RIPARIAN BUFFER ZONES AFFECT THE QUALITY OF MIDWESTERN STREAMS AND RIVERS

Despite similar land use throughout the Corn Belt region of the Midwest, streams flowing through cropland differ considerably in their ecological characteristics, in part because of differences in riparian buffer zones *(see text boxes)*. This conclusion is based on an investigation of 70 streams and rivers within three NAWQA study units in the upper Midwest during August 1997 (fig. A; Sorenson and others, 1999). Specifically, increases in tree cover in buffer zones were associated with aquatic biological communities indicative of good stream quality, reduced nuisance algal growths, and maintenance of sufficient dissolved oxygen concentrations to support diverse communities of aquatic organisms. For example, the number of aquatic insects indicative of good stream quality tended to increase with increases in percentage of tree cover, especially in sites where streamflow and dissolved oxygen conditions were favorable. Fish communities, which were sampled at 24 sites in the Upper Mississippi River Basin, also indicated better overall conditions in streams with wooded riparian zones than those with more open canopy (Stauffer and others, 2000).

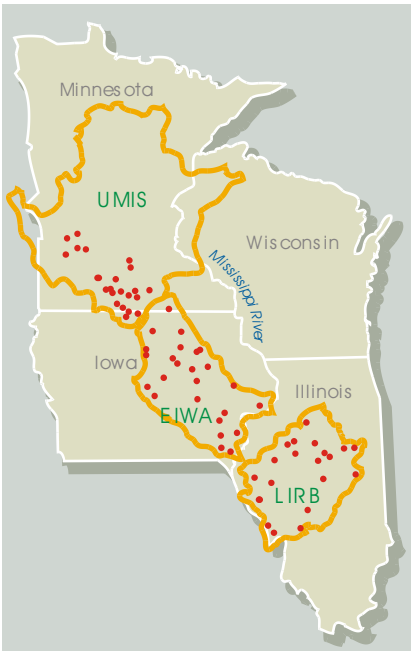

Figure A. *The affect of riparian buffer zones on the quality of 70 midwestern streams and rivers was evaluated in the Upper Mississippi River (UMIS), Eastern Iowa (EIWA), and Lower Illinois (LIRB) River basins.*

Streams with less tree cover, and thus less shading, contained relatively large growths of phytoplankton (algae suspended in the water) at levels considered indicative of eutrophication (Porter, 2000). Organic enrichment resulting from excessive algal production in some midwestern streams may reduce dissolved oxygen concentrations and be detrimental to other requirements of aquatic organisms.

Shading from tree cover in riparian buffer zones may influence nutrient concentrations indirectly by reducing the growth of phytoplankton. In streams where phytoplankton were abundant (often where buffer zones were thin or lacking), dissolved nitrate concentrations were significantly lower (fig. B; Porter, 2000). The lower nutrient concentrations may result from uptake by the abundant phytoplankton. Thus, assessments of eutrophication would benefit from consideration of biological communities and the riparian zone, rather than being based solely on nutrient concentrations in water.

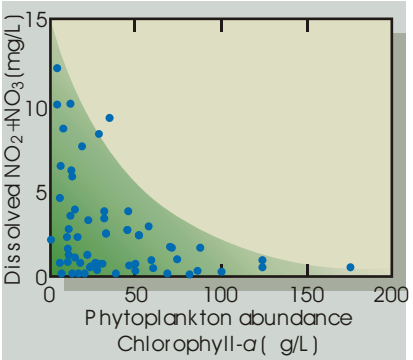

Figure B. *Dissolved nutrient concentrations decreased in eutrophic streams with excessive algal productivity. Rates of nutrient uptake by the algae can exceed rates at which nutrients are transported by streams during low-flow conditions.*

Digital images from USGS topographic maps were used to estimate the percentage of trees in a riparian buffer zone (a 100-meter width on each side of the stream) for 2- to 3-mile segments upstream from each sampling site, supplemented by vegetation surveys at the sampling site (Sorenson and others, 1999).

Resource agencies, including the U.S. Department of Agriculture, encourage maintenance of strips of trees or grass between cropland and streams as a best management practice. These "riparian buffer zones" are thought to intercept runoff of sediment and chemicals from fields, promote bank stability, and provide shading and habitat for aquatic life (Osborne and Kovacic, 1993). Riparian buffer zones need to be considered along with other important factors that affect chemical and biological indicators of stream quality, such as soil drainage properties and stream hydrology (Porter, 2000).

This figure taken from: **Stark, J.R., Hanson, P. E., Goldstein, R.M., Fallon, J.D., Fong, A.L., Lee, K.E., Kroening, S.E., and Andrews, W.J.,** 2001, Water quality in the Upper Mississippi River Basin, Minnesota and Wisconsin, South Dakota, Iowa, and North Dakota, 1995-98: U.S. Geological Survey Summary Circular 1211, 35 p.