reliable geochronological results. The results also indicate that sediment accumulation rates in deep-water areas of Lake Chenghai were relatively constant in recent decades, averaging $0.43 \text{ g cm}^{-2} \text{ y}^{-1}$, despite a variable organic carbon influx. Pb-210(eq) (=Ra-226) activity was relatively constant also, with an average value of $54.3 \pm 3.2 \text{ Bq kg}^{-1}$. Vertical profiles of Pb-210(ex) (=Pb-210(total) - Ra-226) decreased exponentially, resulting in somewhat lower sediment accumulation rates ($0.3 \text{ g cm}^{-2} \text{ y}^{-1}$). These lower rates are likely less reliable, as the relatively large fluctuations in Pb-210(ex) activities correlate closely to the organic carbon (C-org) content of the sediments. For example, the vertical profile of Pb-210(ex) activity displays peaks at mass depths of $3.7\text{-}4.7 \text{ g cm}^{-2}$ (10-12 cm) and $10\text{-}11 \text{ g cm}^{-2}$ (25-28 cm), similar to the maxima in the vertical profile of C-org. This phenomenon must be related to the delivery of particulate organic matter (POM) from the water to the sediments, or to watershed soil erosion. Since the mean atomic ratios of H-org/C-org and C-org/N-org in Lake Chenghai sediments are 5.5 and 7.0, respectively, indicating that POM was predominantly derived from the remains of authigenic algae, this eliminates watershed erosion rates as a primary control on lake sedimentation rates as resolved by Pb-210(ex). Sedimentation fluxes ($F(\text{C-org})$) of particulate organic carbon since 1970 varied between $60 \text{ to } 160 \text{ g m}^{-2} \text{ y}^{-1}$, and appeared to closely influence variations in Pb-210(ex) concentrations. For example, sedimentation fluxes of Pb-210(ex) ($F(\text{Pb-210(ex)})$) showed maxima in the years 1972-1974 and 1986-1989, likely reflecting historical variations of lake biological productivity or carbon preservation. (c) 2005 Elsevier B.V All rights reserved.

847: S. G. Wang, X. C. Jin, Y. Pang, H. C. Zhao, X. N. Zhou and F. C. Wu,. 2005. Phosphorus fractions and phosphate sorption characteristics in relation to the sediment compositions of shallow lakes in the middle and lower reaches of Yangtze River region, China. *Journal of Colloid and Interface Science* 2(289): 339-346.

Abstract: Phosphorus is recognized as the most critical nutrient limiting lake productivity. The trophic status and development of lake systems are also influenced by the phosphorus content and fractions and phosphate sorption characteristics of the lake sediments. The phosphorus fractions and phosphate sorption characteristics of sediments in shallow lakes from the middle and lower reaches of Yangtze River region in China were investigated. The results show that the phosphorus contents in the sediments ranged from 217.8 to 1640 mg kg⁻¹; inorganic phosphorus (IP) was the major fraction of total phosphorus (TP); phosphorus bound to Al, Fe, Mn oxides, and hydroxides (Fe/Al-P), and calcium bound phosphorus (Ca-P) were the main fractions of IP. Phosphate sorption on the sediments mainly occurred within 2 h and then reached equilibrium in 10 h. The phosphate sorption rate was closely related to the concentration of fine particles. The phosphate sorption capacity ranged from 128.21 to 833.33 mg kg⁻¹, showing a significant correlation with the contents of Fe, Fe + Al, total organic carbon (TOC), cationic exchange capacity, total nitrogen, TP, Ca, IP, and the ratio of P/(Al + Fe), and it was higher in the sediments of eutrophic lakes than in mesotrophic lakes. Phosphate was mainly sorbed onto Fe and Al particles. The phosphate sorption efficiency ranged from 26.74 to 312.50 L kg⁻¹, and had a strong positive correlation with Fe content. For the eutrophic lake sediments, there were no significant relationships between the phosphate sorption efficiency and the selected physical and chemical parameters. But for the mesotrophic lake sediments, the phosphate sorption efficiency was found to be positively related to the contents of Al and Fe + Al. (c) 2005 Elsevier Inc. All rights reserved.

848: S. H. Wang, A. R. Dzialowski, J. O. Meyer, F. deNoyelles, N. C. Lim, W. W. Spotts and D. G. Huggins,. 2005. Relationships between cyanobacterial production and the physical and chemical properties of a Midwestern Reservoir, USA. *Hydrobiologia* (541): 29-43.

Abstract: Drinking water reservoirs in agricultural dominated watersheds are particularly vulnerable to cyanobacterial blooms. A major byproduct of cyanobacteria is the production of objectionable taste and odor compounds such as geosmin. During May 1997 to September 1998, we studied spatial and temporal patterns of cyanobacterial abundance and composition with respect to a series of physical and chemical properties in Clinton Lake, located in east central Kansas, USA. Our results suggest that nutrients (in particular TN, NO₃-N concentrations), turbidity, and hydrologic regime all played potentially important roles in regulating cyanobacterial production. Specifically, low levels of nitrogen coupled with the internal release of phosphorus from the lake sediment under brief periods of anoxia may have helped promote cyanobacterial blooms. There was also a strong association between cyanobacterial blooms, geosmin production, and most taste and odor events in Clinton Lake. *Anabaena circinalis* appeared to be the source for geosmin production as a result of senescing algal cells just after the primary die-off of cyanobacteria.

849: S. H. Wang, D. G. Huggins, L. Frees, C. G. Volkman, N. C. Lim, D. S. Baker, V. Smith and F. Denoyelles,. 2005. An integrated modeling approach to total watershed management: Water quality and watershed assessment of Cheney Reservoir, Kansas, USA. Water Air and Soil Pollution 1-4(164): 1-19.

Abstract: Degradation of water quality is the major health concern for lakes and reservoirs in the central regions of the United States as a result of heavily devoted agricultural production. A vital key to the development of a reservoir management strategy is to identify nutrient loading that describes associated water quality conditions in reservoirs. This study integrated AnnAGNPS watershed and BATHTUB lake models to simulate actual lake water quality conditions of Cheney Reservoir, KS, and demonstrated the use of the coupled model for simulating lake response to changes in different watershed land use and management scenarios. The calibrated current-conditions model simulated in-lake reductions as much as 52% for TN, 48% for TP, and 70% for chlorophyll a due to conversion to native grass, and increases as much as 4% for TN, 9% for TP and 6% for chlorophyll a due to conversion of land from the Conservation Reserve Program (CRP) to cropland (15.5% of watershed). This model also demonstrated an increase in chlorophyll a (19%) as the lake sediment capacity was reached over the next century.

850: X. H. Wang, C. Q. Yin and B. Q. Shan,. 2005. The role of diversified landscape buffer structures for water quality improvement in an agricultural watershed, North China. *Agriculture Ecosystems & Environment* 4(107): 381-396.

Abstract: The quality of water flow crossing through the watershed ecosystem reflects the integrated effects of many processes along water pathways. Experiments were conducted in a headwater agricultural watershed in North China to study the hydrological and ecological interactions between complex landscapes and nitrogen (N) flow. It was found that a series of artificial and natural buffer/detention landscape structures, which include four stone dams (SDs), a roadside grassed ditch (RGD), a vegetated filter strip (VFS), two dry ponds (DPs) and a riparian buffer zone (RBZ), distributed along the ephemeral stream, could effectively reduce the export load of sediment and N in surface runoff. During rainfall-runoff events, surface flow velocity and runoff volume were reduced from inlet to outlet of each structure. As a result, the retention rate of water by the system was determined to be 50.2%, total suspended solid (TSS) to be 72.7%, total nitrogen (TN) 66.1 %, total dissolved nitrogen (TDN) 52.5%, NO₃⁻ 43.6%. and NH₄⁺ 51.6%, respectively. For different N forms, each structure had a different retention efficiency. Dry ponds and stone dams were more effective for particulate N, while the vegetated filter strip and riparian buffer zone were more effective for dissolved N forms. Dry ponds were the reliable structures for controlling sediment and N export in this watershed, while the retention efficiency of pollutants by the roadside grassed ditch was highly unreliable. The hydrological control by this system of flow velocity and runoff volume, which were the two key factors determining the export load of pollutants, was one of the main mechanisms in the retention of sediment and N. The use of diversified agricultural landscape buffer structures is an effective way to reduce the discharge of valuable nutrients and thus pollution of downstream waterbodies. © 2004 Elsevier B.V. All rights reserved.

851: B. B. Ward, J. Granger, M. T. Maldonado, K. L. Casciotti, S. Harris and M. L. Wells,. 2005. Denitrification in the hypolimnion of permanently ice-covered Lake Bonney, Antarctica. *Aquatic Microbial Ecology* 3(38): 295-307.

Abstract: The distribution of denitrification was investigated in the hypolimnion of the east and west lobes of permanently ice-covered Lake Bonney, Taylor Valley, Antarctica. Anomalously high concentrations of dissolved inorganic nitrogen (DIN; nitrate, nitrite, ammonium and nitrous oxide) in the oxygen-depleted hypolimnion of the east lobe of the Lake implied that denitrification is or was active in the west, but not in the east lobe. While previous investigations reported no detectable denitrification in the east lobe, we measured active denitrification in samples from both the east and west lobes. In the west lobe, measured denitrification rates exhibited a maximum at the depth of the chemocline and denitrification was not detectable in either the oxic surface waters or in the deep water where nitrate was absent. In the east lobe, denitrification was detected below the chemocline, at the depths where ammonium, nitrate, nitrite and nitrous oxide are all present at anomalously high levels. Trace metal availability was manipulated in incubation experiments in order to determine whether trace metal toxicity in the east lobe could explain the difference in nitrogen cycling between the 2 lobes. There were no consistent stimulatory effects of metal chelators or nutrient addition on the rate of denitrification in either lobe, so that the mechanisms underlying the unusual N cycle of the east lobe remain unknown. We conclude that all the ingredients necessary to allow denitrification to occur are present in the east lobe. However, even though denitrification could be detected under certain conditions in incubations, denitrification is inhibited under the in situ conditions of the lake.

852: G. D. Wardlaw and D. L. Valentine,. 2005. Evidence for salt diffusion from sediments contributing to increasing salinity in the Salton Sea, California. *Hydrobiologia* (533): 77-85.

Abstract: Geochemical investigations of interstitial waters from the Salton Sea, CA reveal evidence of concentrated brines in the sediments underlying the lake's two basins. The brines are likely caused by the gradual dissolution of evaporite deposits. The chemical composition of the brine in the northern basin is dominated by magnesium and sulfate and differs from the southern basin where the dominant components are sodium and chloride. Sediment depth distributions of major ions and porosity indicate diffusion of salts from the sediments into the overlying waters in both basins. Benthic fluxes have been calculated for the four most abundant ions: magnesium, sodium, sulfate and chloride. For the northern basin we calculate diffusive fluxes of 3.7×10^{-2} , 8.2×10^{-2} , 44×10^{-2} , and 5.4×10^{-2} g cm⁻² yr⁻¹ for magnesium, sodium, sulfate and chloride, respectively. For the southern basin we calculate diffusive fluxes of 0.9×10^{-2} , 9.7×10^{-2} , 6.9×10^{-2} , and 25×10^{-2} g cm⁻² yr⁻¹ for these same ions. By scaling up our results we estimate the salinity flux from the sediment to the water column to be between 3.6×10^4 and 3.6×10^5 metric tons per year, equivalent to 1-10% of the riverine input. These results are important for developing strategies to combat rising salinity in the Salton Sea, CA.

853: K. A. Warner, J. C. J. Bonzongo, E. E. Roden, G. M. Ward, A. C. Green, I. Chaubey, W. B. Lyons and D. A. Arrington,. 2005. Effect of watershed parameters on mercury distribution in different environmental compartments in the Mobile Alabama River Basin, USA. Science of the Total Environment 1-3(347): 187-207.

Abstract: Total mercury (THg) and mono-methylmercury (MeHg) levels in water, sediment, and largemouth bass (LMB) (*Micropterus salmoides*) were investigated at 52 sites draining contrasting land use/land cover and habitat types within the Mobile Alabama River Basin (MARB). Aqueous THg was positively associated with iron-rich suspended particles and highest in catchments impacted by agriculture. Sediment THg was positively associated with sediment organic matter and iron content, with the highest levels observed in smaller catchments influenced by wetlands, followed by those impacted by agriculture or mixed forest, agriculture, and wetlands. The lowest sediment THg levels were observed in main river channels, except for reaches impacted by coal mining. Sediment MeHg levels were a positive function of sediment THg and organic matter and aqueous nutrient levels. The highest levels occurred in agricultural catchments and those impacted by elevated sulfate levels associated with coal mining. Aqueous MeHg concentrations in main river channels were as high as those in smaller catchments impacted by agriculture or wetlands, suggesting these areas were sources to rivers. Elevated Hg levels in some LMB were observed across all types of land use and land cover, but factors such as shallow water depth, larger wetland catchment surface area, low aqueous potassium levels, and higher Chl a concentrations were associated with higher Hg burdens, particularly in the Coastal Plain province. It is suggested that the observed large variability in LMB Hg burdens is linked to fish displacement by anglers, differences in food web structure, and sediment biogeochemistry, with surficial sediment iron oxides buffering the flux of MeHg from sediments to deeper water pelagic food webs. (c) 2004 Elsevier B.V All rights reserved.

854: M. J. Wassen, H. O. Venterink, E. D. Lapshina and F. Tanneberger,. 2005. Endangered plants persist under phosphorus limitation. Nature 7058(437): 547-550.

Abstract: Nitrogen enrichment is widely thought to be responsible for the loss of plant species from temperate terrestrial ecosystems. This view is based on field surveys and controlled experiments showing that species richness correlates negatively with high productivity(1,2) and nitrogen enrichment(3). However, as the type of nutrient limitation has never been examined on a large geographical scale the causality of these relationships is uncertain. We investigated species richness in herbaceous terrestrial ecosystems, sampled along a transect through temperate Eurasia that represented a gradient of declining levels of atmospheric nitrogen deposition - from similar to 50 kg ha⁽⁻¹⁾ yr⁽⁻¹⁾ in western Europe to natural background values of less than 5 kg ha⁽⁻¹⁾ yr⁽⁻¹⁾ in Siberia(4). Here we show that many more endangered plant species persist under phosphorus- limited than under nitrogen- limited conditions, and we conclude that enhanced phosphorus is more likely to be the cause of species loss than nitrogen enrichment. Our results highlight the need for a better understanding of the mechanisms of phosphorus enrichment, and for a stronger focus on conservation management to reduce phosphorus availability.

855: M. N. Waters, C. L. Schelske, W. F. Kenney and A. D. Chapman,. 2005. The use of sedimentary algal pigments to infer historic algal communities in Lake Apopka, Florida. *Journal of Paleolimnology* 1(33): 53-71.

Abstract: The primary producer community of Lake Apopka, a large (125 km²), shallow (mean depth, 1.7 m), polymictic Florida lake, shifted from macrophyte dominance to phytoplankton dominance in the 1940s. Today, frequent wind resuspension of highly organic, unconsolidated sediments supports a meroplanktonic community that is predominantly diatoms, but during calm periods the algal community is dominated by planktonic cyanobacteria. Sedimentary algal pigments (chlorophyll derivatives and carotenoids) and chemical proxies for nutrient enrichment (polyphosphate, total phosphorus and biogenic silica) in three sediment cores were used to investigate historic changes in primary producers. Sediments were separated into three stratigraphic zones using multivariate statistical techniques. Stratigraphic zonation was established in each core although sediment deposition at one site was insufficient to adequately resolve temporal changes. These results show the importance of selecting suitable sites for paleolimnological studies. The oldest zone represents macrophyte-derived sediments, and the two overlying zones represent phytoplankton-derived sediments deposited since the 1940s. Algal pigments in the most recent sediment zone show little degradation, which might be due to the presence of viable meroplankton in the sediment. After the initial primary producer shift from macrophytes to phytoplankton, the lake experienced a short period of cyanobacterial dominance followed by a period of benthic diatom abundance before being replaced by the present algal community consisting of cyanobacteria and meroplanktonic diatoms. Chlorophyll derivatives and carotenoids were highly correlated with total phosphorus. Historic trends inferred from the data include algal and cyanobacterial productivity that increased with increased phosphorus loading. The study demonstrates that valid paleolimnological proxies for historic eutrophication are available in loosely consolidated sediments of shallow, subtr

856: I. T. Webster, N. Rea, A. V. Padovan, P. Dostine, S. A. Townsend and S. Cook,. 2005. An analysis of primary production in the Daly River, a relatively unimpacted tropical river in northern Australia. *Marine and Freshwater Research* 3(56): 303-316.

Abstract: In this paper, the dynamics of primary production in the Daly River in tropical Australia are investigated. We used the diurnal-curve method for both oxygen and pH to calculate photosynthesis and respiration rates as indicators of whole-river productivity. The Daly River has maximum discharges during the summer, monsoonal season. Flow during the dry season is maintained by groundwater discharge via springs. The study investigated how primary production and respiration evolve during the period of low flow in the river (April-November). The relationship between primary production and the availability of light and nutrients enabled the role of these factors to be assessed in a clear, oligotrophic tropical river. The measured rate of photosynthesis was broadly consistent with the estimated mass of chlorophyll associated with the main primary producers in the river (phytoplankton, epibenthic algae, macroalgae, macrophytes). A significant result of the analysis is that during the time that plant biomass re-established after recession of the flows, net primary production proved to be similar to 4% of the rate of photosynthesis. This result and the observed low-nutrient concentrations in the river suggest a tight coupling between photosynthetic fixation of carbon and the microbial degradation of photosynthetic products comprising plant material and exudates.

857: X. Wei, S. Liu, G. Zhou and C. Wang,. 2005. Hydrological processes in major types of Chinese forest. *Hydrological Processes* 1(19): 63-75.

Abstract: Overexploitation of forest resources in China has caused serious concerns over its negative impacts on water resources, biodiversity, soil erosion, wildlife habitat and community stability. One key concern is the impact of forestry practices on hydrological processes, particularly the effect of forest harvest on water quality and quantity. Since the mid 1980s, a series of scientific studies on forest hydrology have been initiated in major types of forest across the country, including Korean pine (*Pinus koraiensis*), Chinese fir (*Cunninghamia lanceolata*), oak (*Quercus mongolica*), larch (*Larix gmelinii*), faber fir (*Abies fabri*), Chinese pine (*Pinus tabulaeformis*), armand pine (*Pinus arandi*), birch (*Betula platyphylla*) and some tropical forests. These studies measured rainfall interception, streamflow, evapotranspiration and impacts of forest management (clearcutting and reforestation). This paper reviews key findings from these forest hydrological studies conducted over the past 20 years in China. Forest canopy interception rates varied from 15 to 30% of total rainfall, depending on forest canopy and rainfall characteristics. Stemflow is generally a small percentage (< 5%) of total rainfall, but it accounts for 15% in the oak forest in northeast China. The high amounts of stemflow, as well as higher amounts of nutrients contained in stemflow, may allow oak trees to adapt to a dry and nutrient-poor environment. Evapotranspiration was a significant component of the water budget in these Chinese forests studied, ranging from 80-90% of total rainfall in the northern temperate forests to 40-50% in the southern tropical forests. Forests substantially reduced surface runoff and erosion. However, no consistent response on total streamflows was observed. The reason for the inconsistency may be due to complexities of streamflow processes and the utilization of different methodologies applied at the various spatial scales. Copyright (C) 2005 John Wiley Sons, Ltd.

858: Z. Q. Wei, C. Q. Liu, X. B. Liang, F. S. Wang and S. F. Wang,. 2005. Degradation of organic matter in the sediments of Hongfeng Reservoir. Chinese Science Bulletin 20(50): 2377-2380.

Abstract: In this work, the distribution of organic carbon, DNA and lipids in the sediments of Hongfeng Reservoir were described in addition to SO_4^{2-} profile in pore water. The contents of organic carbon in the sediments range from 23.3 to 76.8 $\text{mg}(\cdot)\text{g}^{-1}$, with the peak value appearing at the depth of 8 cm bellow the sediments water interface (SWI), and tend to decrease gradually with sedimentation depth. The concentrations of SO_4^{2-} decreased from 40.50 $\text{mg}(\cdot)\text{L}^{-1}$ to 12.00 $\text{mg}(\cdot)\text{L}^{-1}$ at SWI in top 4 cm sediment, and was kept at 12.0 $\text{mg}(\cdot)\text{L}^{-1}$ bellow that depth. Newly produced organic carbon can be conserved as long as 14 years in the sediments. The contents of DNA were relatively high in top 9 cm surface sediments, as revealed by agarose gel images, close to those of organic carbon and sulphate reduction index (SRI). This study shows that bacteria played an important role in organic matter degradation; SO_4^{2-} is the primary electron acceptor under anaerobic condition in this reservoir; DNA in the lake sediments can provide important information for the study of cycling of nutrient elements in the lake.

859: M. P. Weinstein, S. Y. Litvin and V. G. Guida,. 2005. Considerations of habitat linkages, estuarine landscapes, and the trophic spectrum in wetland restoration design. Journal of Coastal Research : 51-63.

Abstract: Wetland restoration designs do not frequently consider functional linkages among habitats in the estuarine landscape, nor do they focus sufficient attention on the role of marsh morphology in promoting the efficient exchange of materials and organisms between the intertidal and subtidal water column. These features should be considered, because many marine organisms may benefit from trophic subsidies from adjacent habitats without ever entering them. Stable isotopes were used to examine trophic linkages between primary producers and marine finfishes to highlight the importance of individual life history traits and to punctuate the argument for promoting habitat connectivity (exchange of materials and organisms) in restoration planning. We demonstrate that the trophic spectrum of an estuarine resident, the *Moreno americana* (white perch), and two marine transients, *Anchoa mitchilli* (bay anchovy) and *Cynoscion regalis* (weakfish), are largely functions of locally available organic matter distributed along a gradient of estuarine resources. In both salt marshes and open waters, there was a transition in whole-body isotopic composition in all three species associated with the estuary-wide gradient in nutrient availability ranging from macrophytes and benthic microalgae in marshes, to phytoplankton (as suspended particulate matter) in the open estuary. As anticipated, phytoplankton contributed more to bay anchovy and weakfish biomass, especially in open waters, than to white perch. Our results also suggest that marine transients benefit from the presence of salt marshes without necessarily occupying them. Thus the estuarine "commissary" serves up different recipes in different regions, and the many estuarine-dependent species apparently take full advantage of these varied sources of primary production at the base of the food web when seeking energy for rapid growth and survival.

860: E. B. Welch and G. D. Cooke,. 2005. Internal phosphorus loading in shallow lakes: Importance and control. Lake and Reservoir Management 2(21): 209-217.

Abstract: Decreasing the algal biomass and increasing transparency in shallow, unstratified lakes is usually more difficult than for deep, stratified lakes. Eutrophic unstratified lakes (or shallow, stratified lakes susceptible to metalimnion erosion) have typically responded slowly to reduced external nutrient loading, usually because of longevity of internal loading. That is because sediment-released nutrients (especially phosphorus) readily enter the trophogenic zone of shallow lakes during the growing season and result in high lake concentrations. In stratified lakes, metalimnia may serve as barriers to phosphorus transport into the trophogenic zone. Although the whole water column in shallow lakes is usually aerobic, several mechanisms can combine to produce relatively high sediment phosphorus release rates in these lakes. These include: 1) wind resuspension and bioturbation, combined with high pH or low Fe/P ratio that maintains high P solubility, 2) periodic anoxia and reducing conditions promoted by calm, warm weather, and 3) macrophyte senescence. Attempts to reduce algal biomass by controlling internal phosphorus loading have often been effective.

861: J. F. Weltzin, J. K. Keller, S. D. Bridgham, J. Pastor, P. B. Allen and J. Chen,. 2005. Litter controls plant community composition in a northern fen. *Oikos* 3(110): 537-546.

Abstract: The accumulation of litter or thatch can affect plant community composition by affecting the temperature, nutrient availability, and light availability of the soil environment, thereby forming a potentially important linkage between recent productivity and current ecosystem processes. To investigate the importance of litter on a fen peatland plant community, we conducted a litter addition and removal experiment in a fen in northern Minnesota, USA, between 1998 and 2001. The addition of litter had little effect on fen plant community composition or microenvironmental variables, despite a two-fold increase in litter mass compared to control plots. However, the removal of litter dramatically increased cover of *Rhynchospora fusca* and *R. alba*, and reduced cover of *Carex exilis*. Litter removal also increased availability of light and soil temperature and increased the phosphorus content of aboveground plant biomass. Our results indicate that litter is an important control of plant community composition in this northern fen.

862: P. Werner and J. Kohler,. 2005. Seasonal dynamics of benthic and planktonic algae in a nutrient-rich lowland river (Spree, Germany). International Review of Hydrobiology 1(90): 1-20.

Abstract: We studied chlorophyll a (chl. a), biovolume and species composition of benthic algae and phytoplankton in the eutrophic lower River Spree in 1996. The chl. a concentration was estimated as 3.5 (2.7-4.5) $\mu\text{g}/\text{cm}^2$ for epipsammon, 9.4 (7.4-11.9) $\mu\text{g}/\text{cm}^2$ for epipelon and 6.7 (5.7-7.8) $\mu\text{g}/\text{cm}^2$ for the epilithon (median and 95% C. L.). The mean total biomass of benthic algae was significantly higher (6.0 $\mu\text{g chl. a}/\text{cm}^2$) than the areal chl. a content of the pelagic zone (1.6 $\mu\text{g chl. a}/\text{cm}^2$). Although certain phytoplankton taxa were abundant in the periphyton, benthic taxa generally dominated the assemblages. Seasonal dynamics of benthic algae were probably controlled by light and nitrate supply (sand), discharge fluctuations (sand, mud) and invertebrate grazing (stones). This paper shows the importance of benthic algae even in phytoplankton-rich lowland rivers with sandy or muddy sediments.

863: P. Werner and J. P. Smol,. 2005. Diatom-environmental relationships and nutrient transfer functions from contrasting shallow and deep limestone lakes in Ontario, Canada. *Hydrobiologia* (533): 145-173.

Abstract: Diatom assemblages were analysed in the surface sediments of 44 alkaline lakes in south-western Ontario, Canada, and combined with a pre-existing 58 south-eastern Ontario lake set: (1) to determine if shallow, polymictic Ontario lakes contain different diatom assemblages from deeper, dimictic lakes, and if so, which environmental variables most influence assemblages; (2) to improve the existing transfer functions; (3) to construct and compare transfer functions separately for dimictic, deep lakes and for polymictic, shallow lakes. Polymictic and dimictic lakes covered a similar nutrient range (spring total phosphorus (TP) = 454 $\mu\text{g/l}$, spring total nitrogen (TN) = 200-927 $\mu\text{g/l}$; $n = 101$) and spring pH levels (7.6-9; $n = 101$). However, polymictic lakes were shallower (median mean depth = 2.9 m vs. 7.3 m in dimictic lakes). Benthic diatoms (average 60% relative abundance) dominated the polymictic lakes, whereas planktonic diatoms (average 60%) dominated dimictic lakes. A Canonical Correspondence Analysis with forward selection ($p < 0.05$, 999 Monte Carlo permutations) identified TP, alkalinity, watershed to volume ratios and lake depth as the most important measured environmental variables influencing diatom distribution in both polymictic and dimictic lakes. Additionally, pH was identified as an important variable in polymictic lakes, whereas TN was also forward selected in the dimictic lakes. Adding more lakes to the original southern Ontario calibration set improved the TN transfer function ($r(\text{jack})(2) = 0.42$, root mean squared error of prediction (RMSEP) $_{\text{jak}} = 0.11$ [$\log \mu\text{g TN/l}$]), although there was a high systematic error in the revised model (0.48). However, the strongest TP model was derived from the polymictic lakes ($r^2 = 0.44$, $\text{RMSEP}_{\text{boet}} = 0.20$ [$\log \mu\text{g TP/l}$]), which was the smallest lake set ($n = 30$) with the lowest number of diatom species. The stronger TP model from the polymictic lakes may be partly due to the relatively low macrophyte cover in our polymictic

864: S. J. Westbrook, J. L. Rayner, G. B. Davis, T. P. Clement, P. L. Bjerg and S. T. Fisher,. 2005. Interaction between shallow groundwater, saline surface water and contaminant discharge at a seasonally and tidally forced estuarine boundary. *Journal of Hydrology* 1-4(302): 255-269.

Abstract: This paper presents findings from a 2-year field investigation of a dissolved hydrocarbon groundwater plume flowing towards a tidally and seasonally forced estuarine river system in Perth, Western Australia. Samples collected from transects of multiport wells along the riverbank and into the river, enabled mapping of the fine scale (0.5 m) vertical definition of the hydrocarbon plume and its longitudinal extent. Spear probing beneath the river sediments and water table, and transient monitoring of multiport wells (electrical conductivity) was also carried out to define the zone of mixing between river water and groundwater (the hyporheic zone) and its variability. The results showed that groundwater seepage into the estuarine surface sediments occurred in a zone less than 10 m from the high tide mark, and that this distance and the hyporheic transition zone were influenced by tidal fluctuations and infiltration of river water into the sediments. The dissolved BTEXN (benzene, toluene, ethylbenzene, the xylene isomers and naphthalene) distributions indicated the behaviour of the hydrocarbon plume at the groundwater/surface water transition zone to be strongly influenced by edge-focussed discharge. Monitoring programs and risk assessment studies at similar contaminated sites should therefore focus efforts within the intertidal zone where contaminants are likely to impact the surface water and shallow sediment environments. Crown Copyright (C) 2004 Published by Elsevier B.V. All rights reserved.

865: P. R. Wetzel and A. G. van der Valk,. 2005. The biomass and nutrient levels of *Calamagrostis canadensis* and *Carex stricta* under different hydrologic and fungicide regimes. Canadian Journal of Botany-Revue Canadienne De Botanique 1(83): 124-130.

Abstract: We examined whether fungicide and the subsequent reduction of soilborne pathogenic fungi would differentially enhance the productivity and foliar nutrient content of two coexisting species, *Calamagrostis canadensis* (Michx.) Beauv. and *Carex stricta* Lam. This was tested under hydrologic regimes that simulated those in prairie wetlands and included a 32-d cycle (flooded 16 d, dry 16 d), 6-d cycle (flooded 3 d, dry 3 d), flooded, well-watered, and dry hydroperiods. *Calamagrostis canadensis* biomass increased 26%-45% in the wet hydroperiods (6-d cycle, well watered, and flooded) when fungicide was applied but remained fairly constant over all hydroperiods in nonfungicide treatments. *Calamagrostis canadensis* grown in the wet hydroperiods without fungicide produced the same biomass and growth rates as plants treated with fungicide in the dry hydrologic regime, suggesting that pathogenic fungi in wet hydrologic regimes have the same effect as major environmental stresses such as drought. In contrast, the biomass and growth rate of *Carex stricta* generally did not vary significantly with fungicide treatment. The only exception was in the rapidly alternating hydroperiod (6-d cycle), where *Carex stricta* treated with fungicide produced 48% more biomass and grew 46% faster than plants not treated with fungicide. Mean concentrations of foliar phosphorus generally were not significantly different between the fungicide and nonfungicide treatments for either plant species, while foliar nitrogen concentrations were higher in both species when treated with fungicide in the 32-d cycle, dry, and well-watered hydroperiods. The effect of fungicide on the biomass and foliar nutrients of these two co-occurring plant species depended on the species and the hydrologic regime, and our results suggest that seasonal and interannual changes in hydrologic regimes may confer a temporary advantage to one species or the other that, over the long term, allow them to coexist.

866: P. R. Wetzel, A. G. van der Valk, S. Newman, D. E. Gawlik, T. G. Troxler Gann, C. A. Coronado-Molina, D. L. Childers and F. H. Sklar,. 2005. Maintaining tree islands in the Florida Everglades: nutrient redistribution is the key. *Frontiers in Ecology and the Environment* 7(3): 370-376.

Abstract: The Florida Everglades is an oligotrophic wetland system with tree islands as one of its most prominent landscape features. Total soil phosphorus concentrations on tree islands can be 6 to 100 times greater than phosphorus levels in the surrounding marshes and sloughs, making tree islands nutrient hotspots. Several mechanisms are believed to redistribute phosphorus to tree islands: subsurface water flows generated by evapotranspiration of trees, higher deposition rates of dry fallout, deposition of guano by birds and other animals, groundwater upwelling, and bedrock mineralization by tree exudates. A conceptual model is proposed, in which the focused redistribution of limiting nutrients, especially phosphorus, onto tree islands controls their maintenance and expansion. Because of increased primary production and peat accretion rates, the redistribution of phosphorus can result in an increase in both tree island elevation and size. Human changes to hydrology have greatly decreased the number and size of tree islands in parts of the Everglades. The proposed model suggests that the preservation of existing tree islands, and ultimately of the Everglades landscape, requires the maintenance of these phosphorus redistribution mechanisms.

867: K. L. White, B. E. Haggard, M. D. Matlock and J. W. Kim,. 2005. Periphytic chlorophyll-a response to Triclosan exposure: Application of a passive diffusion periphytometer. *Applied Engineering in Agriculture* 2(21): 307-311.

Abstract: In situ assessments of chemical toxicity in streams may be accomplished using natural periphytic communities when allowed to colonize an artificial substrate. The proliferation of Triclosan (TCS) in consumer products has resulted in its presence in wastewater influent, effluent, and subsequently in streams. In this study, the two objectives were: 1) assess the utility of a passive-diffusion periphytometer in toxicity tests, and 2) evaluate the growth-inhibiting effects of TCS on periphytic algae at the White River, Northwest Arkansas. The periphytometer was deployed for one week with seven replicates of nine treatments, including control (deionized H₂O), methanol, low TCS (50 µg L⁻¹), medium TCS (100 µg L⁻¹), high TCS (500 µg L⁻¹), nutrients (2000 µg PO₄-PL-1 and 20000 µg NO₃-NL-1), low TCS with nutrients, medium TCS with nutrients, and high TCS with nutrients. Relatively low stream nutrient concentrations were observed; maximum nitrate-nitrogen (NO₃-N), total N, ammonium-nitrogen (NH₄N-N), total organic carbon (TOC), and soluble reactive phosphorus (SRP) concentrations during the deployment were 230, 603, < 50, 12500, and 15 µg L⁻¹, respectively. The Student-Newman-Kuels test (alpha = 0.05) identified three significantly different groups within the treatments. The nutrients and low TCS with nutrients treatments had chlorophyll-a means of 10.9 and 5.8 mg m⁻², respectively, which were significantly different from each other and all other treatments. Chlorophyll-a content means of the remaining treatments ranged from 1.8 to 3.5 mg m⁻² and were not significantly different from each other. Exponential regression of chlorophyll-a contents in nutrient and TCS with nutrient treatments against TCS concentration produced a significant decreasing trend; however, no trend in chlorophyll-a content was observed in treatments without nutrients. The observed inhibition of periphytic algal growth in the treatments with additional NO₃ and SRP suggests that the mechan

868: S. L. Whitmire and S. K. Hamilton,. 2005. Rapid removal of nitrate and sulfate in freshwater wetland sediments. *Journal of Environmental Quality* 6(34): 2062-2071.

Abstract: Anaerobic microbial processes play particularly important roles in the biogeochemical functions of wetlands, affecting water quality, nutrient transport, and greenhouse gas fluxes. This study simultaneously examined nitrate and sulfate removal rates in sediments of five southwestern Michigan wetlands varying in their predominant water sources from ground water to precipitation. Rates were estimated using in situ push-pull experiments, in which 500 mL of anoxic local ground water containing ambient nitrate and sulfate and amended with bromide was injected into the near-surface sediments and subsequently withdrawn over time. All wetlands rapidly depleted nitrate added at ambient ground water concentrations within 5 to 20 h, with the rate dependent on concentration. Sulfate, which was variably present in porewaters, was also removed from injected ground water in all wetlands, but only after nitrate was depleted. The sulfate removal rate in ground water-fed wetlands was independent of concentration, in contrast to rates in precipitation-fed wetlands. Sulfate production was observed in some sites during the period of nitrate removal, suggesting that the added nitrate either stimulated sulfur oxidation, possibly by bacteria that can utilize nitrate as an oxidant, or inhibited sulfate reduction by stimulating denitrification. All wetland sediments examined were consistently capable of removing nitrate and sulfate at concentrations found in ground water and precipitation inputs, over short time and space scales. These results demonstrate how a remarkably small area of wetland sediment can strongly influence water quality, such as in the cases of narrow riparian zones or small isolated wetlands, which may be excluded from legal protection.

869: G. Whittaker,. 2005. Application of SWAT in the evaluation of salmon habitat remediation policy. Hydrological Processes 3(19): 839-848.

Abstract: Agricultural non-point source water pollutants such as sediment, pesticides and nutrients have been identified as contributing to the environmental distress of salmon runs in the Pacific Northwest. Policies to control non-point pollution from agricultural production can be classified as command and control or economic incentive policies. In application of a command and control policy, a regulator (usually a government agency) mandates a reduction in emissions or limits an agricultural production activity. Examples are a mandated reduction in nutrient application, or a reduction in emission of a nutrient to streams. Economic incentive policies are designed to achieve the same level of pollution control, while allowing some flexibility in maximizing profit. A tax on inputs is one frequently cited incentive measure. In this study, alternative policies to reduce non-point emissions from agriculture on the Columbia Plateau of Washington, Oregon and Idaho are evaluated. The environmental efficiency and effects on profits by reduction of nitrogen from fertilizer under command and control regulation and tax incentives are compared. Copyright (C) 2005 John Wiley Sons, Ltd.

870: A. Wiberg, R. Koenig and T. Cerny-Koenig,. 2005. Variability in the physical and chemical properties of retail potting media. Horttechnology 4(15): 752-757.

Abstract: Popular press articles report that consumers often experience inconsistent results with retail potting media; however, few reports in the popular or scientific literature have quantified the variability in media properties. The purpose of this study was to assess the variability in physical and chemical properties among different brands of retail potting media and within certain brands. Twenty-four different packages of branded media, and multiple packages of five brands, were acquired from nine regional and national retail chain stores located in the Salt Lake City, Utah, area. Samples were analyzed for five physical and nine chemical properties. The coefficients of variation (cvs) among brands for initial gravimetric water content, bulk density, porosity, water retention, and air space were 85%, 74%, 21%, 59%, and 44%, respectively. The cvs among brands for saturated media (SM) pH, SM extract electrical conductivity (EC), nitrate-nitrogen (NO₃-N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), total carbon (C), total nitrogen (N), and C:N ratio were 18%, 81%, 132%, 153%, 96%, 78%, 71%, 36%, 45%, and 49%, respectively. Only one of the 24 brands met all published standards for chemical properties of premium media. Thirteen of the brands did not meet standards for NO₃-N; 12 did not meet standards for pH; and six did not meet standards for EC. There was more variation in physical and chemical properties among brands than within a brand of media. Label information describing media composition was not consistent with certain physical and chemical properties. No recommendations can be made which would allow consumers to select media that meets published standards. These results indicate better awareness of and/or adherence to standards is needed by the retail media industry to improve product quality and consistency.

871: J. D. Wickham, K. H. Riitters, T. G. Wade and K. B. Jones,. 2005. Evaluating the relative roles of ecological regions and land-cover composition for guiding establishment of nutrient criteria. *Landscape Ecology* 7(20): 791-798.

Abstract: The continuing degradation of United States surface waters by excessive nutrient loads has motivated the establishment of nutrient criteria for streams, lakes, and estuaries as a means to protect aquatic resources. Nutrient criteria have been established based on ecoregional differences, recognizing that geographic variation in climate, topography, geology, and land use require use of different criteria values for different regions of the continental United States. Several studies have demonstrated that land-cover composition also strongly influences nutrient concentrations and yields. We examined the relative importance of ecoregions and watershed land-cover composition in explaining variability in nitrogen (N) and phosphorus (P) concentrations by re-analyzing the National Eutrophication Survey (NES) data reported by Omernik (1977). The variance of N concentrations among land-cover composition classes within ecoregions was six times larger than the variance among ecoregions. For P concentrations, land-cover composition within ecoregions accounted for three times more variance than ecoregions themselves. Variance across ecoregions was only weakly significant after accounting for variance in land-cover composition within ecoregions. The results suggest that the relationship between land-cover composition and nutrient concentrations in aquatic systems should also be used to help guide establishment of nutrient criteria.

872: Y. F. WIERSMA,. 2005. ENVIRONMENTAL BENCHMARKS VS. ECOLOGICAL BENCHMARKS FOR ASSESSMENT AND MONITORING IN CANADA: IS THERE A DIFFERENCE?. Environmental Monitoring and Assessment 100: 1-9.

Abstract: Environmental benchmarks are widely used in Canadian environmental assessment as a standard against which to monitor air or water quality in response to human activities in the environment. Recent work in Canada has developed the concept of ecological benchmarks as a complement to environmental benchmarks. However, implementation of ecological benchmarks may be challenging. This paper presents an analogy between ecological benchmarks and the more commonly used environmental benchmarks, as an attempt to increase understanding and use of ecological benchmarks in resource management, assessment, and monitoring. Ecological benchmarks, and their corresponding indicators, will be challenging to identify and use. However, through the use of the principles of adaptive management, effective ecological indicators and benchmarks can be established. Although it is essential that ecological benchmarks are site-specific, the analogy and general principles outlined here are applicable to assessment and monitoring in any part of the world.

873: C. A. Wilcox, Y. M. Chun and Y. D. Choi,. 2005. Redevelopment of black oak (*Quercus velutina* lam.) savanna in an abandoned sand mine in Indiana Dunes National Lakeshore, USA. *American Midland Naturalist* 1(154): 11-27.

Abstract: We investigated the processes of oak-savanna redevelopment in an abandoned sand mine site in Indiana Dunes National Lakeshore. Our Detrended Correspondence Analysis (DCA) revealed a divergence of vegetation between the prairie and the woodland portions of the study area. Eastern cottonwood (*Populus deltoides*) and black oak (*Quercus velutina*) dominated the woodland canopy. The shallow water table (0.90-1.35 m below ground surface) appeared to support the formation of tree canopy. The prairie, with deeper water table (2.09-2.62 m), was sparsely vegetated by shrubs; mostly choke cherry (*Prunus virginiana*), sand cherry (*P. pumila*) and fragrant sumac (*Rhus aromatica*) without apparent tree canopy. Development of woody vegetation, black oak overstory and sassafras (*Sassafras albidum*) understory was initiated with the colonization of cottonwoods. No evidence was found to support the 'facilitation effect' of cottonwoods for black oak seedling recruitment, survival or growth. The tree canopy formation, promoted by water table depth, appeared to be the major factor for divergence in herbaceous vegetation and soil characteristics. The herbaceous vegetation was dominated by C-4 and CAM species (e.g., little bluestem *Schizachyrium scoparium* and prickly pear cactus *Opuntia humifusa*) in the prairie, whereas horsetails (*Equisetum arvense*), asters (*Aster* spp.) and other C-3 forbs were the dominants in the woodland. Our curve-linear regressions revealed that the cover and diversity of herbaceous species reached their peaks at about 40% tree canopy. The regression analysis also showed strong correlations between the tree canopy and soil organic matter, cation exchange capacity, nitrogen, phosphorus and pH. The 70-y old woodland site had accumulated 1.4% organic carbon and 820 ppm of nitrogen, similar to the 'mature' soil of oak-savanna/ woodlands near our study site. This suggests a rapid accumulation of major nutrients during the early vegetation development. Nitrogen would likely cont

874: C. E. Wilkinson, M. D. Hocking and T. E. Reimchen,. 2005. Uptake of salmon-derived nitrogen by mosses and liverworts in coastal British Columbia. *Oikos* 1(108): 85-98.

Abstract: Throughout forested watersheds bordering the North Pacific, anadromous salmon (*Oncorhynchus* spp.) are transferred into coastal forests by numerous predators and scavengers with remnants providing an important nutrient subsidy to riparian zones. The contribution of these nutrients to mosses and liverworts, which are the dominant ground cover of coastal forests, has not been investigated. We examine here $\delta(15)\text{N}$ isotope signatures and foliar percent N of eight moss and liverwort species, as well as moss and liverwort community structure, in multiple habitat blocks that vary in access to salmon nutrients from two watersheds on the central coast of British Columbia. For the most common moss *Rhytidiadelphus loreus*, we also examine $\delta(15)\text{N}$ values and foliar percent N among salmon carcass micro-sites and along wildlife trails. Overall, $\delta(15)\text{N}$ signatures ranged from 2parts per thousand to 7parts per thousand higher below the falls near the salmon stream than above the small falls that are impassable to salmon, or at the adjacent control watershed that had no salmon. Among micro-sites, $\delta(15)\text{N}$ and %N values were highest near bony carcass remnants from transfer during previous years and high adjacent to wildlife trails indicating spatial heterogeneity in the salmon nutrient pools of these forests. Species richness and prevalence of nitrogen-rich soil indicators were also highest in forests adjacent to the salmon stream. These data suggest an important contribution of salmon-derived nutrients to the non-vascular plants of the riparian zone of old-growth forests throughout the Pacific Rim.

875: A. E. Williams, H. C. Duthie and R. E. Hecky,. 2005. Water hyacinth in Lake Victoria: Why did it vanish so quickly and will it return?. *Aquatic Botany* 4(81): 300-314.

Abstract: Water hyacinth has been a cause of great concern in terms of environmental and socio-economic impacts within Lake Victoria. In the late 1990s however it rapidly disappeared but since the causes are unknown its possible return cannot be predicted. Growth chamber and laboratory experiments investigating CO₂ assimilation and growth rate found that different phenotypic, density-acclimated, growth forms of water hyacinth behaved differently. PI-curves and changes in biomass revealed that short bulbous (SB) growth forms took up CO₂ more rapidly and increased in biomass quicker than tall non-bulbous (TN) growth forms. This allows the two growth forms to flourish within two different niches. One, the SB form, as a colonising opportunist and the other as a taller plant that attempts to avoid self-shading in dense mats. Light is an important limiting factor to water hyacinth growth. Light becomes non-limiting to CO₂ uptake at a PAR of approximate to 2000 $\mu\text{E m}^{-2} \text{s}^{-1}$. In Lake Victoria this light level occurs for about 6 h around midday. Plant growth is thus light limited for most of the day and can be limited even at midday during cloudy weather. Although weevils likely played a role in the rapid disappearance of water hyacinth, its demise was too rapid and synchronous in this large lake for weevils to be solely responsible. The cloudy, wet El Nino weather of 1997/1998 was probably a major contributory factor to poor growth that led to the reduction in water hyacinth biomass lake-wide. Currently within Lake Victoria an improved light climate, an ever increasing supply of nutrients and a potentially unstable weevil population will likely allow the resurgence of this aggressive weed. (c) 2005 Elsevier B.V. All rights reserved.

876: A. E. Wilson, O. Sarnelle, B. A. Neilan, T. P. Salmon, M. M. Gehringer and M. E. Hay,. 2005. Genetic variation of the bloom-forming cyanobacterium *Microcystis aeruginosa* within and among lakes: Implications for harmful algal blooms. *Applied and Environmental Microbiology* 10(71): 6126-6133.

Abstract: To measure genetic variation within and among populations of the bloom-forming cyanobacterium *Microcystis aeruginosa*, we surveyed a suite of lakes in the southern peninsula of Michigan that vary in productivity (total phosphorus concentrations of similar to 10 to 100 $\mu\text{g liter}^{-1}$). Survival of *M. aeruginosa* isolates from lakes was relatively low (i.e., mean of 7% and maximum of 30%) and positively related to lake total phosphorus concentration ($P = 0.014$, $r(2) = 0.407$, $n = 14$). In another study (D. F. Raikow, O. Sarnelle, A. E. Wilson, and S. K. Hamilton, *Limnol. Oceanogr.* 49:482-487, 2004), survival rates of *M. aeruginosa* isolates collected from an oligotrophic lake (total phosphorus of similar to 10 $\mu\text{g liter}^{-1}$ and dissolved inorganic nitrogen:total phosphorus ratio of 12.75) differed among five different medium types (G test, P of < 0.001), with higher survival ($P = 0.003$) in low-nutrient media (28 to 37% survival) than in high-nutrient media. Even with the relatively low isolate survivorship that could select against detecting the full range of genetic variation, populations of *M. aeruginosa* were genetically diverse within and among lakes (by analysis of molecular variance, $\Phi(\text{sc}) = 0.412$ [$\Phi(\text{sc})$ is an F-statistic derivative which evaluates the correlation of haplotypic diversity within populations relative to the haplotypic diversity among all sampled populations], $P = 0.001$), with most clones being distantly related to clones collected from lakes directly attached to Lake Michigan (a Laurentian Great Lake) and culture collection strains collected from Canada, Scotland, and South Africa. Ninety-one percent of the 53 genetically unique *M. aeruginosa* clones contained the microcystin toxin gene (*mcyA*) Genotypes with the toxin gene were found in all lakes, while four lakes harbored both genotypes possessing and genotypes lacking the toxin gene.

877: M. A. Wilzbach, B. C. Harvey, J. L. White and R. J. Nakamoto,. 2005. Effects of riparian canopy opening and salmon carcass addition on the abundance and growth of resident salmonids. Canadian Journal of Fisheries and Aquatic Sciences 1(62): 58-67.

Abstract: We studied the concurrent effects of riparian canopy opening and salmon carcass addition on salmonid biomass, density and growth rates in small streams over 2 years. In each of six streams in the Smith and Klamath River basins in northern California, red alder (*Alnus rubra*) and other hardwoods were removed along both banks of a 100-m reach to increase incident radiation. A second 100-m reach, with an intact canopy, was established in each stream as a light control. Salmon carcasses were added each year to both cut and uncut riparian sections in three of the six streams. Differences in total density and biomass of cutthroat trout (*Oncorhynchus clarki*) and rainbow trout (*Oncorhynchus mykiss*) from pretreatment levels responded positively to canopy removal but were not detectably affected by carcass addition. Differences in specific growth rates of the fish between open and closed canopy reaches were greater in sites without carcasses than in sites with carcasses. In light-limited settings where temperature gains associated with canopy opening are not problematic for aquatic resources, gains in salmonid production might be achieved by selective trimming of riparian hardwoods.

878: M. Winder, D. E. Schindler, J. W. Moore, S. P. Johnson and W. J. Palen,. 2005. Do bears facilitate transfer of salmon resources to aquatic macroinvertebrates?. Canadian Journal of Fisheries and Aquatic Sciences 10(62): 2285-2293.

Abstract: In coastal areas of the Pacific Northwest bears (*Ursus* spp.) prey heavily on spawning Pacific salmon (*Oncorhynchus* spp.) and selectively kill energy-rich individuals that are the most recent arrivals on spawning grounds. Pacific salmon eventually die in spawning habitats anyway, albeit with considerably lower energetic content. We investigated whether foraging activities of bears facilitate growth of stream invertebrates by increasing the duration of salmon carcass availability and the nutritional value of carcasses for scavengers. Our survey in southwest Alaska showed that carcasses are highly colonized by caddisfly (*Trichoptera*) larvae. Caddisflies show a strong preference for bear-killed over senescent carcasses, which may be a result of extended temporal availability, improved accessibility of consumable tissue, and higher energetic content of bear-killed fish. Isotope analyses further indicate uptake of marine-derived nutrients in caddisflies during the salmon run, which, however, does not extend into subsequent generations. Thus, species with life histories linked to the annual marine derived nutrient pulse gain the biggest advantage from the salmon resource subsidy. A long-term survey in several creeks in this region showed that bear predation intensity varied greatly among creeks and years, therefore indirect effects of bear predation on aquatic scavengers are likely highly patchy in time and space.

879: J. G. Winter and P. J. Dillon,. 2005. Effects of golf course construction and operation on water chemistry of headwater streams on the Precambrian Shield. Environmental Pollution 2(133): 243-253.

Abstract: To investigate the effects of golf course construction and operation on the water chemistry of Shield streams, we compared the water chemistry in streams draining golf courses under construction (2) and in operation (5) to streams in forested reference locations and to upstream sites where available. Streams were more alkaline and higher in base cation and nitrate concentrations downstream of operational golf courses. Levels of these parameters and total phosphorus increased over time in several streams during golf course construction through to operation. There was evidence of inputs of mercury to streams on two of the operational courses. Nutrient (phosphorus and nitrogen) concentrations were significantly related to the area of unmanaged vegetation in a 30 X 30 m area on either side of the sampling sites, and to River Bank Quality Index scores, suggesting that maintaining vegetated buffers along the stream on golf courses will reduce in-stream nutrient concentrations. (C) 2004 Elsevier Ltd. All rights reserved.

880: B. Wissel, A. Gace and B. Fry,. 2005. Tracing river influences on phytoplankton dynamics in two Louisiana estuaries. Ecology 10(86): 2751-2762.

Abstract: To evaluate effects of river inputs on estuarine phytoplankton, we compared particulate organic matter (POM) dynamics in two neighboring estuaries from the Mississippi River delta. The two estuaries, Barataria Basin and Breton Sound, have been isolated from the Mississippi River at their upstream ends for most of the last century due to levee construction, but for the last 13 years, Breton Sound has been reconnected to the Mississippi River via a gated diversion at Caernarvon, Louisiana. Thus, Barataria Basin was the reference estuary and Breton Sound was the river-impacted estuary. We focused on POM because it was relatively easy to collect and analyze, and because POM dynamics gave a good ecosystem-level overview of phytoplankton responses to riverine nutrient forcing and hydrologic forcing. A combination of C:N and (POC)-C-13 analyses indicated that most POM was phytoplankton with smaller contributions of sediment. Estuarine concentrations of particulate organic carbon (POC) and nitrogen (PON) were typically higher than end-member freshwater or marine inputs, indicating the importance of within-system phytoplankton growth likely fueled by rapid nutrient regeneration in these warm, shallow and well-mixed estuarine systems. Isotopic analyses generally showed typical estuarine gradients in the reference Barataria Basin estuary, but the river-influenced upper Breton Sound had elevated (POC)-C-13 and (PON)-N-15 values useful for following the spatial extent of river impacts. Rapid river-assisted flushing in Breton Sound probably prevented widespread development of algal blooms in response to introductions of the nutrient-rich river water, but study of some isolated lakes suggested that when longer residence times apply, introduction of river water to coastal estuaries can lead to eutrophic conditions and in some cases, harmful algal blooms. Overall, routinely monitoring amounts and isotopic compositions of POM proved an effective way to trace linkages between river in

881: A. Witthoft-Muhlmann, W. Traunspurger and K. O. Rothhaupt,. 2005. Influence of river discharge and wind field on the freshwater meiofauna of a dynamic river mouth area. Archiv Fur Hydrobiologie 3(163): 307-327.

Abstract: The littoral meiofauna adjacent to a river mouth on Lake Constance (Germany) was studied in order to determine the effect of the river on the community. From February 1999 until January 2000 sets of four replicate sediment cores were collected from a total of six sampling sites on a seasonal scale. Nematodes dominated the meiofaunal community at all sites. The combined effect of wind speed and river discharge correlated strongly with the meiofaunal abundance at the four sites closest to the river mouth. In contrast, meiofauna of sites further from the river mouth were dominated by temperature, lake level variation, and nutrient-related factors. Of the meiofauna taxa observed, the presence of nematodes and oligochaetes was closely related to the interaction between wind and river. Nematodes and oligochaetes within the river-influenced littoral area seemed to be adapted to frequent changes in their habitats. However, the study also showed the complexity of littoral areas in proximity to rivers, owing to the strong interaction between the river and wind on a seasonal scale.

882: A. Witthoft-Muhlmann, W. Traunspurger and K. O. Rothhaupt,. 2005. Meiobenthic response to river-borne benthic particulate matter - a microcosm experiment. *Freshwater Biology* 9(50): 1548-1559.

Abstract: 1. Benthic communities inhabiting river-lake interfaces are confronted with temporal variation in the import of river-borne material to the associated littoral zone. The primary objective of this study was to evaluate the exposure to river-borne benthic particulate matter as a force shaping the meiofauna of the river-lake interface. 2. In a 2 x 2 factorial design, combinations of strongly and weakly river-influenced communities (near or far from the river mouth) with and without river-borne benthic particulate matter enrichment were studied in laboratory microcosms to assess the response of the heterotrophic meiobenthos to river-borne matter. 3. Nematodes dominated both habitat types and were the only meiofaunal taxon that responded to the enrichment. 4. A strong interactive effect between experimental enrichment and location of site was observed. Whereas nematodes from the littoral habitat close to the river mouth responded to the enrichment only marginally, nematodes from the remote site were strongly affected in the presence of river-borne particulate matter. 5. In the non-enriched samples of the remote site, the number of nematodes increased greatly over time. Among nematode feeding types, deposit feeders dominated over chewers at the beginning of the experiment but both types were equally abundant at the end. In the presence of river-borne matter the increase of chewers ceased and a shift in feeding type composition did not occur. 6. It was shown that for river-lake interface meiofaunal assemblages in relative proximity, the same taxon might respond differently if exposed to an external pressure, e.g. river-borne components. These components may have a stronger influence on taxa with longer life cycles.

883: A. T. Wolf, R. W. Howe and R. P. Dana,. 2005. Conservation of the northern blue butterfly *Plebejus (Lycaeides) idas nabokovi* in the western Great Lakes region. *Natural Areas Journal* 1(25): 77-85.

Abstract: The northern blue butterfly (*Plebejus (Lycaeides) idas nabokovi*: Lycaenidae) is part of a complicated Northern Hemisphere taxon that includes several endangered species or subspecies. *P. idas nabokovi* is distinguished by its specific larval host plant, *Vaccinium caespitosum*, which itself is locally rare in the Great Lakes region. Both the butterfly and plant typically occur in clusters of populations within a 2-10 km(2) area. Fewer than 30 extant populations or metapopulations of the butterfly are known to occur in Wisconsin, Upper Michigan, and northeastern Minnesota. Most of these occur in natural or human-created openings on nutrient poor soils, often in topographic depressions or "frost pockets." At least four local *P. idas nabokovi* populations have disappeared during the past decade, while several others are very small and isolated. Woody plants and invasive forbs threaten to overgrow many existing populations of *P. idas nabokovi* and *V. caespitosum*, especially near the southern edge of the butterfly's geographic range. During the past 75 years, conifer planting and fire suppression might have contributed to the loss of *V. caespitosum* and *P. idas nabokovi* populations. Controlled burning in rotating units might be appropriate for maintaining areas of *V. caespitosum*, but risks to butterfly eggs, larvae, and pupae make burning a dangerous option for today's small and patchy *P. idas nabokovi* populations. At the same time, passive or uninformed protection of forest landscapes in the western Great Lakes region is not likely to be adequate for conservation of *P. idas nabokovi*, *V. caespitosum*, and probably other species or subspecies that once inhabited small, natural forest openings.

884: J. A. Wolin and E. F. Stoermer,. 2005. Response of a Lake Michigan coastal lake to anthropogenic catchment disturbance. Journal of Paleolimnology 1(33): 73-94.

Abstract: A paleolimnological investigation of post-European sediments in a Lake Michigan coastal lake was used to examine the response of Lower Herring Lake to anthropogenic impacts and its role as a processor of watershed inputs. We also compare the timing of this response with that of Lake Michigan to examine the role of marginal lakes as 'early warning' indicators of potential changes in the larger connected system and their role in buffering Lake Michigan against anthropogenic changes through biotic interactions and material trapping. Sediment geochemistry, siliceous microfossils and nutrient-related morphological changes in diatoms, identified three major trophic periods in the recent history of the lake. During deforestation and early settlement (pre-1845-1920), lake response to catchment disturbances results in localized increases in diatom abundances with minor changes in existing communities. In this early phase of disturbance, Lower Herring Lake acts as a sediment sink and a biological processor of nutrient inputs. During low-lake levels of the 1930s, the lake goes through a transitional period characterized by increased primary productivity and a major shift in diatom communities. Post-World War II (late 1940s-1989) anthropogenic disturbances push Lower Herring Lake to a new state and a permanent change in diatom community structure dominated by *Cyclotella comensis*. The dominance of planktonic summer diatom species associated with the deep chlorophyll maximum (DCM) is attributed to epilimnetic nutrient depletion. Declining Si:P ratios are inferred from increased sediment storage of biogenic silica and morphological changes in the silica content of *Aidacoseira ambigua* and *Stephanodiscus niagarae*. Beginning in the late 1940s, Lower Herring Lake functions as a biogeochemical processor of catchment inputs and a carbon, nutrient and silica sink. Microfossil response to increased nutrients and increased storage of biogenic silica in Lower Herring Lake and other regional

885: W. M. Wollheim, B. A. Pellerin, C. J. Vorosmarty and C. S. Hopkins,. 2005. N retention in urbanizing headwater catchments. *Ecosystems* 8(8): 871-884.

Abstract: Urbanization can potentially alter watershed nitrogen (N) retention via combined changes in N loading, water runoff, and N processing potential. We examined N export and retention for two headwater catchments (similar to 4 km²) of contrasting land use (16% vs. 79% urban) in the Plum Island Ecosystem (PIE-LTER) watershed, MA. The study period included a dry year (2001 - 2002 water year) and a wet year (2002 - 2003 water year). We generalized results by comparing dissolved inorganic nitrogen (DIN) concentrations from 16 additional headwater catchments (0.6 - 4.2 km²) across a range of urbanization (6 - 90%). Water runoff was 25 - 40% higher in the urban compared to the forested catchment, corresponding with an increased proportion of impervious surfaces (25% vs. 8%). Estimated N loading was 45% higher and N flux 6.5 times higher in the urban than in the forested catchment. N retention (1) measured stream export / estimated loading) was 65 - 85% in the urban site and 93 - 97% in the forested site, with lower retention rates during the wetter year. The mechanisms by which N retention stays relatively high in urban systems are poorly known. We show that N retention is related to the amount of impervious surface in a catchment because of associated changes in N loading (maximized at moderate levels of imperviousness), runoff (which continues to increase with imperviousness), and biological processes that retain N. Continued declines in N retention due to urbanization have important negative implications for downstream aquatic systems including the coastal zone.

886: C. A. Woodward and J. Shulmeister,. 2005. A holocene record of human induced and natural environmental change from lake forsyth (Te wairewa), new zealand. Journal of Paleolimnology 4(34): 481-501.

Abstract: A 1.2 m sediment core from Lake Forsyth, Canterbury, New Zealand, records the development of the catchment/lake system over the last 7000 years, and its response to anthropogenic disturbance following European settlement c. 1840 AD. Pollen was used to reconstruct catchment vegetation history, while foraminifera, chironomids, Trichoptera, and the abundance of *Pediastrum simplex* colonies were used to infer past environmental conditions within the lake. The basal 30 cm of core records the transition of the Lake Forsyth Basin from a tidal embayment to a brackish coastal lake. Timing of closure of the lake mouth could not be accurately determined, but it appears that Lake Forsyth had stabilised as a slightly brackish, oligo-mesotrophic shallow lake by about 500 years BP. Major deforestation occurred on Banks Peninsula between 1860 AD and 1890 AD. This deforestation is marked by the rapid decline in the main canopy trees (*Prumnopitys taxifolia* (matai) and *Podocarpus totara/hallii* (totara/mountain totara), an increase in charcoal, and the appearance of grasses. At around 1895 AD, pine appears in the record while a willow (*Salix* spp.) appears somewhat later. Redundancy analysis (RDA) of the pollen and aquatic species data revealed a significant relationship between regional vegetation and the abundance of aquatic taxa, with the percentage of disturbance pollen explaining most (14.8%) of the constrained variation in the aquatic species data. Principle components analysis (PCA) of aquatic species data revealed that the most significant period of rapid biological change in the lakes history corresponded to the main period of human disturbance in the catchment. Deforestation led to increased sediment and nutrient input into the lake which was accompanied by a major reduction in salinity. These changes are inferred from the appearance and proliferation of freshwater algae (*Pediastrum simplex*), an increase in abundance and diversity of chironomids, and the abundance of cases and

887: S. R. Xiang, T. D. Yao, L. Z. An, B. L. Xu and J. X. Wang,. 2005. 16S rRNA sequences and differences in bacteria isolated from the Muztag Ata glacier at increasing depths. *Applied and Environmental Microbiology* 8(71): 4619-4627.

Abstract: Small subunit 16S rRNA sequences, growth temperatures, and phylogenetic relationships have been established for 129 bacterial isolates recovered under aerobic growth conditions from different regions of a 22-m ice core from the Muztag Ata Mountain glacier on the Pamirs Plateau (China). Only 11% were psychrophiles (grew at 2 degrees C or -2 degrees C up to similar to 20 degrees C), although the majority (82%) were psychrotolerant (grew at 2 degrees C or -2 degrees C up to 37 degrees C). The majority of the isolates had 16S rRNA sequences similar to previously determined sequences, ranging from 85% to 100% identical to database sequences. Based on their 16S rRNA sequences, 42.6% of the isolates were high-G+C (HGC) gram-positive bacteria, 23.3% were gamma-Proteobacteria, 14.7% were alpha-Proteobacteria, 14.7% were Flavobacteria, and 4.7% were low-G+C (LGC) gram-positive bacteria. There were clear differences in the depth distribution, with Proteobacteria, HGC/Cytophaga-Flavobacterium-Bacteroides (CFB), Proteobacteria, LGC/CFB/HGC, Cryobacterium psychrophilum, HGC/CFB, Proteobacteria/HGC/CFB, and HGC/CFB being the predominant isolates from ice that originated from 2.7 to 3.8, 6.2, 7.5, 8.3, 9.0, 9.7, 12.5, and 15.3 m below the surface, respectively. This layered distribution of bacterial isolates presumably reflects both differences in bacteria inhabiting the glacier's surface, differences in bacteria deposited serendipitously on the glacier's surface by wind and snowfall, and nutrient availability within the ice.

888: X. D. Xie, S. Norra, Z. Berner and D. Stuben,. 2005. A GIS-supported multivariate statistical analysis of relationships among stream water chemistry, geology and land use in Baden-Wurttemberg, Germany. Water Air and Soil Pollution 1-4(167): 39-57.

Abstract: The present study was carried out to analyse and identify relationships among stream water chemistry, land use, and geology in Baden-Wurttemberg, a federal state in the south-west of Germany. The investigation is based on data from 88 monitoring stations, which cover almost the whole area of Baden-Wurttemberg. The database on water chemistry includes 21 parameters such as major cations, anions, heavy metals, dissolved organic carbon, pH, acid neutralization capacity, and conductivity. The study area is classified into 16 different land use categories and 12 types of geological formations. Using multivariate statistical methods (factor analysis), the relationships among different parameters were revealed by identifying ten uncorrelated factors. The data analysis indicates a complex interaction among stream water chemistry, lithologic composition of the geological formations, and land use type, with an intricate fingerprintings of the different parameters. The most important factors in terms of the represented variance are the main mineralization of the stream water (due to interaction with the geological underground) and anthropogenic nutrients introduced by different agricultural activities. Based on the results of factor analysis (factor score), the stream water chemistry is regionalized using a Geographic Information System (ArcView).

889: Y. H. Xie, S. Q. An and B. F. Wu,. 2005. Resource allocation in the submerged plant *Vallisneria natans* related to sediment type, rather than water-column nutrients. *Freshwater Biology* 3(50): 391-402.

Abstract: 1. Phenotypic plasticity in resource allocation by *Vallisneria natans* was investigated in a greenhouse experiment, using three types of sediment [sandy loam, clay, and a 50 : 50 (by volume) mixture of the two sediments] and two levels of water-column nutrient. The clay was collected from a highly eutrophic lake in Jiangsu Province, China, and the N and P concentrations applied in nutrient media were at the upper limits observed in most lakes of China. 2. Growth and biomass allocation were significantly affected by sediment type, rather than water-column nutrients. Plant growth in clay and the mixture were similar, and 2.4-3.4 times higher than that in sandy loam. Compared with the plants grown in clay or the mixed sediments, the plants grown in sandy loam allocated relatively more biomass to root (11-17% versus 7-8% of total biomass), and relatively less to leaf (76-82% versus 86-87% of total biomass). Plastic variations in root area were induced by sediment type alone ($P < 0.05$), whereas the impacts of sediment type and water-column nutrients on leaf area were insignificant ($P > 0.05$). 3. Plant N and P concentrations were significantly affected by both sediment type and water-column nutrients. Increased nutrient availability in the water column enhanced plant N concentration by 3.5-20.2%, and plant P concentration by 19.1-25.8%. 4. Biomass accumulation and plant nutrient concentration in plants grown in different sediment types and water-column nutrients indicate that sediment type had more significant impacts on growth and N and P concentrations of *V. natans* than did water-column nutrients. Changes in phenotype are a functional response to nutrient availability in sediment, rather than to water-column nutrients.

890: Y. P. Xing, P. Xie, H. Yang, L. Y. Ni, Y. S. Wang and K. W. Rong,. 2005. Methane and carbon dioxide fluxes from a shallow hypereutrophic subtropical Lake in China. Atmospheric Environment 30(39): 5532-5540.

Abstract: Up to now, there have been few studies in the annual fluxes of greenhouse gases in lakes of subtropical regions. The fluxes of methane (CH₄) and carbon dioxide (CO₂) across air-water interface were measured in a shallow, hypereutrophic, subtropical Lake Donghu (China) over a year cycle, using a static chamber technique. During the year, Lake Donghu emitted CH₄ and CO₂; the average flux of CH₄ and CO₂ was 23.3 +/- 18.6 and 332.3 +/- 160.1 mg m⁽⁻²⁾ d⁽⁻¹⁾, respectively. The fluxes of CH₄ and CO₂ showed strong seasonal dynamics: CH₄ emission rate was highest in summer, remaining low in other seasons, whereas CO₂ was adsorbed from the atmosphere in spring and summer, but exhibited a large emission in winter. Annual carbon (C) budget across air-water interface in Lake Donghu was estimated to be 7.52 +/- 4.07 x 10⁽⁸⁾ g. CH₄ emission was correlated positively with net primary production (NPP) and temperature, whereas CO₂ flux correlated negatively with NPP and temperature; however, there were no significant relationships between the fluxes of CH₄ and CO₂ and dissolved organic carbon, a significant difference from boreal lakes, indicating that phytoplankton rather than allochthonous matter regulated C dynamics across air-water interface of subtropical lake enriched nutrient content. (c) 2005 Elsevier Ltd. All rights reserved.

891: H. Yamada, F. Nakamura, Y. Watanabe, M. Murakami and T. Nogami,. 2005. Measuring hydraulic permeability in a streambed using the packer test. Hydrological Processes 13(19): 2507-2524.

Abstract: Permeability of a streambed is an important factor regulating nutrient and oxygen availability for aquatic biota. In order to investigate the relationship, an accurate permeability should be measured. However, it is difficult to measure permeability in a coarse gravel bed using a conventional permeability test. Moreover, turbulent flow may occur in coarse bed material, and then deviations from Darcy's law do occur. Thus, permeability calculated following Darcy's law may be overestimated under turbulent flow conditions and should be corrected. The packer test can be used in highly permeable gravel beds. We developed a field method applicable to a gravel bed using the packer test and derived an equation adopting a law of turbulent flow to study the problems under any type of flow condition. The accuracy of the equation was examined using a laboratory flume with a gravel bed. The results suggested that permeability calculated from Hvorslev's equation is overestimated for turbulent flow. In contrast, our equation, developed here, could evaluate permeability accurately under any type of flow condition. Copyright (c) 2005 John Wiley & Sons, Ltd.

892: Y. Yamamoto and H. Nakahara,. 2005. Competitive dominance of the cyanobacterium *Microcystis aeruginosa* in nutrient-rich culture conditions with special reference to dissolved inorganic carbon uptake. *Phycological Research* 3(53): 201-208.

Abstract: The aim of the present study was to determine what factors contribute to the competitive advantage of cyanobacteria in eutrophic conditions. Mixed species batch culture experiments were conducted at three pHs (8.2, 8.8, 10.2) and irradiances (30, 90, 180 $\mu\text{mol photons m}^{-2} \text{s}^{-1}$) between *Microcystis aeruginosa* Kutzinger and *Staurastrum dorsidentiferum* W. et West or *Synedra ulna* (Nitzsch) Ehrenberg, which always resulted in the dominance of *M. aeruginosa*. The final yields of competitors were often significantly lower than when cultured singly. The dominance of the surface-loving *M. aeruginosa* appears to be related to its advantageous CO_2 uptake. To clarify the importance of dissolved inorganic carbon (DIC) as a selective factor, the effect of aeration was examined with *M. aeruginosa*. The growth of *M. aeruginosa* quickly stopped in nonaerated conditions, while it continued growing throughout the culture when aerated. This result indicates that DIC limitation easily occurs in static conditions and the viewpoint of CO_2 exchange efficiency would be helpful in discussing the competitive advantage of *M. aeruginosa*. When the three species were cultured at various ratios of surface area to volume (s/v), postulating it as an index of the gas exchange efficiency, the increases in population densities strongly correlated with s/v , and the relationships between the specific growth rate and s/v corresponded well to a Monod type saturation function. We found that *M. aeruginosa* had the lowest half-saturation constant among the three, reflecting its high affinity for DIC.

893: W. J. Yan, S. Zhang, X. B. Chen and Y. J. Tang,. 2005. Nitrogen export by runoff from agricultural plots in two basins in China. *Nutrient Cycling in Agroecosystems* 2(71): 121-129.

Abstract: Runoff and sediment yields from agricultural fields are major sources of nitrogen (N) entering lakes in China. Export of sediment and N can be impacted by soil and cropping management practices, but there is relatively little information on N leaving agricultural fields in lake basins in China. Sediment and surface runoff N from a series of field plots in two experimental lake basins were evaluated in situ under simulated rainfall conditions. Objectives of the study were to evaluate the effects of crop cover, slope, and fertilizer application on N in surface runoff and eroded soils. Sediment yields varied from 4.3 to 299.0 g m⁻², depending on management practice. Mean dissolved nitrogen (DN) and total nitrogen (TN) concentrations are 1.35 and 5.4 mg L⁻¹, respectively, in Lake Taihu basin, while mean DN and TN concentrations are 2.66 and 4.3 mg L⁻¹, respectively, in Lake Baiyangdian basin. For all experimental plots in two basins, weighted average concentrations of N for total-N, dissolved N and sediment N are 1.0-5.0 mg L⁻¹, much higher than 0.2 mg L⁻¹, indicating a problem in lake eutrophication due to high N concentration from agricultural surface runoff. The estimated mean annual export of total N was 6.0 and 14.7 kg ha⁻¹ yr⁻¹ for Baiyangdian and Taihu lake basins, respectively. The study showed that significantly more N (approximately ranging from 10% to 90% of total N) exported was associated with sediment, constituting a long-term source of potentially bioavailable N in lakes.

894: S. Yanai and K. Kochi,. 2005. Effects of salmon carcasses on experimental stream ecosystems in Hokkaido, Japan. Ecological Research 4(20): 471-480.

Abstract: The effects of salmon carcasses on dissolved nutrients, epilithic production, leaf decomposition rates. and aquatic invertebrates were examined using 10-m-long, artificial channels fed by an adjacent natural stream in Hokkaido, northern Japan. Bags containing maple leaf litter were placed in nine channels, each of which was assigned to one of three treatments with three replicates, for 6 weeks in fall 2002. The three treatments were: (1) salmon carcasses+invertebrates, (2) invertebrates only. and (3) control (no salmon carcasses or invertebrates added). Nutrient concentrations, biomass of epilithic algae (chlorophyll), leaf weight loss, abundance and biomass of invertebrates in the leaf packs were compared among the three treatments at 14, 27, and 40 days after the beginning of the experiment. The NH_4^+ in stream water and chlorophyll concentrations of epilithic algae were higher in the salmon treatment than the other treatments, and the maple leaves decomposed faster in the salmon treatment than in the other treatments. Moreover. the N content of the leaves was highest and the C/N ratio was lowest in the salmon treatment. although not significantly so. The abundance and biomass of the dominant leaf-shredding invertebrate *Goerodes satoi* did not differ between the first two treatments. However, the stable N isotope ratio in *G. satoi* was nearly 3 parts per thousand higher in the salmon treatment, suggesting that around 20% of salmon-derived N was taken up by this shredder. Our results indicate that salmon carcasses affect stream ecosystems directly by enhancing primary production, indirectly by accelerating woody leaf decomposition, and finally by incorporating into the food web primary consumers that utilize fertilized woody leaves.

895: V. Yanamadala,. 2005. Calcium carbonate phosphate binding ion exchange filtration and accelerated denitrification improve public health standards and combat eutrophication in aquatic ecosystems. Water Environment Research 7(77): 3003-3012.

Abstract: Cultural eutrophication, the process by which a lake becomes rich in dissolved nutrients as a result of point and nonpoint pollutant sources, is a major cause of the loss of natural lake ecosystems throughout the world. The process occurs naturally in all lakes, but phosphate-rich nutrient runoff from sources such as storm drains and agricultural runoff is a major cause of excess phosphate-induced eutrophication. Especially in Madrona Marsh, one of the last remaining vernal marshes in the greater Los Angeles area, California, cultural eutrophication has become a major problem. In this study, calcium carbonate was found to be an excellent phosphate binder, reducing up to 70% of the phosphates in a given sample of water, and it posed relatively negligent ecological repercussions. This study involved the testing of this principle in both the laboratory and the real ecosystem. A calcium carbonate lacing procedure was first carried out to determine its efficacy in Madrona Marsh. Through this, ammonia was found to interfere with the solubility of calcium carbonate and therefore to be a hindrance to the reduction of phosphate. Therefore, various approaches for reduction of ammonia were tested, including aeration, use of fiber growth media, and plants, mainly *Caulerpa verticellata*, chosen for its hardiness, primarily in an attempt to increase population of *Nitrobacter* and *Nitrosomonas*. All were successful in moderately reducing ammonia levels. In addition, soil sampling, sediment analysis, microscopic plant analysis, microorganism and macroinvertebrate identification, and rate law formulations were conducted. The effect of phosphate and ammonia reduction on the populations of enterobacteria was also an important focus of this experiment. Varying concentrations of phosphate, ammonia, and calcium carbonate in conjunction with phosphate were tested in Madrona Marsh to determine their effects on the populations of enteropathogens on nonspecific blood agar, MacConkey agar, and He

896: X. D. Yang, X. H. Dong, G. Gao, H. X. Pan and J. L. Wu,. 2005. Relationship between surface sediment diatoms and summer water quality in shallow lakes of the middle and lower reaches of the Yangtze River. *Journal of Integrative Plant Biology* 2(47): 153-164.

Abstract: The relationship between surface sediment diatoms and summer water quality was investigated at 49 lakes in the middle and lower reaches of the Yangtze River. Lakes ranging from oligomesotrophic to hypereutrophic were examined, providing an obvious nutrient gradient. With the shift from mesotrophic to eutrophic levels, diatom multi-ecotypes dominated by epiphytic and facultative planktonic taxa were replaced by nutrient-tolerant planktonic taxa, such as *Cyclotella meneghiniana* Skvortzow, *C. atomus* Hustedt, *Cyclostephanos* Round, and *Stephanodiscus* Ehrenberg etc., reflecting the nutrient changes in the lake. The relationship between diatoms and summer water quality indices was explored further using numeric analysis. Canonical correspondence analysis (CCA) with forward selection and a Monte Carlo permutation test revealed that of all 25 summer water environmental variables, total phosphorus (TP), chlorophyll a (Chl a), Secchi depth (SD), dissolved inorganic phosphorus, Cl^- , SO_4^{2-} , Mg^{2+} , CO_3^{2-} , and water depth were significant variables ($P < 0.05$) in explaining diatom distributions. Of these, TP, Chl a, SD, and Cl^- , were the most important variables. The result of the correlation analysis also showed that a significant correlation exists among these variables, implying that these indices are either interconnected or independent in explaining the diatom data. For phosphorus-limited sites, TP was the most significant variable affecting the diatoms, also affecting changes in Chl a, SD, and iron concentrations. The independence of Chl a may be related to algal competition induced by lake eutrophication, resulting in the feedback to diatom community. In addition to TP, SD can be related to sediment disturbance by wave action and the growth of macrophytes in large shallow lakes. These relationships between diatom ecotypes and water quality provide the basis for a future quantitative reconstruction of historic lake nutrient evolution in the study area and will also provide a wea

897: X. D. Yang, S. Ji, R. T. Jones, S. M. Wang, G. B. Tong and Z. K. Zhang,. 2005. Pollen evidence of early human activities in Erhai basin, Yunnan Province. Chinese Science Bulletin 6(50): 568-576.

Abstract: The evidence of human activities around Erhai Lake catchment was revealed by pollen records from a sediment core in the lake, northwest Yunnan Province. The chronologic sequence based on AMS C-14 data made it possible for pollen results to compare with archaeological records and historical documents. The preliminary deforestation started from the selective clearance at about 5500 C-14 a BP, marked by the loss of vertically distributed montane forest and the expansion of second pine woodland across the catchment. The deforestation resulted in the increase of surface runoff and the enhanced erosion in the catchment. The increased herbs of pasture and crop suggested the primitive agriculture and stockbreeding in study region. With the limited human activity, as well as the suitable climatic condition, second pine forest expanded quickly, resulting in the weakened soil erosion around the basin. The strong forest clearance inferred from pollen occurred since 2160 14 C a BP, paralleling to the first dense immigration of population, when Yeyu County was first set up around west coast of Erhai Lake, documented in historic record. The development of agriculture led to the steady enhancement of soil erosion from farming land, increasing the input of fine materials and nutrients to the lake. Moreover, the serious deforestation by human activity stressed the vulnerability in ecosystem of the landscape. The time of primary anthropologic impact recorded from pollen is earlier than that of the oldest archaeological record by 1500 a (C-14 year).

898: J. Yongpisanphop, M. Kruatrachue and P. Pokethitiyook,. 2005. Toxicity and accumulation of lead and chromium in *Hydrocotyle umbellata*. *Journal of Environmental Biology* 1(26): 79-89.

Abstract: The aquatic plant, *Hydrocotyle umbellata*, was studied for its toxicity and accumulation of lead (Pb) and chromium (Cr) in a synthetic solution. Plants were cultured in a modified Hoagland's nutrient solutions supplemented with 20, 40, 60, 80, and 100 mg Pb/l as lead nitrate [Pb(NO₃)(2)] and 2, 4, 6, 8, and 10 mg Cr/l as potassium dichromate (K₂Cr₂O₇). They were separately harvested after 3, 6, 9, and 12 days. Plants exposed to Pb and Cr showed significant decreases in the biomass productivity and total chlorophyll content when the exposure time and metal concentration were increased. The accumulation of Pb and Cr in the plants was significantly increased, but it was not linear with the exposure time and metal concentration. Both metals were accumulated higher in the roots than in the shoots. The bioconcentration factor of Pb was higher than that of Cr at the same exposure time, indicating a higher accumulation potential of Pb than Cr in *H. umbellata*. Toxicity symptoms of both metals showed a reduction in the production of new plantlets, withering of petioles, and change in color of roots from light green to dark brown. Pb caused leaf chlorosis, whereas Cr caused leaf necrosis. The toxicity symptoms increased when the exposure time and metal concentration were increased.

899: E. O. Young and R. D. Briggs,. 2005. Shallow ground water nitrate-N and ammonium-N in cropland and riparian buffers. *Agriculture Ecosystems & Environment* 3-4(109): 297-309.

Abstract: The extent of nutrient reduction in shallow ground water flow between cropland and riparian buffers in the Northeast is not well established, yet there is an increasing need to quantify such reductions. A four-year project was initiated in 2002 to determine the relative effectiveness of riparian buffers on reducing nutrients in soil water and shallow ground water flow from adjacent cropland. The main objective of this study was to determine if shallow ground water nitrate nitrogen ($\text{NO}_3\text{-N}$) and ammonium nitrogen ($\text{NH}_4\text{-N}$) concentrations differed among cropland (hay or corn), restored riparian buffers (grass and *Salix*-grass), and established forested riparian buffers. Sixteen paired ground water monitoring wells were established in cropland and riparian buffers at two agricultural research sites during July 2002 and July 2003. Samples of ground water, tile drainage water, and stream water were collected approximately monthly over the 2003 field season and analyzed for $\text{NO}_3\text{-N}$ and $\text{NH}_4\text{-N}$ concentration. Average $\text{NO}_3\text{-N}$ concentration across sites was significantly lower in buffers for each sampling. Average $\text{NH}_4\text{-N}$ concentration was consistently higher beneath buffers, and decreased markedly over the sampling period. Soil drainage, as indexed by depth to water table, was significantly correlated with $\text{NO}_3\text{-N}$ concentrations among cropland and buffer wells at individual sites. We hypothesize that this reflects the relationship between soil drainage and its direct impact on both $\text{NO}_3\text{-N}$ leaching and denitrification potentials across the landscape. Forested buffers had the lowest average $\text{NO}_3\text{-N}$, highest $\text{NH}_4\text{-N}$, and the highest water table. Cropland soils with appreciable $\text{NO}_3\text{-N}$ in ground water adjoining riparian buffers on outwash deposits were ineffective at reducing $\text{NO}_3\text{-N}$. Consistent $\text{NO}_3\text{-N}$ reductions occurred between cropland and buffers where ground water flowed from moderately well and well drained cropland to poorly drained riparian buffer soils. (c) 2005 Elsevier B.V. All rights reserv

900: R. G. Young, A. J. Quarterman, R. F. Eyles, R. A. Smith and W. B. Bowden,. 2005. Water quality and thermal regime of the Motueka River: influences of land cover, geology and position in the catchment. New Zealand Journal of Marine and Freshwater Research 4(39): 803-825.

Abstract: We examined the effects of land use, geology, and longitudinal position within the river network on water quality and thermal regime at 23 sites within the Motueka River catchment. The concentrations of suspended solids, nitrate nitrogen, total nitrogen, Escherichia coli, and Campylobacter were higher at sites draining pastoral and horticultural land than in similar-sized native or plantation forest streams. Average daily mean temperature and minimum temperature in summer and maximum winter temperature were higher in unshaded pastoral and horticultural streams than at native forest sites. Differences in water quality and thermal regime were also observed among sites with contrasting geology. Conductivity, pH, and minimum winter temperatures were highest at sites draining marble terrain. In contrast, longitudinal patterns in water quality and temperature regime along the 120-km length of the river were relatively weak, although longitudinal patterns in amplitude of daily temperature fluctuation matched theoretical predictions. In this study, differences in land use appeared to have the strongest influence on most water quality and thermal variables examined. However, geology was an important factor explaining variation in certain variables (e.g., pH and conductivity). Longitudinal patterns in water quality and temperature were relatively weak and in many instances were linked with longitudinal patterns in land use and geology rather than catchment location alone.

901: K. S. H. Yu, A. H. Y. Wong, K. W. Y. Yau, Y. S. Wong and N. F. Y. Tam,. 2005. Natural attenuation, biostimulation and bioaugmentation on biodegradation of polycyclic aromatic hydrocarbons (PAHs) in mangrove sediments. Marine Pollution Bulletin 8-12(51): 1071-1077.

Abstract: The biodegradability of a mixture of PAHs, namely fluorene (Fl), phenanthrene (Phe) and pyrene (Pyr), in mangrove sediment slurry was investigated. At the end of week 4, natural attenuation based on the presence of autochthonous microorganisms degraded more than 99% Fl and Phe but only around 30% of Pyr were degraded. Biostimulation with addition of mineral salt medium degraded over 97% of all three PAHs, showing that nutrient amendment could enhance Pyr degradation. Bioaugmentation with inoculation of a PAH-degrading bacterial consortium enriched from mangrove sediments did not show any promotion effect and the degradation percentages of three PAHs were similar to that by natural attenuation. Some inhibitory effect was observed in bioaugmentation treatment in week 1 with only 50% Fl and 70% Phe degraded. These results indicate that autochthonous microbes may interact and even compete with the enriched consortium during PAH biodegradation. Natural attenuation appeared to be the most appropriate way to remedy Fl- and Phe-contaminated mangrove sediments while biostimulation was more capable to degrade Pyr-contaminated sediments. The study also shows that although a large portion of the added PAHs (more than 95%) was adsorbed onto the sediments at the beginning of the experiment, most PAHs were degraded in 4 weeks, suggesting that the degraders could utilize the adsorbed PAHs efficiently. (c) 2005 Elsevier Ltd. All rights reserved.

902: A. Zalat and S. S. Vildary,. 2005. Distribution of diatom assemblages and their relationship to environmental variables in the surface sediments of three northern Egyptian lakes. Journal of Paleolimnology 2(34): 159-174.

Abstract: Surficial sediments of three northern Egyptian lakes (Manzala, Burullus and Edku) show differences in diatom assemblages deposited in different sites of these lakes. A total of 172 species and varieties belonging to 58 genera were identified and counted from 62 samples. Of these, 163 diatom taxa were recorded from Manzala Lake sediments, 147 taxa were found in Burullus Lake sediments, and 117 taxa were identified in Edku Lake sediments. The considerable variation in the composition and distribution of the diatom assemblages among these lakes was mainly related to differences in the water quality, salinity, the concentration of nutrients and climatic changes. The planktonic diatom *Cyclotella meneghiniana* was dominant in the majority of the samples from Manzala Lake, but dominant in only a few samples from the middle parts of Burullus and Edku lakes. The non-planktonic epiphytic taxa *Cocconeis placentula* and *Epithemia sorex* were the subdominant species in the surface sediments, especially in shallow and marginal parts of the lakes. Multivariate statistical techniques (hierarchical ascending clustering and canonical correspondence analysis) were used to identify ecological groups of diatoms and to investigate which environmental variables were important in explaining the variation between these groups. Eight ecological groups containing distinctive diatom assemblages reflect current environmental conditions; especially saltwater intrusion in the north and nutrient-rich freshwater in the south.

903: C. Zammit, M. Sivapalan, P. Kelsey and N. R. Viney,. 2005. Modelling the effects of land-use modifications to control nutrient loads from an agricultural catchment in Western Australia. *Ecological Modelling* 1(187): 60-70.

Abstract: The estuary of the Swan and Canning Rivers in Western Australia is becoming increasingly prone to algal blooms, fish deaths and other biochemical problems that are thought to be associated with increasing eutrophication. Phosphorus and nitrogen enrichment are seen as the two most common causes of such eutrophication, with both elements being transported in streamflow and with concentrations strongly dependent upon land-use in the catchment. Many of the efforts to prevent and control eutrophication in the estuary are focused on managing land-use within the catchment. In this paper, the large-scale catchment model (LASCAM) is applied to Ellen Brook, a rural catchment located within the Swan River catchment, to simulate catchment exports of phosphorus and nitrogen, under a range of land cover scenarios that are designed to control the eutrophication. The scenarios, which are related to different management options for the catchment, are: (i) reforestation of agricultural land; (ii) reduction in fertiliser application; and (iii) urbanisation following a highway development. The model results show that: (i) full reforestation of agricultural land is expected to reduce phosphorus and nitrogen export by 50 and 85%, respectively; (ii) a proportionally greater reduction of phosphorus and nitrogen export occurs for smaller areas of reforestation than for larger areas; (iii) reduction in phosphorus fertiliser application produces a linear response with respect to phosphorus export; (iv) urbanisation increases runoff due to the larger impermeable areas causing an increase of overland flow during storms; and (v) phosphorus and nitrogen loads are expected to increase about 4 and 12%, respectively, during the 10 years following urbanisation. (c) 2005 Elsevier B.V. All rights reserved.

904: X. Q. Zeng and T. C. Rasmussen,. 2005. Multivariate statistical characterization of water quality in Lake Lanier, Georgia, USA. Journal of Environmental Quality 6(34): 1980-1991.

Abstract: Watershed monitoring programs depend on water quality characterization data collected for many parameters, at many times and places, and with limited resources. Our objective is to present a strategy that reduces the measured parameters, locations, and frequency without compromising the quality of the monitoring program. One year of twice-monthly (growing season) and monthly (dormant season) water quality data collected from 17 lake and 10 tributary sites are used in conjunction with multivariate statistical techniques to improve the utility of collected data by identifying key parameters and monitoring locations. Factor analysis shows that tributary water quality data consists of three components-stormwater runoff, municipal and industrial discharges, and ground water-which can be distinguished using total suspended solids, total dissolved solids, and alkalinity plus soluble reactive P, respectively. Lake water quality characterization is more ambiguous than tributary water quality characterization, but factor analysis indicates that anoxia associated with lake stratification is the largest source of lake water quality variation, followed by nutrient abundance, and finally by biomass abundance. Cluster analysis suggests that tributary and lake monitoring stations can be consolidated. Reducing the number of parameters and stations frees up resources for increased monitoring elsewhere.

905: I. A. Zhabin, L. N. Propip, T. I. Volkova and P. Y. Tishchenko,. 2005. Variability of hydrochemical and hydrological parameters near the Amur fiver estuary. *Oceanology* 5(45): 664-670.

Abstract: During cruise 29 of R/V Akademik Oparin (July 2003), a comprehensive study of the ecosystem of the Amur River estuary was performed. The data obtained during the cruise allow one to study the spatial variability of the hydrochemical and hydrological parameters in the zone of mixing of riverine and sea waters in the Gulf of Sakhalin of the Okhotsk Sea. Three structural zones can be recognized: the runoff lens, the stream at the outer boundary of the lens, and the Okhotsk Sea shelf waters. The runoff lens of the Amur River is located in the eastern area of the Gulf of Sakhalin. The surface layer dilution in the lens is traceable down to a depth of 20 m. Due to photosynthesis, the concentration of nutrients in the lens was lower than that in the surface layer of the Okhotsk Sea shelf waters. Meanwhile, high concentrations of nutrients were observed in the cold near-bottom layer that directly underlies the lens. Photosynthesis causes an oversaturation of the upper layer of the Gulf of Sakhalin with oxygen and its undersaturation with carbon dioxide.

906: B. Zhang, Y. Zhang, K. Song, Z. Wang, F. Li and H. Duan,. 2005. The optical properties of the eutrophic water: A case study of Nanhu Lake in Changchun, China. Journal of Electromagnetic Waves and Applications 3(19): 389-400.

Abstract: In this study, we present the optical properties of the eutrophic water in Nanhu Lake of Changchun, China, as a case study done in September 2003 and April 2004. The lake water in Nanhu Lake is optically dominated by scattering from suspended matter, and the lake water is dominated by absorption from phytoplankton (CHL-a), total suspended matter (TSM) and yellow substance (or so-called CDOM). The main reason is that the Nanhu Lake is highly affected by the input from rivers and drainage systems from the city of Changchun which discharges a high concentration of CDOM, nutrients, and suspended mineral solids. We measured the spectral characteristics (400-900 nm) of Nanhu Lake using the ASD-field spectrometer and analyzed the optical properties of the eutrophic water. The spectral measurements will be continued during the period of 2004-2005. Further studies are still needed to refine the method for determining the optical properties of inland waters under study.

907: J. J. Zhang and S. E. Jorgensen,. 2005. Modelling of point and non-point nutrient loadings from a watershed. Environmental Modelling & Software 5(20): 561-574.

Abstract: An integrated model was developed to estimate the loadings of nutrients and organic matter from point and non-point sources in a watershed by use of the software Pamolare. The model accounted for the loadings from industrial and municipal wastewaters, atmospheric deposition and runoff from the drainage area. We tested the model using data from Lake Glumsphi, Denmark, with a drainage area of about 1054.9 ha and with known annual loadings into the lake in 1978, 1982 and 2000. The model was first calibrated against one year's record, followed by one year's validation, and finally a prognosis scenario was performed. The predictions by the model were consistent with the observations. Thus, the model may be applicable for estimating nutrient loadings from drainage areas, when observations in general are not available. It can also be used to examine the current conditions and test the effects of management and planning scenarios within a watershed. (C) 2004 Elsevier Ltd. All rights reserved.

908: J. Q. Zhang, K. Q. Xu, L. H. Qi, Y. H. Yang and M. Watanabe,. 2005. Estimation of freshwater and material fluxes from the Yangtze River into the East China Sea by using TOPEX/Poseidon altimeter data. Hydrological Processes 18(19): 3683-3698.

Abstract: In order to determine material fluxes in rivers by non-contact methods, it is essential to estimate river discharge first. Although developed and optimized for open oceans, satellite radar altimetry has the potential to monitor variations in the levels of inland waters such as lakes and rivers. Making use of the concept of an 'assumed reference point', we converted TOPEX/Poseidon satellite altimetry data on water level variations in the Yangtze River (Changjiang) to 'water level' data. We also used 'water level' time-series data and in situ river discharge to establish a rating curve. By use of the rating curve, we converted data on 'water level' derived from 7 years (1993-99) of TOPEX/Poseidon data to actual river discharge. On the basis of statistical correlation between discharge and nutrient concentration data collected in 1987-88 and in 1998-99, we estimated the total amounts of freshwater and material fluxes transferred by the Yangtze River during the 1990s. The result reveals that an overall, but very slight, increase in freshwater and material fluxes occurred during the 1990s. Copyright (c) 2005 John Wiley & Sons, Ltd.

909: L. Zhang, W. J. Mitsch and D. F. Fink,. 2005. Hydrology, water quality, and restoration potential for the upper Big Darby Creek, central Ohio. Ohio Journal of Science 3(105): 46-56.

Abstract: The restoration of riparian buffers as well as the creation and restoration of wetlands along streams are practices that can be used to control point and non-point source pollution. Our study provides hydrology and water quality data from 2000-2002 in anticipation of recommending restoration of the headwaters of the Big Darby Creek Watershed in central Ohio. one tributary of concern in the headwaters, Flat Branch, contributed 11% of the total river flow during April 2002 flooding and 56 and 88% of the flow in the headwater study area during non-growing (winter and early spring) and growing (summer and early fall) seasons, respectively. There were significant differences in water chemistry, both temporally and spatially, at each sampling station within the upper watershed. Flat Branch was seasonally or continuously higher in temperature, pH, and turbidity, and lower in dissolved ions and oxygen than Darby Creek. Low dissolved oxygen at dawn during the summer months caused by diurnal metabolism in the water column is also a concern in Darby Creek. We propose the creation/restoration of riparian wetlands at the confluence of the Big Darby and Flat Branch as one solution to degrading water quality in the upper Big Darby watershed. Flood pulses, particularly from the Flat Branch, could be directed to riparian wetlands, which would minimize downstream erosion and capture the water exactly when several pollutants (sediments, nitrates, and so forth) are in higher concentrations. The restoration area could have flood control, habitat, and ecotourism values as well.

910: G. W. Zhu, B. Q. Qin and G. Gao,. 2005. Direct evidence of phosphorus outbreak release from sediment to overlying water in a large shallow lake caused by strong wind wave disturbance. Chinese Science Bulletin 6(50): 577-582.

Abstract: Concentration variations of suspended solids (SS), total phosphorus (TP), dissolved total phosphorus (DTP), dissolved reactive phosphorus (SRP), and algae available phosphorus (AAP) in overlying water were observed during the coldest week in a year in Lake Taihu, a large shallow lake in China. Water samples at different water depths were collected with wind speeds of 8, 12, 0 and 0 m/s on 23, 24, 26 and 30 January 2004, respectively. On 23 January 2004, SS concentration increased to 258 mg/L with a wind speed of 8 m/s lasting for 1 h. SS concentration kept increasing and reached to 07 mg/L when the strong wind lasted for 24 h and the peak value of wind-speed reached to 12 m/s on 24 January 2004. On 26 January 2004, SS concentration decreased to 51 mg/L with the wind speed smaller than 2 m/s lasting for about half a day. Then after five continuous waveless days, SS concentration decreased to 21 mg/L on 30 January 2004. The observed results confirmed that sediments in Lake Taihu would be intensively suspended if the surface wind speed is greater than 8 m/s, and the magnitude of SS would increase with increasing wind-speed. Coupled with the intensive sediment suspending, concentrations of TP, DTP and SRP on 23 January were 0.210, 0.048 and 0.035 mg/L, respectively. And they were 0.299, 0.054 and 0.026 mg/L on 24 January, which were significantly higher than those on 26 and 30 January. SRP concentration on 23 January was twice as high as that observed on 30 January. It indicates that the strong wind may result in an outbreak release of phosphorus. Moreover, AAP contents in suspended solids were 132, 97 and 226 mg/kg on 23, 24 and 26 January, respectively. Therefore, it could be estimated that this strong wind process resulted in 987 t of TP, 80 t of SRP and 167 t of AAP releasing from sediments into overlying water. Since such strong wind process is frequent in the area of Lake Taihu, dynamical release driven by wind-induced wave disturbance may be the main mode for i

911: Z. X. Zhu, P. A. Arp, A. Mazumder, F. R. Meng, C. P. A. Bourque and N. W. Foster,. 2005. Modeling stream water nutrient concentrations and loadings in response to weather condition and forest harvesting. Ecological Modelling 2-4(185): 231-243.

Abstract: A process-based biogeochemistry model, ForNBM, was used to simulate stream water nutrient concentrations and monthly and cumulative stream nutrient loadings according to the monthly air temperature and precipitation records at the Nashwaak Experimental Watershed in central New Brunswick, Canada. Compared with the field measurement data from 1973 to 1985, the simulation results show that the best simulation of stream water nutrient concentrations is for Mg^{2+} with $r(2) = 0.59$, and the poorest is for NH_4^+-N with $r(2) = 0.48$. The best simulation of the monthly stream nutrient loadings is for Ca^{2+} with $r(2) = 0.66$, and the poorest is for NO_3--N with $r(2) = 0.53$. All simulations of the cumulative stream nutrient loadings have $r(2)$ values more than 0.90. Seasonal precipitation and air temperature played the most important role in determining the patterns of the stream nutrient concentrations and loadings. The stream nutrient concentrations were high during the winter and low during the spring. The peak values of the stream nutrient loadings appeared in the springs and the low values appeared in the winters. Although snowmelt diluted the stream water nutrient concentrations during the springs, it resulted in high stream nutrient loadings due to stream flooding. According to the assessments of the model simulations and the field measurements, the increased watershed soil nutrient losses through the stream exports after forest harvesting may not cause the decline of the watershed soil productivity because (1) the annual increments of the stream nutrient exports were small, with 2.34 kg ha⁻¹ year⁻¹ for NO_3--N , 0.93 for NH_4^+-N , 3.34 for Ca^{2+} , 0.30 for Mg^{2+} , and 5.21 for K^+ and (2) the increased watershed soil nutrient losses occurred during the stage of forest regeneration when vegetation growth requires low soil nutrient supply. (c) 2004 Elsevier B.V. All rights reserved.

912: B. Zippel and T. R. Neu,. 2005. Growth and structure off phototrophic biofilms under controlled light conditions. Water Science and Technology 7(52): 203-209.

Abstract: Phototrophic biofilms may be defined as interfacial microbial communities mainly driven by light as energy source. Structure, productivity and taxonomic composition of freshwater phototrophic biofilms under different growth conditions were investigated within the EU-project PHOBIA with the following aims: 1) optimisation of wastewater treatment in wetlands, 2) control and prevention of biofouling on submersed objects, and 3) modelling of phototrophic biofilm development. Experiments were carried out in a flow-lane incubator with precise control of external light, temperature, velocity conditions and nutrient-adapted artificial medium. Structure and architecture of phototrophic biofilms at different developmental stages were examined by using multi-channel confocal laser scanning microscopy (CLSM). The development of phototrophic biofilms was clearly light dependent. Fast growing phototrophic biofilms were mostly dominated by single species algae and formed less stable structures of up to 900 μm thickness. Biofilms with these dimensions had to be cryo-sectioned and post-stained for CLSM. Laser microscopy analysis also revealed a stratification of phototrophic organisms which was more pronounced in slow growing biofilms. In contrast, at very low light intensity the development of phototrophic biofilms was strongly delayed. In conclusion, structural features and subsequent functional relationships may be key parameters for exploitation, control and modelling of phototrophic biofilms.

913: R. Zonta, F. Collavini, L. Zaggia and A. Zuliani,. 2005. The effect of floods on the transport of suspended sediments and contaminants: A case study from the estuary of the Dese River (Venice Lagoon, Italy). Environment International 7(31): 948-958.

Abstract: A flood event was investigated in a measurement section of the estuary of the Dese River, the major tributary of the Venice Lagoon (mean annual discharge = 7.5 m³/s), to observe the variations induced by the flow on the physico-chemistry of the water column and the transport of particles and pollutants. The flood was generated by a typical summer storm, which had a return period of 2 years. The study was based on the continuous recording of the discharge and the measurement of both current speed and physico-chemical variables along the vertical profile. Water samples were also collected for the analysis of total and dissolved heavy metals (As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn), and nutrients (TKN, N-NO₃⁻, N-NO₂⁻, N-NH₃, total phosphorous, P-PO₄³⁻). The suspended particle matter (SPM) concentration increased in the water column during the flood, and the discharge versus SPM relationship showed a counterclockwise hysteresis. The occurrence of hysteresis was related to the delayed response of the load, deriving from the runoff on the basin soils with respect to materials mobilized from the streambed in the initial phases of the flood. The transport of most of the analysed heavy metals was driven by the SPM. The increase in concentration of this parameter significantly affected the amount of Fe, Cu, Pb, Cr, Ni, and partially Zn transported by the stream. Among nutrients, N-NO₃⁻ concentration also increased significantly during the flood, due to the runoff on agricultural surfaces. The study allowed describing the mechanisms of load generation with high flow magnitudes, highlighting the importance of floods in the transport of materials and pollutants from the drainage basin to the Venice Lagoon. (C) 2005 Elsevier Ltd. All rights reserved.

914: C. Zurbrugg, S. Drescher, I. Rytz, A. Sinha and I. Enayetullah,. 2005. Decentralised composting in Bangladesh, a win-win situation for all stakeholders. Resources Conservation and Recycling 3(43): 281-292.

Abstract: The paper describes experiences of Waste Concern, a research based Non-Governmental Organisation, with a community-based decentralised composting project in Mirpur. Dhaka, Bangladesh. The composting scheme started its activities in 1995 with the aim of developing a low-cost technique for composting of municipal solid waste, which is well-suited to Dhaka's waste stream, climate. and socio-economic conditions along with the development of public-private-community partnerships in solid waste management and creation of job opportunities for the urban poor. Organic waste is converted into compost using the "Indonesian Windrow Technique", a non-mechanised aerobic and thermophile composting procedure. In an assessment study conducted in 2001, key information on the Mirpur composting scheme was collected. This includes a description of the technical and operational aspects of the composting scheme (site-layout, process steps, mass flows, monitoring of physical and chemical parameters), the evaluation of financial parameters, and the description of the compost marketing strategy. The case study shows a rare successful decentralised collection and composting scheme in a large city of the developing world. Essential for acceptance by consumers was that the composting scheme was able to get formal approval from the Bangladesh Agriculture Research Council on the use of the compost product for agricultural purposes as well as policy support by the Ministry of Agriculture. Financial success of the scheme is based on the fact that large bulk buyers of compost were found. The compost product is mainly sold to fertiliser producing companies which blend the compost with additives/nutrients to suit different customers. Sales of the products are then done through existing agricultural extension services and retail networks of these companies. Thus the compost marketing strategy of the composting schemes is based on letting others do the individual marketing of the compost. The case of Mi

915: Albay, M; Matthiensen, A; Codd, GA. 2005. Occurrence of toxic blue-green algae in the Kucukcekmece Lagoon (Istanbul, Turkey). ENVIRONMENTAL TOXICOLOGY 20(3): 277-284.

Abstract: The concentration of microcystin (MC) in the Kucukcekmece Lagoon, Istanbul, Turkey, and the physicochemical and biological parameters of water quality were investigated from October 2000 to June 2003. Water samples were collected from surface waters at three sites. Most bloom samples were dominated by *Microcystis aeruginosa*. The major microcystin variants detected by HPLC-PDA were microcystin-YR and microcystin-LR. Microcystin concentration increased dramatically from early summer to early autumn and thereafter tended to decrease. The toxin concentration found in the filtered samples from surface waters varied between 0.06 and 24.2 $\mu\text{g L}^{-1}$ microcystin-LR equivalents. Each year extensive fish mortality was recorded between mid-June and early October, coinciding with heavy algal blooms. A comparison of the conditions associated with cyanotoxin episodes in 2000, 2001, and 2002 showed that the microcystin increase was related to temperature, high concentration of dissolved nutrients, high light intensity (PAR). The highest MC concentrations were recorded at temperatures between 24 degrees C and 28.5 degrees C. Field data showed that the highest MC concentration ($> 3 \mu\text{g L}^{-1}$) and the highest cyanobacterial biomass ($> 30 \text{ mg L}^{-1}$) corresponded to a total nitrogen:total phosphorus ratio greater than 7:1. The highest concentrations of *M. aeruginosa* biomass (173 mg L^{-1}) and MC (24.2 $\mu\text{g L}^{-1}$ MC-LR equiv.) and the highest salinity (8.8%) were measured concurrently in the lagoon. To our knowledge, this is the first evidence of cyanobacterial toxins in the Kucukcekmece Lagoon. (c) 2005 Wiley Periodicals, Inc.

916: Rao, PVL; Gupta, N; Jayaraj, R; Bhaskar, ASB; Jatav, PC. 2005. Age-dependent effects on biochemical variables and toxicity induced by cyclic peptide toxin microcystin-LR in mice. COMPARATIVE BIOCHEMISTRY AND PHYSIOLOGY C-TOXICOLOGY & PHARMACOLOGY 140(1): 11-19.

Abstract: Microcystins are naturally occurring hepatotoxins produced by certain strains of *Microcystis aeruginosa* and microcystin-LR is the most toxic among the 60 microcystin variants isolated so far. These toxins have been implicated in both human and livestock mortality. In the present study we evaluated the age-dependent hepatotoxic effects of microcystin-LR (MC-LR) in mice after intraperitoneal and oral route of exposure. For acute toxicity studies by intraperitoneal route, 1 LD50 dose of MC-LR (43.0 μ g/kg) was administered to 6- to 36-week-old mice. Results showed that time to death in toxin treated animals decreased with age of mice. In comparison to control mice, treated animals of all age groups showed significant increases in liver body mass index and increases in serum enzymes (lactate dehydrogenase, alanine aminotransferase, aspartate aminotransferase, gamma-glutamyl transpeptidase, sorbitol dehydrogenase). For acute oral toxicity studies, 1 LD50 of microcystin-LR containing extracts (3.5 g of MCE/kg) was administered to 6- and 36-week-old mice. The effects on biochemical variables were similar to intraperitoneal route of exposure. Significant age-dependent effects that were observed in microcystin treated animals by intraperitoneal and oral routes of exposure include: time to death, hepatic lipid peroxidation, glutathione depletion and DNA fragmentation. The age-dependent effects observed in some of the biochemical variables may be due to difference in the amount of microcystin-LR up take and also the age-dependent ability to detoxify the toxin in mice. (c) 2004 Published by Elsevier Inc.

917: Paul, John F. and Michael E. McDonald,. 2005. Development of empirical, geographically specific water quality criteria: a conditional probability analysis approach. Journal of the American Water Resources Association 41(5): 1211-1223.