IOWA'S WATER
Ambient Monitoring Program

River and Stream Health in Iowa

The Iowa Department of Natural Resources' (IDNR) *Iowa Water Monitoring Plan 2000* identified Iowa's rivers and streams as the highest priority for the ambient monitoring program. Iowa has over 70,000 miles of rivers including more than 26,000 miles of perennial streams. These waters are vital for a variety of uses including drinking, recreation, commercial, and wastewater disposal as well as for biological habitat.

In spite of our rivers' importance, routine water-quality monitoring has not been a state priority in the past. Some important historic data sets are available, but statewide historic data is generally lacking as a baseline from which to interpret water quality data.

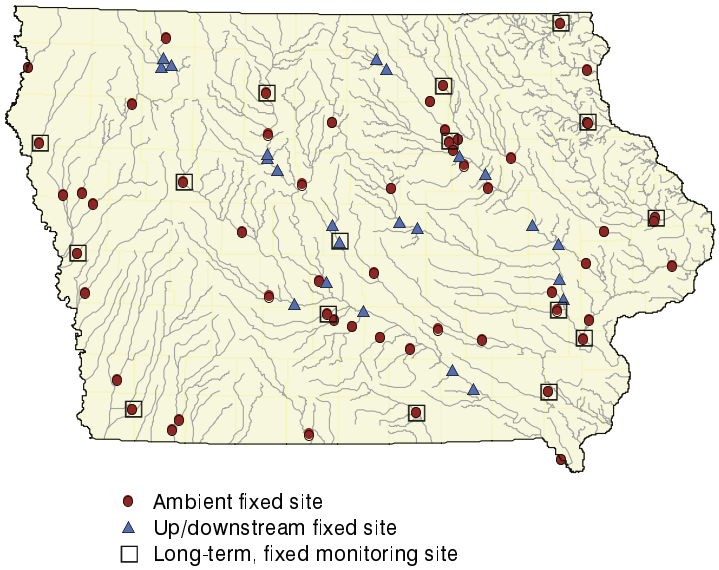

Figure 1. *Location of 79 monitoring sites in IDNR/UHL interior stream network in 2001.*

IDNR's statewide ambient monitoring program began in 1986 with a network of 60 river sites. Lack of funding restricted the network to 16 "fixed" sites (monitored monthly), while the other 44 sites were rotated into the network and sampled on a quarterly basis. All funding for the historic network was derived from the U.S. Environmental Protection Agency; the State of Iowa did not contribute any money toward the early monitoring program. Things changed in 1999 when various groups approached the Governor and Legislature and asked them to increase Iowa's water-quality monitoring program. They responded by appropriating significant funds and the monitoring of Iowa's water resources is being enhanced incrementally as money becomes available.

Chemical/Physical Monitoring. In the year 2001, Iowa rivers are monitored monthly for 94 physical, chemical and bacterial parameters at 79 sites through a contract with the University Hygienic Laboratory (UHL), which provides both data collection and laboratory

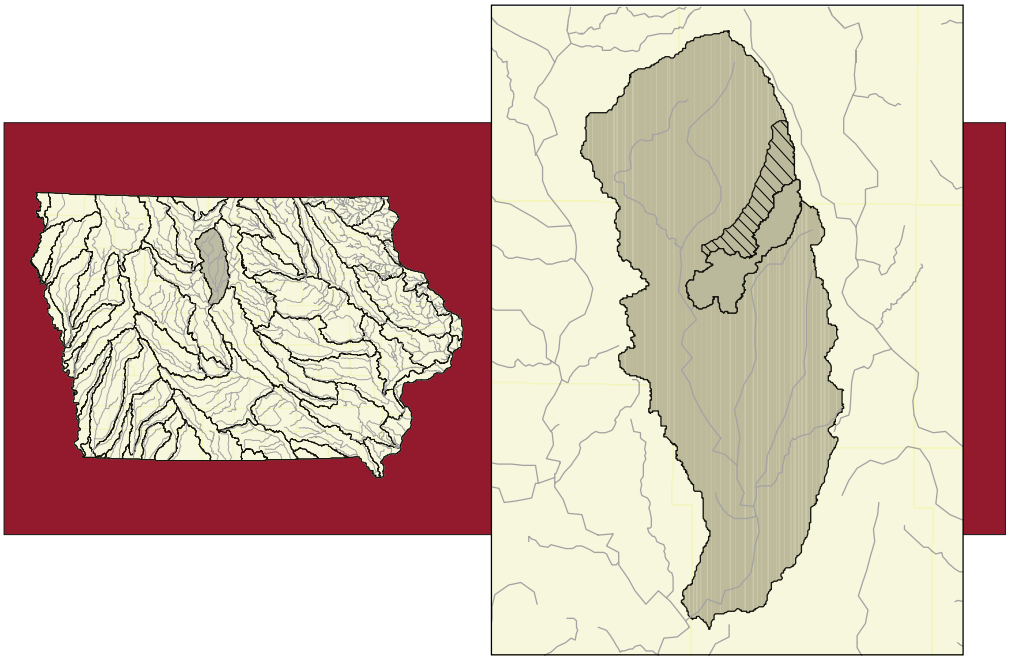

Figure 2. *Location of 56 eight-digit hydrologic units (HUC 8) in Iowa. The HUC 8 representing the Boone River Basin is highlighted (far left). Outlined within the Boone River is the HUC 10 known as Otter Creek (near left). The upper, hatched portion is the HUC 12 called West Otter Creek.*

services. Sixty-two of these sites are classified as ambient (background) sites. These sites are distributed throughout every major river basin in an effort to provide good geographic coverage of the state. The current network is primarily focused on larger watersheds or HUC 8 basins (8-digit Hydrologic Unit Code). As the program grows, more attention can be focused on smaller watersheds within the HUC 8 basins. Iowa's 56 HUC 8 watersheds can be subdivided into HUC 10 (10-digit HUCs) watersheds and further subdivided into HUC 12 (12-digit HUCs), see Figure 2. Monitoring these smaller "subwatersheds" is key to understanding how changes on the landscape affect our overall stream quality.

Twenty-three of the 79 sites are associated with 10 major cities, located both upstream and downstream from the cities. These are monitored monthly and provide a measure of the influence our urban areas have on water quality.

This framework is augmented substantially by water-quality monitoring conducted by the U.S. Army Corps of Engineers, U.S. Geological Survey, and utilities such as the Des Moines Water Works and the Rathbun Rural Water Association.

Biological Monitoring. Aquatic organisms are increasingly being utilized to assess water quality. Because some of these organisms are tolerant to pollution while others are not, the presence and abundance of certain species indicates the level of contamination. Fish and invertebrate species, such as aquatic insects and mussels, are identified and counted. To date, 109 sites across Iowa have been studied as *reference sites*. They are visited on a rotating basis to establish trends and as a basis for comparison when evaluating *test sites*. About 40 test sites will be evaluated each year for potential impairment.

Citizen Monitoring. It is nearly impossible for professional staff to sample and test each of Iowa's streams and creeks. Citizen monitoring can provide information on Iowa's

streams, many of which would never be monitored in other way. IOWATER (Iowa's citizen monitoring program) has trained over 550 volunteers about water-quality issues and how to conduct simple water monitoring tests. These volunteers currently monitor more than 350 sites.

Objective Data and Context. The primary goals for the monitoring program include describing our current water quality and identifying changes or trends in water quality across the state. Each goal requires the collection of reliable, objective data. This data is the basis for making informed water resource policy decisions or day-to-day management decisions. Streams are dynamic systems and the water quality data must reflect the inherent variability. To make valid interpretations, both spatial and temporal context is important. Parameter values change from site to site, based on each watershed's unique hydrology, soils, geology and land use or management factors. Parameters also vary daily based on weather, and seasonally or annually based on climate. Variability makes trend assessment and interpretation difficult, but it is a necessary part of measuring trends or interpreting short-term water quality measurements obtained for local management decisions (such as Total Maximum Daily Load estimation).

For example, consider the monthly pattern in nitrate concentrations from Iowa's 16 long-term stations, 1987-1999 (Fig. 3a). Nitrate normally varies throughout the year with peak concentrations in June during spring rains and lows in September due to reduced flows

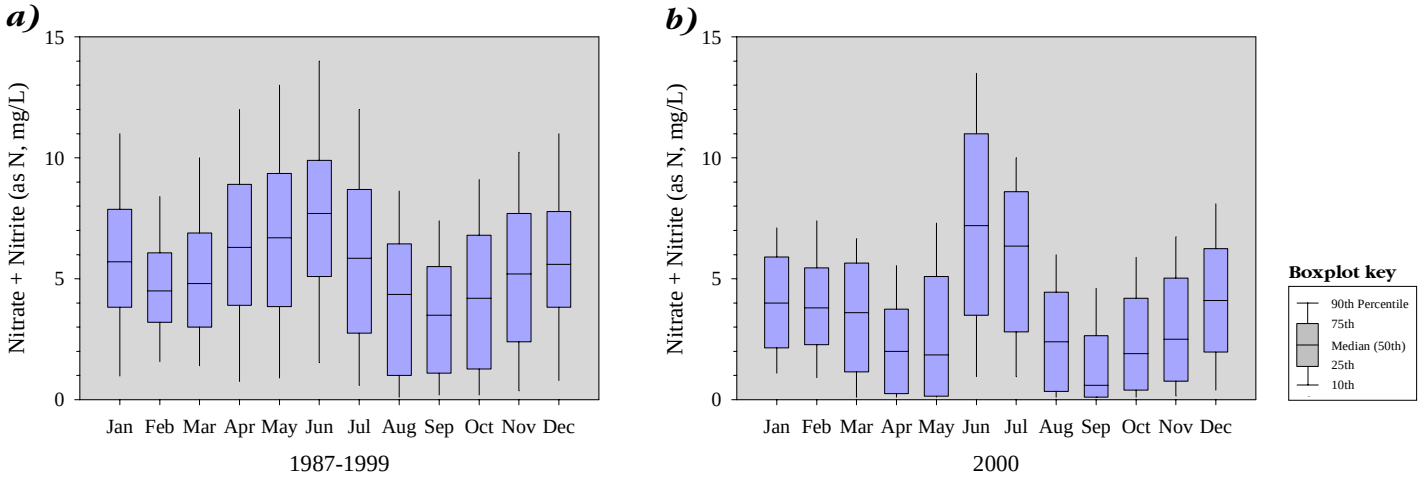

Figure 3. *Water quality parameters vary both during the year and from year to year. Based on 13 years of records statewide for 16 "fixed" sites* ***(a)****, nitrate peaks in June and is lowest in late winter and late summer. Data from the year 2000 for the larger network of sites follow the same general pattern* ***(b)****, but nitrate values are substantially lower, reflecting statewide drought conditions. Long-term ambient monitoring documents variability and provides a context for interpretation of short-term records.*

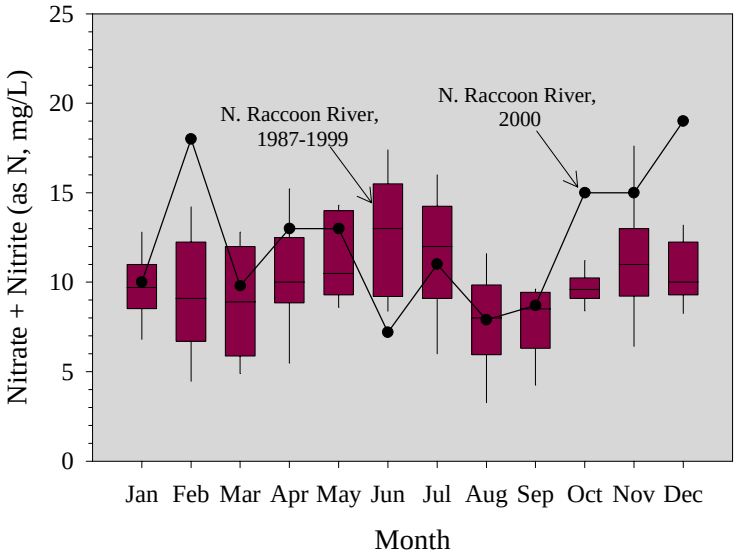

Figure 4. *Water quality varies at individual sites from year to year. Although statewide nitrate values were generally low in 2000, for this North Raccoon River site near Sac City, nitrate was highly variable, but tended to be very high relative to the past.*

and maximum in-stream biological processing. In 2000, the same overall pattern existed for the 60 ambient sites (Fig. 3b), but nitrate concentrations were generally lower, reflecting below normal rainfall. Interpretations of data collected in 2000 need to reflect this reality. Additionally, individual watersheds across the state will deviate from the general patterns. For example, data from the North Raccoon River near Sac City is shown in Figure 4. Nitrate concentrations for the year were generally higher than averages across the state and higher than historic averages for the site itself. Again, long-term monitoring provides an appropriate context to interpret local water quality.

Future Needs. Although many of the state's monitoring needs are being met, the ambient program needs to expand to include Iowa's most important contaminant: sediment. With additional funding, a network of stations should established in representative watersheds of different sizes across the state. The monitoring program will continue to adapt to meet new water-quality challenges and provide vital information to the state's citizens.

Acknowledgements

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