

## **Appendix A: Recommendations for Improving Future Nutrient Loss Assessments**

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Improved estimation of nitrate and TP losses at the HUC8 scale seems to be hampered by 1) relatively low frequency of concentration observations, especially for phosphorus at high flows, 2) lack of concentration and/or flow data for some HUC8s, 3) mismatches between HUC8 areas and monitored drainage areas for some HUC8s, and 4) mismatches between the locations of USGS flow monitoring and Illinois EPA concentration sampling for a few HUC8s.

A potential response to the second and third issue would be to expand concentration and flow data collection at more locations closer to HUC8 outlets. While such an expansion would provide a more complete picture of nutrient losses at the HUC8 scale in the future, the lack of historical data at new monitoring locations would not allow the assessment of changes since the baseline period.

An additional strategy for improving and spatially expanding nutrient loss estimates would be to make greater use of geographic information systems to identify and quantify relationships between nutrient loads in monitored drainage areas to land use, soils, and other watershed characteristics; then use these relationships to estimate nutrient loads from unmonitored areas. Watershed models such as SWAT and SPARROW may be useful in this regard. Accurate implementation of this approach will require some improvements in the accuracy of point source discharges and outfall locations.

Riverine concentration and flow data from the 1980s and 1990s at specific locations are highly valuable for assessing changes in nutrient losses over time. Significantly changing monitoring station locations would compromise our ability to quantify changes over time. Increasing the frequency of sampling at existing monitoring locations would seem to produce greater value quicker, and at lower cost, than relocating or expanding the number of monitoring locations.

Load estimates are most reliable when concentration and flow are measured at the same river location. Expanding or relocating sampling to coincide with USGS flow monitoring would likely be beneficial for estimating loads for the South Fork of the Sangamon River, the Illinois River at Kingston Mines, and Bay Creek at Pittsfield.



Exclusive focus on HUC8s may obscure conservation priorities and opportunities at smaller scales. For instance, nitrate-N yields for Big Bureau Creek, Spring Creek, and the Embarras River at Camargo are among the highest in the state, but they are located in HUC8s with relatively low yields. Small watersheds with high quality flow and nutrient concentration data may provide better opportunities to demonstrate actual nutrient loss reductions resulting from management practice changes than larger HUC8s where load estimation requires extrapolation from monitoring data and additional assumptions.

At the Ambient Water Quality Monitoring Network locations, Illinois EPA collects water samples approximately nine times per year. Higher frequency sampling, especially at high flows, would reduce uncertainties in riverine load estimations. To improve future river load assessments, perhaps concentration data from additional organizations (e.g., federal, state, local, and/or non-governmental organization) with adequate sampling and laboratory capabilities and that conform to standard quality assurance and control procedures, might also be included. The capability to collect samples at high flow at USGS flow monitoring locations would be particularly valuable.

