U.S. Department of the Interior
U.S. Geological Survey

Water-Quality Assessment in the Trinity River Basin, Texas

Nutrient Concentrations in Streams Winter and Spring 1994

NAWQA
Fact Sheet

A consistent, basin-wide set of data for streams in the Trinity River Basin is a necessary baseline to compare current conditions with historical data and to provide a reference for future studies. In addition, the basin-wide surveys begin the process of addressing the cause-effect relations for water quality in the basin. Effects of land use, geology, vegetation, soils, and reservoirs on water quality were considered in selection of sites. Seasonal differences were addressed by conducting two surveys, the first during the winter low-flow period and the second during the late spring high-flow period.

Basin Description

The 18,570-square-mile basin includes all or part of 38 counties. There are 22 reservoirs with greater than 10,000 acre-feet capacity in the basin. In 1990, the basin had a population of about 4 million including the Dallas-Fort Worth metropolitan area with an estimated population of 3.5 million. Total outflow from the major urban wastewater-treatment plants was about 600 million gallons per day during 1990. According to the most recent (1970) land-use data, the basin is about 57 percent cropland or pasture; 25 percent forest or wetlands; 10 percent rangeland; and 5 percent urban. The remaining 3 percent is classified as either open water or barren land. Agriculture is a major economic activity in the basin. Livestock operations are predominant; however, a variety of crops are grown across the basin. According to data from 1989, the top nine crops grown in the basin include alfalfa or hay, corn, cotton, peanuts, pecans, rice, sorghum, soy beans, and wheat. The major manufacturing industries currently (1995) include automotive, aerospace, electronics, plastics, and oil-field equipment.

Nutrient Sampling

Water samples were collected from 43 sites within the basin. The sites were located on the major tributaries and on the main stem of the Trinity River to provide broad spatial coverage of the basin. The chemical analyses include total (unfiltered sample) and dissolved (filtered sample) nutrients (nitrogen and phosphorus). In this report only dissolved nitrogen and total phosphorus are discussed. At each site, samples were collected and streamflow, specific conductance, pH, temperature, and dissolved oxygen were measured. The samples also were analyzed for major ions, organic carbon, pesticides, and suspended sediment.

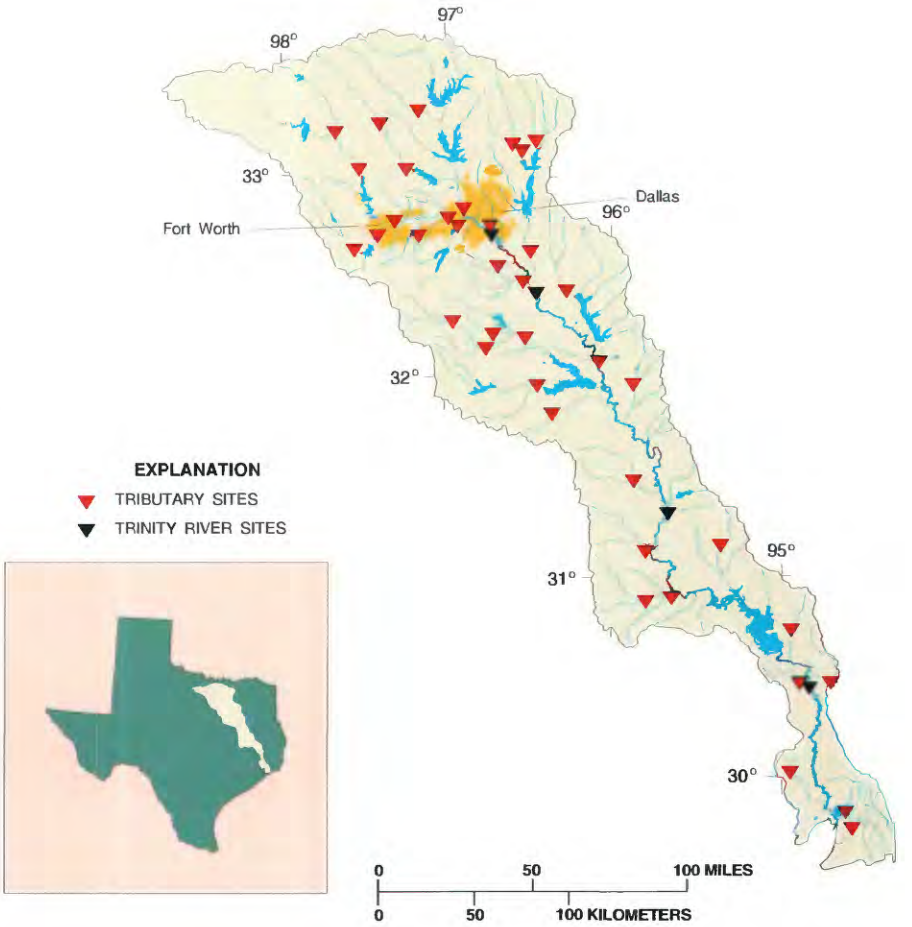
The winter sampling occurred during January, February, and March 1994. The spring sampling occurred during May 1994. Streamflow was less during the winter sampling than during the spring sampling.

Nutrient Concentrations

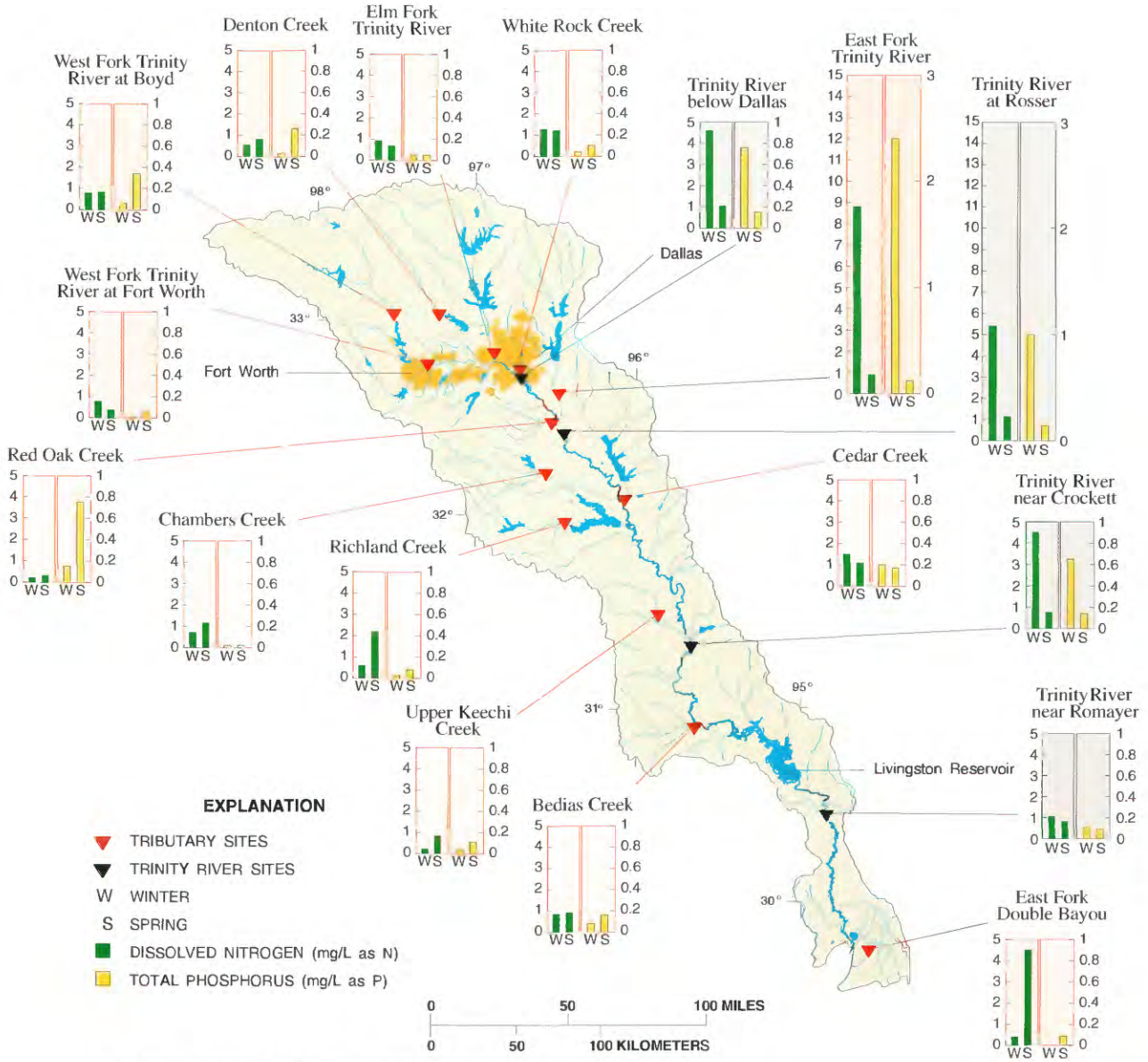
Nutrient concentrations in samples collected during winter varied across the basin. Dissolved nitrogen concentrations ranged from 0.11 to 8.8 milligrams per liter (mg/L) as nitrogen (N). Total phosphorus concentrations ranged from less than 0.01 to 2.4 mg/L as phosphorus (P). The highest dissolved nitrogen concentration during the winter, 8.8 mg/L, was from a sample from the East Fork Trinity River. The highest total phosphorus concentration during winter sampling, 2.4 mg/L, was at the same site.

Nutrient concentrations in samples collected during the spring varied less than concentrations in samples collected during the winter. During the spring, dissolved nitrogen concentrations ranged from 0.20 to 4.5 mg/L. Total phosphorus concentrations ranged from 0.01 to 0.75 mg/L. The highest dissolved nitrogen concentration during the spring, 4.5 mg/L, was from a sample collected at East Fork Double Bayou. The highest total phosphorus concentration during the spring, 0.75 mg/L, was at Red Oak Creek.

Comparison of tributary sites indicates that nutrient concentrations in samples collected during winter sampling generally are lower than concentrations in samples collected during spring sampling. Of the 39 tributary sites, 10 were in urban areas, and 29 were in rural areas. Dissolved nitrogen concentrations were lower during winter sampling than during spring sampling in 60 percent of the urban samples. For total phosphorus



Surface-water synoptic sampling sites, Trinity River Basin, 1994.



Nutrient concentrations at selected surface-water synoptic sampling sites, Trinity River Basin, 1994.

concentrations, 80 percent of the urban sites had lower concentrations during winter sampling than during spring sampling. For the rural sites, 66 percent had lower dissolved nitrogen concentrations during winter sampling than during spring sampling. Total phosphorus concentrations were lower during winter at 72 percent of the rural sites.

Comparison of mainstem sites indicates that nutrient concentrations in samples collected during winter sampling generally were higher than concentrations in samples collected during spring sampling. All mainstem sites are downstream from a large metropolitan area.The highest dissolved nitrogen concentration was 5.4 mg/L and the highest total phosphorus concentration was 1.0 mg/L at the Trinity River near Rosser during the winter sampling. Dissolved nitrogen and total phosphorus concentrations during winter were lower at the site downstream from Livingston Reservoir than at upstream sites. However, dissolved nitrogen concentrations in samples collected during spring at the site downstream from Livingston Reservoir were slightly higher than concentrations at the site immediately upstream from the reservoir.

— Allison A. Shipp

Information on technical reports and hydrologic data related to the NAWQA Program can be obtained from:

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In 1991, the U.S. Geological Survey, U.S. Department of the Interior, began a National Water-Quality Assessment (NAWQA) Program. The long-term goals of the NAWQA Program are to describe the status of and trends in the quality of a large representative part of the Nation's surface- and ground-water resources and to identify the major factors that affect the quality of these resourses. In addressing these goals, NAWQA will produce water-quality information that is useful to policymakers and managers at Federal, State and local levels.

Studies of 60 hydrologic systems that include parts of most major river basins and aquifer systems are the building blocks of the national assessment. The 60 study units range in size from less than 1,000 to more than 60,000 square miles and represent 60 to 70 percent of the Nation's water use and population served by public water supplies. Twenty investigations began in 1991, 15 investigations began in 1994, and 20 are scheduled to begin in 1997.