Idaho's Surface-Water-Quality Monitoring Program: Results From Five Sites Sampled During Water Years 1990–93

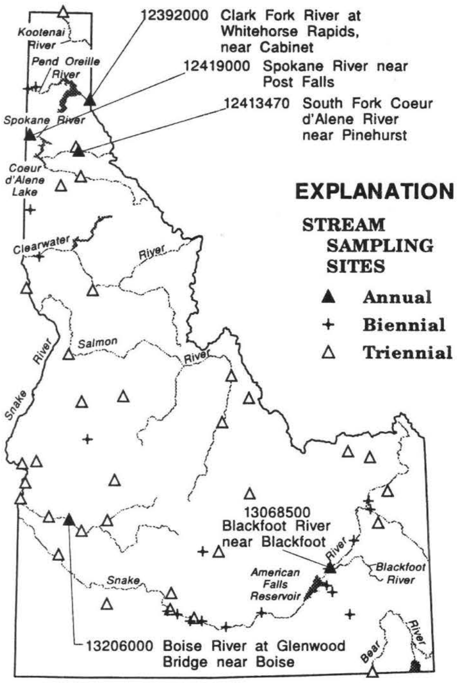

Figure 1. Locations of sampling sites in the surface-water-quality monitoring program.

Background

In 1990, the U.S. Geological Survey (USGS), in cooperation with the Idaho Department of Health and Welfare, Division of Environmental Quality, implemented a statewide water-quality monitoring program in response to Idaho's antidegradation policy as required by the Clean Water Act. The program objective is to provide water-quality managers with a coordinated statewide network to detect trends in surface-water quality.

The monitoring program includes the collection and analysis of samples from 56 sites on the Bear, Clearwater, Kootenai, Pend Oreille, Salmon, Snake, and Spokane Rivers and their tributaries (fig. 1). Samples are collected every year at 5 sites (annual sites) in drainage basins where long-term water-quality management is practiced, every other year at 19 sites (biennial sites) in basins where land and water uses change slowly, and every third year at 32 sites (triennial sites) where future development may affect water quality. Each year, 25 of the 56 sites are sampled. This report discusses results of sampling at five annual sites.

During water years 1990–93 (October 1, 1989, through September 30, 1993), samples were collected six times per year at the five annual sites (fig. 1). Onsite analyses were made for discharge, specific conductance, pH, temperature, dissolved oxygen, bacteria (fecal coliform and fecal streptococci), and alkalinity. Laboratory analyses were made for major ions, nutrients, trace elements, and suspended sediment. Suspended sediment, nitrate, fecal coliform, trace elements, and specific conductance were used to characterize surface-water quality. Because concentrations of all trace elements except zinc were near detection limits, only zinc is discussed.

Water Quality at Annual Sites

Sediment is the most common nonpoint source of water pollution in Idaho streams. Currently (1994), the State has no instream standards for sediment. However, high concentrations of sediment can (1) adversely affect aquatic habitat, (2) transport trace elements, (3) increase turbidity, and (4) cause declines in the minimum required dissolved-oxygen concentration of 6 milligrams per liter (mg/L) in fish-spawning beds. The median concentration (27 mg/L) of suspended sediment at site 13068500 was about three times higher than at the other four sites (fig. 2) and probably is the result of farming. Occasionally, concentrations also were high at sites 13206000, 12392000, and 12413470 and may be the result of urbanization. The low concentrations at site 12419000 (fig. 2) are probably because of its location below Post Falls Dam at the outlet of Coeur d'Alene Lake.

Nitrate is the most abundant form of nitrogen in water. Common sources of nitrate are agricultural fertilizers, livestock feedlots, dairy-cattle operations, and untreated sewage. A nitrate concentration of 0.3 mg/L is considered the limit for preventing nuisance growths of aquatic algae and plants. The U.S. Environmental Protection Agency (USEPA) set a maximum contaminant level (MCL) of 10 mg/L for nitrate as nitrogen in drinking water. In about 25, 70, and 30 percent of the samples from sites 13068500, 13206000, and 12413470, respectively, nitrate concentrations were

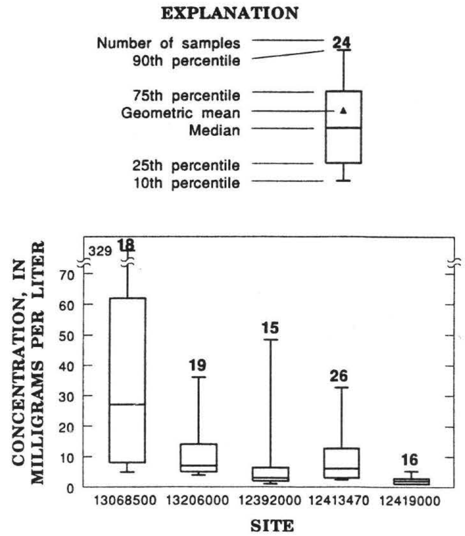

Figure 2. Suspended sediment concentrations.

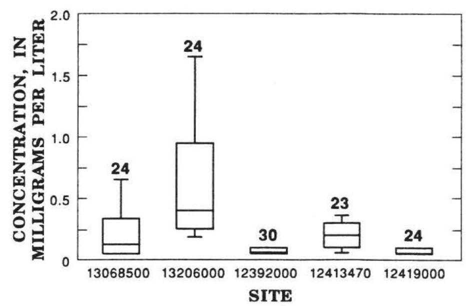

Figure 3. Dissolved nitrate concentrations.

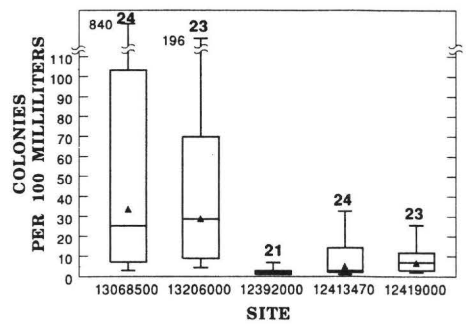

Figure 4. Fecal coliform.

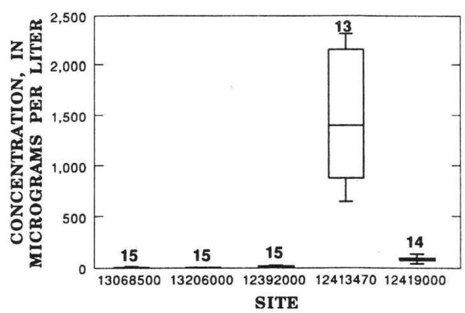

Figure 5. Dissolved zinc concentrations.

equal to or greater than 0.3 mg/L. At site 13206000, concentrations were 0.1 to 3.2 mg/L. High concentrations at sites 13206000 and 12413470 probably are the result of urbanization, whereas high concentrations at site 13068500 probably are the result of farming. Concentrations of nitrate in all samples (fig. 3) were less than the USEPA drinking-water MCL.

Fecal coliform is an indicator of pollution from warmblooded animals and is also an indicator of the presence of pathogenic microorganisms. Raw sewage, for example, typically contains millions of colonies of fecal coliform per 100 milliliters (mL) of water. To protect public health, the USEPA set the maximum contamination level goal (MCLG) for fecal coliform in drinking water to be zero colonies per 100 mL. Idaho standards for primary contact recreation (mainly swimming) state that (1) no water sample can contain fecal coliform that exceeds 500 colonies per 100 mL, (2) only 10 percent of the samples can exceed 200 colonies per 100 mL, and (3) the geometric mean of the samples cannot exceed 50 colonies per 100 mL. Fecal coliform in several samples from all annual sites exceeded the MCLG (fig. 4). High counts at site 13068500 may be the result of dairy-cattle and feedlot operations; high counts at site 13206000 probably are the result of runoff and discharges from urban areas.

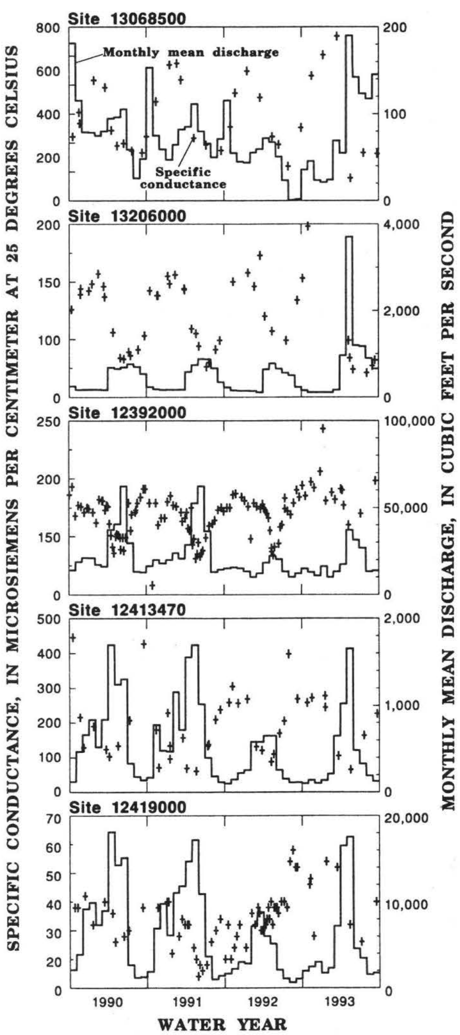

Figure 6. Specific conductance and monthly mean discharge.

High concentrations of zinc in water may be objectionable to users because of odor and taste but do not pose a known human health risk. Zinc in high concentrations can be toxic to plants. For agricultural purposes, the National Academy of Sciences and National Academy of Engineering recommended a maximum concentration of 2,000 micrograms per liter (μg/L) for irrigation water. Concentrations of zinc in more than 30 percent of the samples at site 12413470 exceeded 2,000 μg/L (fig. 5), probably the result of mining activities upstream.

Specific conductance, a measure of the ability of water to conduct electricity, is often used to estimate the dissolved-solids concentration of natural water. Specific conductance and monthly mean discharge at the five annual sites are shown in figure 6. The graph shows an inverse relation between conductance and discharge—as discharge increases, conductance decreases; as discharge decreases, conductance increases. At high discharges, conductance is usually low because precipitation and snowmelt dilute the concentrations of dissolved ions. At site 12419000, the relation between conductance and discharge is poorly defined because the chemical composition of Coeur d'Alene Lake is highly variable. For the period of record, no increases or decreases in specific conductance were evident at the five sites.

Continued Monitoring

The statewide surface-water-quality monitoring program is currently in its fifth year. The program furnishes critical information to State and Federal managers of surface-water resources and provides important spatial coverage for Federal monitoring programs such as the USGS National Stream-Quality Accounting Network. Continued monitoring of surface-water quality provides a direct measure of the effectiveness of Idaho's water-quality management programs.

Selected References

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