EPA
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Agency

Nitrogen and Phosphorus Pollution in the Mississippi River Basin: Findings of the Wadeable Streams Assessment

Introduction

Beginning as a tiny outlet stream in northern Minnesota at Lake Itasca, the Mississippi River is the largest river in the United States and drains all or part of 31 states and more than 1,245,000 square miles of the country's heartland. The Mississippi River has played an important role in influencing America's economic and cultural development, and its watershed (i.e., the land area it drains) is considered the most productive agricultural land in the country. Today, however, the watershed of the Mississippi River suffers from the effects of excess inputs of nitrogen and phosphorus, often referred to as "nutrient pollution." Many studies have linked this pollution to the contamination of drinking water, surface water, and ground water throughout the Mississippi River watershed and to the growth of the hypoxic (oxygen-poor) zone in the northern Gulf of Mexico.

Sixty percent of North American birds use the Mississippi River as their migratory flyway. (Photo: U.S. Fish and Wildlife Service)

The Wadeable Streams Assessment

In 2005, the U.S. Environmental Protection Agency (EPA) began a new program to assess the condition of the nation's water resources. Partnering with the states, tribes and other agencies, EPA launched the National Aquatic Resource Surveys (NARS). The goals of the surveys are to quantify the health of the nation's waters based on a set of physiochemical and biological indicators, and to identify the relative importance of key stressors, including nitrogen and phosphorus. Each survey uses standardized field and lab methods and is designed to produce unbiased estimates of the condition of the whole water resource being studied (i.e., rivers and streams, lakes and reservoirs, wetlands, or coastal waters).

The Wadeable Streams Assessment (WSA), released in 2006, was the first such survey of the condition of the nation's small streams. The assessment shows that 30 percent of streams across the country have high levels of nitrogen or phosphorus and that these streams are twice as likely to have poor biological condition as those with lower levels of nutrients. ("Biological condition" is a comprehensive indicator of the health of a water body). In addition, the findings of the assessment illustrate that while the problem is widespread, sites with the highest concentrations of nitrogen occur in the Upper Mississippi sub-basin (Figure 1 and Table 1).

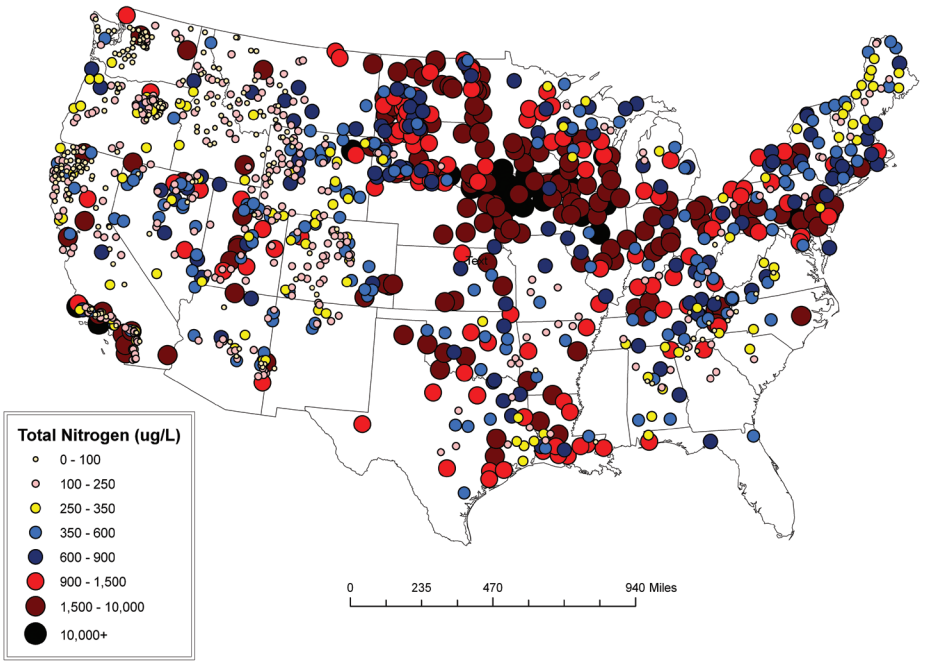

Figure 1. Total nitrogen concentrations (Source: WSA)

Findings for the Mississippi River Basin

EPA developed "thresholds" to compare nitrogen and phosphorus levels for the WSA. These thresholds are regionally specific and based on nutrient concentrations found in a collection of reference sites within that region. A reference site is a water body that is "least disturbed," meaning that it is as close to natural conditions as can be found in that region.

Nationally, assessment results show that 32 percent of streams have high levels of nitrogen and 31 percent of streams have high levels of phosphorus. By comparison, in the Mississippi River Basin, 39 percent of streams have high levels of nitrogen and 32 percent of streams have high levels of phosphorus. Findings for nitrogen and phosphorus in the Mississippi River Basin are presented below (Table 1), but a few key messages are:

- In general, high levels of nitrogen affect more streams than high phosphorus levels, except in the Upper Missouri, the Arkansas and Lower Mississippi sub-basins
- In the Upper Mississippi sub-basin, where 61 percent of the land area is used for agricultural production, 50 percent of streams have high levels of nitrogen (Figure 2).
- The Ohio sub-basin has the highest percentage of streams affected by nutrients in the Mississippi River basin (55 percent of stream miles affected by nitrogen, and 43 percent affected by phosphorus).

The results of the assessment provide insight into the problem of nitrogen and phosphorus pollution in the Mississippi River Basin. Future river and stream surveys conducted by EPA and its partners will continue to provide crucial, consistent and comparable information to allow water quality managers and others to track the health of these important water resources.

Table 1. Percent of wadeable streams with high levels of nutrients (Source: WSA)

	Phosphorus	Nitrogen
Total U.S. (lower 48)	30.9%	31.8%
Total MS River Basin	32.5%	39.5%
Upper Mississippi	23.4%	50.4%
Ohio	43.2%	54.6%
Tennessee*	18.1%	36.3%
Upper Missouri	22.4%	18.6%
Lower Missouri	27.7%	34.9%
Arkansas	41.2%	25.9%
Lower Mississippi*	38.6%	1.6%

* *Small sample sizes in these sub-basins result in lower statistical significance*

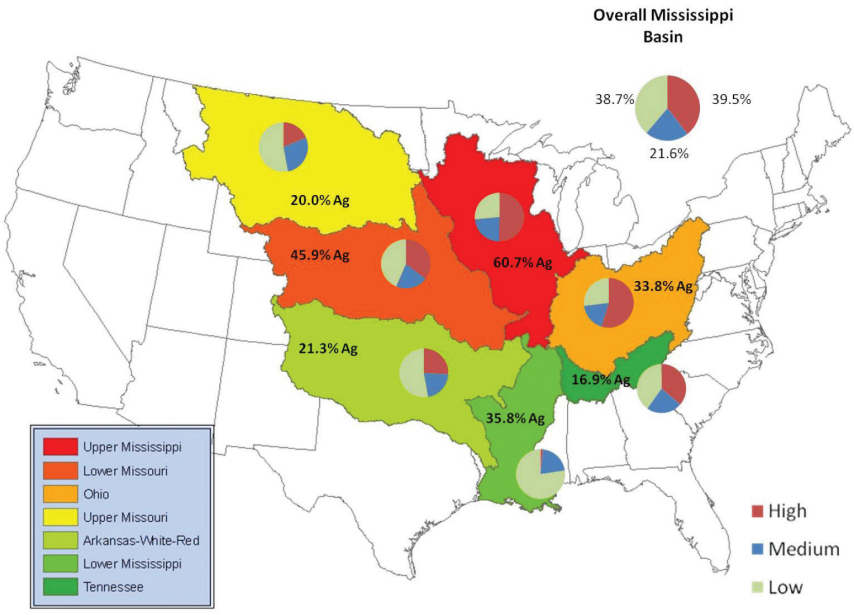

Figure 2. Percent of streams with high, medium and low levels of nitrogen and percent of land area in agricultural use (Source: WSA)

United States Environmental Protection Agency

*For more information on the **Wadeable Streams Assessment** and the **National Aquatic Resource Surveys**, visit www.epa.gov/aquaticsurveys. Additional information on nitrogen and phosphorus pollution in the Mississippi River Basin can be found at www.epa.gov/msbasin and www.epa.gov/nutrientpollution.*

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