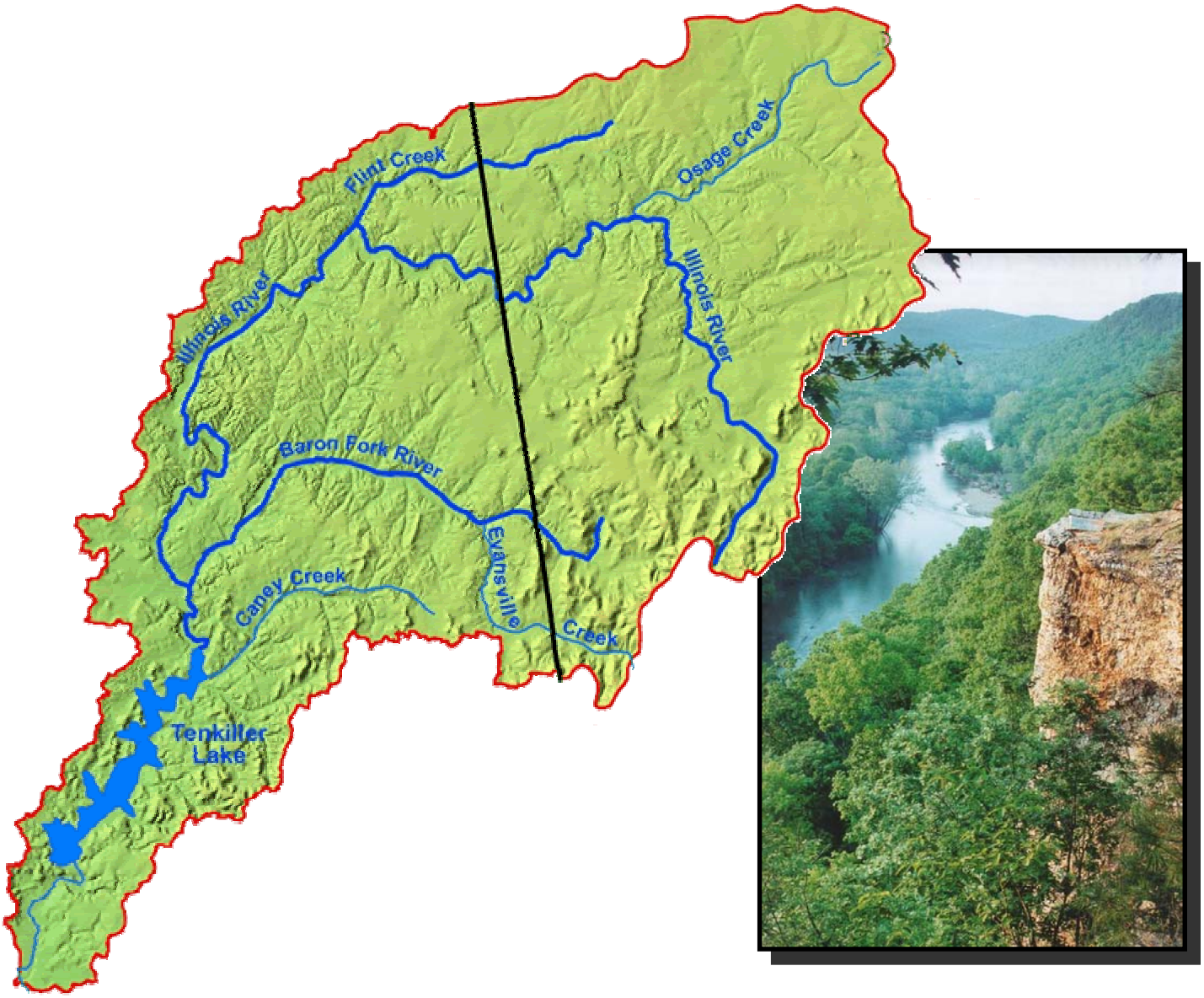
Illinois River Basin Tour

August 12, 2002

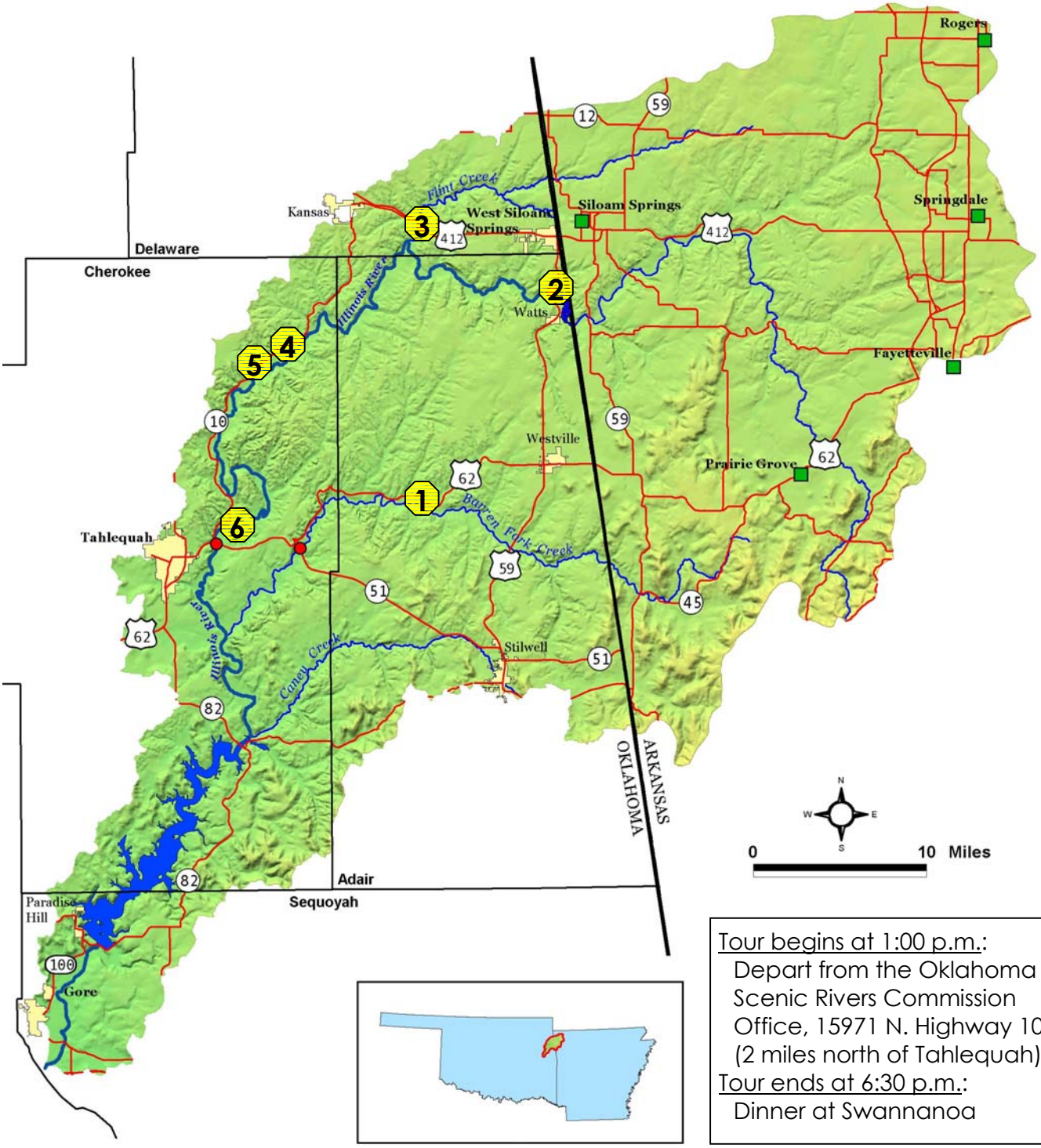


Oklahoma Water Resources Board

Oklahoma Scenic Rivers Commission

Tour Sites:

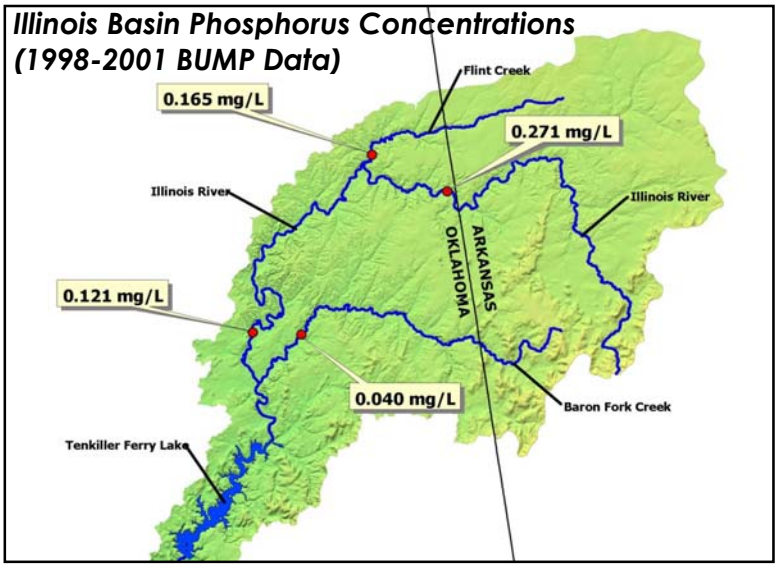
1. Barren Fork Creek at Adair County Rural Water District #5
2. Illinois River at Watts (Lake Frances)
3. Flint Creek near Kansas
4. Illinois River at the Emerson Poultry Facility
5. Illinois River at Peavine Hollow (public access point/canoe rental site)
6. Illinois River at Swannanoa (private ranch/residence)



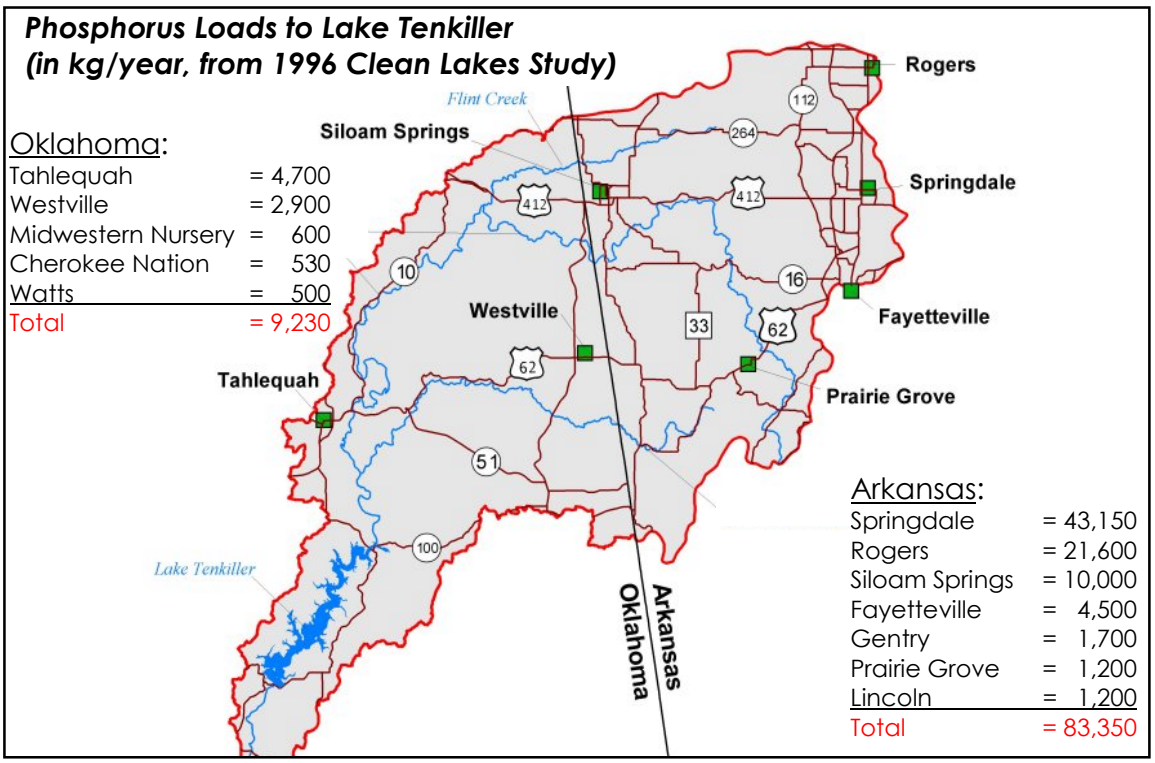
Tour begins at 1:00 p.m.:
Depart from the Oklahoma Scenic Rivers Commission Office, 15971 N. Highway 10 (2 miles north of Tahlequah).
Tour ends at 6:30 p.m.:
Dinner at Swannanoa

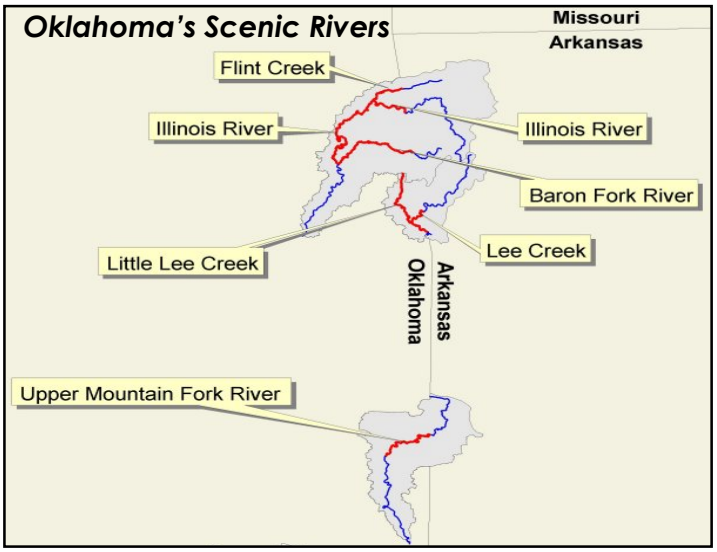
Introduction & Background

The primary intent of this tour of the Illinois River Basin is to educate decision-makers, the press, and public about the many issues impacting the quality of Oklahoma waters, especially those of particular economic, social, and environmental importance.



Perhaps the most significant issue involves the 0.037 milligram per liter (mg/L) standard for phosphorus enacted July 1, 2002 by the OWRB. This, the state's first-ever numerical phosphorus standard, applies only to Oklahoma's designated Scenic Rivers and was promulgated through Oklahoma's Water Quality Standards, administered by the OWRB. The rule seeks to reduce excess loadings of phosphorus, a nutrient contributed to waters through municipal wastewaters and agricultural and urban/residential runoff. Recent increased phosphorus loadings have resulted in the growth of excess algae, which have limited aesthetic benefits of the state's Scenic Rivers, especially the Illinois River and Lake Tenkiller, which has become increasingly turbid in recent years. Data collected through the OWRB's Beneficial Use Monitoring Program (BUMP), initiated in 1998, and other sources verify this serious water quality degradation problem.





The Oklahoma Scenic Rivers Act was enacted in 1977 to protect Oklahoma's most outstanding surface waters. Rivers deserving this special protection are specifically designated by the State Legislature and include portions of the Illinois River, Flint Creek, Barren (Baron) Fork Creek, Big Lee Creek, Little Lee Creek, and the Mountain Fork River. Both Flint and Barren Fork Creeks are tributaries of the Illinois River. The Oklahoma Scenic Rivers Commission (OSRC), a state agency, is primarily responsible for the preservation and protection of the aesthetic, scenic, historic, archaeological, and scientific benefits of Oklahoma's Scenic Rivers.

The total length of the Illinois River is 98.8 miles, including 56.3 miles in Oklahoma (to Tenkiller). The total watershed area is 1,645 square miles (897 square miles in Oklahoma, 748 square miles in Arkansas). Major land area uses in the Illinois River Basin include pasture/hay (46 percent) and deciduous forest (34 percent). All other uses make up approximately 20 percent of the watershed area.

In general, the most populous cities, as well as the largest municipal dischargers, in the Basin exist in the State of Arkansas. The combined population of the three largest cities, all in Arkansas (Fayetteville, Springdale, and Rogers), amounts to 142,674. The largest city in the Oklahoma portion of the basin is Tahlequah, with a population of 14,458; the next largest city, Stilwell, is home to 3,276 residents. While generally all of these municipalities contribute various quantities of phosphorus to rivers, streams and lakes in the region, treatment facilities at both Fayetteville and Tahlequah actively treat their discharge to reduce phosphorus levels.

2000 Population of Selected Larger Cities/Towns
Illinois River Basin

Oklahoma		**Arkansas**	
Tahlequah	14,458	Fayetteville	58,047
Stilwell	3,276	Springdale	45,798
Westville	1,596	Rogers	38,829
West Siloam Springs	877	Siloam Springs	10,843
Kansas	685	Prairie Grove	2,540
Watts	316		

Comparison of Population Growth
Oklahoma-Arkansas Cities/Towns
Illinois River Basin

	1990	**2000**	**Growth**
Oklahoma	15,365	20,623	5,258 (25%)
Arkansas	115,075	174,691	59,616 (34%)

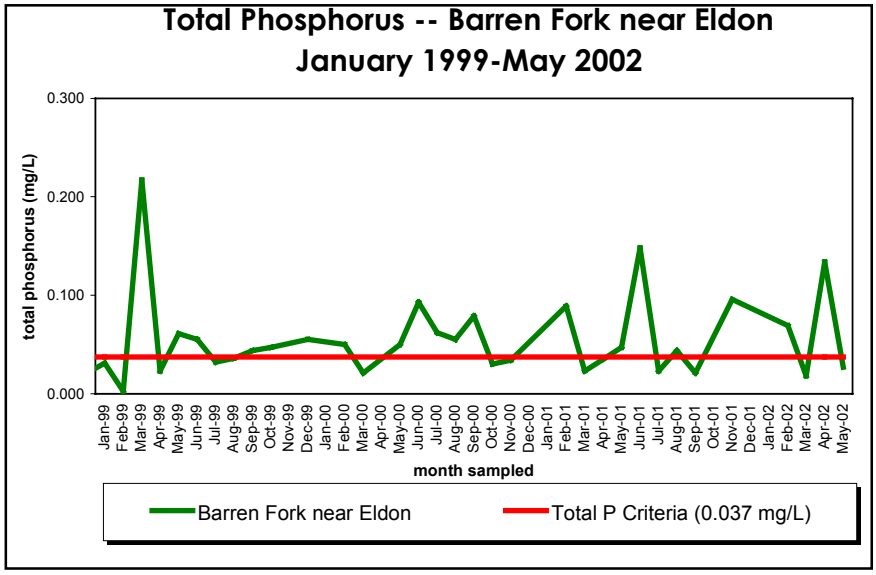
Site 1 -- Barren Fork Creek at Adair County RWD #5

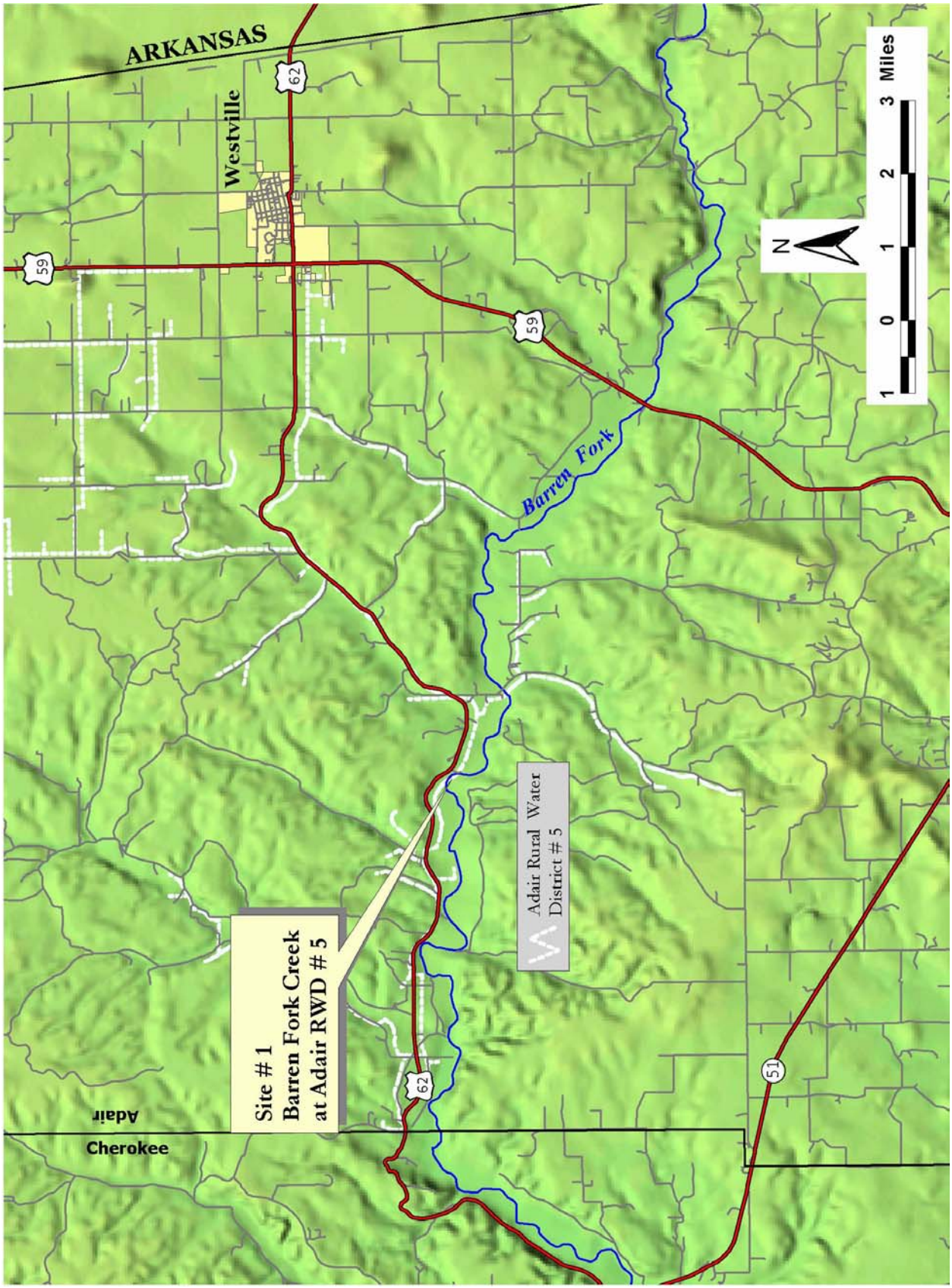
OWRB staff (Monty Porter and Jeff Everett) will illustrate the current chemical and physical integrity of water in Barren Fork Creek through collection of relevant data at the site. They will demonstrate chemical sampling techniques at this location, typical to that conducted during a BUMP sampling visit. (A BUMP station exists downstream of this site at Eldon, Oklahoma and a U.S. Geological Survey stream gage there has monitored water quality and quantity continuously since 1958.) After the tour departs this location, staff will collect biological samples (fish and other aquatic life) that will be presented and compared later with similar samples gathered for visitors at Flint Creek (Site 3).

Water quality at Site 1 is relatively unimpaired, compared to later sites nearer the Arkansas border, and general conditions represent what is achievable through implementation of the 0.037 mg/L phosphorus standard. However, a gravel mining operation upstream of the site may result in limited impacts through increased sediment and alteration of natural habitat in this stream segment.

Adair County Rural Water District #5, which serves 1,000 customers in Adair and Cherokee Counties, derives its water supply from an intake on Barren Fork Creek very near to this location. The water system includes 400 residential and seven industrial meters. Average water usage by the District is 154,000 gallons per day with a maximum daily usage of 250,000 gallons. Adair County RWD #5 has a stream water use allocation of 182 acre-feet per year from the OWRB. The District's supply is generally adequate, but recent concerns have surfaced regarding the environmental impacts of withdrawals during low-flow conditions. The OWRB has initiated a cooperative study with Oklahoma State University to quantify these impacts and with the U.S. Army Corps of Engineers to investigate water supply alternatives for the District.

Data gathered at the Barren Fork (Eldon) BUMP station downstream indicate that this segment of the river is not nutrient-threatened and supports all but one of its designated beneficial uses under the Oklahoma Water Quality Standards. The Primary Body Contact—Recreation use is not supported due to elevated levels of enterococci bacteria.

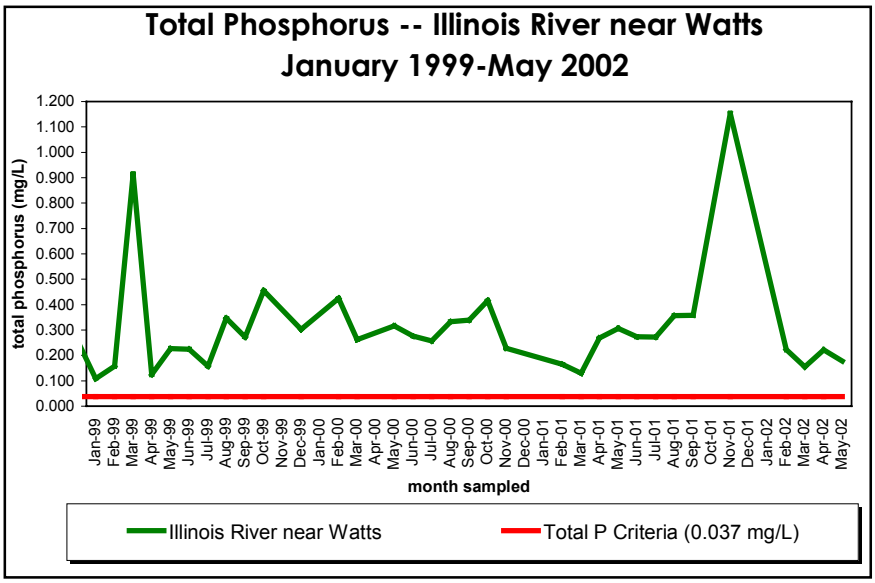



ARKANSAS
Westville
62
59
59
Barren Fork
Adair Rural Water
District # 5
Site # 1
Barren Fork Creek
at Adair RWD # 5
62
51
Adair
Cherokee
N
1 0 1 2 3 Miles

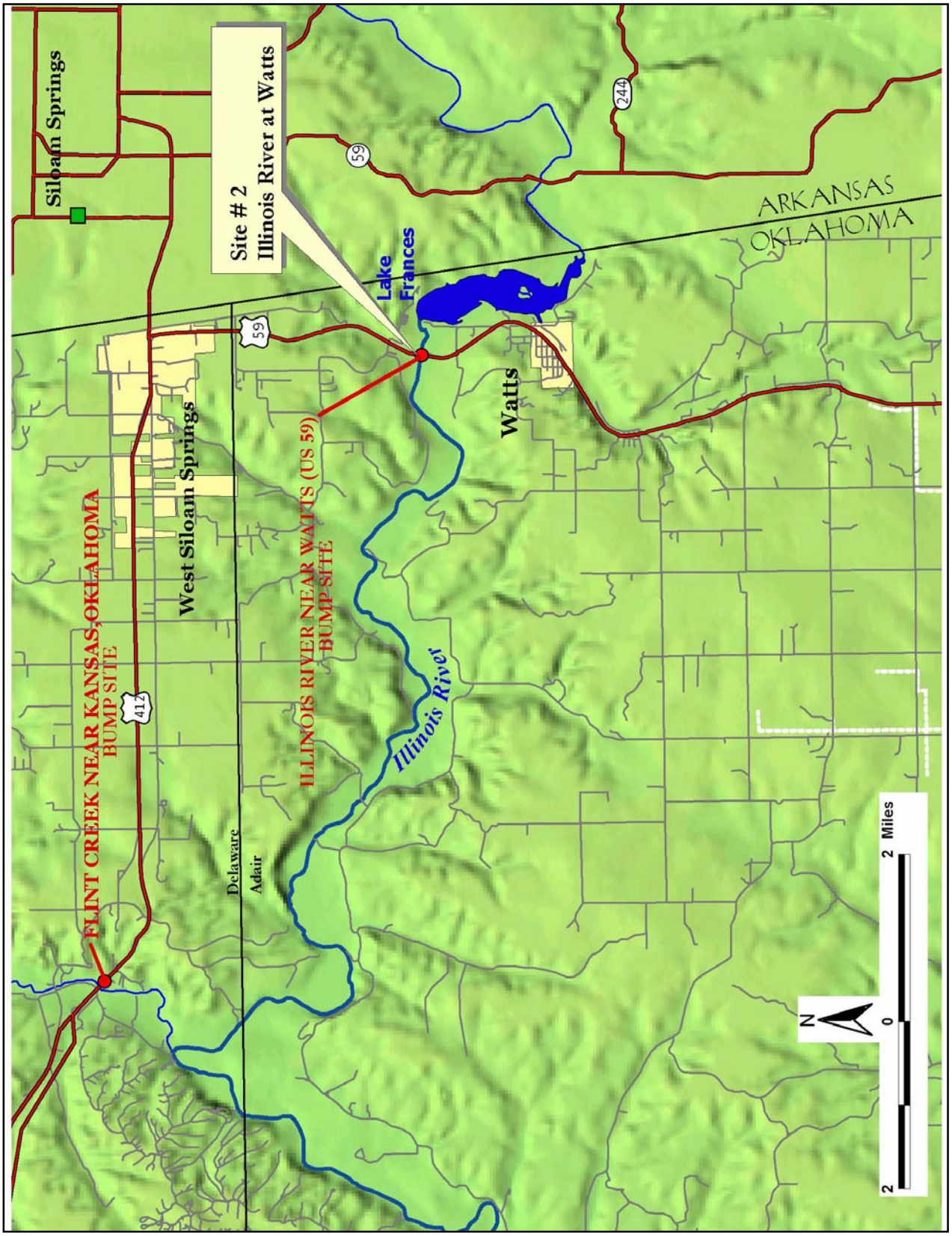
Site 2 -- Illinois River at Watts (Lake Frances)

The former Lake Frances, near Watts approximately one-half mile from the state line, is the location of the City of Siloam Springs' water supply intake as well as a permanent BUMP water quality monitoring station. This site, receiving runoff almost exclusively from point and nonpoint sources in the State of Arkansas, illustrates relatively poor water quality compared to Site 1 (Barren Fork Creek). The usual pea-green color of the water in the Illinois River at this location is indicative of excess algae production resulting from phosphorus and other nutrients in the watershed. In addition, the existence of the remnants of Lake Frances dam substantially reduces the river's natural flow and causes the build-up of sediment at this point, thus resulting in poor water clarity and increased turbidity.

Data gathered at the Illinois River (Watts) BUMP station indicate that this segment of the river is representative of the river from its entrance into Oklahoma downstream to its confluence with Flint Creek, just downstream of Site 3. The Cool Water Aquatic Community—Fish and Wildlife Propagation beneficial use, assigned to this segment under Oklahoma's Water Quality Standards, is not supported due to excess turbidity. Similarly, the Primary Body Contact—Recreation beneficial use is not supported due to relatively high concentrations of enterococci.



Site 2 is also the location of a continuous-recording USGS stream gage that has gathered water quality data since 1955. Lake Frances dam was breached by a major flood in 1992. At the time, the dam was in a state of disrepair and deemed a hazard by OWRB dam safety inspectors.


Siloam Springs
Site # 2
Illinois River at Watts
59
244
ARKANSAS
OKLAHOMA
Lake
Frances
59
Watts
West Siloam Springs
ILLINOIS RIVER NEAR WATTS (US 59)
BUMP SITE
FLINT CREEK NEAR KANSAS, OKLAHOMA
BUMP SITE
412
Illinois River
Delaware
Adair
N
2
0
2 Miles

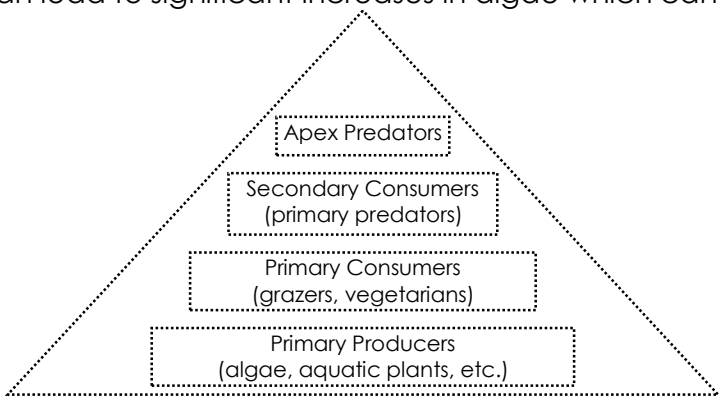
Site 3 -- Flint Creek near Kansas

Board staff (Chuck Potts and Phil Moershel) will collect biological samples at this site on Flint Creek (also a BUMP station) and compare with those collected earlier in the day from Barren Fork Creek (Site 1), thus contrasting the biological health and water quality between the two locations. This demonstration should clearly illustrate that the biological health of Barren Fork Creek obviously exceeds that of the Flint Creek site.

Although water quality at this location appears good due to the immediate site's beneficial physical characteristics (riffles, etc.), the general quality is in fact very similar to that observed at the Illinois River (Watts) site as is evidenced by the habitat immediately upstream and downstream of this site. This segment is moderately impacted by both point and nonpoint source contributions, including the City of Siloam Springs' (Arkansas) municipal wastewater discharge into Sager Creek, a tributary of Flint Creek.

In addition to chemical analysis, biological health—ascertained through an accounting of the type, number, and diversity of aquatic organisms present at a particular body of water—is an excellent indicator of water quality. Accurate biological assessments are especially important in watersheds impacted by excess nutrients, because this problem, unchecked, can lead to significant increases in algae which can devastate the natural aquatic community.

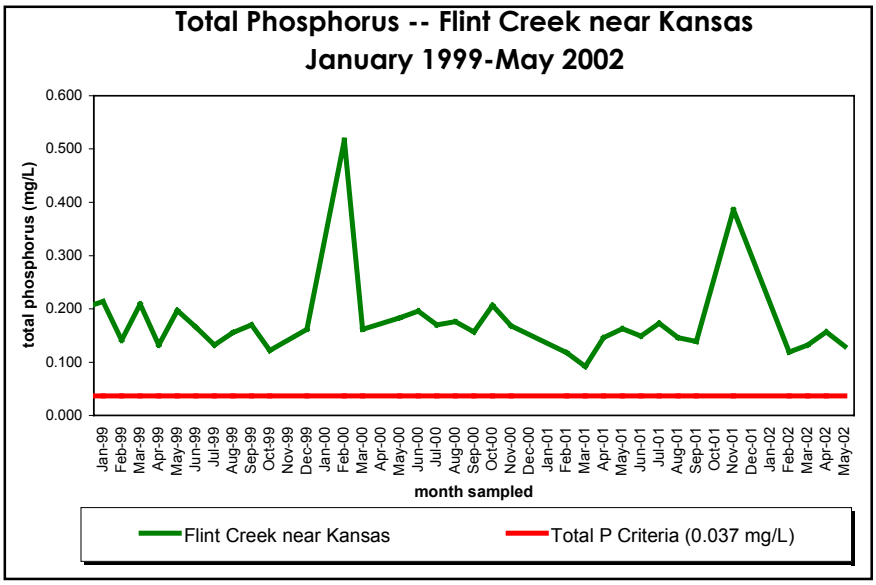
Each level of a biological community depends upon the level below it to feed it as well as the level above it to control its size. Without these controls, the "trophic pyramid" becomes unbalanced and can collapse. For example, a significant increase in the density of a particular algae can allow the number of "grazing" organisms to increase so much that a particular type of grazer who prefers this type of algae may out-compete others, causing a detrimental population decline. In turn, predators (secondary consumers) who depend upon the invertebrates (primary consumers) will also decrease because their food source is depleted. This leaves a community dominated by only a few species of grazers. Apex predators who once fed upon all levels of the pyramid are now forced to feed on only one type of prey, which may not be the preferred prey, and their numbers may also collapse. Without the apex predators to control their numbers, the density of algae eaters (primary consumers) will eventually become too high to be supported by existing resources and they will

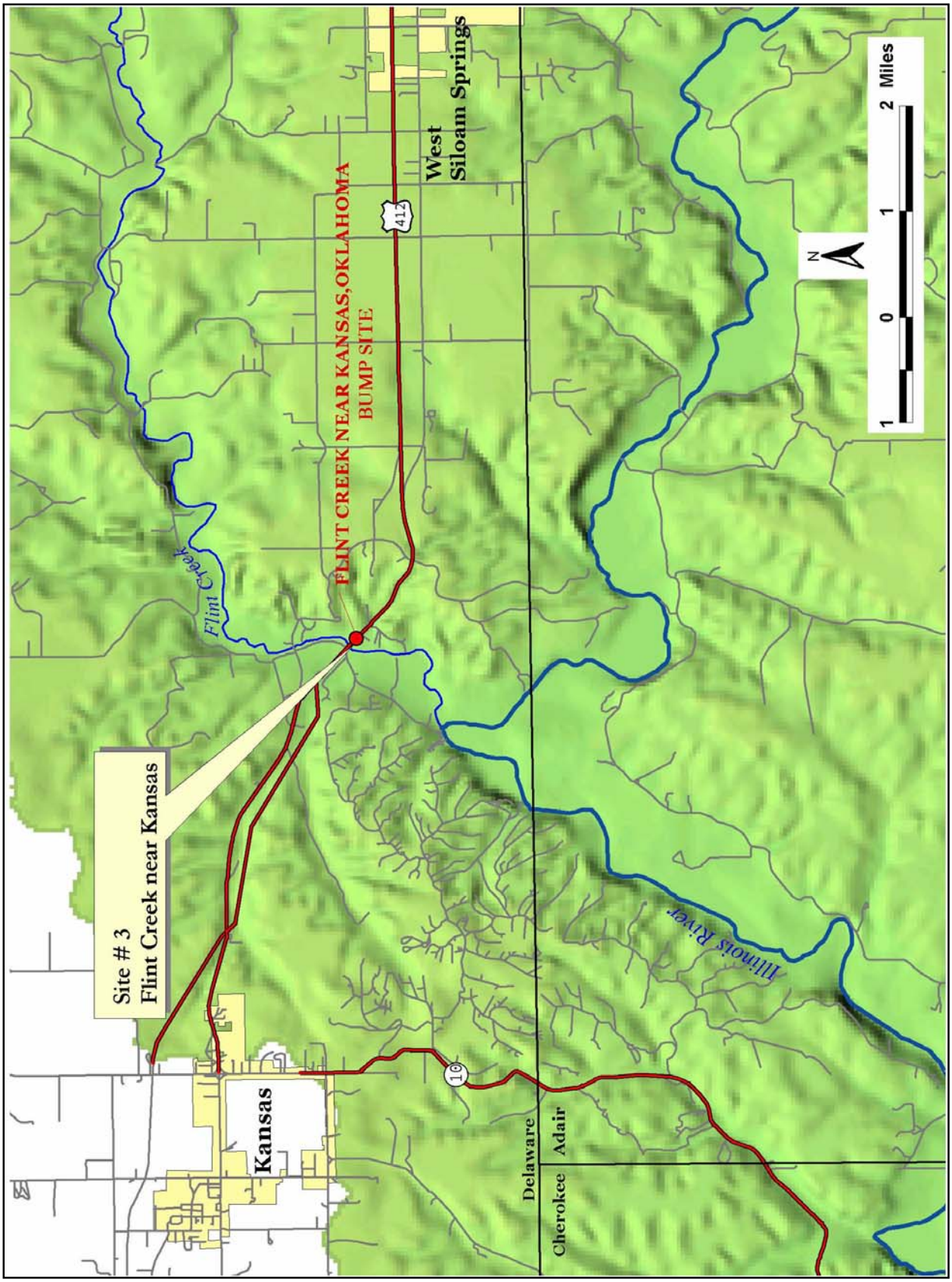


Simplified Trophic Pyramid
(also known as food chain or energy web)

gradually consume their species out of existence. This leaves an aquatic ecosystem without a stable, self-regulating biotic component.

Data gathered at the Flint Creek (Kansas) BUMP station indicate that this stream segment does not support the Primary Body Contact—Recreation beneficial use assigned in the Water Quality Standards, again due to excess levels of enterococci. Elevated concentration samples of total dissolved solids were not numerous enough to preclude irrigation uses. This stream segment is listed as impaired on Oklahoma's 303(d) list of waters.




Site # 3
Flint Creek near Kansas
Kansas
Flint Creek
FLINT CREEK NEAR KANSAS,OKLAHOMA
BUMP SITE
412
West
Siloam Springs
10
Delaware
Adair
Cherokee
Illinois River
N
1
0
1
2 Miles

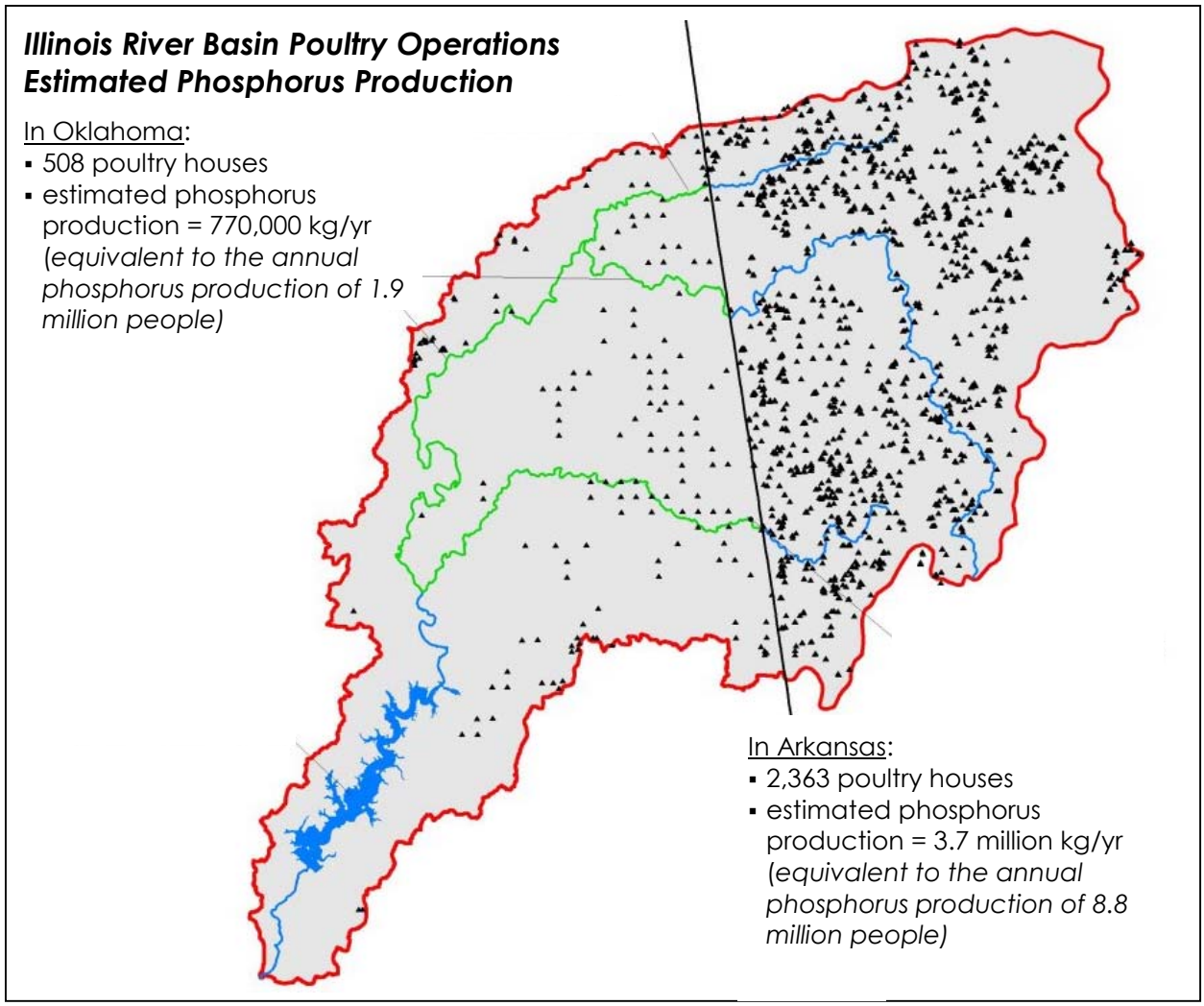
Site 4 -- Illinois River at the Emerson Poultry Facility

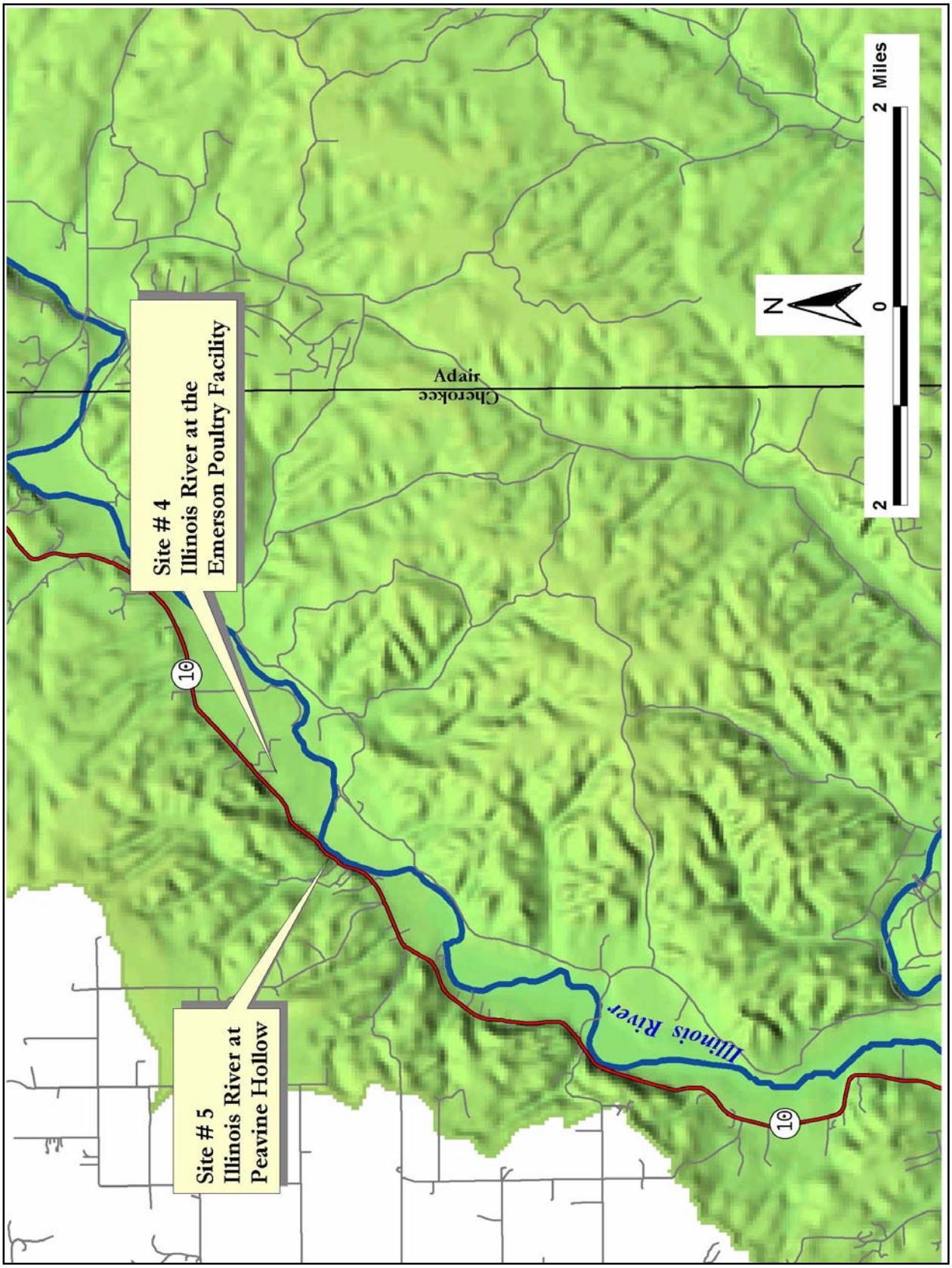
This poultry operation is owned by Larry Emerson, a contract turkey grower for Willowbrook Farms. Mr. Emerson's facility includes six houses, including three near the Illinois River. The three river area houses include one brood house, where chicks are kept for approximately seven weeks, and two range houses, where they are transferred for an additional 12 to 13 weeks. Every 13 weeks, Mr. Emerson procures approximately 8,000 chicks. He experiences a success rate of as much as 93 percent. Hens obtain an average body weight of 22 to 24 pounds; toms average about 40 pounds.

Emerson Farms generates approximately 120 tons of litter, which is transferred outside the basin. Because his soil, in some areas, contains as much as 400 pounds of phosphorus per acre, Mr. Emerson is precluded from applying the litter/fertilizer to the land. He sells the litter for $40 per truckload (five to seven tons per load) and makes $2,500 to $3,000 per year from litter sales.

Mr. Emerson began part-time farming with his father in 1965 while attending college at Northeastern Oklahoma State College, where he graduated in 1970. Prior to operating a full-time poultry farm in 1973, Mr. Emerson taught drafting at a high school in Port Arthur, Texas.

Individuals who have recently visited a poultry operation must be properly decontaminated to prevent possible transmission of various poultry diseases.




Site # 4
Illinois River at the
Emerson Poultry Facility
Site # 5
Illinois River at
Peavine Hollow
Cherokee
Adair
Illinois River
10
10
N
2
0
2 Miles

Site 5 -- Illinois River at Peavine Hollow

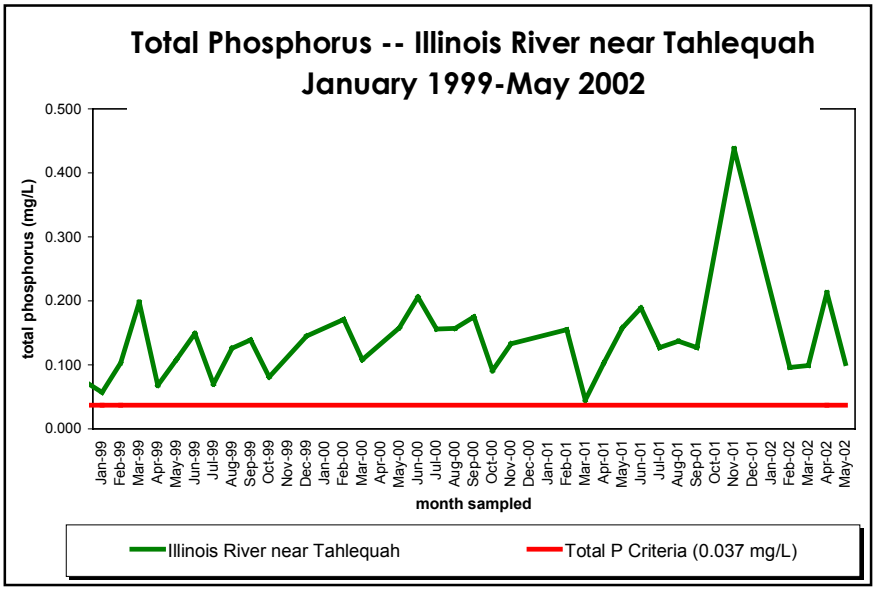
Peavine Hollow is a public access point and popular canoe rental location on the Illinois River. Recreation is a major benefit provided by state waters, especially Oklahoma's Scenic Rivers. It is estimated that some 350,000 visitors visit the Illinois River each year; more than one-half of these visitors float the river, infusing an estimated $9 million/year directly into the region's economy. Numerous additional benefits are provided by Lake Tenkiller.

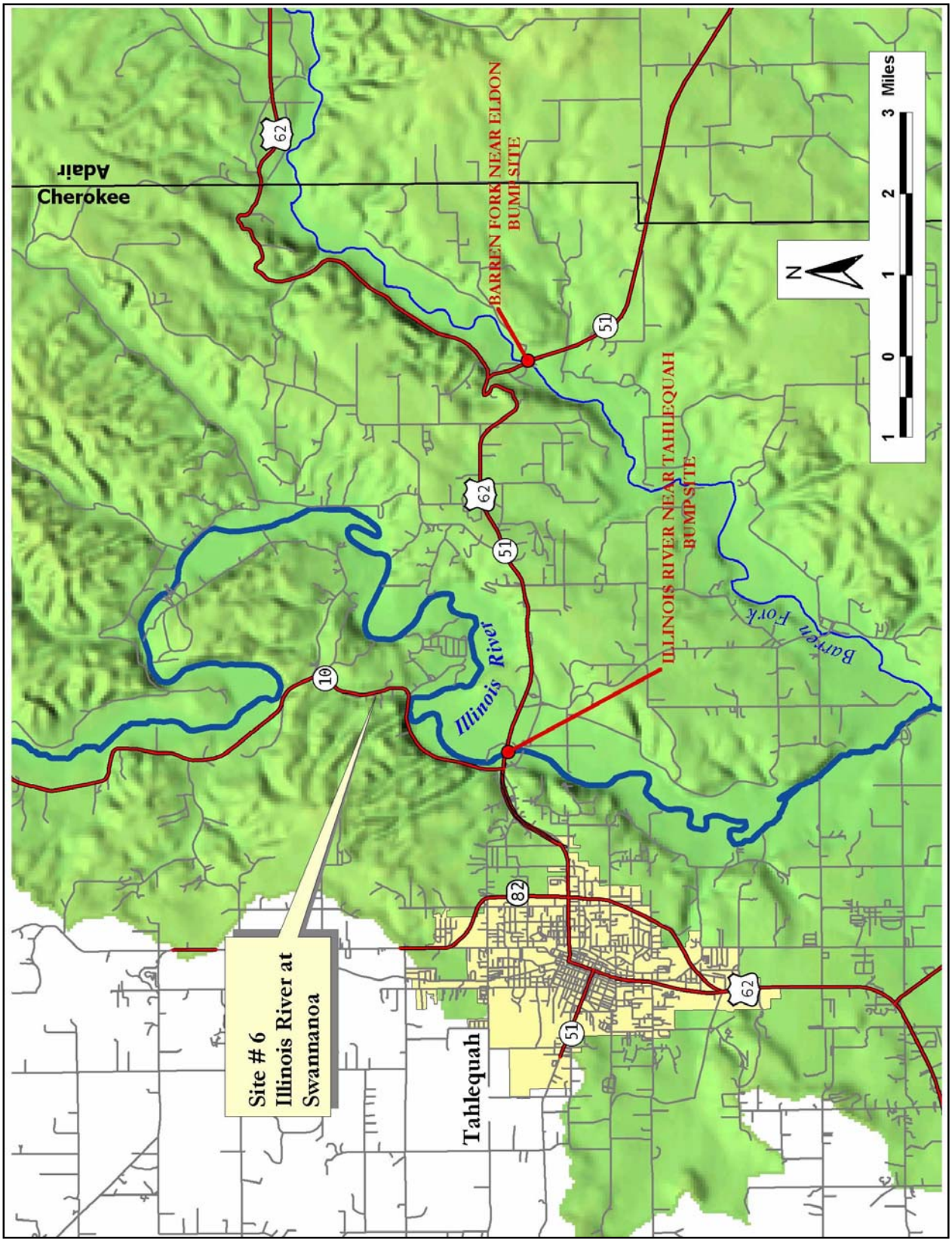
Site 6 -- Illinois River at Swannanoa

In 1974, Swannanoa was the location for the filming of the motion picture "Where the Red Fern Grows," from the novel by Wilson Rawls. Several structures on the property were constructed by the film crew. The private ranch/residence is owned by Ed Fite, Director of the Oklahoma Scenic Rivers Commission.

At this site, you will observe several examples of best management practices (BMPs)—i.e., land use and operational strategies aimed at controlling sources of nonpoint pollution in the Illinois River watershed. Implementation of BMPs is one of the most effective ways to reduce and control the loading of nutrients, including phosphorus, to waterbodies. In Oklahoma, the Oklahoma Conservation Commission and associated state conservation districts work with landowners, businesses, and municipalities to apply these techniques, including stream bank stabilization, establishment of riparian buffer zones, crop/cattle rotation, adjustment/reduction of fertilizer application rates, and other appropriate actions.

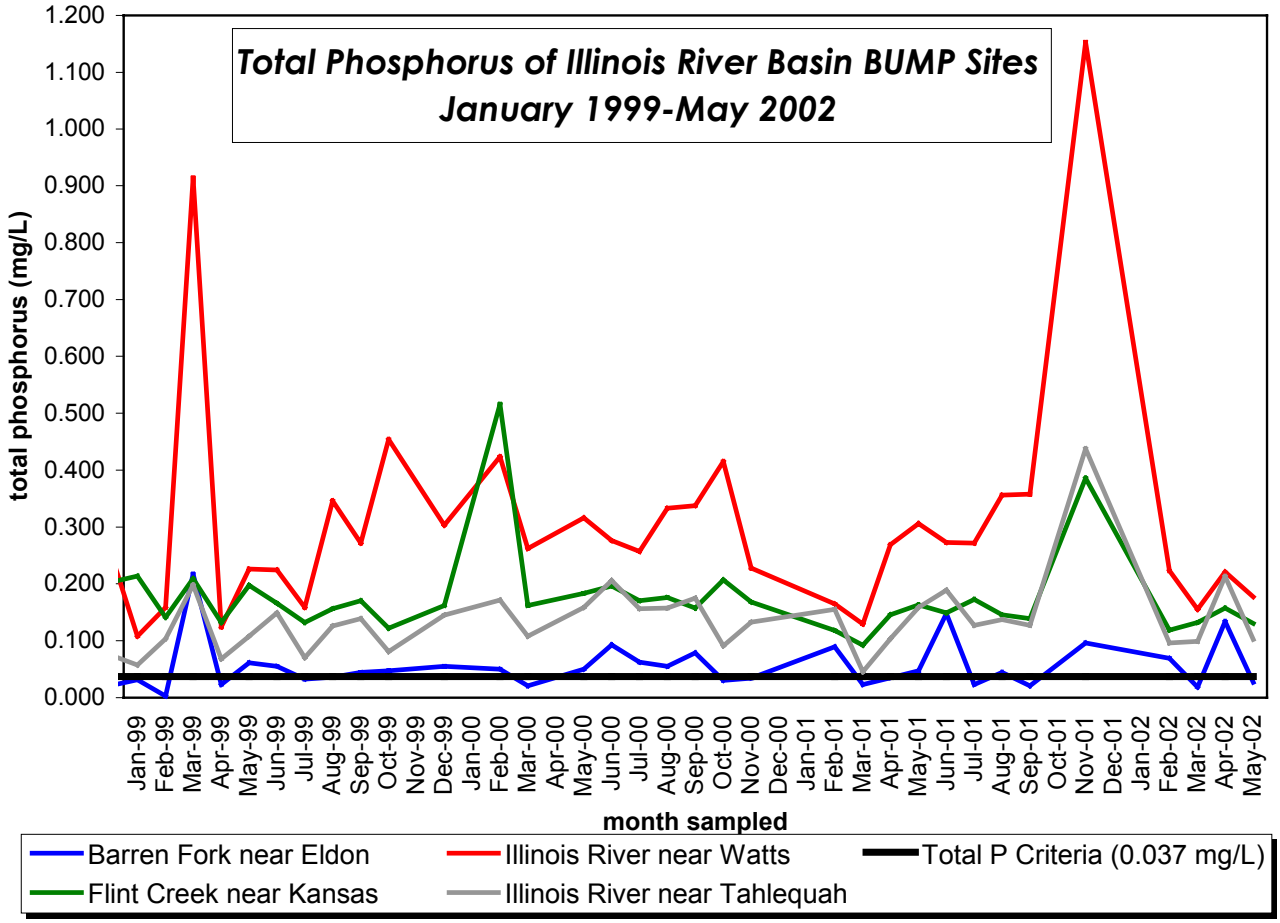
Data gathered at the Illinois River (near Tahlequah) BUMP station indicate that this stream segment does not support the Primary Body Contact—Recreation beneficial use assigned in the Water Quality Standards, again due to excess levels of enterococci. Relatively high levels of total dissolved solids do not generally limit the Agriculture—Class 1 Irrigation beneficial use. This stream segment is listed as impaired by nutrients on Oklahoma's 303(d) list.




Site # 6
Illinois River at
Swannanoa
Tahlequah
Cherokee
Adair
Illinois River
Barren Fork
BARREN FORK NEAR ELDON
BUMPSITE
ILLINOIS RIVER NEAR TAHLEQUAH
BUMPSITE
N
1 0 1 2 3 Miles
10
51
62
82

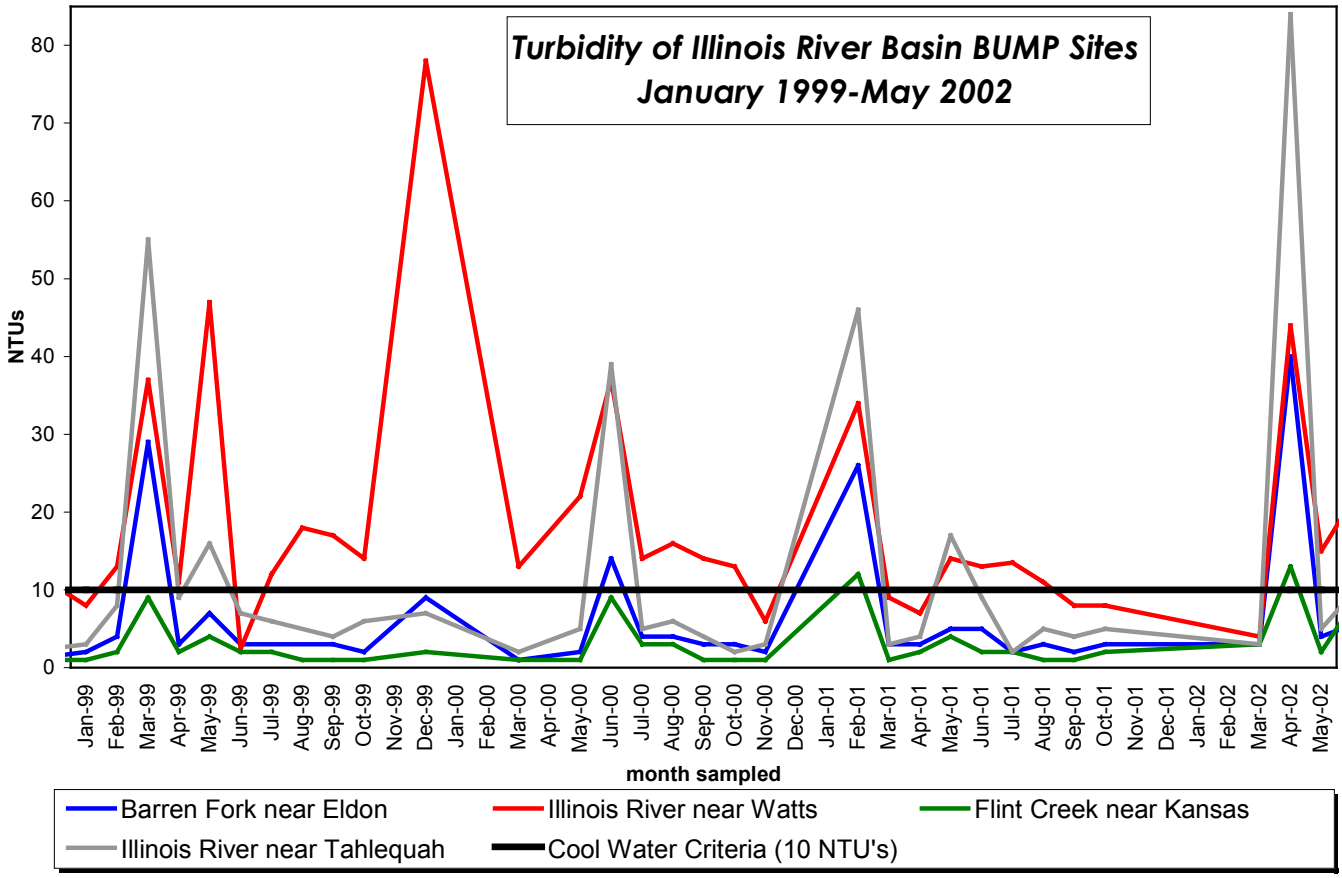
Comparison of 1999-2002 BUMP Permanent Station Data
Illinois River Basin
Phosphorus

Total Phosphorus				
Statistic	**Barren Fork near Eldon**	**Flint Creek near Kansas**	**Illinois River near Tahlequah**	**Illinois River near Watts**
Geo. Mean	0.042	0.166	0.126	0.272
Max. Value	0.217	0.516	0.438	1.153
75th percentile	0.062	0.181	0.158	0.344
Median	0.046	0.162	0.130	0.272
25th percentile	0.028	0.140	0.100	0.222
Min. Value	0.003	0.092	0.045	0.108



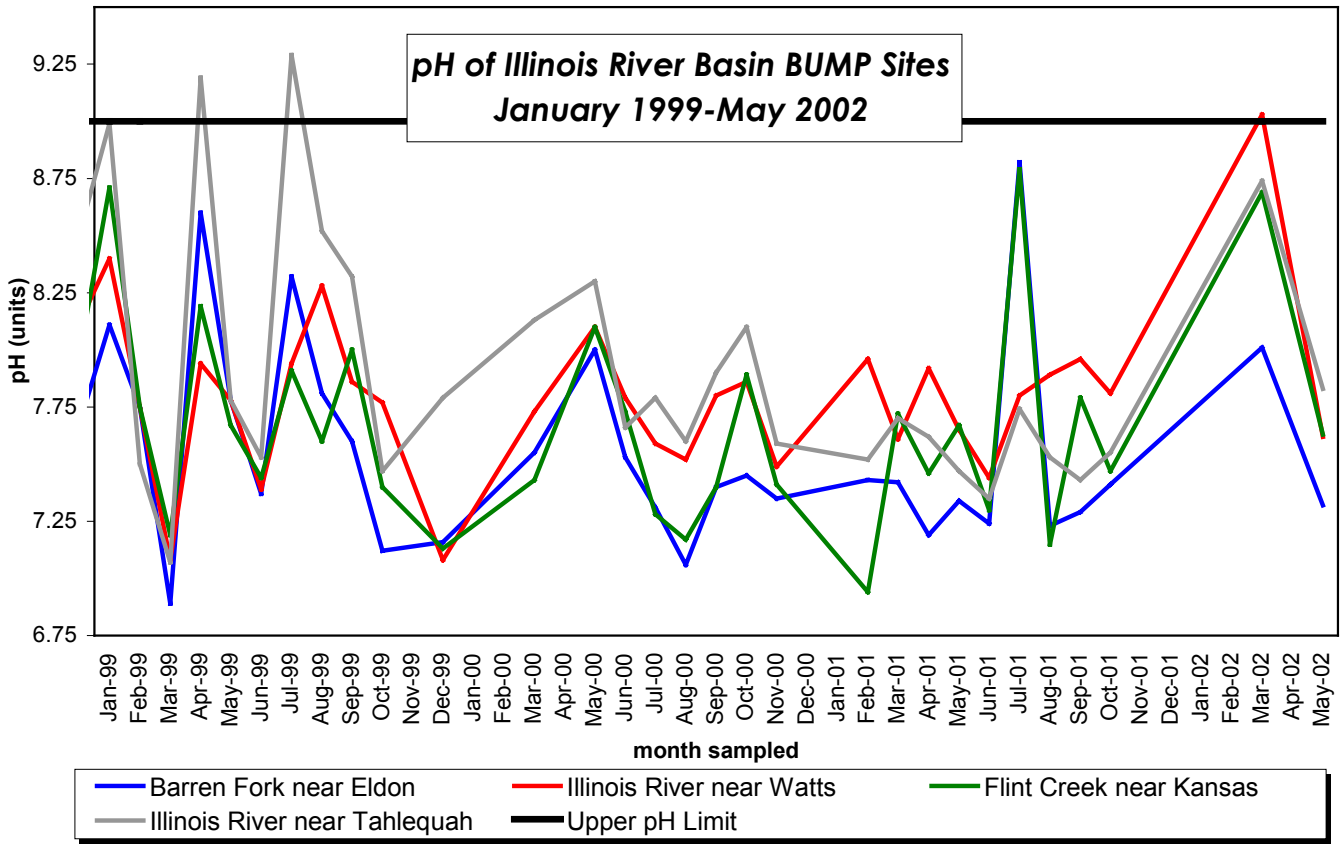
Comparison of 1999-2002 BUMP Permanent Station Data
Illinois River Basin
Turbidity

Turbidity				
Statistic	**Barren Fork near Eldon**	**Flint Creek near Kansas**	**Illinois River near Tahlequah**	**Illinois River near Watts**
Geo. Mean	3.9	2.1	6.6	14.4
Max. Value	40	14	84	78
75th percentile	5	3	9	18
Median	3	2	5	14
25th percentile	3	1	4	11
Min. Value	1	1	2	2



Comparison of 1999-2002 BUMP Permanent Station Data
Illinois River Basin
pH

pH				
Statistic	**Barren Fork near Eldon**	**Flint Creek near Kansas**	**Illinois River near Tahlequah**	**Illinois River near Watts**
Geo. Mean	7.54	7.64	7.89	7.79
Max. Value	8.82	8.79	9.29	9.03
75th percentile	7.77	7.84	8.12	7.93
Median	7.41	7.60	7.74	7.80
25th percentile	7.27	7.35	7.53	7.62
Min. Value	6.89	6.94	7.07	7.08



APPENDIX

FACT SHEET
Beneficial Use Monitoring Program (BUMP)

Program Goal:
Document beneficial use impairments, identify impairment sources where possible, detect water quality trends, provide information for the Water Quality Standards and facilitate the prioritization of pollution control activities.

Program Facts:
- Statutorily assigned to OWRB in 1998; sampling began in October of that year.
- Monitors 99 rivers and streams statewide at fixed locations on a monthly basis for a variety of chemical, physical, and biological parameters (coordinates with United States Geological Survey (USGS) to collect flow information).
- Five stations are located on scenic rivers including the Illinois River near Watts, Illinois River near Tahlequah, Barren Fork River near Eldon, Flint Creek near Kansas, and the Mountain Fork River near Smithville.
- Approximately 40 additional stream sites are monitored monthly. Monitoring sites are reprioritized annually in cooperation with sister agencies and new sites selected for sampling.
- Fifty eight (58) lakes are sampled quarterly on alternating years such that a total of one hundred sixteen (116) lakes are monitored by the Oklahoma Water Resources Board (OWRB) including Lake Tenkiller.
- Places priority for rotational stream sampling on waters listed on Oklahoma's 303(d) list.
- Annual Program Final Report(s) are available in hard copy or on the OWRB website at www.owrb.state.ok.us.

Benefits:
- Since program inception in 1998, the OWRB has evaluated and assessed 4,500 stream miles and 572,954 lake surface acres.
- BUMP sampling has provided the data necessary to make numerous water quality decisions related to the states 303(d) list of beneficial use impaired waters. Waters listed on the 303(d) have impaired beneficial uses (or will have impaired beneficial uses within two years of listing) and the Clean Water Act requires a Total Maximum Daily Load (TMDL) study be conducted to restore impaired uses.
- It fulfills the Clean Water Act/Environmental Protection Agency mandated assessment monitoring for the 305(b) Report to Congress on the water quality status of our state waters.
- It fulfills the Clean Water Act/Environmental Protection Agency mandated assessment monitoring for the 314 Lake Water Quality Assessment Report to Congress.
- The BUMP has recommended that approximately 49 waters be added to the 303(d) list, approximately 27 waters be retained on the list, and that roughly 112 waters be removed from the list.
- Point source and Non-point source control Best Management Practices (BMPs) may be prioritized to restore uses in threatened or impaired waters.

- Provides data necessary to refine Oklahoma's Water Quality Standards (OWQS), assists in the development of numerical criteria (e.g., the scenic river 0.037 mg/L total phosphorus criterion) and provides insights into the development of beneficial use assignments.
- Provides a monitoring network foundation to detect water quality trends, allowing proactive water quality management to occur.
- Provides data and feedback vital to the development and implementation of Use Support Assessment Protocols (USAP) for our waters.
- Allows water quality decisions to be made based upon current "real world" data.

PROFESSIONAL BACKGROUND
Oklahoma Water Resources Board Staff

Derek R. Smithee is Chief of the Water Quality Programs Division for the Oklahoma Water Resources Board. In that capacity he oversees the Division responsible for the promulgation of Oklahoma's Water Quality Standards and Standards Implementation rules, all lake's work including diagnostic and feasibility studies and restorations, and much of Oklahoma's surface and groundwater monitoring programs. Specific widely recognized programs include the Beneficial Use Monitoring Program (BUMP), the Oklahoma Water Watch Volunteer Monitoring Program, Use Support Assessment Protocol Rules and the WQS Implementation Advisory Council established to assure that WQS Implementation Rules of other environmental agencies are compliant with state law.

He has served on numerous state and federal workgroups, including currently serving on the National USDA/EPA Nutrient Criteria Advisory Committee, EPA's National Large Rivers Workgroup, Bacteria/Recreation Workgroup, and others. He was instrumental in the development of numerous state and federal regulations including the WQS Implementation Rules, Antidegradation requirements, numerical aquatic life criteria and human health criteria, and Use Support Assessment Protocols. He also serves on Oklahoma's Water Quality Monitoring Council, 303(d)/305(b) workgroup, the ODEQ's Water Rules Committee, the ODA's CAFO Rules Committee, as well as chairing the WQS Implementation Advisory Committee.

Mr. Smithee received his B.S. from Oklahoma State University in Zoology in 1983 while playing football for Jimmy Johnson and working at the Cooperative Fish and Wildlife Research Unit. He received his M.S. from the University of Oklahoma in 1987 in Environmental Science. He began work for the Oklahoma State Department of Health in 1984, transferred to the OWRB in 1987 as WQS Coordinator and has been Water Quality Programs Division Chief since 1995.

Bill Cauthron works for the Oklahoma Water Resources Board where he serves as the Water Quality Monitoring Program Coordinator in the agencies Water Quality Division. He oversees the operation of the Oklahoma Beneficial Use Monitoring Program (BUMP), which is designed to assess the support status of Oklahoma's numerous lakes and streams. He is involved with development of the state's Use Support Assessment Protocols (USAP), which outlines standardized data requirements and decision criteria to be used when assessing if waters are meting their assigned beneficial uses. He also oversees the agency volunteer monitoring program "Oklahoma Water Watch" and groundwater monitoring initiative. He received his B.S. in Biology from East Central University and his MPH in Environmental Health from the University of Oklahoma Health Sciences Center

Monty Porter is the Streams and Rivers Monitoring Coordinator at the Oklahoma Water Resources Board, where he has been employed since December 1997. He is responsible for writing the streams and rivers portion of the BUMP report, and he serves on several informal technical committees such as USAP, 303(d) listing procedure, and the CPP committees. He has presented at several national and local conferences. He earned his B.S. in Biology from University of Central Oklahoma in Edmond, and anticipates completing his M.S. in Biology this fall.

Jeff Everett works in the Beneficial Use Monitoring Program Streams Section at the Oklahoma Water Resources Board, where he coordinates trips and is responsible for coordination of flow monitoring with USGS. He has worked at the OWRB for three years and was previously employed with the Oklahoma Department of Agriculture for five years. He earned his B.S. in Biology from Southwestern Oklahoma State University in Weatherford.

Phillip Moershel heads the Water Quality Standards Section of the Oklahoma Water Resources Board. He received a B.A. in biology in 1978 from Iowa State University and then served as a Peace Corps volunteer promoting aquaculture in Tanzania. After the Peace Corps and graduate courses at the University of Oklahoma, he acquired a small fish farm where he raised bass, grass carp and catfish fingerlings for stocking in central Oklahoma form 1983 through 1990. Phil started with OWRB in 1990 by assessing beneficial uses for 130 streams over four years and incorporating those streams into the Oklahoma Water Quality Standards. For eight years until returning to the standards program, he served as the senior "Technical Writer" for the Oklahoma 319(h) nonpoint source pollution control program supervising preparation of annual budgets, workplans, Watershed Restoration Action Strategies, QAPPs and project reports.

Chuck Potts works in the Water Quality Standards division of the Oklahoma Water Resources Board, where he has been employed for six years. He is currently responsible for directing development of biocriteria and water quality standards for wetlands. He is the co-author of two peer-reviewed publications, with one more in draft. He earned his B.S. in Biology from the State University of New York at Old Westbury. He has done graduate work at the University of Central Oklahoma majoring in Biology, with thesis study involving the invertebrate community composition of a southeastern Oklahoma bog.

Katera Whitaker is about to complete her two year Carl Albert Executive Fellowship at the Oklahoma Water Resources Board, after which she will be hired on as a regular full-time employee in the Water Quality Standards section. She is currently responsible for coordinating interagency committees on groundwater quality standards, water quality standards implementation plans, and development of sediment impairment assessment protocols. She also helps coordinate the Water Quality Standards revision process and is responsible for updating the standards revision web page. She earned her B.S. in Biology from Oklahoma State University in Stillwater, and is anticipating completion of her M.S. in Environmental Science from Oklahoma State this fall. Her thesis work was done for an EPA/NSF study on the Illinois River Basin.