

Nutrients in the South Platte River, 1993-95

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

NAWQA FACT SHEET

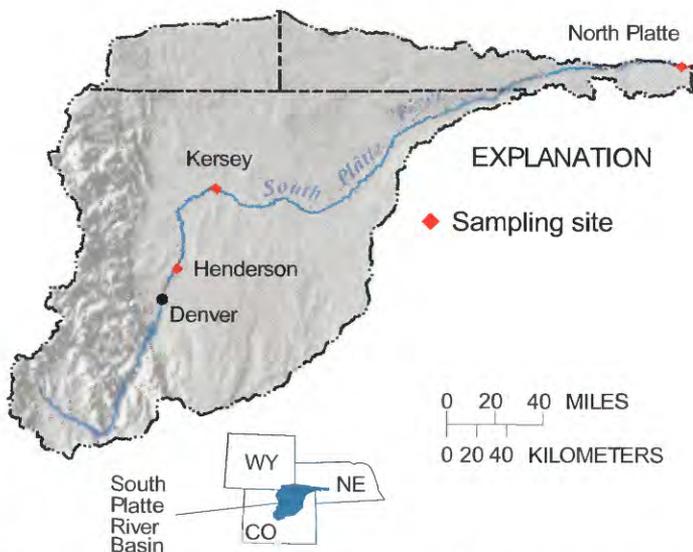
The U.S. Geological Survey (USGS), as part of its National Water-Quality Assessment (NAWQA) program has been collecting and analyzing water samples from streams in the South Platte River Basin in Colorado, Nebraska, and Wyoming to characterize the water-quality conditions within the basin. Nutrients (nitrogen and phosphorus compounds) have been a focus of this sampling effort because of their potential effects on the use of the water. Water samples were collected at sites along the South Platte River during different seasons. Preliminary findings indicated that nutrient concentrations in the South Platte River do not exceed the U.S. Environmental Protection Agency's (USEPA) drinking-water standards, but nutrient concentrations do occur at high enough levels to accelerate growth of algae and other aquatic plants.

In 1991, the South Platte River Basin was one of 20 study units across the country selected for the full-scale implementation of the NAWQA program. A priority issue for the first 20 studies was the investigation of the source and distribution of nutrients in river systems.

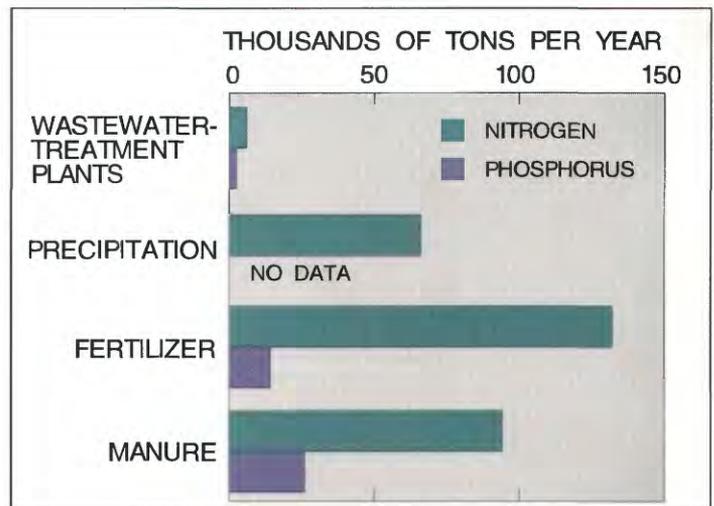
Nutrients include nitrogen and phosphorus compounds that are necessary components in the diets of plants and animals. However, in excessive concentrations, nutrients are a water-quality concern in drinking water and in rivers, lakes, and reservoirs. In drinking water, one form of nitrogen (nitrate) can interfere with the oxygen supply in the bloodstream of infants (blue-baby syndrome); the USEPA has established a maximum contaminant level (MCL) for nitrate in drinking water of 10 milligrams per liter as nitrogen. In rivers, lakes, and reservoirs, excessive nutrient levels can accelerate the growth of algae and other aquatic plants, causing problems such as clogged pipelines, fishkills, and restricted recreation; to avoid these problems, the USEPA recommends that total phosphorus should be less than 0.1

milligram per liter in rivers, and less than 0.05 milligram per liter where rivers enter lakes and reservoirs.

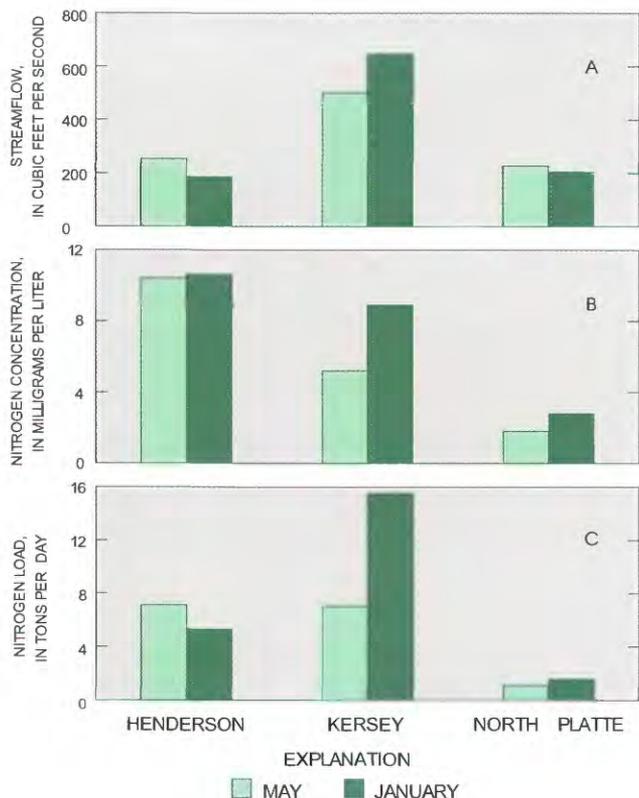
About 300,000 tons of nitrogen and 40,000 tons of phosphorus enter the South Platte River Basin every year from wastewater-treatment plants, precipitation, fertilizer, and manure. The largest of these sources are manure and fertilizer, which are applied on croplands in agricultural areas and on turf in urban areas to enhance plant growth. Most of the nutrients in manure and fertilizer remain in the soil and are taken up by the plants. However, when it rains, when irrigation water is applied to fields, or when turf is watered, part of the nutrients are carried with the water, and the nutrient-enriched water may find its way into streams. Wastewater-treatment plants discharge about 200 million gallons per day of effluent directly into streams in the basin. This effluent contains about 7,000 tons of nitrogen and 860 tons of phosphorus every year, which is a small amount compared to other sources of nutrients, but which is important because the effluent is a direct input into streams.



Location of the South Platte River and three selected sampling sites discussed in this factsheet.



Sources of nutrients to the South Platte River Basin.



Nitrogen loads in the South Platte River.

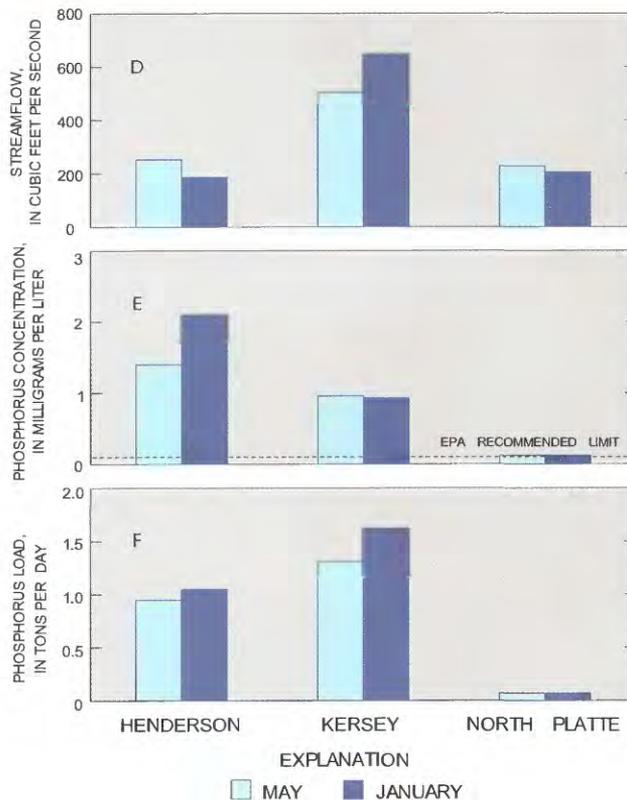
To investigate nutrients in the South Platte River, the USGS has been collecting monthly water samples from the South Platte River at six water-monitoring stations during 1993-95 and has done more detailed sampling and nutrient analysis at 40 sites along the river during 1994 and 1995. Preliminary findings can be summarized by comparing three sites along the river: Henderson, which is located just downstream from Denver's wastewater-treatment plants; Kersey, which is located in the heart of the basin's agricultural area; and North Platte, which is at the mouth of the South Platte River in Nebraska.

Streamflow in the South Platte River usually is largest at Kersey (fig. A and D) but flow in the river can change from day to day depending on the amount of water removed from the river by the many irrigation ditches. Flow was larger at Kersey in January than in May because fewer ditches were taking water out of the river in January. Flow at North Platte always is smaller than at Kersey because ditches between these two sites take water out of the river year-round.

Nitrogen concentrations in the South Platte River (fig. B) generally are largest at Henderson. Almost all the water and nutrients at this site come from Denver's wastewater-treatment plants. Nitrogen concentrations decreased in a downstream direction during May and January (fig. B). Nitrate usually is about one-half of the nitrogen concentration, and nitrate levels in the South Platte River did not exceed the USEPA MCL of 10 milligrams per liter. Phosphorus concentrations (fig. E), however, were much greater than the USEPA recommended level at Henderson and at Kersey.

Nitrogen loads (fig. C), which are a measure of how much nitrogen the river is carrying, are calculated by multiplying streamflow by concentration. Nitrogen loads usually are largest at Kersey, although in May the load is decreased by ditches taking water and nutrients out of the river. The nitrogen load at North Platte is small because the streamflow and the nitrogen concentrations are both small (fig. C). The nitrogen load leaving the basin at North Platte (less than 2 tons per day) is much less than the total annual input of nitrogen to the basin. Phosphorus concentration and load patterns (figs. E and F) are similar to those for nitrogen at the three sampling sites.

Nitrate concentrations in the South Platte River are less than the USEPA maximum contaminant levels. Phosphorus concentrations however, are much greater than the USEPA recommended limit.



Phosphorus loads in the South Platte River.

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

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