Developing nutrient criteria and classification schemes for wadeable streams in the conterminous US

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Abstract

We analyzed nutrient data from a probability survey of 1392 wadeable streams across the 48 conterminous states of the US and from intensified survey data in 921 streams in the Pacific Northwest (PNW) to examine different methods of setting nutrient criteria and to develop a nutrient stream typology. We calculated potential nutrient criteria for total P (TP) and total N (TN) by 3 methods (ecoregion population 25th percentile of population, least-disturbed reference-site 75th percentile, and disturbance modeling) and compared them with existing draft US Environmental Protection Agency (EPA) criteria within 14 national nutrient ecoregions. All criteria derived from the methods were highly correlated; however, absolute values within ecoregions differed greatly among approaches. Population 25th percentiles of TP were almost always lower from statistically designed survey data than from found data. TN percentiles were more similar than were TP profiles, but they still tended to be lower from survey data than from found data. TP and TN population 25th percentiles were lower (often by a factor of 2–6) than reference-site 75th percentiles in all ecoregions. This result indicates that population 25th percentiles cannot be used as surrogates for reference-site 75th percentiles. Thirty-nine percent of the assessed national stream length exceeded TP criteria and 47% exceeded TN criteria when compared to nutrient criteria based on EPA Wadeable Stream Assessment reference-site 75th percentiles. In the PNW data set, all disturbance regression model estimates of background nutrient concentrations were lower than reference-site 75th percentiles. Regression tree analysis based on PNW reference sites used runoff, elevation, acid neutralizing capacity, forest composition, substrate size, and Omernik level III ecoregion as environmental class predictors to explain 46 to 48% of the total deviance in nutrient concentration. Reference-site nutrient concentrations varied widely among Omernik level III ecoregions in nutrient ecoregion II. Our analysis and the literature strongly suggest that 14 national nutrient ecoregions are too coarse to account for natural variation in stream nutrient concentrations. Setting appropriate national nutrient criteria will require finer-scale typology or classification of sites that better controls for natural variation.

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