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Status of and Changes in Water Quality Monitored for the Idaho Statewide Surface-Water-Quality Network, 1989–2002

Scientific Investigations Report 2005–5033
Version 1.2

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

Note: The changes listed below were made to this report on July 7, 2005 (Version 1.1):

Page 2: figure 1, line added to explanation
Page 12: first paragraph under pH, Lapwai River changed to Lapwai Creek
Page 13: first paragraph under NITROGEN, Clearwater River changed to Lapwai Creek

The change listed below was made to this report on October 25, 2005 (Version 1.2):
Page 66: Table 10, column heading DO > Idaho criteria changed to DO < Idaho criteria

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By Mark A. Hardy, D.J. Parliman, and Ivalou O'Dell

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U.S. Department of the Interior
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U.S. Department of the Interior
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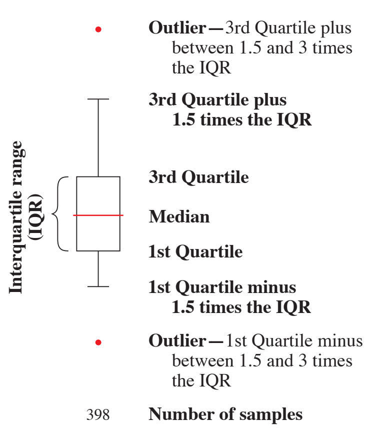
FIGURES (explanation for various boxplots is on page v)

EXPLANATION

For figures 3, 5, 9, 11, 12, 13, 15, 17, 19, 20, 22, and 29



TABLES

Conversion Factors, Datum, and Other Abbreviated Units

Multiply	By	To obtain
centimeter (cm)	0.3937	inch (in.)
cubic meter per second (m^3/s)	35.31	cubic foot per second (ft^3/s)
kilometer (km)	0.6214	mile (mi)
meter (m)	3.281	foot (ft)
square kilometer (km^2)	0.3861	square mile (mi^2)
square meter (m^2)	10.76	square foot (ft^2)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32$$

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD of 1929). Elevation above sea level, as used in this report, refers to distance above the vertical datum.

Other abbreviated units:

micrograms per gram	(µg/g)
micrograms per liter	(µg/L)
microsiemens per centimeter	(µS/cm)
milligrams per liter	(mg/L)
milliliters	(mL)

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Status of and Changes in Water Quality Monitored for the Idaho Statewide Surface-Water-Quality Network, 1989–2002

By Mark A. Hardy, D.J. Parliman, and Ivalou O'Dell

ABSTRACT

The Idaho statewide surface-water-quality monitoring network consists of 56 sites that have been monitored from 1989 through 2002 to provide data to document status and changes in the quality of Idaho streams. Sampling at 33 sites has covered a wide range of flows and seasons that describe water-quality variations representing both natural conditions and human influences. Targeting additional high- or low-flow sampling would better describe conditions at 20 sites during hydrologic extremes. At the three spring site types, sampling covered the range of flow conditions from 1989 through 2002 well. However, high flows at these sites since 1989 were lower than historical high flows as a result of declining ground-water levels in the Snake River Plain.

Summertime stream temperatures at 45 sites commonly exceeded 19 and 22 degrees Celsius, the Idaho maximum daily mean and daily maximum criteria, respectively, for the protection of coldwater aquatic life. Criteria exceedances in stream basins with minimal development suggest that such high temperatures may occur naturally in many Idaho streams.

Suspended-sediment concentrations were generally higher in southern Idaho than in central and northern Idaho, and network data suggest that the turbidity criteria are most likely to be exceeded at sites in southern Idaho and other sections of the Columbia Plateaus geomorphic province. This is probably because this province has more fine-grained soils that are subject to erosion and disturbance by land uses than the Northern Rocky Mountains province of northern and central Idaho has. Although erodable soils are likely a cause of elevated turbidities, suspended-sediment concentrations were not strongly correlated with turbidities.

Dissolved-solids and hardness concentrations were strongly correlated. This is probably because the limestones present in some basins are more soluble than the igneous rocks that predominate in others. Low hardness in streams of northern Idaho, where watersheds are underlain by resistant igneous rocks, enhances the toxicity of some trace elements to aquatic life in these streams.

Only a few measurements of dissolved-oxygen concentrations at six sites were less than 6.0 milligrams per liter, the Idaho minimum criterion for protection of aquatic organisms. High supersaturations of dissolved oxygen at four sites suggest excessive photosynthetic activity by algal communities. Nighttime monitoring would help determine whether dissolved-oxygen concentrations at these sites might fall below the Idaho criterion. Data from four sites suggest that dissolved-oxygen concentrations may have decreased over time.

The pH at 15 sites sometimes fell outside the range specified (6.5–9.0) for the protection of aquatic organisms in Idaho streams. Values exceeded 9.0 at 10 sites, probably because of excessive algal photosynthetic activity in waters where carbonate rocks are present. Values were sometimes less than 6.5 at five sites in areas of mountain bedrock geology where pH is likely to be naturally low. Mining activities also may contribute to low pH at some of these sites.

Inorganic nitrogen and total phosphorus concentrations commonly exceeded those considered sufficient for supporting excess algal production (0.3 and 0.1 milligrams per liter, respectively). Data from a few sites suggest that nitrogen and(or) phosphorus concentrations might be changing over time. Low concentrations of nitrogen and phosphorus at six sites, most representing forested basins, might make them

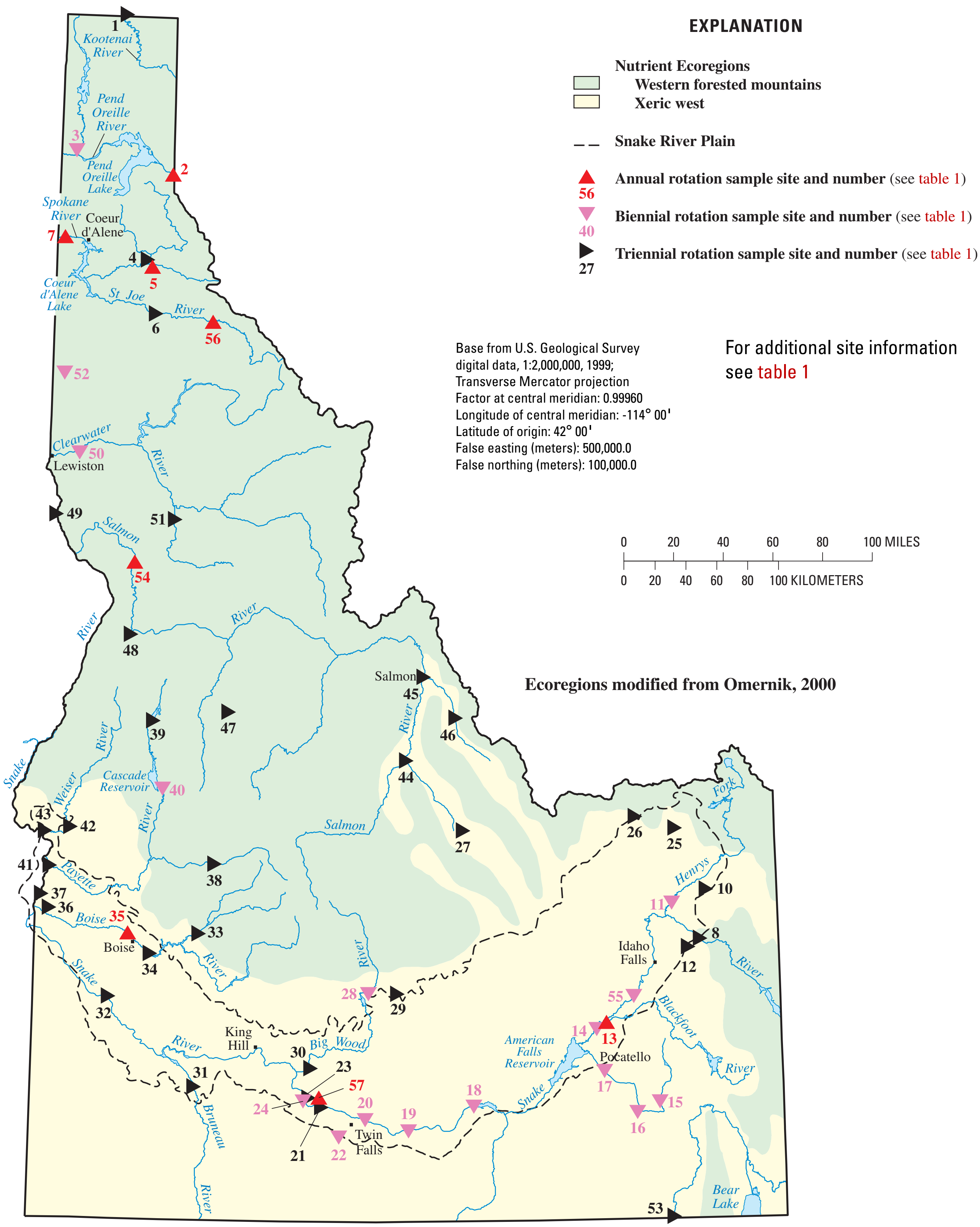

Figure 1. Locations of sampling sites and nutrient ecoregions in the Idaho statewide surface-water-quality monitoring network (Rotation of sampling sites shown represents status in 2002 or status when site was dropped from network.)

good candidates as reference sites that represent naturally occurring nutrient concentrations.

Trace elements examined for this report were cadmium, copper, lead, mercury, selenium, and zinc. In water, many trace-element concentrations were below the minimum analytical reporting levels. Concentrations of cadmium, copper, lead, and zinc generally were highest in mined and other mineral-rich basins in northern Idaho. Concentrations of mercury were highest in southern Idaho. Data showed that concentrations of one or more of these elements at 33 sites sometimes exceeded Idaho criteria for protection of aquatic organisms. Selenium concentrations were not high at any of the sites.

Concentrations of these elements in fish tissue were highest in some of the same areas where concentrations were high in water. However, there were 22 instances where trace-element concentrations in water exceeded criteria but concentrations in fish tissue did not. These inconsistencies may require that the scope of trace-element monitoring be reassessed to meet network objectives. Mercury concentrations in several fish-tissue samples were greater than 0.3 micrograms per gram, the maximum concentration for edible fish tissue that the U.S. Environmental Protection Agency recommends for protection of human health.

Organic compounds detected in fish tissue included PCBs (in northern and southeastern Idaho) and the pesticides dieldrin, nonachlor, and DDT and its metabolites (in southern and central Idaho). The common presence of PCBs, DDT, and DDT metabolites reflects the wide-scale use of PCBs and DDT before they were banned more than 30 years ago and their persistence in the environment.

Populations of fecal coliform bacteria exceeded the current Idaho primary- or secondary-contact criteria for *Escherichia coli* (*E. coli)* (406 and 526 colonies per 100 milliliters, respectively) at 22 sites representing a wide range of site types. The number of samples in which populations exceeded criteria were greatest at agricultural site types on the Boise River and Lapwai Creek, where populations in more than 25 percent of the samples exceeded both criteria. Replacing fecal coliform analyses with *E. coli* analyses would provide data that would directly address current criteria.

INTRODUCTION

The Idaho statewide surface-water-quality monitoring network was implemented in 1989 by the U.S. Geological Survey (USGS), in cooperation with the Idaho Department of Environmental Quality (IDEQ), in response to Idaho's antidegradation policy as required by the Clean Water Act (CWA). The program objective was to provide resource managers with data to document status and changes over time in surface-water quality through a network that was coordinated with and supplemented by data from other State and Federal agencies. Many of the data are used in biennial reports on the status of Idaho water quality published by the IDEQ. The data also are used for establishing total maximum daily loads (TMDLs). As programs are implemented to meet TMDLs, the network data will continue to be important for verifying the effectiveness of these programs and tracking overall trends in Idaho's surface-water quality.

Purpose and Scope

The purpose of this report is to describe the status of and changes in selected chemical and physical data collected for the Idaho statewide surface-water-quality monitoring network from 1989 through 2002. Data addressed in the report include those constituents related to water-quality issues that are currently priorities to IDEQ (Don Essig, oral commun., 2004). All data collected at each site, including additional data collected for other USGS projects, were evaluated.

Network Design and Evolution

The network consists of 56 stream sites on the Bear, Clearwater, Kootenai, Pend Oreille, Salmon, Snake, and Spokane Rivers and their major tributaries (**figure 1** and **table 1**). Whenever possible, all sites are located at existing USGS gaging stations where continuous stream discharge data are available. From 1989 through 1995, water samples were collected and analyzed for temperature, suspended sediment, turbidity, specific conductance, dissolved oxygen, pH, major ions, nutrients, trace elements, and fecal bacteria. Bimonthly samples were collected each year at 5 sites (annual sites), every other year at 19 sites (biennial sites) and every third year at 32 sites (triennial sites). This sampling rotation occasionally was changed to meet evolving needs for data. As a result, about 25 sites representing annual, biennial, and triennial sites were sampled each year.

The network was changed in 1996 to include continuous temperature monitoring during summer months, habitat evaluation, and sampling of aquatic biological communities. Biological communities were chosen because they reflect the time-integrated effects of water quality better than water samples do through community structure and accumulation of chemicals in tissues. Evaluation of biological communities also provided more direct measures of biotic integrity and associated beneficial uses (such as coldwater biota populations, fish spawning, and recreation), which were needed for water-quality reporting required under sections 305(b) and 303(d) of the CWA. Additional information on biological aspects of the network is provided in a report by Maret and others (2001). To make these changes without increasing program costs, analyses of trace elements in water were dropped and major-ion analyses were reduced to one set of samples during base-flow conditions in September. The frequency of water-sample collection was changed from bimonthly throughout the year, to monthly during April through September, the period when beneficial uses are most likely to be stressed by poor water quality. Sites in **figure 1** were classified as annual,

Table 3. Sampling site changes made to the Idaho statewide surface-water-quality monitoring network

[Locations of sites shown on figure 1; No., number; WA, Washington; USGS, U.S. Geological Survey]

Site No.	Site name	Action	Comments
8	Snake River at Heise	Replacement 1997	Replaced Snake River at Lorenzo (site 9). New site better represents low impacted water quality and was originally part of a national program with historical water-quality data.
12	Willow Creek near Ririe	Dropped 1996	Site represented water quality in upstream reservoir.
22	Rock Creek at Daydream Ranch	Replacement 1996	Replaced Rock Creek near Twin Falls. Gage discontinued at old site. New site was part of an existing national program with several years of water-chemistry and biological data.
25	Camas Creek at Red Road	Dropped 1997	Intermittent flow owing to location in the basin. The gage was discontinued in 1992.
26	Beaver Creek at Spencer	Dropped 1997	Intermittent flow owing to location in the basin. The gage was discontinued in 1993.
27	Big Lost River near Chilly	Replacement 1999	Replaced Big Lost River below Mackay, which represented water quality in upstream reservoir. New site was part of an existing national program with additional chemical and biological data.
28	Big Wood River near Bellevue	Replacement 1999	Site moved about 1.6 kilometers upstream because of gage-operation problems at old location. Data from both locations combined for analysis.
34	Boise River below Diversion Dam	Dropped 1999	Site represented water quality in upstream reservoir.
40	North Fork Payette River at Cascade	Dropped 1998	Site represented water quality in upstream reservoir.
49	Snake River near Anatone, WA	Dropped 1998	Site operation transferred to Washington District of USGS.
54	Salmon River near White Bird	Added 2000	Site was part of a national program. Site represents all of the flow from the Salmon River and has considerable historical data.
56	St. Joe River at Red Ives Ranger Station	Added 2001	Site was part of a national program as a reference site with considerable chemical and biological data. The location in the upper basin makes it a candidate as a reference site.

biennial, or triennial by their sample collection frequency in 2002 or by their status at the time they were dropped from the network.

Some network sites also were sampled as part of other USGS projects. Where possible, sampling was coordinated at these sites to avoid duplication of efforts and allow better coverage for other network sites. However, higher intensity sampling for selected constituents for some projects resulted in more data for some sites than for others.

The types and periods of data collection for the network are summarized in table 2. Some sampling sites were added, dropped, or replaced for various reasons and are summarized in table 3. Chemical, physical, and hydrologic data collected for this program are stored in the USGS National Water Information System (NWIS). This database can be accessed at http://www.usgs.gov. Much of the biological data collected for this program can be accessed at http://id.water.usgs.gov/public/wq/index.html.

Environmental Setting

Idaho is a large State that spans 7 degrees of latitude, from 42°N at its southern border with Nevada to 49°N at its northern border with Canada. Its varied geography covers 11 ecoregions (McGrath and others, 2002). Major river basins are the Bear, Clearwater, Kootenai, Pend Oreille, Salmon, Snake, and Spokane and their tributaries. Most of the sampling sites in this study are located in the Snake River Basin/High Desert and Central Basin and Range ecoregions.

Elevations in Idaho range from about 225 m above sea level where the Snake River leaves Idaho to 3,859 m at Borah Peak in east-central Idaho. Sampling site elevations in the network range from about 300 m to just over 2,000 m. Precipitation varies widely with topography; average rainfall is about 56 cm a year. The climate of Idaho is primarily arid during summer. Precipitation is primarily winter snowfall, and peak flows in streams generally result from spring snowmelt (Maret and others, 2001).

Idaho includes parts of four geomorphic provinces (Ross and Savage, 1967). The Northern Rocky Mountains province covers most of the northern and central parts of the State and is characterized by steep, high mountains and deep valleys. Granitic rocks of the Idaho batholith primarily underlie and outcrop in the southern and central parts of this province, and sedimentary and metamorphosed sedimentary rocks primarily underlie the northern part. Rich mineral deposits have supported an extensive mining industry in this province.

The Middle Rocky Mountains province occupies the southeastern edge of Idaho along the Wyoming border. The northern part of this province includes the Yellowstone Plateau, which is dominated by volcanic rocks and is characterized by high mountains and deep, narrow canyons. The southern part is characterized by mountains of complexly folded sedimentary rocks and wide valleys. Carbonate deposits and rich phosphate deposits are present in the central and southern parts of this province, and phosphate mining is a major industry.

The Basin and Range province is located in southeastern Idaho between the Utah State line and the Snake River Plain and is characterized by mountains separated by open valleys and basins. The mountains are sedimentary rocks that are sometimes metamorphosed, and valleys are filled with alluvial material. Carbonate deposits and limestone quarries are common throughout this province.

The Columbia Plateaus province includes the Snake River Plain and Owyhee uplands in southern Idaho and extends northward along the west-central edge of the State along the Oregon and Washington borders. The eastern part of this province is primarily basalt flows covered with thin loess in places. The porous basalts account for significant subsurface drainage, some of which resurfaces as major springs on the north side of the Snake River. In the southwestern part of the province, basalts of the Snake River Plain become interbedded with lacustrine and fluvial sediments, and the silty soils support the most intensely developed agricultural lands in Idaho. The Owyhee uplands consist of a variety of volcanic rocks that are covered by volcanic ash and loess deposits in places. River canyons are cut deeply into the volcanic rocks. North of the Snake River Plain, topography becomes rugged and dominated by igneous and sedimentary rocks that include numerous limestone deposits. Lacustrine and alluvial sediments here are subject to frequent landslides as a result of the steep mountain slopes. The northernmost part of this province consists of the Palouse Hills, which are large dunes of thick loess over basalt flows.

LAND USE, LAND COVER, AND STREAM-QUALITY EFFECTS

Rangeland and forested land dominate the Idaho landscape. Of the 56 network sites, 33 of them are located in drainage basins that consist of more than 80 percent combined rangeland and forested land cover, and 46 of them are located in basins that consist of more than 70 percent combined rangeland and forested land cover (**table 1**). Although Idaho has a small population of just over 1 million, it ranks fifth in the Nation in amount of irrigated cropland, according to the 1997 Census of Agriculture (U.S. Department of Agriculture, Farm and Ranch Irrigation Survey, Census of Agriculture, table 4, accessed July 29, 2004 at **http://www.nass.usda.gov/census/census97/fris/fris.htm**). Agricultural land composes at least 10 percent of the land cover in half of the network basins. In the central part of the State, much of the land is roadless national forest and wilderness, and water use is minimal.

The southern basins are primarily in semiarid, high desert plains and contain the greatest population densities. The population of Ada and Canyon Counties (including the Boise metropolitan area) constitutes more than a third of the population in the State. The basins toward the north are primarily forested and sparsely populated; logging, mining, and grazing are the predominant land uses. The State's landscape makes it a popular destination for sports enthusiasts and tourists. More than 60 percent of the land is federally owned and available for recreational activities such as hiking, fishing, hunting, and whitewater rafting (Maret and others, 2001).

The site types used by Maret and others (2001) were assigned to all network sites on the basis of land use and land cover (**table 1**). Generally, irrigated agriculture and rowcrop production composed more than 10 percent of the land use in basins represented by agricultural site types; rangeland composed more than 40 percent of the land use in basins represented by rangeland site types; and forested land composed more than 60 percent of the land use in basins represented by forested site types. Large-river sites included streams larger than sixth order. Three sites were assigned to a spring category because of their small size and proximity to spring sources.

Nonpoint-source pollution and water diversions are the predominant influences on surface-water quality in the State (Idaho Department of Health and Welfare, 1998). Pollutants of greatest concern that have been associated with habitat degradation of streams are nutrients, suspended sediment, bacteria, organic waste, and elevated water temperature. Beneficial uses of streams most impaired by pollutants are coldwater aquatic life, salmonid spawning, and water-contact recreation (Idaho Department of Health and Welfare, 1998). Water diversions often result in large streamflow reductions in many streams. In addition, water transfer from one river basin to irrigate crops in another is common practice in most of southern Idaho. The ecological consequences of this practice include changes in streamflow, introduction of exotic species, alteration of habitat, and changes in water quality (Meador, 1992). Most rivers in Idaho are designated as supporting coldwater aquatic life (Grafe and others, 2002), and water-quality standards require conditions supporting maintenance and propagation of coldwater-adapted fish and other aquatic life in these waters.

HYDROLOGIC CONDITIONS

Streamflow is a major factor that can affect water quality, and sampling at a wide range of flows usually is desirable for monitoring programs. Because samples for monitoring programs often are collected at predetermined time intervals and high-flow events are difficult to predict and often short lived, it is not unusual to miss flow extremes that might cause unique water-quality conditions. To determine how well the network samples represented the range of long-term streamflow conditions at sites, the flows measured when samples were collected from 1989 through 2002 were compared to flow frequencies representing all recorded historical flows for each site. Discharge records for 10 selected network streams are shown in **figure 2**.

Generally, sampling at network sites represented a wide range of flow conditions without targeting specific flow events. Sampling at 33 sites covered conditions ranging from low flows that were exceeded more than 98 percent of the time to high flows that were exceeded less than 2 percent of the time. Sites 54, 56, and 57 are examples of the sites having this desirable sample distribution.

Sample distributions at 10 sites missed some of the lowest flows (sites 18, 26, 39, and 40) or were somewhat biased toward high flows (sites 1, 2, 10, 12, 25, and 38). These sites might benefit from targeting low flows for sample collection to better describe water quality during such conditions. Sites 2, 25, and 39 are examples of sites having poor coverage of lowest flows or high-flow bias.

Sample distributions at 12 sites missed some of the highest flows (sites 24 and 29) or were somewhat biased toward low flows (sites 14, 15, 19, 21, 23, 28, 32, 44, 46, and 53). All spring site types (sites 21, 23, and 29) were biased toward low flows, probably as a result of declining ground-water levels in the Snake River Plain. For example, since the beginning of the monitoring network in 1989, flows exceeding 6 m^3/s (200 ft^3/s; a flow historically exceeded less than 42 percent of time) have not occurred at Blue Lakes Spring (site 21). However, during the recent period of the network, sample distributions at the spring site types covered flow conditions well and represented some of the highest flows that have occurred since 1989. All of these sites except the three spring site types might benefit from targeting high flows for sample collection to better describe water quality during such conditions. Sites 15, 21, and 24 are examples of sites having poor coverage of high flows or low-flow bias.

Although samples collected at site 13 (Blackfoot River) were not biased toward low or high flows, neither lowest nor highest flows were well represented (**figure 2**). This might be a result of different regulation of releases from the Blackfoot Reservoir since 1989 than during earlier times. This site might benefit from targeting low and high flows for sample collection to better describe water quality during such conditions.

METHODS

Site Selection

The network originally was built around, but did not include, seven sites that composed the USGS National Stream Accounting Network (NASQAN) in 1989. These sites were located either near the outflow of major hydrologic units or where broad, temporal patterns in water quality related to upstream land and water uses could be detected. A wide range of water-quality constituents were monitored—nutrients, major ions, trace elements, bacteria, and sediment. Since the end of the NASQAN program, only three of these sites (sites 8, 36, and 54) have continued to be sampled as part of the network or other projects.

Fifty-six sites were chosen for the network. Only sites that were part of the existing USGS streamflow-gaging network were chosen, so that continuous flow information would be available for interpreting data. Water-quality constituents analyzed for the monitoring network were the same as those analyzed for the NASQAN program. Annual, biennial, and triennial sampling rotations were assigned to sites on the basis of spatial distribution, upstream land and water uses, and point sources. Annual sites were located in basins where water quality has been managed on a long-term basis. Biennial sites were located in basins where land and water uses were expected to change slowly. Triennial sites were located in basins where future development proposals could affect water quality. To provide flexibility, sampling rotations can be changed to accommodate available funding or unanticipated changes in land or water use.

Sample Collection and Analyses

Water samples for analyses of chemical constituents and suspended sediment were collected and processed using depth-integrating samplers, the equal-width-increment method, and a modified clean-sampling procedure described by Wilde and others (May 1999 and September 1999). At the time of sample collections, temperature, pH, dissolved oxygen, and specific conductance were measured instream at the center of flow using calibrated electrometric meters. All analyses designated as “dissolved” were filtered through 0.45-µm capsule filters that are certified by the manufacturer and verified by USGS to be free of contamination. Suspended sediment was analyzed according to methods described by Guy (1969). These analyses were performed at the USGS Boise District Sediment Laboratory from 1989 through 1993 and at the USGS Sediment Laboratory in Vancouver, Washington, starting in 1994. Chemical constituents in water were analyzed at the USGS National Water Quality Laboratory (NWQL) using the methods of Fishman (1993). Because samples from many network sites contained very low nutrient concentrations, low-level analytical techniques (Fishman, 1993) were adopted in 1999.

Samples for analyses of fecal coliform bacteria were collected using sterilized bottles at the center of flow. Samples were analyzed using the membrane filtration methods described by Myers and Wilde (July 1997).

Fish were collected from a representative reach using electrofishing techniques described by Meador and others (1993). Whole-body fish-tissue and fish-liver composite samples were analyzed at the NWQL for organic compounds and trace elements using methods described by Leiker and others (1995) and Hoffman (1996), respectively.

Hourly water-temperature data were collected by deploying calibrated, self-logging microthermistors from April through September 1996 through 2002. The thermistors were deployed in deep parts of stream channels to ensure that they would remain submerged during summer low flows. In most cases, daily minimum, mean, and maximum values were stored in the USGS Automated Data-Processing System (ADAPS). However, the earliest daily mean values were not stored for sites 1, 36, and 49.

Data Verification

Temperature, pH, dissolved oxygen, and specific conductance were measured at the center of flow where the stream appeared to be well mixed. Measurements were made periodically at 10 equally spaced locations in the stream cross section to ensure that measurements at the center of flow represented the entire stream cross section.

Quality-control procedures used by the NWQL consisted of verifying condition of reagents and equipment, managing samples, participating in internal and external performance-evaluation studies, conducting internal and external audits, verifying data, performing chemical-logic checks, and following protocols for continuously monitoring quality-control data. These procedures are summarized in reports by Pritt and Raese (1995) and Friedman and Erdmann (1982).

STATUS OF AND CHANGES IN WATER QUALITY

Water Temperature

Temperature criteria for Idaho streams vary according to designated uses that have been adopted in Idaho Water Quality rules (**http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**). Data in this report were compared with criteria recommended for protection of coldwater aquatic life and seasonal coldwater aquatic life. Other Idaho stream criteria, such as those for protection of fish during spawning and rearing periods, were not considered because the effective locations and timing of the criteria vary, depending on presence and activities of specific communities to be protected.

Nearly 80 percent of network sites sometimes had temperatures exceeding criteria for coldwater aquatic life (daily mean and maximum temperatures not to exceed 19° and 22°C, respectively) (figure 3 and figure 4). At nearly 65 percent of sites, even the daily minimum temperatures sometimes exceeded both of these criteria. Because 12 of the 16 forested network sites had temperatures that exceed criteria, it is likely that such high temperatures in many streams occur naturally. The only sites where temperature did not exceed criteria were located in basin headwaters in mountainous and foothill terrain (sites 12, 26, 27, 44, 46, 47, and 56); downstream from large reservoirs (sites 8 and 34); and at springs discharging to the Snake River (sites 21 and 23).

In the Snake River, temperature exceeded coldwater criteria most frequently at middle and lower Snake River sites (sites 19, 20, 32, and 37). Temperature criteria exceedances at the lowest Snake River site (site 49) were less frequent than at upstream sites and may be a result of discharges from large, upstream reservoirs in Hells Canyon.

Temperatures in the North Fork Payette River downstream from Cascade Reservoir (site 40) and the Bruneau River (site 31) exceeded criteria most frequently among all the sites. Water-temperature variations at site 40 were small compared with those at most other sites, and although only 25 percent of the measurements exceeded the maximum daily criterion (22°C), more than 75 percent of measurements exceeded the daily mean criterion (19°C). At site 31, where discharge from hot springs may affect the stream, more than 75 percent of both maximum and mean daily temperatures exceeded criteria.

Although the effects of discharges from thermal springs on stream temperatures might not be readily apparent during periods when streams are naturally warm, the effects might be detected during cooler periods. For this reason, year-round collection of temperature data might benefit the network.

Sediment and Turbidity

Sediment has been identified as a pollutant of concern in more than 90 percent of Idaho streams identified as impaired, and is considered the State's most extensive water-quality problem (Rowe and others, 2003). Most sediment in streams is fragmentary material that originates primarily from weathering of rocks. Sources to streams can be natural, such as resuspension of streambed materials during high flows or streambank collapse, or human-caused, such as erosion of soils that have been disturbed by construction, livestock grazing, crop cultivation, and other land uses. Certain contaminants such as trace elements and pesticides sometimes preferentially partition onto sediment; thus, their distribution throughout the watershed is controlled primarily by sediment transport, and their availability to biota is most significant in zones of sediment deposits. Movement and deposition of uncontaminated sediment also affects biota and the beneficial uses of streams by scouring, reducing light penetration, accumulating in low-velocity reaches where bottom-dwelling organisms may suffocate, reducing reservoir storage capacities, interfering with irrigation pumps, and esthetically degrading recreational waters.

Measurements made at network sites to address sediment transported in water were suspended-sediment concentrations (SSC) and turbidity, an optical, qualitative measure of water clarity. The only numeric, sediment-related criterion for Idaho streams is based on turbidity (**http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**). Note that SSC measurements cannot routinely be interchanged with the commonly used measurements of total suspended solids because of differences in sampling and analytical techniques (Gray and others, 2000). Turbidity can be measured by several different methods and technologies, and these variables can result in turbidity data that are not comparable between or within sites, even if the data are collected with calibrated instruments and reported in the same measurement units (Gray and Glysson, 2003). In addition, other factors besides the amount of sediment in suspension (such as water color and phytoplankton) can significantly affect turbidity measurements.

SSCs were measured at the 56 network sites from 1989 through 2002 (**figure 1** and **table 2**). SSCs throughout the network ranged from less than 1 to 1,930 mg/L. Concentration distributions varied widely throughout the network, which suggests that normal conditions might be different for individual streams or groups of streams. The data for each site are summarized in **figure 5**.

At most sites in northern and central Idaho, at least 75 percent of SSCs were less than 40 milligrams per liter (mg/L), and few concentrations exceeded 50 mg/L. These low concentrations probably are due to the resistant granitic rocks and coarse soils that develop from such rocks in the Northern Rocky Mountains province. Concentrations less than 40 mg/L were also common in southern Idaho. Some of the consistently lowest concentrations were measured in the middle Snake River upstream from Twin Falls (where reservoirs probably reduce the load of sediment in suspension) and near headwater springs.

Higher SSCs were measured at more sites in the Columbia Plateaus province of southern Idaho than in northern or central Idaho. In southeastern Idaho, at least 25 percent of the concentrations exceeded 80 mg/L at sites in the Portneuf River Basin (sites 15, 16, and 17); Bear River (site 53); Blackfoot River (site 13); and Rock Creek (site 22). In southwestern Idaho, at least 25 percent of the concentrations exceeded 65 mg/L in the lower Snake River (sites 37 and 43), Boise River (sites 33 and 36), South Fork Payette River (site 38), and Weiser River (site 42). Natural basin characteristics, presence of loess and other fine-grained soils, and land use probably contribute to these high concentrations. Most of these sites are agricultural site types or Snake River sites located at or downstream from large areas of irrigated rowcrop agriculture.

Sediment concentrations usually were highest during some of the highest stream discharges. However, correlations between sediments and stream discharge were not particularly strong (all r^2 less than 0.6).

Data from only two sites suggest patterns in SSCs over time. Data from the Pahsimeroi River (site 44) suggest that concentrations have decreased in the latter years of the network, whereas data from Camas Creek (site 25) suggest that concentrations have increased (**figure 6**). However, the increase in Camas Creek is due to high concentrations in 1997, the last year of data collection in an extreme high-flow year when SSCs may have been elevated naturally.

Correlations between SSCs and turbidity were generally poor (**figure 7**). Considering the variety of factors that can affect turbidity measurements, this is not surprising. Correlations between turbidity and suspended sediment for two sites representing the range of relations from poor (site 42) to relatively good (site 16) are shown in **figure 8**. As a result of poor

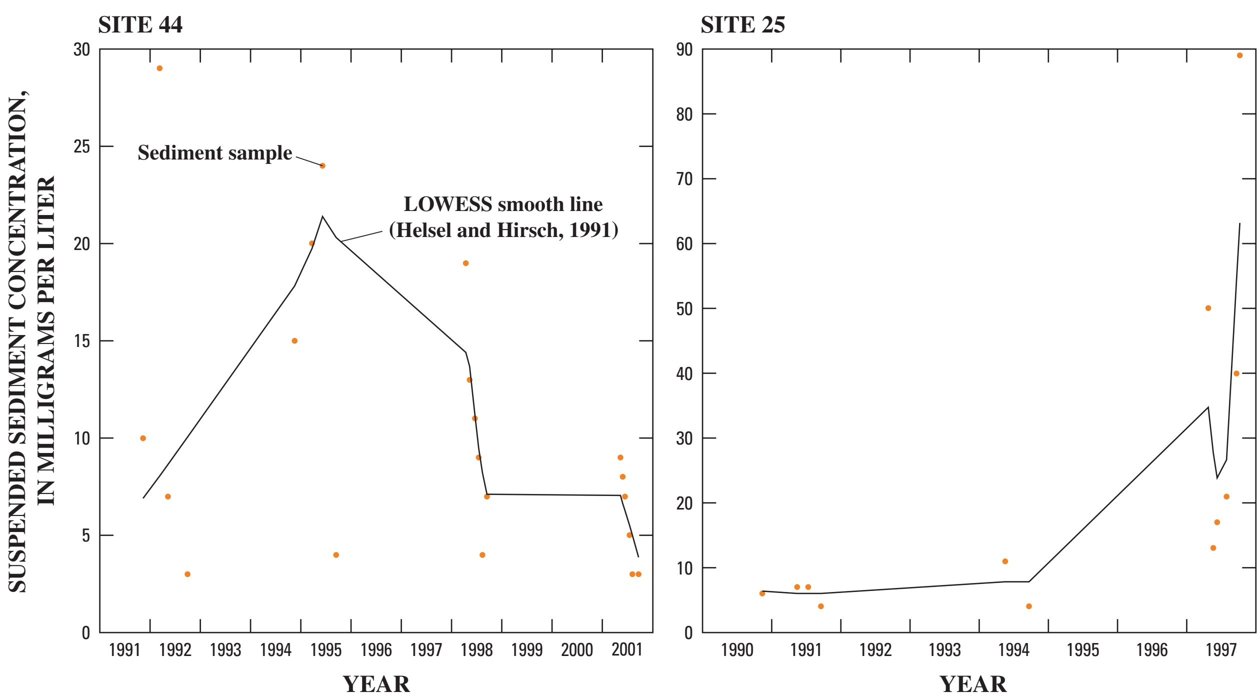

Figure 6. Suspended-sediment concentrations in relation to time at selected sites in the Idaho statewide surface-water-quality monitoring network (Locations of sites shown on **figure 1**)

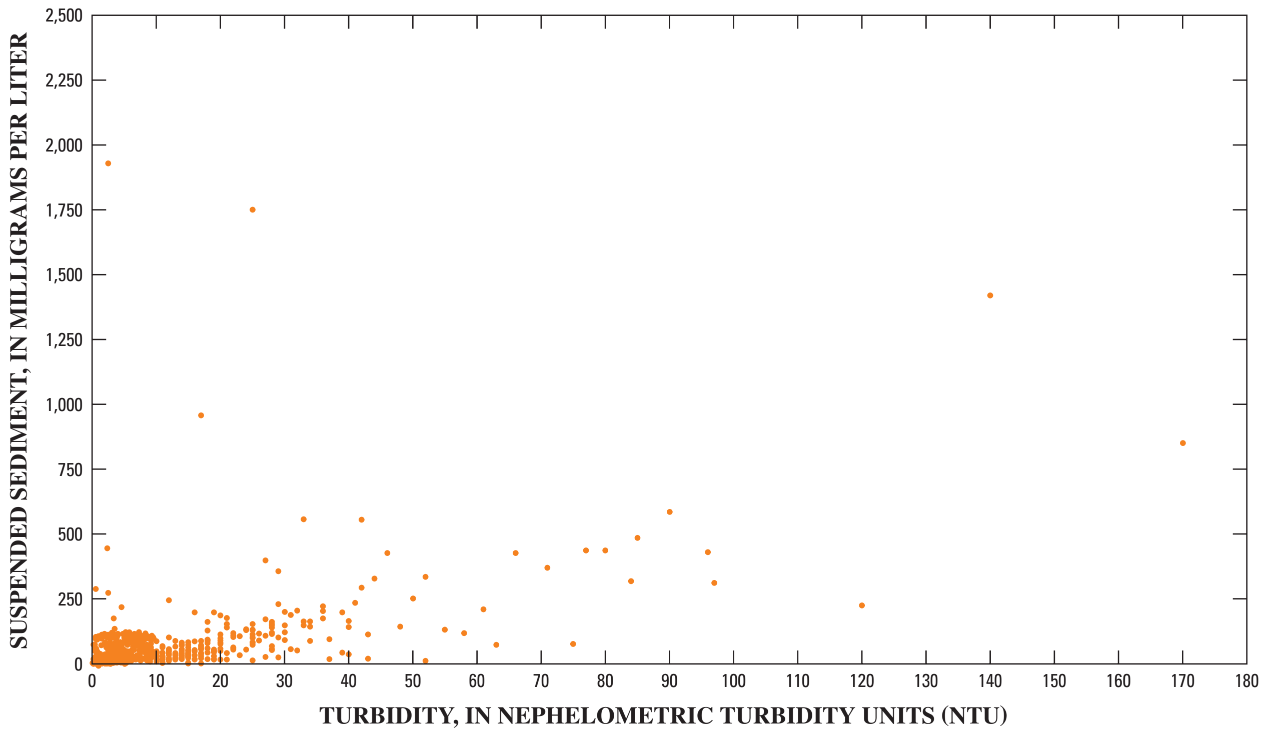

Figure 7. Turbidity in relation to suspended-sediment concentrations at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002

correlations, the utility of turbidity as a surrogate measure of SSC needs to be determined on a site-by-site basis.

Idaho water-quality criteria require that turbidity shall not exceed background concentrations by more than 50 nephelometric turbidity units (NTU) instantaneously or more than 25 NTU for more than 10 consecutive days (**http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**). Because background concentrations are not known and only instantaneous measurements were made, exceedances of criteria could not be determined. However, background concentrations of turbidity are likely to be low (minimums never exceeded 3 NTU and the 25th percentile for any individual site never exceeded 8 NTU; **figure 9**). Network sites where turbidity exceeded 25 NTU (**figure 10**) indicate locations where the potential to exceed Idaho turbidity criteria may be greatest. Although turbidity exceeded 25 NTU at a variety of site types, nearly all the sites where turbidity exceeded 50 NTU are agricultural site types.

Dissolved Solids, Specific Conductance, and Hardness

Specific conductance (SC) is the ability of water to conduct electrical current, and it increases as the concentrations of ions dissolved in water increase. As a result, SC frequently is used to estimate concentrations of dissolved solids in water. Geology and land use primarily control SC in streams, and values generally vary inversely with flow as a result of dilution from runoff.

SC at network sites ranged from 10 to 1,330 µS/cm, indicating a wide range of dissolved-solids concentrations across Idaho (**figure 11**). SC was commonly less than 100 µS/cm at sites in northern Idaho and mountainous areas of central Idaho associated with argillites, quartzites, and granitic rocks (sites 3, 4, 6, 7, 33, 34, 38, 39, 40, 47, 51, 52, and 56). Most of these are forested site types.

SC was commonly 100 to 400 µS/cm at 24 sites distributed widely across the network (sites 1, 2, 5, 10, 11, 13, 14, 25, 27, 28, 29, 30, 31, 35, 41, 42, 43, 44, 45, 48, 49, 50, 54, and 55). These sites were located where the streams came into contact with various sedimentary and volcanic rocks, alluvial deposits, urban and suburban areas, and agricultural activities.

SC commonly exceeded 400 µS/cm in the middle and upper Snake River (sites 8, 18, 19, 20, 32, 37, and 57); its tributaries and springs (sites 12, 15, 16, 17, 21, 22, 23, 24, 26, and 36); the Lemhi River (site 46); and Bear River (site 53). These sites are in areas likely to be affected by irrigated agriculture and(or) urban effluents.

The ratios of dissolved-solids concentration to SC (**figure 12**) ranged from 0.34 to 1.16, and most were within the 0.55 to 0.75 range that Hem (1992) reported for most waters. The median ratio for each site can be multiplied by SC measurements to yield reasonable estimates of dissolved-solids concentrations. Estimates will be better for sites having small ratio variations than for those having wide variations.

Ratios were largest and most variable at selected forested, rangeland, and agricultural site types. SC at many of these sites (sites 3, 4, 6, 7, 33, 38, 39, 40, 47, 51, 52, and 56), most being forested site types, was typically less than 100 µS/cm. In such dilute waters, small variations and bias in laboratory analyses and SC measurements combined with rounding of analytical reports can significantly affect the variation and accuracy of ratios. At sites 11, 25, 31, 42, 48, and 50, SCs typically exceeded 100 µS/cm, and ratios of dissolved solids to SC commonly exceeded 0.70 and varied widely. The large ratios at these sites are probably the result of different dominant dissolved ions than those at sites where ratios are small.

Generally, SC at most sites was inversely correlated with stream discharge, and correlations at 14 sites (sites 6, 8, 15, 27, 28, 33, 41, 42, 45, 47, 48, 54, 56, and 57) were fairly strong (r^2 greater than 0.7). In contrast, correlations at other sites were poor (r^2 from 0.7 to less than 0.1). Data for Silver Creek (site 29) suggest a weak positive correlation with stream discharge ($r^2 = 0.33$). The variations in SC/stream-discharge correlations did not seem to be associated with any particular geology or land cover.

Hardness is a property of water caused by content of dissolved alkaline-earth cations and is expressed as equivalent weight of calcium carbonate ($CaCO_3$). Because calcium and magnesium ions are the most common alkaline-earth cations in natural waters, hardness values are calculated from concentrations of these ions. Toxicity of many trace elements to aquatic organisms often is inversely related to hardness. As a result, this information is important for determining potential effects of trace elements on beneficial uses of streams, particularly in areas where mining and other activities contribute trace elements to streams. The relative contributions of calcium and magnesium to hardness also may affect toxicities of trace elements (Welsh and others, 2000) but are not currently considered in Idaho water-quality criteria.

The distribution of hardness concentrations across Idaho (**figure 13**) was similar to the distribution of SC. Concentrations generally exceeded 100 mg/L as $CaCO_3$ at sites in or downstream from basins or ground-water recharge zones where limestone and other carbonate rock deposits were present (Ross and Savage, 1967). These sites were: all sites on the Snake River (sites 8, 14, 18, 19, 20, 32, 37, 43, 49, 55, and 57); all spring site types (sites 21, 23, and 29); selected tributaries to the Snake River (sites 10, 12, 13, 15, 16, 17, 22, 24, 26, 30, and 36); the Wood River (site 28); the upper Salmon River drainage (sites 44, 45, and 46); Lapwai Creek (site 50); and Bear River (site 53). Concentrations were generally highest (most exceeding 200 mg/L as $CaCO_3$) at sites in the Twin Falls area (sites 20, 21, 22, 24, and 57); the Portneuf River drainage (sites 15, 16, and 17); the Bear River (site 53); and Beaver Creek (site 26).

Concentrations were generally less than 100 mg/L as $CaCO_3$ at sites in areas without deposits of carbonate rocks (Ross and Savage, 1967). These sites were: most sites at and north of Potlach (sites 2, 3, 4, 5, 6, 7, 52, and 56); the South Fork Clearwater River (site 51); the lower Salmon River

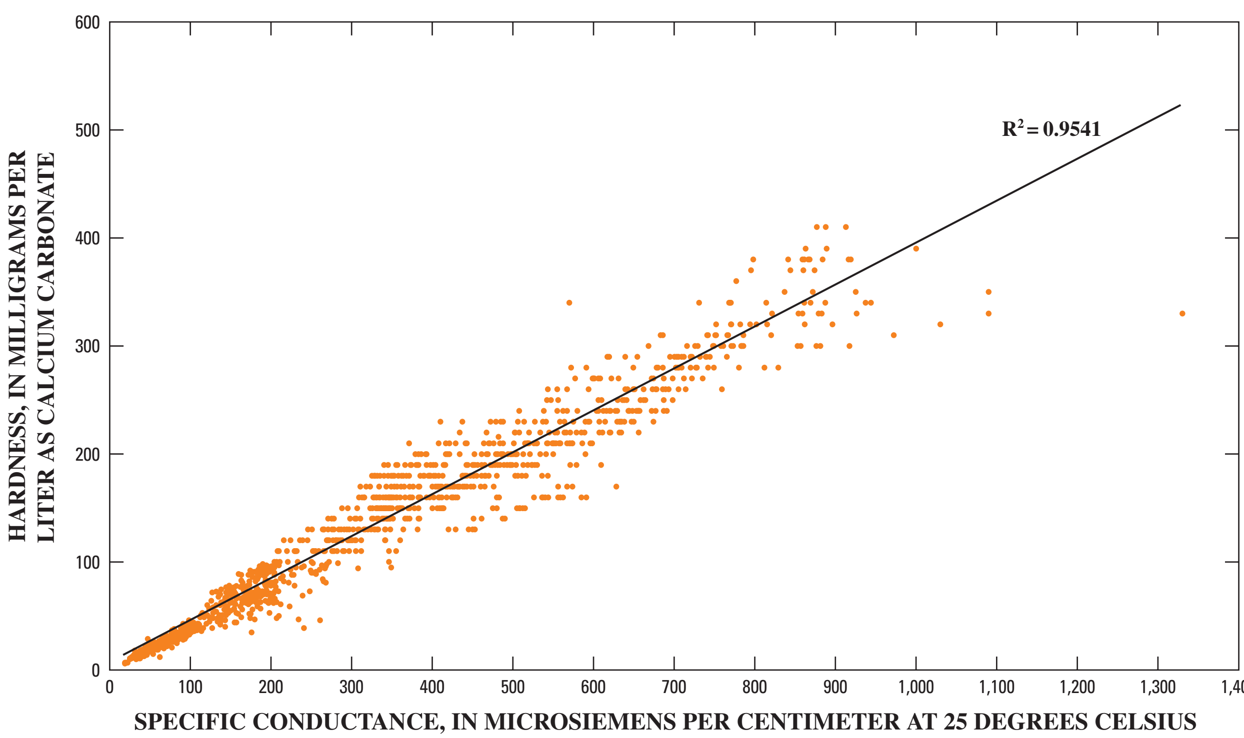

Figure 14. Hardness in relation to specific conductance at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002

drainage (sites 48 and 54); the Weiser River (site 42); the Payette River drainage (sites 38, 39, 40, and 41); the Boise River upstream from Parma (sites 33, 34, and 35); Johnson Creek (site 47); the Bruneau River (site 31); Henrys Fork (site 11); Camas Creek (site 25); and the Big Lost River (site 27). Hardness concentrations were lowest (commonly less than 25 mg/L as $CaCO_3$) in the northern and central mountains of Idaho at sites on the Priest River (site 3); Spokane River and tributaries (sites 4, 6, 7, and 56); Palouse River (site 52); South Fork Clearwater River (site 51); and North Fork Payette River (sites 39 and 40). Many of these areas are rich in trace elements, and low hardness values provide minimal offset to the toxicity of these elements.

Hardness concentrations generally were directly correlated with SC (figure 14), possibly allowing hardness values to be reasonably estimated from a simple field measurement when laboratory analyses are not available. Similar correlations could be developed for individual sites to provide site-specific estimates of hardness for evaluations of trace-element toxicities.

The ratio of calcium and magnesium that contributes to hardness has been reported to significantly affect toxicities of some trace elements to aquatic organisms (Welch and others, 2000). Low ratios favor high trace-element toxicities. Molar ratios of calcium : magnesium across the network ranged from 0.56 to 9.73, and median ratios at all sites except one exceeded 1.3. Ratios were lowest at the Bear River (site 53), where values ranged from 0.56 to 1.36 and the median value was 1.0. Although these low ratios suggest that the current adjustments made to criteria may underestimate the true trace-element toxicities, hardness concentrations at this site were some of the highest in the network.

Dissolved Oxygen

Nearly all stream fauna depend on adequate dissolved oxygen (DO) in water, though different organisms have different minimum requirements. Fish, particularly salmon species, require some of the highest concentrations, and Idaho water-quality criteria are generally designed to accommodate these fish.

Major factors and processes affect DO in water:

- **Atmospheric pressure.** The amount of DO that water can hold is directly related to barometric pressure. As a result, the maximum DO concentration that water can hold (saturation) is lower at high elevations (where pressure is low) than at low elevations.

- **Stream turbulence.** Turbulence in stream riffles enhances the contact of stream water with the atmosphere, improving the diffusion of oxygen and other gasses between water and air. If DO concentrations are below saturation, oxygen will move into the water. If concentrations exceed saturation (supersaturation), oxygen will move out. Water spilling from high-head dams is an extreme form of turbulence that frequently results in supersaturation of oxygen and other gasses in streams that can persist for significant distances downstream.

- **Photosynthesis by aquatic plants.** Attached and suspended algae and other plants photosynthesize during daylight at a rate exceeding their respiration rate, which results in increased DO concentrations. Water enriched in nutrients can support abnormally large populations of aquatic plants that can, in turn, cause significant supersaturations of DO during daylight.

- **Respiration by aquatic organisms.** Plants and animals in streams deplete DO from water as they respire. Discharges of sewage and other types of organic pollution to streams can result in large populations of organisms that decompose the organic materials. Respiration by these large populations can significantly reduce DO in streams. Large populations of aquatic plants that cause supersaturations of DO during daylight can cause significant oxygen depletions at night as they continue to respire in the absence of photosynthesis.

- **Water temperature.** DO concentrations are inversely related to water temperature. Cold water accommodates higher concentrations than warm water accommodates. In addition, warm water increases metabolic rates of organisms, including those that decompose organic matter, and results in faster depletion of DO.

- **Dissolved solids.** Although the solubility of oxygen is inversely related to dissolved-solids concentrations, this factor is not significant for fresh water where dissolved-solids concentrations are small.

In Idaho, the DO criterion (Idaho Department of Environmental Quality, http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf) for protection of coldwater aquatic organisms is a minimum of 6.0 mg/L for most streams. There can be additional criteria. For example, segments of streams supporting salmon spawning must maintain at least the greater of 6.0 mg/L or 90 percent saturation during spawning seasons.

All saturation data in this report were based on onsite measurements of atmospheric pressure and water temperature made at the time that DO measurements were made. The DO data from network sites are presented in figure 15.

DO concentrations less than 6 mg/L are not common, but such concentrations were measured one time at the Kootenai River (site 1), South Fork Coeur d'Alene River (site 5), and North Fork Payette River (site 40); two times at Clark Fork River (site 2) and Snake River at Milner (site 19); and three times at Silver Creek (site 29). Because all of these concentrations were less than 70 percent of saturated conditions, it is likely that decomposition of organic loads contributed to the low DO concentrations measured in these streams. Most of these measurements were made from May through early

September, when warm temperatures may have contributed to low DO concentrations. However, the measurement on the Kootenai River was made in early April at cold temperatures with no ice cover on the river and would have supported DO concentrations nearly 3.7 times higher.

Because measurements at sites in this network always are made during daylight, the lowest DO concentrations probably were not measured. Sites where large supersaturations of DO were measured may have large phytoplankton and periphyton communities that could have depleted DO by respiration at night. All measurements of DO that exceeded 170 percent saturation were made during the summers of 1991, 1993, and 1994 in eastern Idaho at the Blackfoot River (site 13), Marsh Creek (site 16), the Portneuf River (site 17), and the Snake River near Shelley (site 55). These sites probably would be good candidates for more intensive DO monitoring, such as diel measurements (measurements made throughout a 24-hour period) during warm periods, to determine whether minimum concentrations are met throughout the day.

During the summer, temperatures of many Idaho streams can exceed 25°C. At such high temperatures, even saturated DO concentrations may be near the 6 mg/L criterion. Only small amounts of natural or human-caused organic loading might result in concentrations that fall below the criterion under these summer conditions.

Data suggest decreasing concentrations and saturation of DO over time at the Snake River at Milner (site 19), Silver Creek (site 29), Lapwai Creek (site 50), and the Bear River (site 53) (**figure 16**). All these sites are agricultural site types or large-river and spring site types where agricultural land composes more than 20 percent of the land cover. Although specific causes of DO reduction are not known, it is likely that land-use changes and(or) population growth in each basin might be major factors. All these sites were sampled on only 2- or 3-year cycles, and more frequently collected data probably will be necessary to verify whether the patterns are real and to determine when continued DO reductions might significantly affect the aquatic communities.

pH

Most network pH values (**figure 17**) were within the 6.5–9.0 range specified to protect aquatic organisms in Idaho streams (Idaho Department of Environmental Quality, **http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**). pH values in at least one sample equaled or exceeded 9.0 at sites on the Snake River (sites 19, 32, 37, 43, 55, and 57); Camas Creek (site 25); the Lemhi River (site 46); the Blackfoot River (site 13); the Malad River (site 30); the Boise River (site 36); North Fork Payette River (site 40); and the Lapwai Creek (site 50). Sites where pH values were consistently higher than at other sites were on the lower Snake River (sites 32, 37, and 43), where 90 percent of pH measurements equaled or exceeded 8.4. Except for the Lemhi River site, all of these are agricultural site types or large-river and rangeland site types where agricultural land composes at least 16.2 percent of the land cover. Although the Lemhi River is a rangeland site type and agricultural land composes only 8.6 percent of the land cover, agriculture is concentrated in the alluvial river bottom and uses an extensive system of diversions and returns of river water (Donato, 1998).

All these sites are located in basins where carbonate deposits are common (Ross and Savage, 1967). The high pH values are probably a result of the combination of high-carbonate water and photosynthetic activity by large algal communities. DO concentrations as high as 118 to 212 percent of saturated conditions are additional evidence that algal communities are highly active at all of these sites. In addition to adequate nutrient concentrations, physical conditions such as velocity of streamflow, light penetration, warm temperature, and depth of water can enhance photosynthesis of phytoplankton and periphyton that favor high pH.

pH values in at least one sample were less than 6.5 at sites on the North Fork Coeur d'Alene River (site 4), South Fork Coeur d'Alene River (site 5), Palouse River (site 52), North Fork Payette River (site 39), and Boise River below Diversion Dam (site 34). Values of pH were consistently lower on the Spokane River (site 7) and sites 4, 5, 39, and 52 than at other sites. These sites are not located in basins with significant amounts of limestone or other carbonate deposits (Ross and Savage, 1967). Specific conductance at all of these sites except site 5 was generally less than 100 μS/cm, which suggests that water in these streams is naturally poorly buffered against pH reduction. The South Fork Coeur d'Alene River has been affected by extensive mining activities for many years, but it is not known if these activities might have caused any of the low pH measurements made at site 5.

Data suggest decreasing pH over time at the Snake River at Milner (site 19), Big Wood River (site 28), Silver Creek (site 29), and the Snake River near Anatone (site 49) (**figure 18**). At two of these sites (19 and 29), the decreases in pH are accompanied by possible decreasing concentrations of DO, total phosphorus, and(or) nitrogen, which suggests that primary production by algal communities may be decreasing at these sites.

Nutrients

Phosphorus and nitrogen are two major nutrients essential to aquatic plant growth, and high concentrations in water can cause excessive amounts of plant growth that can seriously limit beneficial uses of streams. High concentrations commonly are caused by sewage disposal, urban runoff, agricultural activities, and some industrial activities. Adequate amounts of both of these nutrients must be present to support nuisance plant growth. If one is present in high concentrations while concentrations of the other are too low to support growth, the low-concentration nutrient is called the "limiting" nutrient. Dissolved inorganic forms of nitrogen (ammonia, nitrite, and nitrate) and phosphorus (orthophosphate) are the most readily usable forms for most plants. However, organic and suspended forms are naturally cycled into dissolved inorganic forms, so total nutrient concentrations are of ultimate concern.

Ammonia is a form of nitrogen that can be toxic to aquatic organisms. It can enter natural water systems from several sources, including discharge of industrial wastes and sewage effluents, runoff from agricultural fields where commercial fertilizers and animal manure are applied, and degradation of nitrogenous organic matter carried in streams. Laboratory analyses of total dissolved ammonia measure both ammonium ions (NH_4^+) and un-ionized ammonia (NH_3). The latter is the more toxic form, and concentrations vary as temperature, pH, and concentrations of dissolved ammonia vary. High pH and temperature favor higher proportions of NH_3.

NITROGEN

Total nitrogen concentrations ranged from less than 0.001 to 7.3 mg/L and commonly exceeded 0.5 mg/L across the network (**figure 19**). Concentrations equaled or exceeded 0.99 mg/L in more than 25 percent of the samples from sites on the middle and lower Snake River (sites 20, 32, 37, 43, 49, and 57); spring site types on the Snake River Plain (sites 21, 23, and 29); the Portneuf River drainage (sites 15, 16, and 17); Rock Creek (site 22); Salmon Falls Creek (site 24); the Boise River at Parma (site 36); the Bear River (site 53); and the Lapwai Creek (site 50). Nearly all these sites are agricultural site types or large-river or spring site types in areas of significant agricultural land use. Concentrations were generally highest at springs and stream sites near Twin Falls (sites 21, 22, and 24) and the Boise River (site 36), exceeding 2.0 mg/L in more than 50 percent of the samples.

At almost half of the network sites, inorganic nitrogen concentrations in more than 25 percent of the samples exceeded 0.3 mg/L (**figure 20**), a concentration considered critical for supporting algal production when adequate phosphorus is present (Mackenthun, 1969). These sites were: all sites listed in the previous paragraph, the Snake River at Milner (site 19), the Teton River (site 10), the Malad River (site 30), the Boise River at Glenwood Bridge (site 35), the Payette River (site 41), Willow Creek (site 12), the Pahsimeroi River (site 44), and the South Fork Coeur d'Alene River (site 5).

Dissolved ammonia concentrations were generally well below 0.07 mg/L at most sites. Exceptions were sites 5, 12, 16, 22, 53, and 57. Calculations presented in the Idaho Administrative Code (Idaho Department of Environmental Quality, http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf) were performed on all ammonia data to determine if concentrations exceeded Idaho criteria. No concentrations exceeded Idaho's acute or chronic toxicity criteria for aquatic biota at ambient temperatures and pH.

Depending on sources of nitrogen and activities of biological communities, the forms of nitrogen can be quite variable at sites, sometimes over short periods of time. Nonetheless, some forms of nitrogen were prevalent at some sites (**figure 19**). At about 50 percent of the network sites, organic and(or) particulate forms composed more than half of the nitrogen in more than 75 percent of the samples. Many of these samples were from sites where nitrogen concentrations were low and from sites in the upper Snake River Basin. At about 25 percent of the network sites, inorganic forms composed more than half of the nitrogen in more than 75 percent of the samples. These samples were from spring site types, tributaries, and large-river sites in the middle and upper Snake River Basin. No consistently prevalent form of nitrogen was associated with any individual site type or area of Idaho.

Data suggest possible patterns in total nitrogen over time at several sites (**figure 21**). Data from agricultural site types (sites 10, 16, and 17) and two sites associated with irrigated agriculture in the middle Snake River and tributaries (sites 19 and 24), Silver Creek (site 29), and Bear River (site 53) suggest decreasing concentrations. Data from Rock Creek (site 22), also an agricultural site type, suggest increasing concentrations in total nitrogen.

Few sites suggest correlations (r^2 greater than 0.75) between stream discharge and nitrogen concentrations. Although sites 39 and 52 showed a correlation, only one measurement at each site was made during a relatively high flow; more data during high flows would be needed to support a high-confidence correlation.

There were no strong correlations between SSCs and nitrogen or between turbidity and nitrogen at any network sites.

PHOSPHORUS

Concentrations of total phosphorus ranged from less than 0.001 to 1.3 mg/L. Concentrations exceeding 0.1 mg/L are considered able to support nuisance levels of algal production in flowing waters (Mackenthun, 1969; U.S. Environmental Protection Agency, 1986). Phosphorus in more than 25 percent of the samples from sites 16, 17, 19, 20, 22, 30, 35, 36, 37, 42, 43, 50, 53, and 57 equaled or exceeded this concentration (**figure 22**). All of these sites are agricultural site types, Snake River sites in areas of significant agricultural land use, or sites downstream from Boise. Concentrations were consistently highest at the Boise River near Parma (site 36), where total phosphorus exceeded 0.2 mg/L in more than 75 percent of the samples and exceeded 0.4 mg/L in more than 25 percent of the samples. In contrast, some of the lowest total phosphorus concentrations were from the three spring sites (sites 21, 23, and 29), also located in areas of significant agricultural land use. This may reflect the fact that phosphorus is not readily transported in ground water due to sorption and precipitation reactions.

Depending on sources of phosphorus and activities of biological communities, the forms of phosphorus can be quite variable at sites, sometimes over short periods of time. Nonetheless, some forms of phosphorus were prevalent at some network sites (**figure 22**). At about 13 percent of the sites, organic and(or) particulate forms composed more than half of the phosphorus in more than 75 percent of the samples. These samples were from the South Fork Coeur d'Alene River (site 5); Palouse River (site 52); the middle to lower Snake River (sites 32, 37, and 43); Blackfoot River (13); and Bear River (site 53). At about 23 percent of the sites, orthophosphate composed more than half of the phosphorus in more than 75 percent of the samples. These samples were from the lowest Snake River site (site 49); Lapwai Creek (site 50); Boise River (sites 35 and 36); spring site types in south-central Idaho (sites 21, 23, and 29); upper reaches of the Salmon River Basin (sites 44 and 46); Kootenai River (site 1); Johnson Creek (site 47); Beaver Creek (site 26); and Willow Creek (site 12). No consistently prevalent form of phosphorus was apparent at any individual site type or area of Idaho.

Data suggest a possible decreasing total phosphorus concentration over time at the Snake River near Kimberly (site 20) and possible increasing concentrations at Salmon Falls Creek (site 24) and Bear River (site 53) (**figure 23**). All these sites are affected by agricultural activities, and trends might reflect changes in the amount of agricultural land use or land-management practices employed.

Only site 50 showed a correlation (r^2 greater than 0.75) between stream discharge and total phosphorus concentrations. Although site 50 showed a correlation, only one measurement was made during high flow; more data during high flows would be needed to support a high-confidence correlation. Donato (2004) examined the relation between phosphorus and stream discharge at sites 34, 35, and 36 in greater detail to estimate phosphorus loads transported in the lower Boise River.

Five sites (sites 4, 31, 49, 50, and 54) showed correlations (r^2 greater than 0.75) between SSCs and phosphorus concentrations.

REFERENCE SITES

Some network sites may be good indicators of naturally occurring (background) nutrient concentrations that may be useful for assessing nutrient impacts on other streams. Total nitrogen concentrations at 15 sites (sites 1, 2, 3, 4, 6, 7, 27, 38, 39, 45, 47, 48, 51, 54, and 56) and total phosphorus concentrations at 21 sites (sites 1, 2, 3, 4, 6, 7, 8, 10, 21, 23, 27, 29, 33, 38, 39, 47, 48, 51, 54, 55, and 56) were less than or similar to those summarized by Clark and others (2000) for relatively undeveloped basins in the United States. Most of the Idaho sites where nutrient concentrations were low are forested site types.

Seven of these sites were chosen as "reference" sites on the basis of low concentrations of both nitrogen and phosphorus, minimal land development, and location. Three of the sites are on the North Fork Coeur d'Alene and St. Joe River (sites 4, 6, and 56) in northern Idaho, where median nitrogen and phosphorus concentrations were less than 0.14 and 0.01 mg/L, respectively. Two sites are on the South Fork Payette River and Johnson Creek (sites 38 and 47) in central Idaho, where median nitrogen and phosphorus concentrations were 0.19 and 0.01 mg/L, respectively. The site on the Big Lost River (site 27) in central Idaho represents a rangeland site type where median nitrogen and phosphorus concentrations were less than 0.25 and 0.01 mg/L, respectively. The site on the Salmon River near White Bird (site 54) in north-central Idaho is unique because it is a large-river site type where median nitrogen and phosphorus concentrations were less than 0.25 and 0.02 mg/L, respectively.

The U.S. Environmental Protection Agency (USEPA) recommends two methods for determining background nutrient concentrations (U.S. Environmental Protection Agency, 2000a). One method uses the 25th percentile of all data from a nutrient ecoregion. The other uses the 75th percentile of all data from a selected reference site. Comparisons between nutrient concentrations at the reference sites and background concentrations calculated from network data for two nutrient ecoregions, the Western Forested Mountains and the Xeric West (**figure 1**), using USEPA's 25th percentile method are

Table 4. Total nitrogen and phosphorus concentrations at proposed reference sites in the Idaho statewide surface-water-quality monitoring network in relation to nutrient criteria recommended for, and background concentrations modeled for, two nutrient ecoregions

[mg/L, milligrams per liter; USEPA, U.S. Environmental Protection Agency]

	Ecoregion II - Western Forested Mountains			Ecoregion III - Xeric West		
Constituent	Idaho network data	USEPA criteria (2000b)	Modeled by Smith and others (2003)	Idaho network data	USEPA criteria (2000c)	Modeled by Smith and others (2003)
Total nitrogen (mg/L)	0.12	0.12	0.21	0.4	0.38	0.11
Total phosphorus (mg/L)	0.008	0.01	0.02	0.023	0.021	0.03

shown in **figure 24**. On the basis of USEPA assumptions, the 75th percentile of all data from the reference sites will be similar to the 25th percentile of all data from the nutrient ecoregion. The background concentrations calculated using Idaho network data compared well with USEPA criteria (U.S. Environmental Protection Agency, 2000b and 2000c) (**table 4**). In contrast, for both the network calculations and USEPA criteria, total phosphorus concentrations were lower than concentrations modeled by Smith and others (2003) in both nutrient ecoregions, and total nitrogen concentrations were lower than modeled concentrations in the Western Forested Mountains ecoregion but were higher in the Xeric West ecoregion.

For the Xeric West site (site 27), nearly all total nitrogen concentrations were lower than the 25th percentile of all nutrient ecoregion concentrations. Slightly fewer than 75 percent of total phosphorus concentrations at this site were lower than the 25th percentile of all nutrient ecoregion concentrations.

For the northern Idaho sites in the Western Forested Mountains nutrient ecoregion, about 75 percent of total nitrogen concentrations at sites 4 and 56 and about 50 percent at site 6 were lower than the 25th percentile of all nutrient ecoregion concentrations. About 50 percent of total phosphorus concentrations at all three sites were lower than the 25th percentile of all nutrient ecoregion concentrations. This suggests that sites 4 and 56 might be the best choices as reference sites in northern Idaho.

For the central Idaho streams (sites 38 and 47) and large-river site (site 54) in the Western Forested Mountains nutrient ecoregion, fewer than 25 percent of both total nitrogen and phosphorus concentrations were lower than the 25th percentile of all nutrient ecoregion concentrations. If the concentrations at these sites are not a result of low-level contamination, they might be better estimates of background nutrient concentrations specifically for central Idaho and large-river site types.

Small analytical variations can affect these background concentrations. For several sites in **figure 24**, the difference between the 75th percentile concentration and the background concentration is less than one analytical detection limit. These calculated background concentrations may not represent historical background concentrations. For example, atmospheric nutrient contributions to streams may be higher than in the past (Smith and others, 2003), or instream contributions from anadromous fish may be lower (Thomas and others, 2003).

Trace Elements

Trace-element concentrations in water at network sites were measured from 1989 through 1995 and, in fish tissue, from 1996 through 2002. Variations in trace-element sources, water chemistry, and flow conditions can affect solubility and amounts of trace elements delivered to streams. As a result, trace-element concentrations in water can be variable, and more frequent sampling than done for this network would be required to adequately characterize all streams. Because aquatic organisms and bottom sediments are continuously exposed to the stream water, accumulations of trace elements in organism tissues and on sediments can sometimes help to better define where impacts of trace elements are the greatest.

Trace elements analyzed for network sites were aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, vanadium, and zinc. However, only those constituents related to water-quality issues that are currently priorities to IDEQ—cadmium, copper, lead, mercury, selenium, and zinc—are addressed in this report (Don Essig, oral commun., 2004).

WATER

Many of the trace elements were not routinely detected at many sites (**appendix A**). In general, concentrations of dissolved cadmium, copper, lead, and zinc were highest at sites in northern Idaho, although some copper and zinc concentrations were elevated at Snake River sites and spring site types in southern Idaho. Mercury concentrations were highest at sites in southern Idaho. Selenium concentrations had a narrow range and were not high at any site.

Table 5. Idaho criteria for selected dissolved trace elements in water

[Hardness concentrations in milligrams per liter as calcium carbonate; trace-element concentrations in micrograms per liter; CMC, criterion maximum concentration; CCC, criterion continuous concentration; criteria from Idaho Department of Environmental Quality, http://www2.state.id.us/adm/adminrules/rules/ idapa58/0102.pdf; HCwater+orgs, human consumption of water and organisms; HCorgs, human consumption of organisms only]

	Cadmium		Copper		Lead		Selenium		Zinc		Mercury			
Hardness	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	HCwater+orgs	HCorgs
25	0.78	0.35	4.6	3.4	11	0.43	18	5	35	32	2.1	0.012	0.14	0.15
50	1.7	0.6	8.9	6.3	27	1	18	5	64	58	2.1	0.012	0.14	0.15
100	3.7	1	17	11	65	2.5	18	5	114	105	2.1	0.012	0.14	0.15
200	8.1	1.8	33	21	156	6	18	5	206	188	2.1	0.012	0.14	0.15

Idaho criteria for trace elements consider concentration, duration, and frequency of exposure (http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf). Criteria maximum concentrations (CMC) are not to exceed 1-hour average concentrations more than once in 3 years. Criteria continuous concentrations (CCC) are not to exceed 4-day average concentrations more than once in 3 years. To determine whether trace-element concentrations in network streams could pose a risk of toxicity to some aquatic organisms, network data were compared with Idaho water-quality criteria concentrations without considering duration or frequency of occurrence. For cadmium, copper, lead, and zinc, the criteria were based on hardness values of 25, 50, 100, or 200 mg/L as $CaCO_3$ (**table 5**), whichever value was below and closest to the lowest hardness value measured at each site. The lowest hardness value assigned was 25 mg/L as $CaCO_3$, as required by Idaho water-quality criteria (http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf).

Concentrations of all the trace elements except selenium exceeded criteria at some network sites. The most common areas where concentrations exceeded criteria were northern Idaho; the Snake River and tributaries upstream from American Falls Reservoir; and the Salmon, Weiser, Payette, and Boise Rivers. The naturally mineral-rich geology and(or) mining activities in these basins may contribute to the high trace-element concentrations. In addition, the extremely low hardness concentrations in many northern Idaho streams result in higher sensitivity of some aquatic organisms to selected trace elements and corresponding lower criteria values. At several of these northern Idaho sites, particularly those in the Coeur d'Alene River Basin, some trace-element concentrations in more than 25 percent of the samples exceeded Idaho criteria. Sites where one or more concentrations exceeded Idaho criteria are summarized in **table 6** and **figure 25.**

Concentrations of cadmium, copper, and lead exceeded criteria at the spring site types (sites 21, 23, and 29). It is not known whether the presence of these trace elements reflects land-use activities or the geology of the aquifers that support the springs.

Although mercury was detected in only 25 of 536 samples analyzed, concentrations at 18 of the 25 sites exceeded CCCs and human-consumption criteria. These criteria were below or nearly the same as analytical reporting levels. As a result, only concentrations that were reported above the minimum reporting level are known to exceed these criteria. It is probable that lower laboratory reporting levels would show a greater frequency of criteria exceedances. In addition to natural geology, mining, and other land-use activities, atmospheric deposition also might contribute to mercury in these streams.

FISH TISSUE

Since the network was changed in 1996, tissue samples from trout, catfish, and(or) suckers have been collected and analyzed for trace elements at only 15 of the 56 network sites. More than one sample was collected at some sites, and liver was the most common tissue analyzed. Fourteen liver samples from fish at 10 of the 15 sites, additional fillet samples from fish at 4 of the 10 sites, and whole-body samples from fish at the remaining 5 sites were analyzed. Sites where fish were collected and types of tissue analyzed are shown in **table 7**.

Probability plots of selected trace-element concentrations in fish-liver samples were used to identify sites where concentrations were enriched (Helsel and Hirsch, 1991; Hardy, 1984). Concentrations that plotted on or near a straight line were considered to be from a single statistical population having background concentrations. Concentrations that plotted above those on the background line were considered enriched concentrations that belonged to a different statistical population. Plots of the six trace elements examined for this report are shown in **figure 26**. On the basis of these plots, cadmium, copper, lead, and zinc concentrations that exceeded 5, 75, 2, and 200 μg/g, respectively, appeared to be enriched. Both background and enriched concentrations of trace elements were identified in trout and sucker tissues, which suggests that combining data from different fish species might not seriously bias comparisons.

Sites where samples of fish livers contained enriched trace-element concentrations are shown in **figure 27**. Sites where any fillet or whole-body samples contained enriched concentrations also are identified on this figure. Enriched concentrations of cadmium, lead, and(or) zinc were most common in northern Idaho in the Spokane River Basin (sites 4, 5, 6, and 7). Zinc also was enriched in whole-body samples of

Table 7. Sites in the Idaho statewide surface-water-quality monitoring network where fish tissue was analyzed for selected trace elements, 1996–2000

[Locations of sites shown on **figure 1**]

Site No.	Liver	Fillet	Whole body
3	X		
4	X	X	
5	X	X	
6	X	X	
7	X		
11			X
14			X
17			X
22	X		
33	X		
36			X
37	X	X	
54	X		
56	X		
57			X

Table 8. Sites in the Idaho statewide surface-water-quality monitoring network where concentrations of selected trace elements exceeded criteria for water or were enriched in fish tissue, 1989-2000

[Locations of sites shown on figure 1; CMC, criterion maximum concentration; CCC, criterion continuous concentration; criteria from Idaho Department of Environmental Quality, **http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**; #, trace element enriched in fillet or whole-body samples]

Site No.	Cadmium		Copper		Lead		Mercury		Zinc	
	CMC or CCC exceeded	Enriched in fish	CMC or CCC exceeded	Enriched in fish	CMC or CCC exceeded	Enriched in fish	CMC or CCC exceeded	Enriched in fish	CMC or CCC exceeded	Enriched in fish
3			X		X				X	
4	X	X	X		X	X	X		X	
5	X	X	X	X	X	X	X		X	X
6			X	X		X	X			
7	X		X		X	X			X	
11	X						X			
14				#	X		X	#	X	
17				#						#
22				X						
33				X	X					
36	X						X			
37								#		
54	X		X	X	X					
56	X				X					
57										

fish from the Portneuf River (site 17). These trace elements typically were not enriched in samples of fish fillets, except for those of fish collected from the South Fork Coeur d'Alene River (site 5).

Mercury concentrations in several fish-liver samples exceeded 0.3 µg/g, the maximum concentration for edible fish tissue recommended by USEPA (U.S. Environmental Protection Agency, 2002), and probability plots (**figure 26**) suggest that background concentrations of mercury may exceed this criterion. Because mercury preferentially concentrates in muscle tissue (Goldstein and others, 1996), such high concentrations in livers suggest that concentrations in edible tissues might be at least as high. However, sites 4, 5, and 6 are examples of sites where concentrations in fish fillets were lower than those in livers. High mercury concentrations in fillets of fish from the Snake River at Nyssa (0.9 µg/g at site 37) and in whole-body fish from the Snake River near Blackfoot (1.0 µg/g at site 14) further suggest that mercury concentrations exceeding edible-tissue criteria might not be unusual in Idaho. Additional study of fillet samples from fish collected across Idaho is needed to verify that background mercury concentrations might exceed the edible fish tissue criteria.

A comparison between trace-element concentrations in fish tissue and concentrations in water (**table 8**) indicates seven sites where concentrations were enriched in fish tissue but did not exceed maximum criteria for water. This is not surprising, given that trace-element concentrations in water can be quite variable and difficult to represent by routine monitoring. However, there were 22 sites where concentrations may have exceeded criteria for water but were not enriched in fish tissue. This inconsistency suggests that fish-tissue data were not a good indicator of enrichment for streams where concentrations of dissolved trace elements were sometimes high. Part of the problem might be that the water and tissue data were collected during different years. In addition, fish are mobile and are likely to have been exposed to a wider range of environments than the one where they were collected. This presents a dilemma for water-quality monitoring. If the purpose of the data is to address impacts to fish or consumers of fish, direct analyses of fish-tissue samples are probably most appropriate. If the purpose of the data is to identify streams that may be subject to impacts from trace elements, a less mobile media (such as a selected size fraction of bottom sediments or low-mobility aquatic insects) might be most appropriate.

Organic Compounds in Fish Tissue

Many synthetic organic compounds that have significant implications for the environment have low solubility in water. As a result, they often preferentially partition into organisms and other organic material in streams. Analyses of whole-body fish for content of 28 organic compounds began in 1996 to help define where fauna are accumulating these contaminants. So far, only 15 sites have been sampled. Compounds analyzed were:

Aldrin	cis-Chlordane
trans-Chlordane	DCPA
o,p′-DDD	p,p′-DDD
o,p′-DDE	p,p′-DDE
o,p′-DDT	p,p′-DDT
Dieldrin	Endrin
alpha-HCH	beta-HCH
delta-HCH	Heptachlor
Heptachlor epoxide	Hexachlorobenzene
Lindane	o,p′-Methoxychlor
p,p′-Methoxychlor	Mirex
cis-Nonachlor	trans-Nonachlor
Oxychlordane	PCBs
Pentachloroanisole	Toxaphene

Only four compounds or groups of compounds were detected above analytical reporting limits: PCBs and the pesticides dieldrin, nonachlor, and DDT and its metabolites (DDD and DDE). One or more of these compounds were detected in fish from all 15 sites sampled, and the greatest number of compounds was detected in fish from the Boise River (site 36). The most commonly detected compounds were PCBs, DDT, and DDT metabolites.

Many of the organic compounds analyzed preferentially accumulate in fatty tissues. For comparisons among sites, data were normalized by calculating the ratios of compound and lipid concentrations (table 9). Concentrations of DDT and metabolites were added and evaluated as “total DDT.” These data are summarized in figure 28.

Ratios of PCBs to lipids were highest in samples from the Priest River (site 3); the Spokane River Basin (sites 4, 5, and 7); and the Portneuf River (site 17). High ratios at these sites may be the result of industrial and urban activities in those basins. Ratios of pesticides to lipids were highest in samples from the Salmon River (site 54); the Snake River (sites 14, 37, and 57); Henrys Fork (site 11); the Boise River (sites 33 and 36); Rock Creek (site 22); and the Portneuf River (site 17). High ratios at these sites may be the result of urban and agricultural activities in those basins. The wide-scale presence of DDT and its metabolites and PCBs reflects both the persistence and wide-scale use of these compounds before being banned from use in the United States in the 1970s. Use of nonachlor and dieldrin have been banned since the 1980s.

Fecal Coliform Bacteria

At the beginning of network monitoring, fecal coliform bacteria (FC) routinely were monitored as indicators of water contamination by humans and other warmblooded animals. Analysis for this organism was adopted by the network and has continued for the sake of consistency. In addition, a relatively simple procedure and limited equipment were required for onsite analyses of FC that were needed to accommodate remote network sites. However, current Idaho microbiological water-quality requirements have replaced FC with *Escherichia coli* (*E. coli*) criteria. Although *E. coli* is part of the FC group of bacteria, *E. coli* is more strongly correlated with swimmers’ gastrointestinal illness than FC is (Dufour, 1984). In the future, if the network can accommodate the necessary equipment and procedures, replacing FC with *E. coli* analyses (with a period of replicate *E. coli* and FC analyses) would be a benefit for monitoring statewide water quality.

E. coli and FC populations are often strongly correlated. Studies in Ohio report *E. coli*:FC ratios from 0.72 to 0.89 (Francy and others, 1993). Problems with agar selectivity that, for example, allows nonfecal coliform bacteria to grow could result in ratios higher than 1 (Dufour, 1984). Because *E. coli* and FC are frequently correlated, FC data for this study were compared with Idaho single-sample criteria for *E. coli* (526 and 406 colonies/100 mL for secondary- and primary-contact recreation, respectively (**http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**), as a conservative indicator of network sites where bacterial problems may exist and may warrant further investigation.

FC populations ranged from 0 to 4,770 colonies/100 mL and sometimes exceeded *E. coli* criteria at agricultural site types and agriculture-affected large-river site types in the Portneuf River Basin (sites 15, 16, and 17); Blackfoot River (site 13); Bear River (site 53); Bruneau River (site 31); Payette River (site 41); Weiser River (site 42); Lapwai Creek (site 50); Palouse River (site 52); and lower Snake River (sites 37 and 43) (figure 29). FC populations also exceeded *E. coli* criteria at rangeland site types in the upper Snake River Basin (sites 25 and 26) and upper Salmon River Basin (sites 44 and 46); agricultural and rangeland site types in tributaries to the middle Snake River (sites 22, 24, and 30); and agricultural, rangeland, and forested site types in the lower Boise River (sites 34, 35, and 36). The number of samples that exceeded criteria was greatest at the Boise River near Parma (site 36) and Lapwai Creek (site 50). Populations in more than 25 percent of the samples from these sites exceeded both primary- and secondary-contact criteria.

Table 9. Concentrations of selected organic compounds and ratios of concentrations to lipid content in whole-body samples of fish from sites in the Idaho statewide surface-water-quality monitoring network, 1996–99

[Locations of sites shown on **figure 1**; concentrations in micrograms per kilogram; %, percent]

Site No.	Lipids %	Diel-drin	Diel-drin: Lipid	o,p'DDD	o,p'DDE	p,p'DDD	p,p'DDE	p,p'DDT	Total DDT	Total DDT: Lipid	PCBs	PCBs: Lipid	Nona-chlor	Nona-chlor: Lipid
3	3.4						11		11	3.2	60	17.6		
4	9.4										150	16.0		
5	7.1						14		14	2.0	310	43.7		
5	11						9		9	0.8	200	18.2		
6	3.9						10		10	2.6				
7	3						11		11	3.7	270	90.0		
11	13					16	290	17	323	24.8	50	3.8		
14	16					17	250	13	280	17.5	60	3.8		
17	4.2						47	13	60	14.3	240	57.1	6	1.43
22	5.3					16	650	38	704	132.8	50	9.4		
22	9.2	5	0.54			8	68	6	82	8.9	60	6.5		
33	3					5	79	14	98	32.7				
36	22	14	0.64	6		52	770	60	888	40.4	100	4.5	13	0.59
37	10	5	0.50		9	24	510	50	593	59.3				
54	5.5	5	0.91				33	6	39	7.1				
56	8.9													
56	5.8						5		5	0.9				
57	6.4					17	470	11	498	77.8			5	0.78

Although FC populations sometimes were highest when suspended-sediment concentrations were highest, correlations of FC with both suspended sediment and stream discharge were generally poor. Data suggest no obvious patterns in FC populations over time.

SUMMARY AND CONCLUSIONS

The Idaho statewide surface-water-quality network was implemented in 1989 by the U.S. Geological Survey, in cooperation with the Idaho Department of Environmental Quality, to provide water-quality managers with data to document status and changes in the quality of Idaho streams. The 56-site network covers forested, rangeland, agricultural, spring, and large-river site types across the State. This report summarizes selected data collected at network sites from 1989 through 2002. Some of the major issues addressed in the report are summarized in **table 10**.

Although sampling was not designed to represent the full range of flow conditions at sites, sampling at 33 sites covered the range of flows well. The network might benefit from additional high- or low-flow sampling at 20 sites. At the 3 spring site types, high flows during the period of network operation were lower than historical high flows. This was probably a result of declining ground-water levels in the Snake River Plain.

Summertime stream temperatures commonly exceeded Idaho criteria for the protection of coldwater aquatic life (daily mean and daily maximum temperatures of 19 and 22 degrees Celsius, respectively). Only temperatures at sites near headwaters, sites immediately downstream from large reservoirs, and spring site types did not exceed these criteria. Criteria exceedances in stream basins with minimal development suggest that such high temperatures may occur naturally in many Idaho streams.

Suspended-sediment concentrations were generally higher in southern Idaho than in central and northern Idaho. Although correlations between suspended-sediment concentrations and stream discharge were not particularly strong, most of the highest concentrations occurred during the highest flows. Idaho's only sediment-related numeric criteria are based on turbidity, which was not strongly correlated with suspended sediment at most network sites. Network data indicated that the turbidity criterion is most likely to be exceeded at sites in southern Idaho and other sections of the Columbia Plateaus geomorphic province where loess and other fine-grained soils are subject to erosion and disturbance by land uses.

Specific conductance values ranging from 10 to 1,320 microsiemens per centimeter indicated a wide range of dissolved solids across the network. At most sites, specific conductance was inversely correlated with stream discharge. Values were generally lowest in northern Idaho and the mountainous areas of central Idaho and highest in southern Idaho in rivers affected by agricultural and urban land uses. Water hardness was closely correlated with specific conductance across the network. Hardness concentrations less than 25 milligrams per liter (mg/L) as calcium carbonate were common in streams in northern and central Idaho. Such low hardness concentrations enhance the toxicities of some trace elements to aquatic organisms in these streams. Hardness concentrations exceeded 100 mg/L as calcium carbonate in basins where carbonate rocks are present, primarily in southern Idaho.

Only a few measurements of dissolved-oxygen (DO) concentrations at six sites were less than 6.0 mg/L, the Idaho criterion for protection of aquatic organisms. Highly supersaturated DO concentrations at another four sites suggest excessive photosynthetic activity by large algal communities. These sites might benefit from nighttime monitoring to determine whether DO concentrations might fall below the criterion as these large communities respire in the absence of photosynthesis. Data from four sites suggest that DO concentrations may have decreased over time.

The pH at 15 sites sometimes fell outside the range Idaho has adopted for protection of aquatic organisms (6.5 – 9.0). Values exceeded 9.0 at 10 sites and are likely a result of photosynthetic activity by large algal communities in water where pH was elevated owing to contact with carbonate minerals. Values were less than 6.5 at five sites and are likely to be naturally low as a result of low concentrations of carbonate and other dissolved solids. One of these sites receives drainage from areas of extensive mining activities that may contribute acidic discharges.

Nutrient concentrations commonly exceeded those considered necessary for supporting algal production. At nearly half of the network sites, inorganic nitrogen concentrations in more than 25 percent of the samples exceeded 0.3 mg/L, a level considered necessary for supporting algal production. Total nitrogen concentrations exceeding 1 mg/L were not unusual. Data from eight sites suggest that total nitrogen concentrations might be changing over time. Total phosphorus concentrations in 25 percent or more of the samples at one-fourth of network sites exceeded 0.1 mg/L, a concentration considered sufficient for supporting nuisance algal growth. Data from three sites suggest increasing or decreasing phosphorus concentrations over time. Low concentrations of nitrogen and phosphorus at six sites might make them good candidates as reference sites that represent naturally occurring nutrient concentrations. The sites represent forested site types in mountainous areas of northern and central Idaho, a rangeland site type in south-central Idaho, and a large-river site type in north-central Idaho.

Trace elements in water were monitored from 1989 through 1995 and, in fish tissue, from 1996 through 2002. Of the 20 trace elements monitored, only cadmium, copper, lead, mercury, selenium, and zinc were addressed in this report. In water, many of these trace elements were not routinely detected. Concentrations of cadmium, copper, lead, and zinc generally were highest in mined and other mineral-rich basins in northern Idaho. Concentrations of mercury were highest in southern Idaho. Data showed that concentrations of one or more of these elements at 33 sites sometimes exceeded Idaho criteria for the protection of aquatic organisms. Selenium concentrations were not particularly high at any network sites.

Fish-tissue samples have not yet been collected at all network sites. At the 15 sites sampled, liver was the most common tissue analyzed, but fillet and whole-body tissue samples were analyzed for selected sites. Similar to the results from water analyses, cadmium, copper, lead, and zinc were enriched in tissue of fish collected at sites in mined and other mineral-rich basins in northern Idaho, and mercury concentrations were highest in fish collected from sites in southern Idaho. Although these data did not demonstrate mercury to be enriched in livers of fish from any of the sites sampled, several concentrations were greater than 0.3 micrograms per gram, the maximum concentration for edible fish tissue recommended for the protection of human health.

The water and fish-tissue data seemed to give inconsistent information about impacts from trace elements. Trace-element concentrations in water at 22 sites exceeded criteria but were not enriched in fish tissue. Collection of water and tissue data in different years and the mobility of fish might contribute to this problem. If fish mobility is a significant contributor, the scope of the network might have to be reassessed to meet network objectives. Although fish tissue is appropriate for assessing direct impacts of trace elements on fish and consumers of fish, another less mobile media might be better for identifying specific streams that may be subject to significant trace-element impacts.

Twenty-eight synthetic organic compounds were analyzed in samples of whole-body fish from the same 15 sites where samples of fish tissue were analyzed for trace elements. Compounds detected in these samples were PCBs (in northern and southeastern Idaho) and the pesticides DDT and its metabolites, dieldrin, and nonachlor (in southern and central Idaho). PCB residues might be a result of past urban and industrial activities, and the pesticide residues might be more closely related to urban and agricultural activities. The common presence of PCBs, DDT, and DDT metabolites reflects the wide-scale use of these compounds before they were banned more than 30 years ago and their persistence in the environment. Additional sampling will help to better assess the distribution of these compounds in fish across Idaho. As observed for trace elements, a less mobile media might be better for identifying stream reaches significantly affected by these compounds.

Populations of fecal coliform bacteria ranged from 0 to 4,770 colonies per 100 milliliters. Because fecal coliform and *Escherichia coli* (*E. coli*) are closely related, fecal coliform populations were compared with the current Idaho criteria for *E. coli* to identify sites where *E. coli* criteria might be exceeded. Fecal coliform populations exceeded Idaho primary- or secondary-contact criteria for *E. coli* (406 and 526 colonies per 100 milliliters, respectively) at 22 sites representing a wide range of site types. Populations exceeded criteria most frequently at agricultural site types on the Boise River and Lapwai Creek, where populations in more than 25 percent of the samples exceeded both criteria. Replacing fecal coliform analyses with *E. coli* analyses, allowing an overlap period when both are analyzed, would benefit the network.

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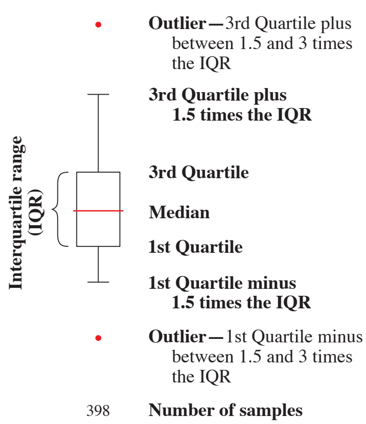
Figures 2–5, 8–13, and 15–29 (explanation for various boxplots on next page)

EXPLANATION

For figures 3, 5, 9, 11, 12, 13, 15, 17, 19, 20, 22, and 29



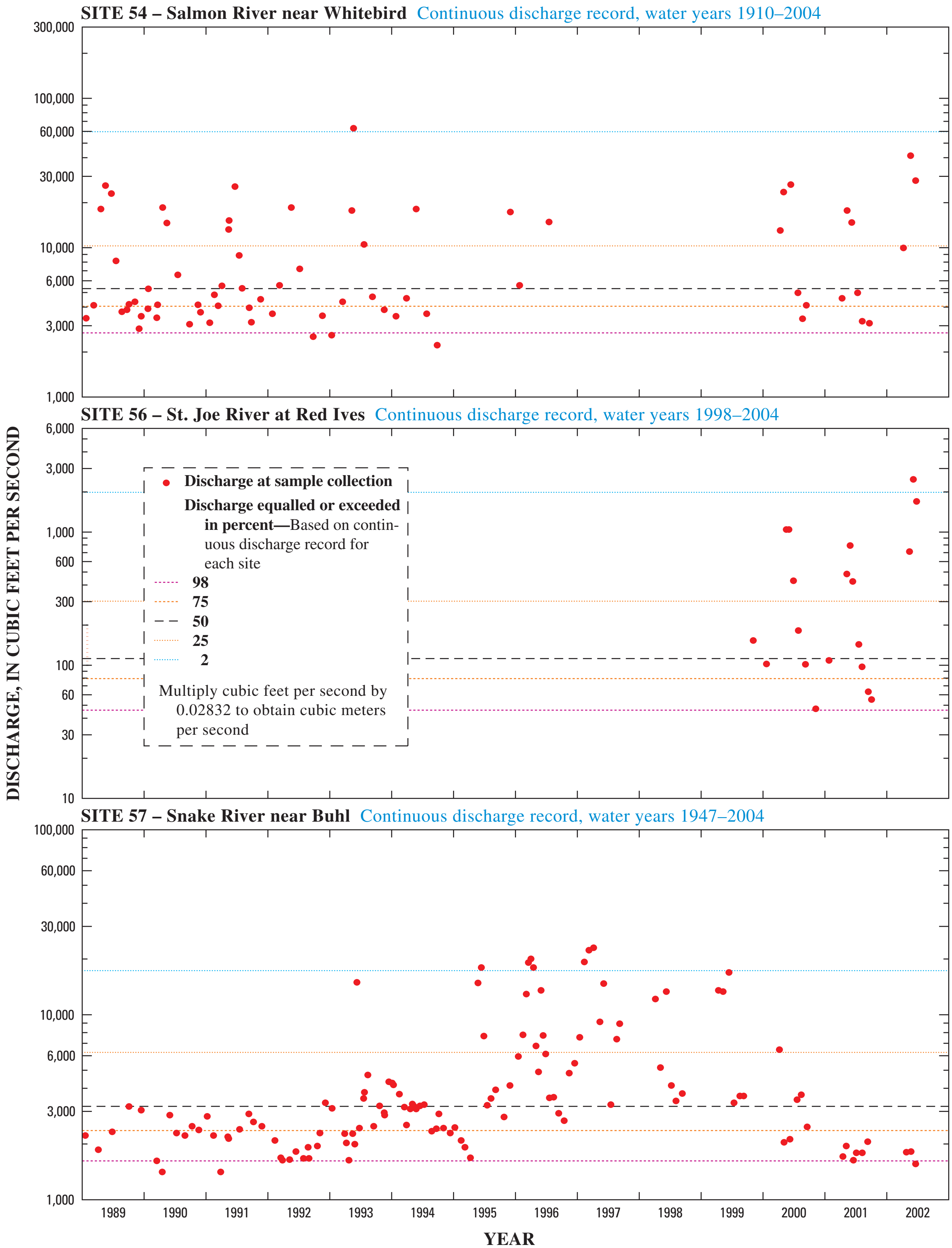


Figure 2. Stream discharges at times samples were collected for selected sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

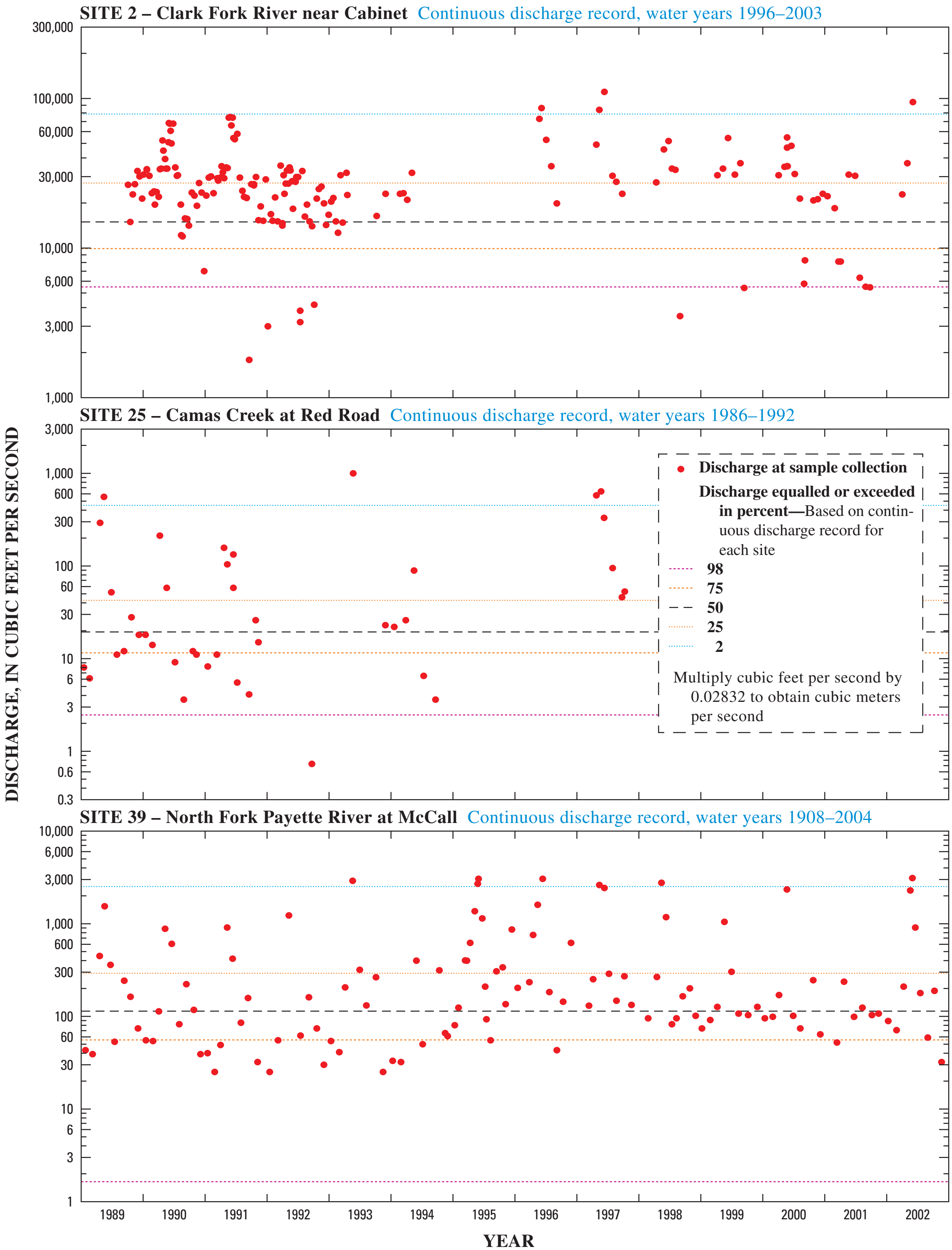


Figure 2. Stream discharges at times samples were collected for selected sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002—Continued (Locations of sites shown on figure 1)

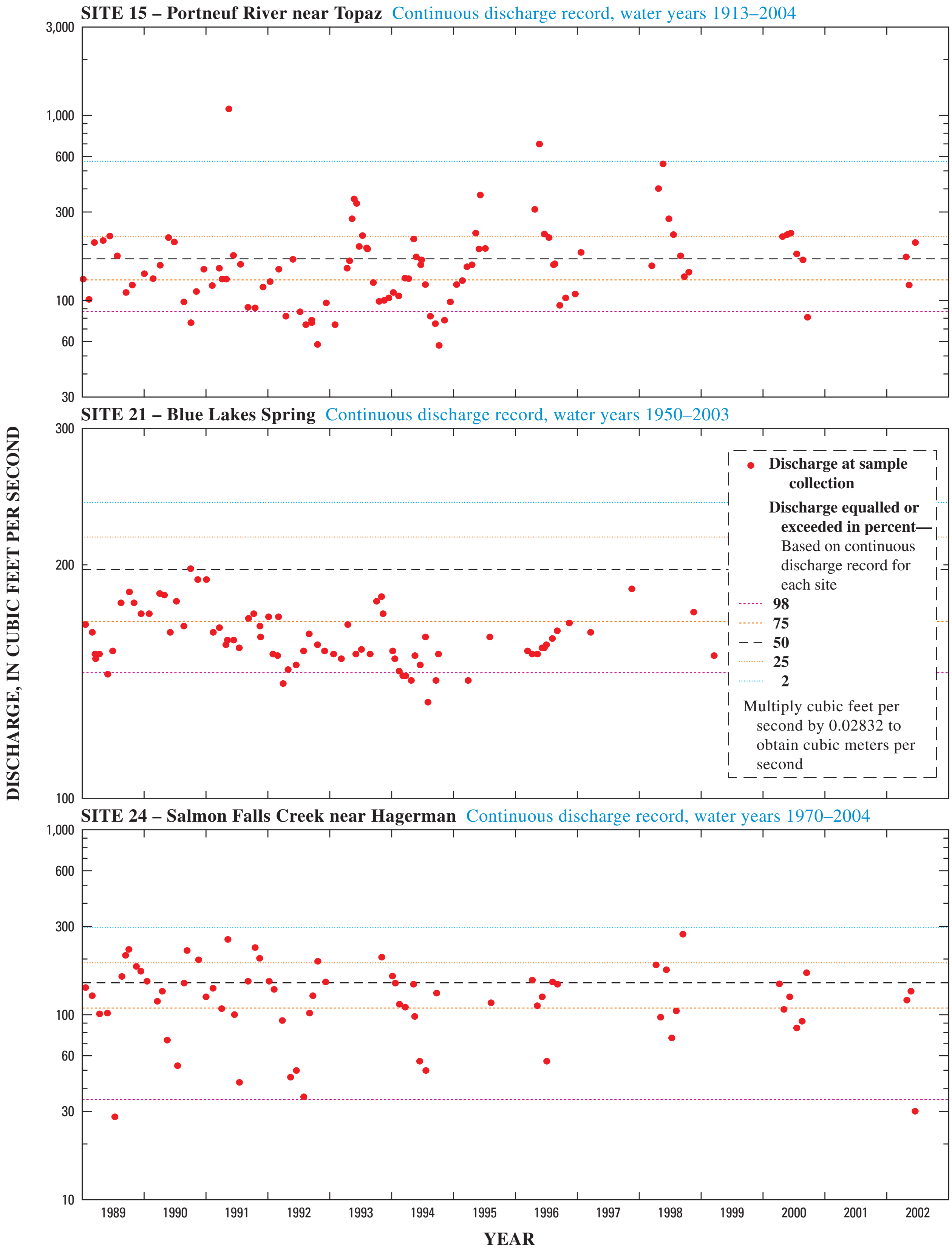


Figure 2. Stream discharges at times samples were collected for selected sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002—Continued (Locations of sites shown on figure 1)

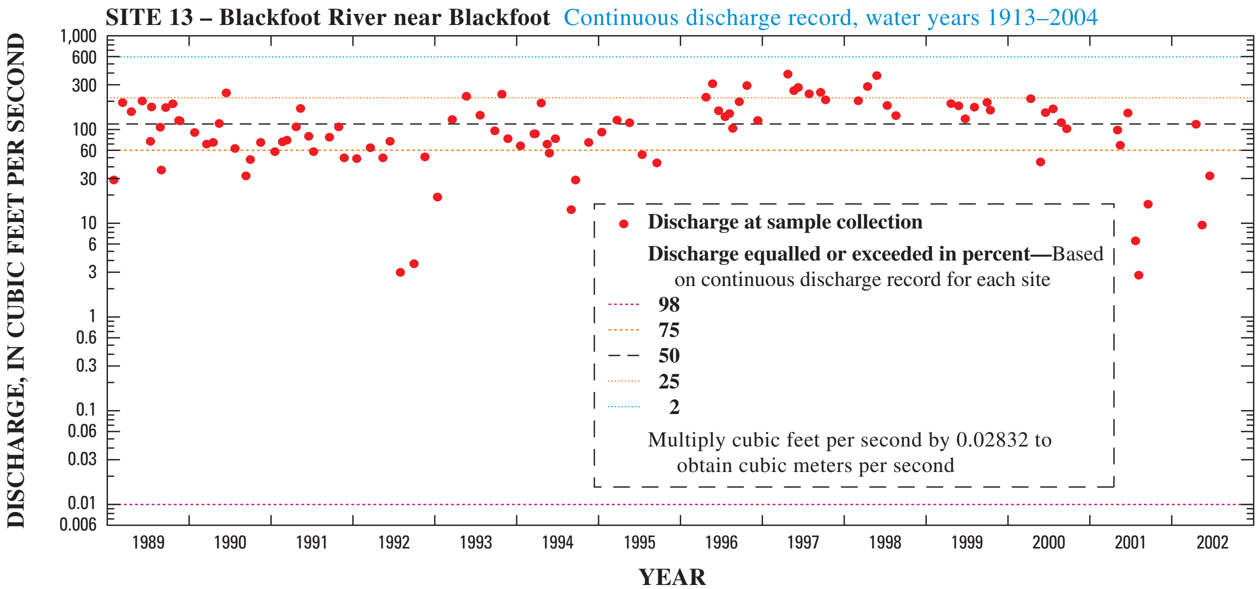


Figure 2. Stream discharges at times samples were collected for selected sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002—Continued (Locations of sites shown on figure 1)

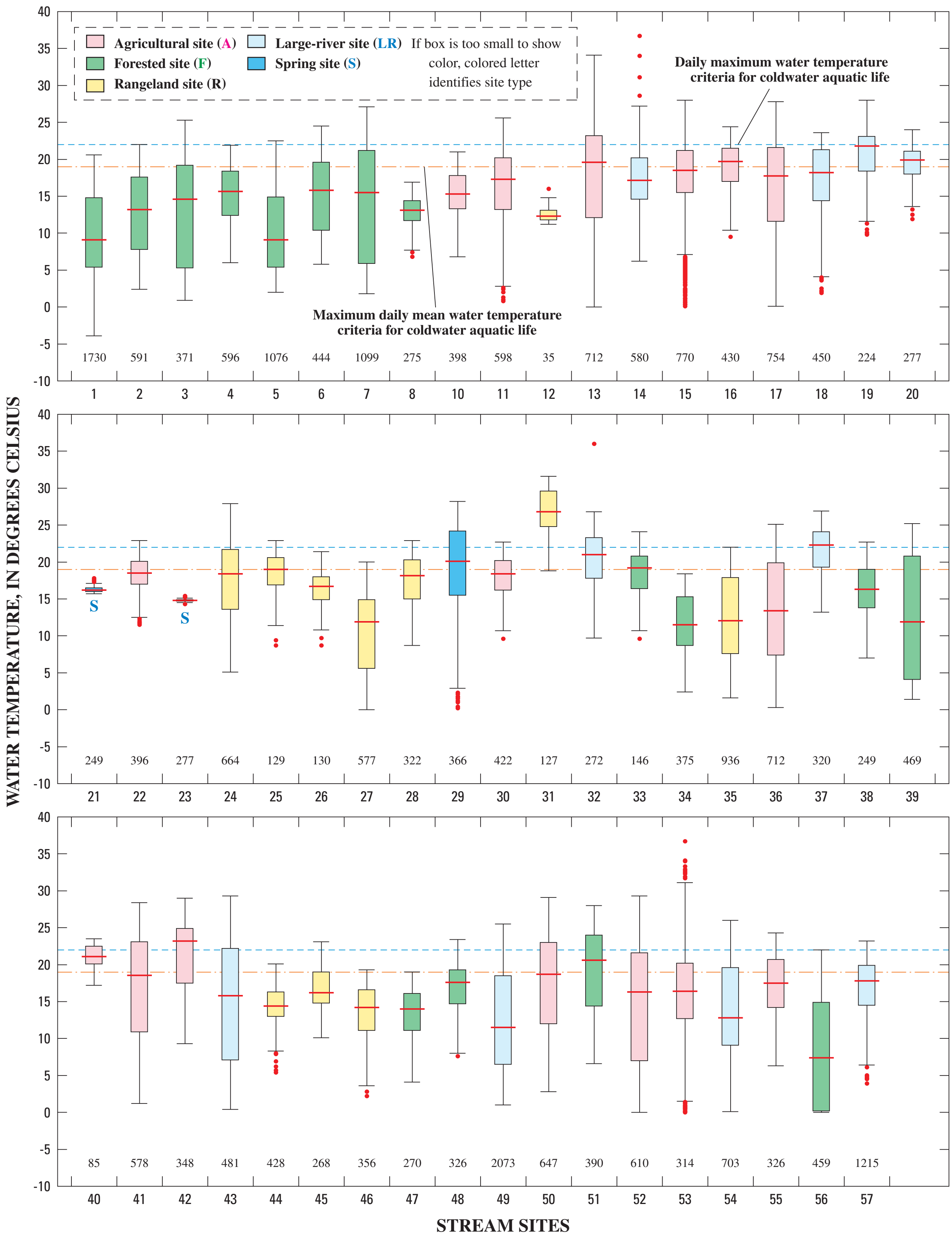


Figure 3A. Summer maximum daily water temperatures at all sites in the Idaho statewide surface-water-quality monitoring network, 1996–2002. (Locations of sites shown on figure 1; temperature criteria from Idaho Department of Environmental Quality, http://www2.state.id.us/adm/adminrules/idapa58/0102.pdf)

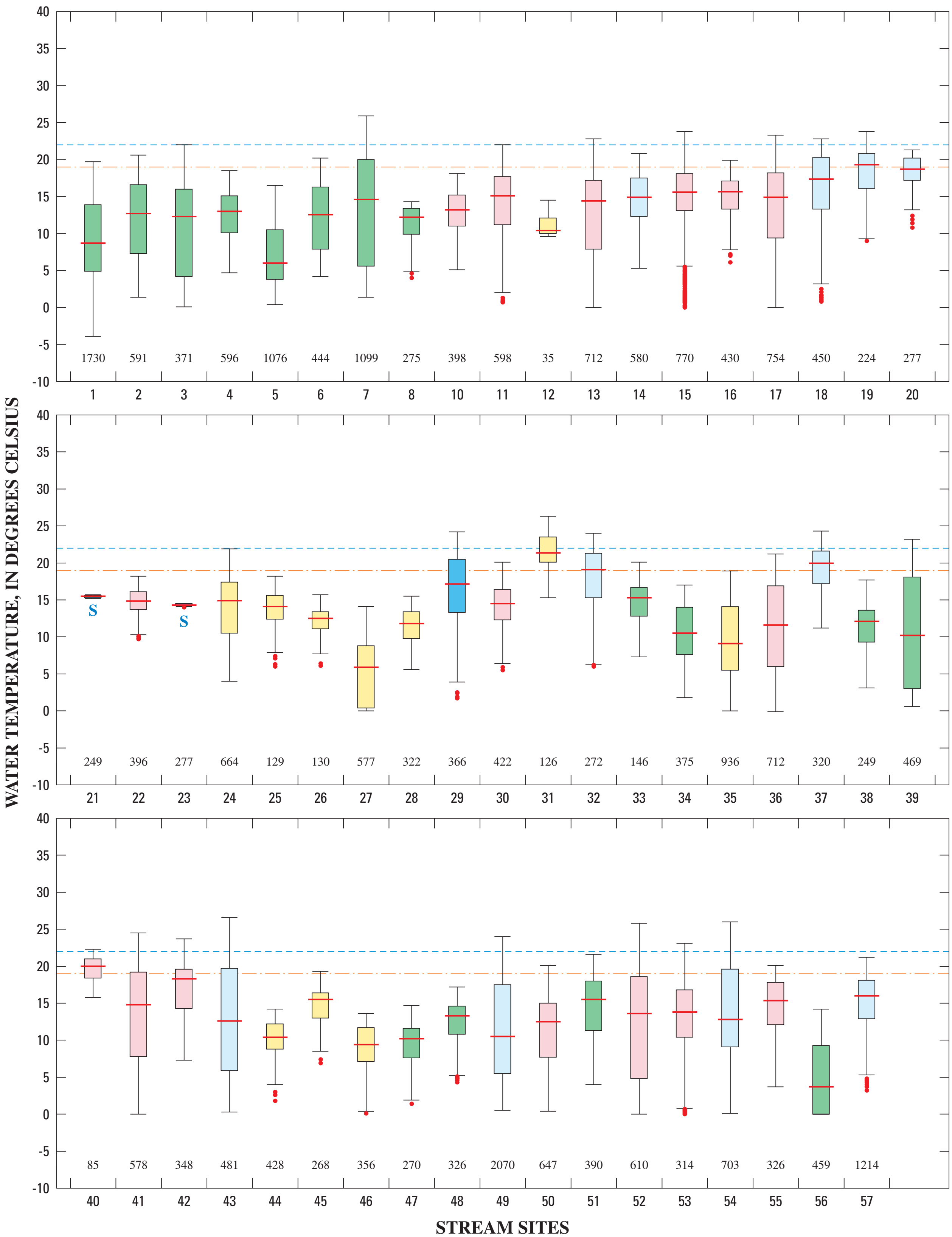


Figure 3B. Summer minimum daily water temperatures at all sites in the Idaho statewide surface-water-quality monitoring network, 1996–2002. (Locations of sites shown on figure 1; temperature criteria from Idaho Department of Environmental Quality, **http://www2.state.id.us/adm/adminrules/idapa58/0102.pdf**)

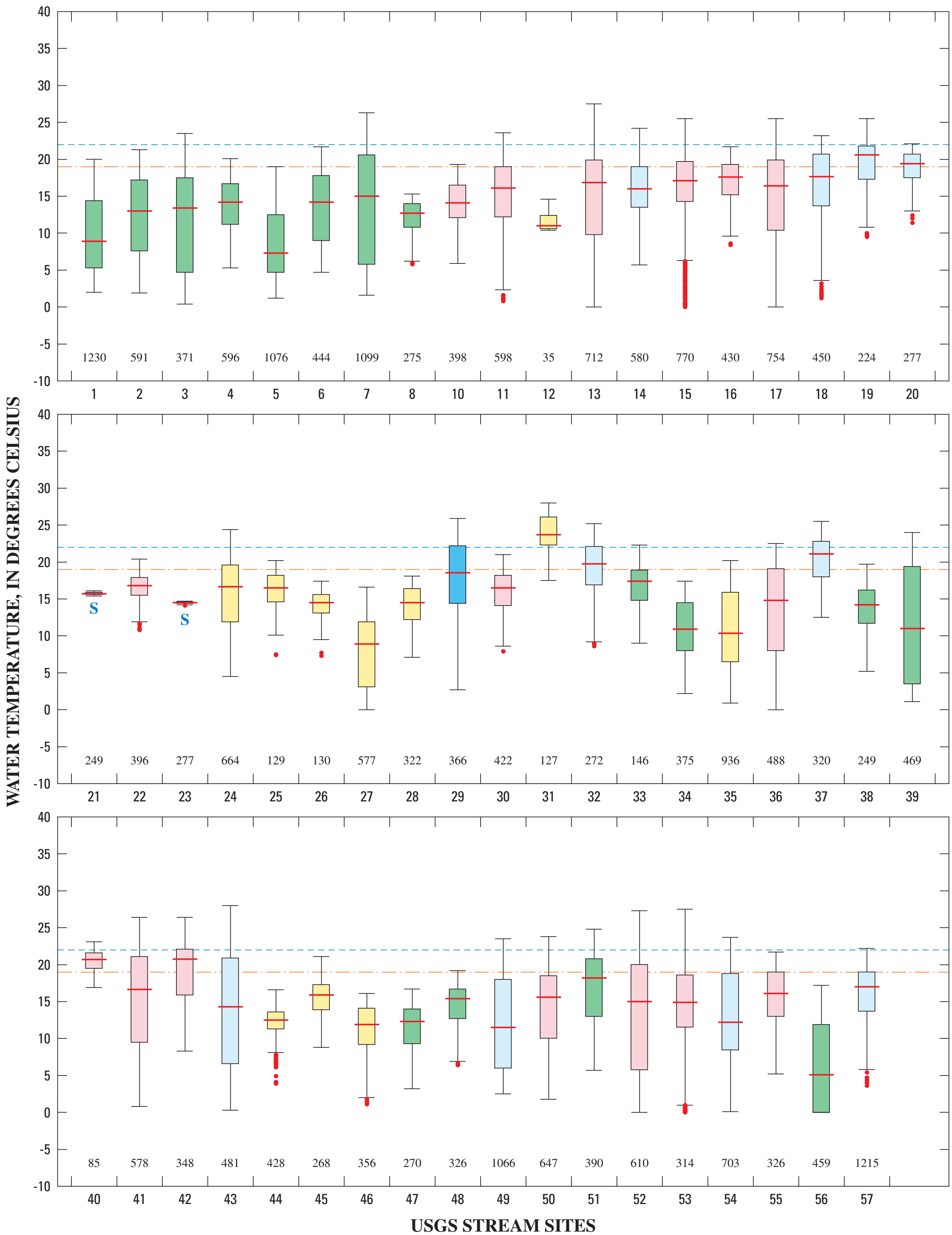


Figure 3C. Summer mean daily water temperatures at all sites in the Idaho statewide surface-water-quality monitoring network, 1996–2002. (Locations of sites shown on figure 1; temperature criteria from Idaho Department of Environmental Quality, http://www2.state.id.us/adm/adminrules/idapa58/0102.pdf)

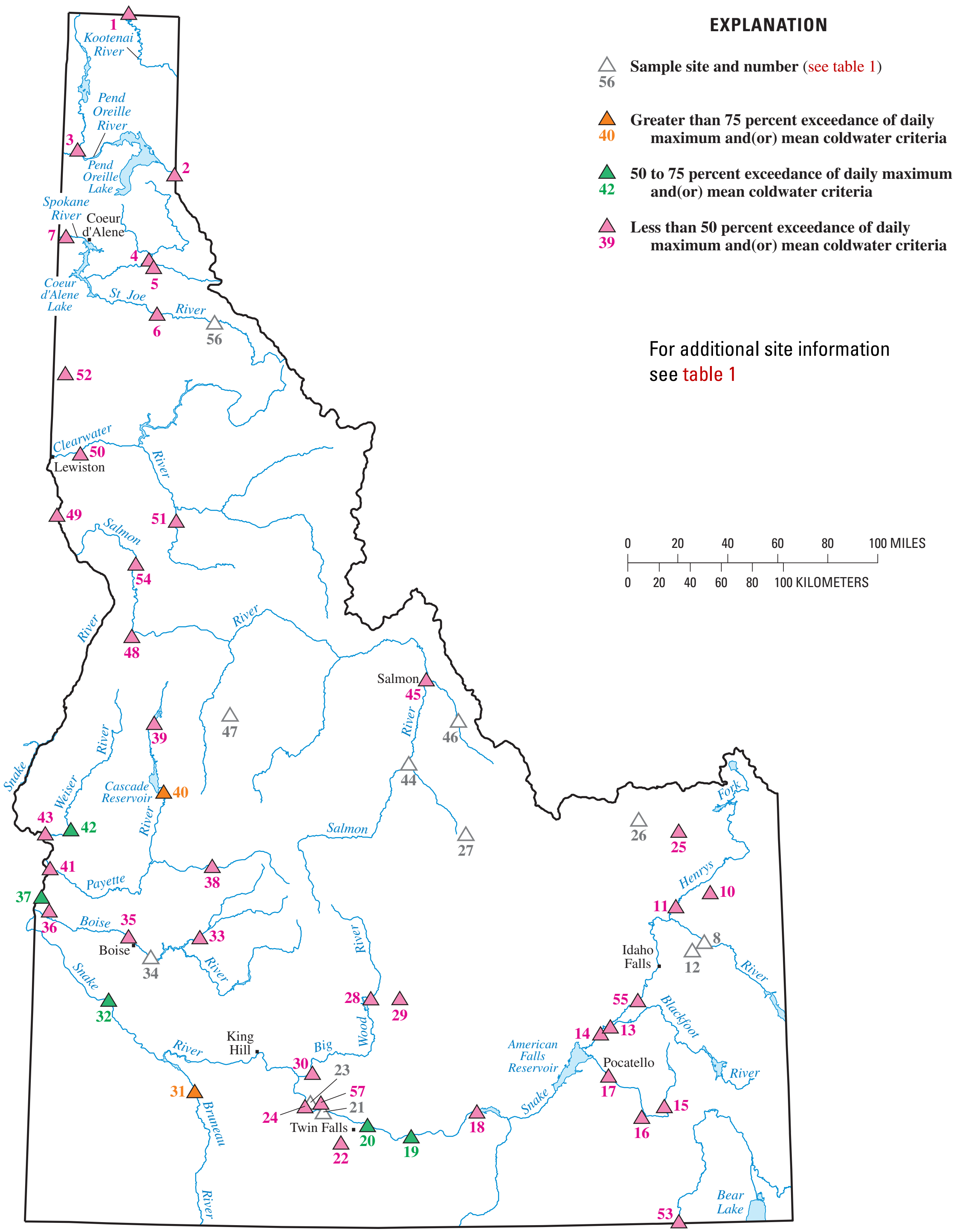


Figure 4. Sites in the Idaho statewide surface-water-quality monitoring network where water temperature exceeded criteria1996–2002. (Temperature criteria from Idaho Department of Environmental Quality, http://www2.state.id.us/adm/adminrules/idapa58/0102.pdf)

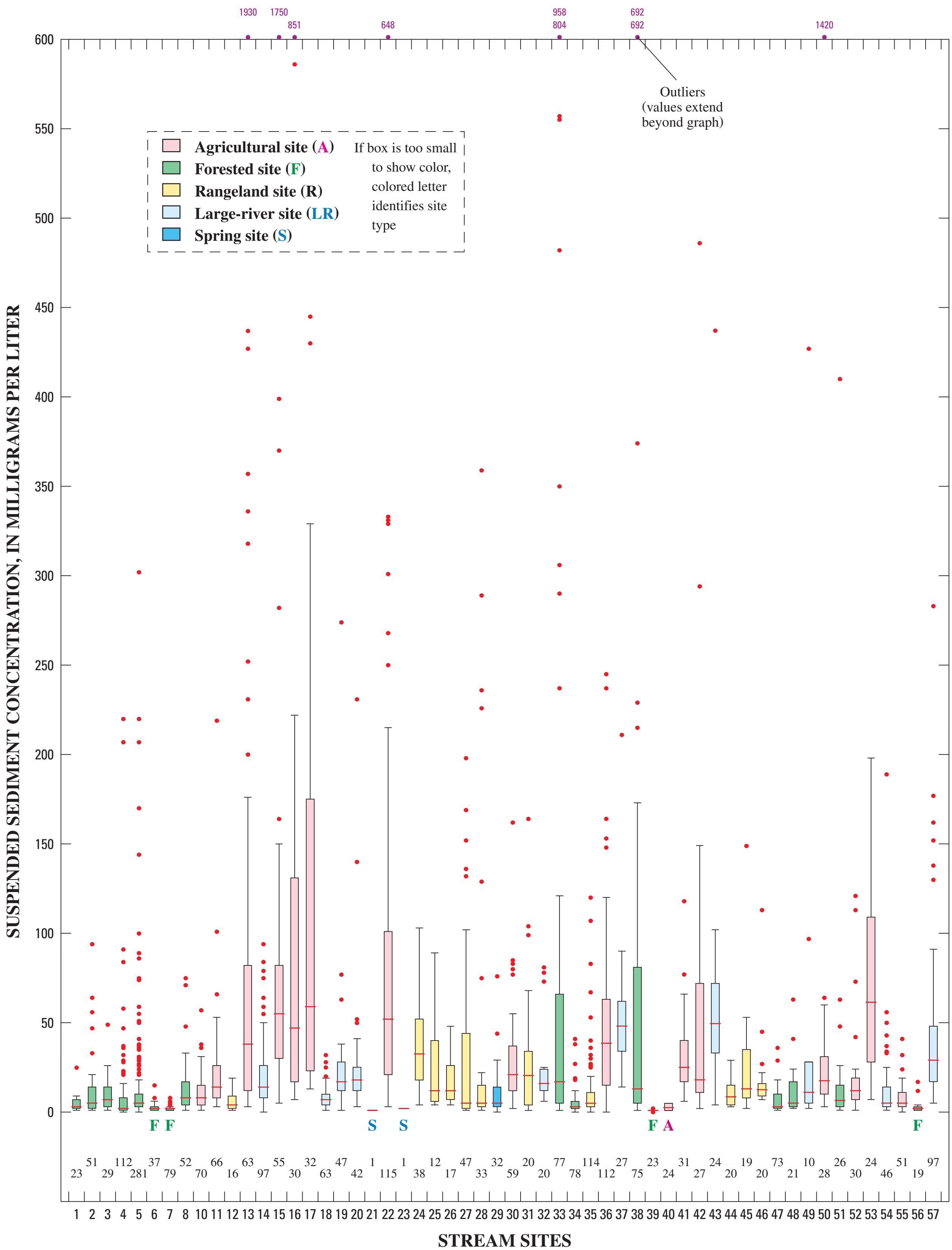


Figure 5. Suspended-sediment concentrations at all sites in the Idaho statewide surface-water-quality monitoring network, 1996—2002 (Locations of sites shown on figure 1)

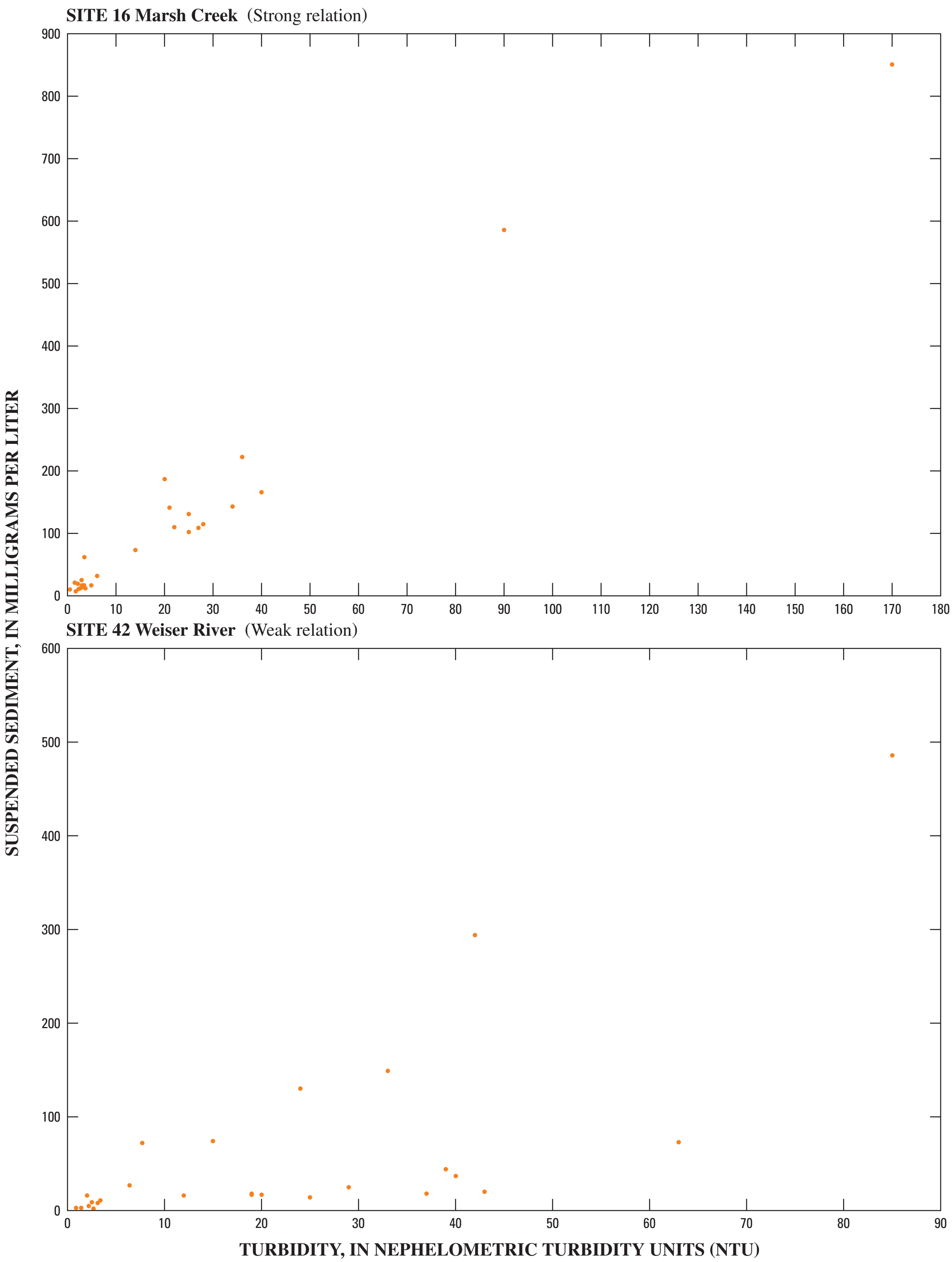


Figure 8. Turbidity in relation to suspended-sediment concentrations at selected sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002

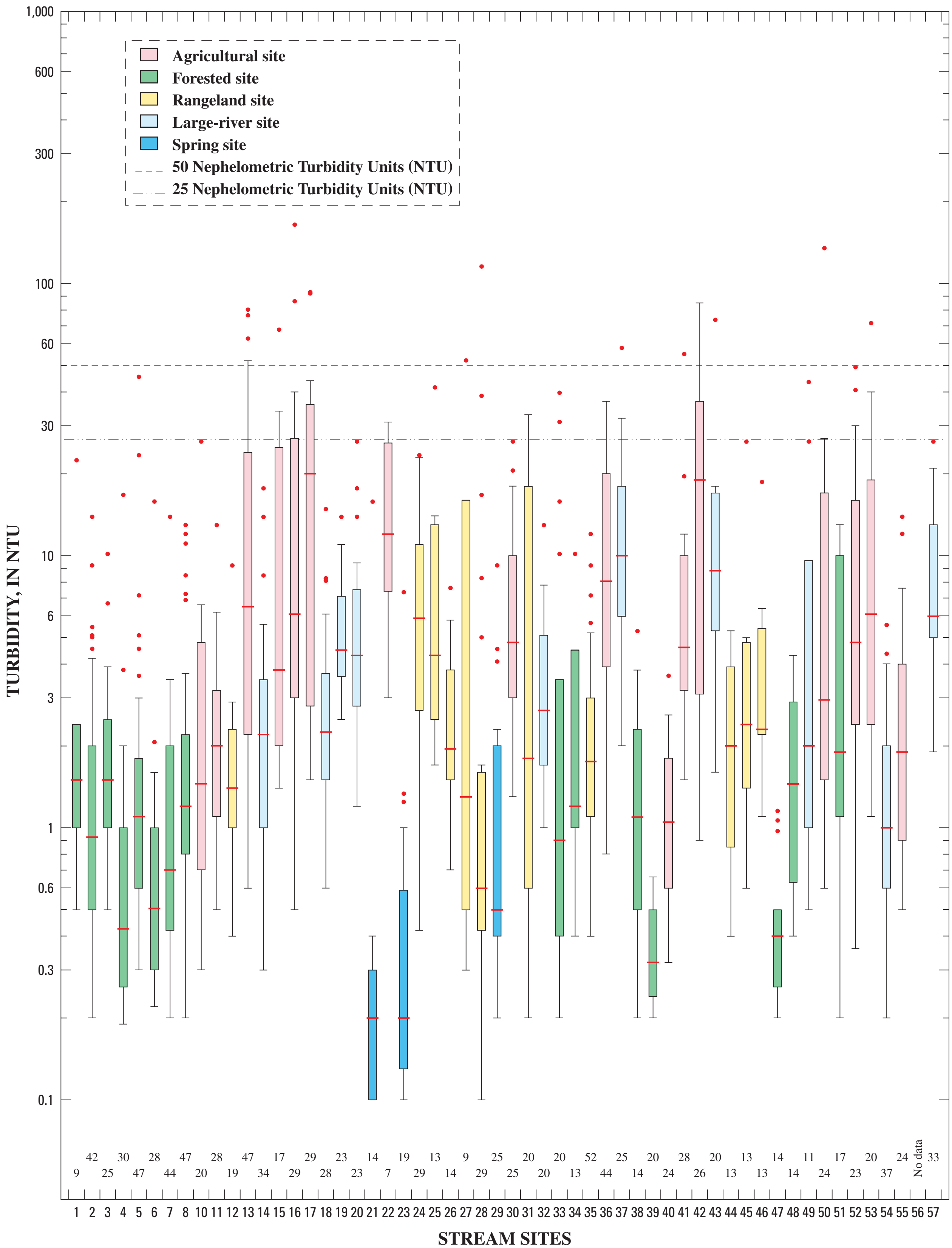


Figure 9. Turbidity at sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown in figure 1)

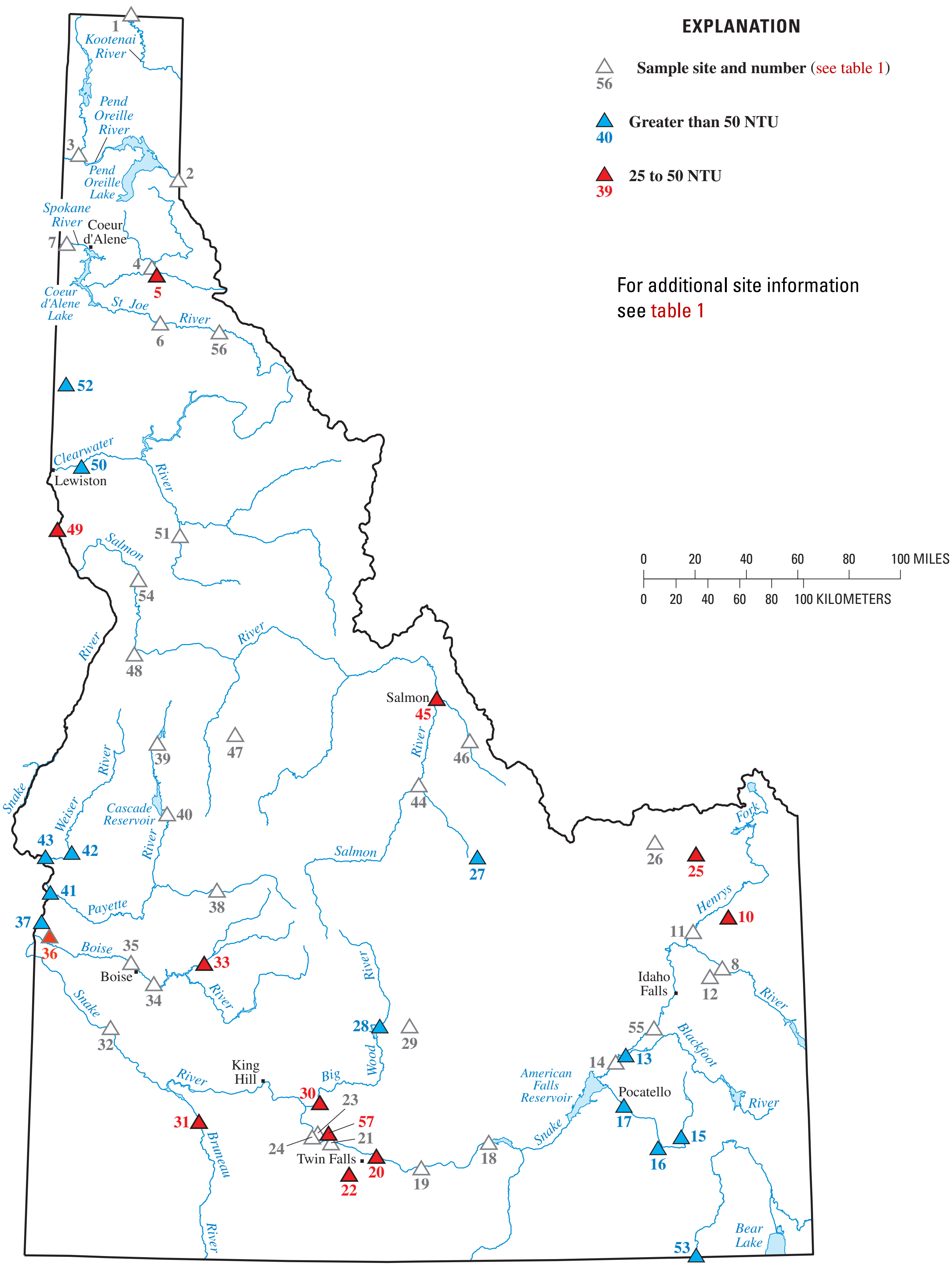


Figure 10. Sites in the Idaho statewide surface-water-quality monitoring network where turbidity exceeded 25 nephelometric turbidity units (NTU), 1989–2002

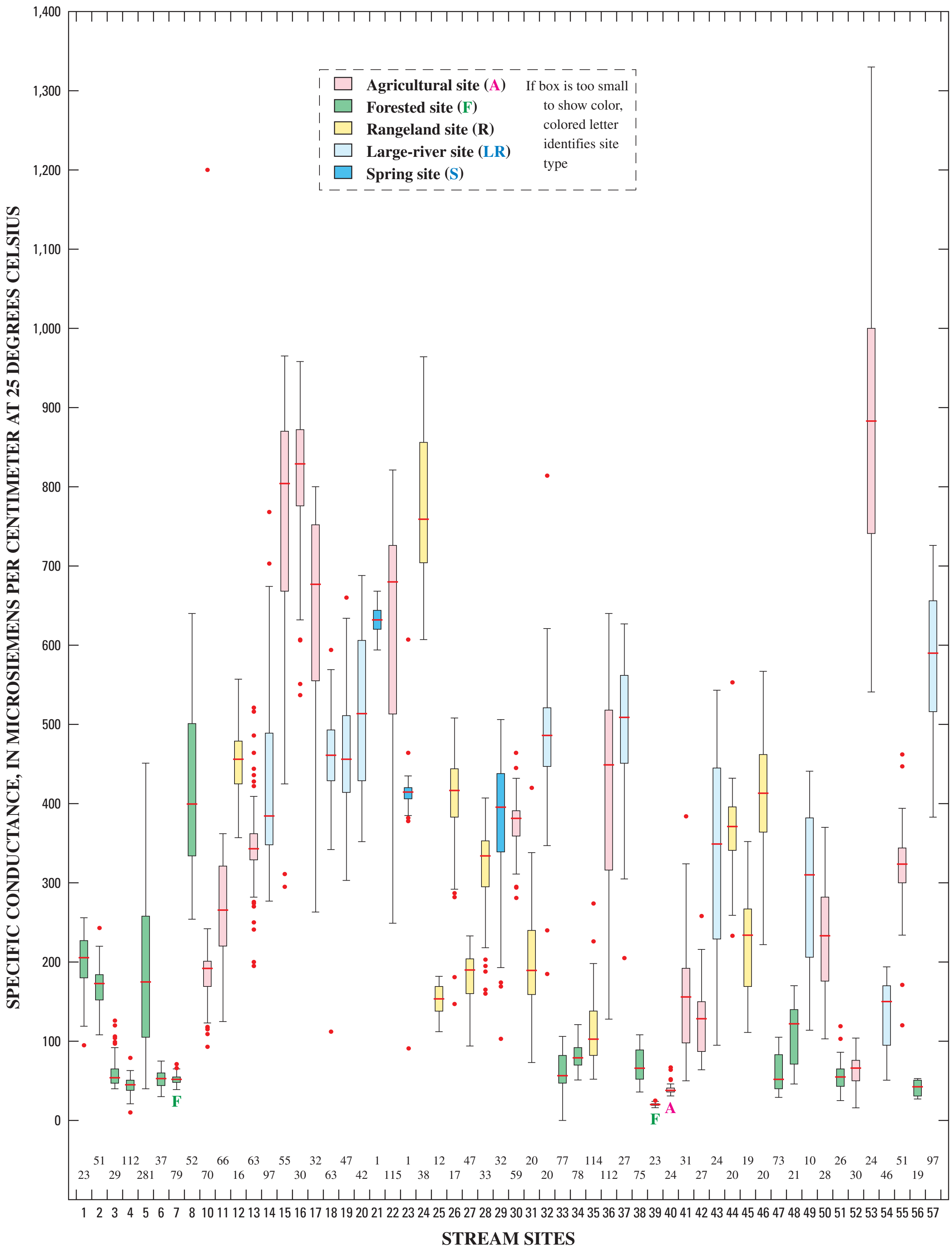


Figure 11. Specific conductance at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

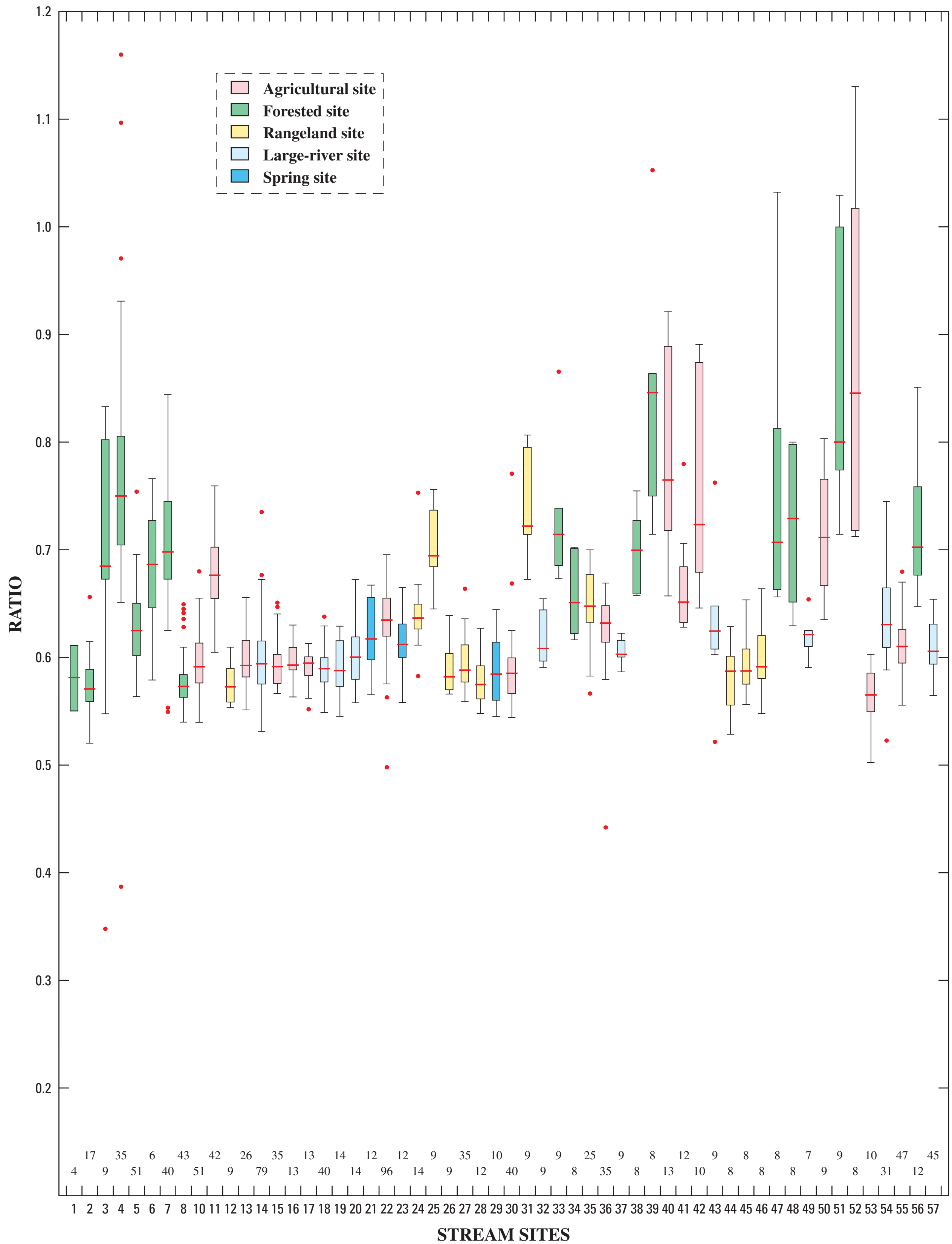


Figure 12. Ratios of total dissolved-solids concentrations to specific conductance at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

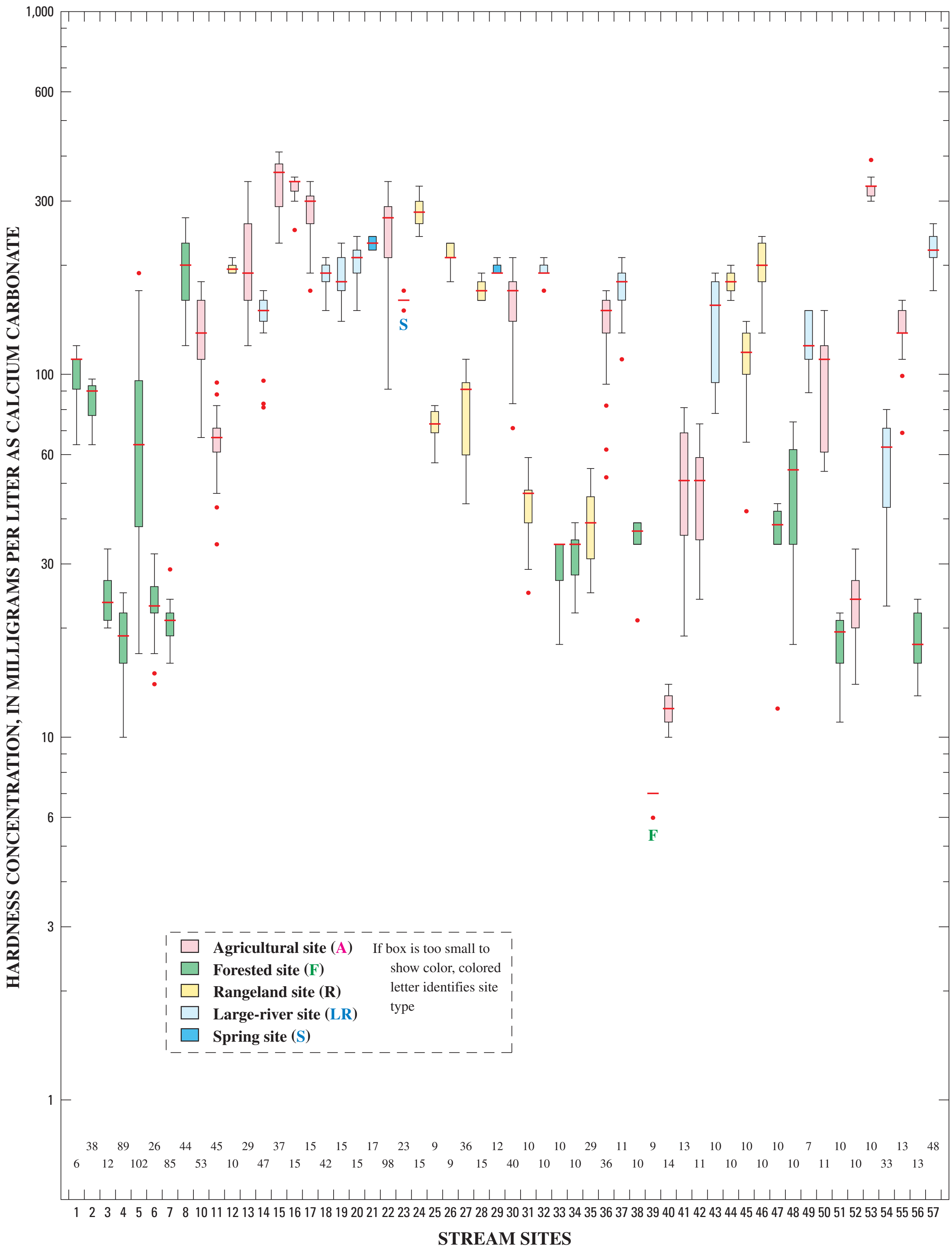


Figure 13. Hardness concentrations at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

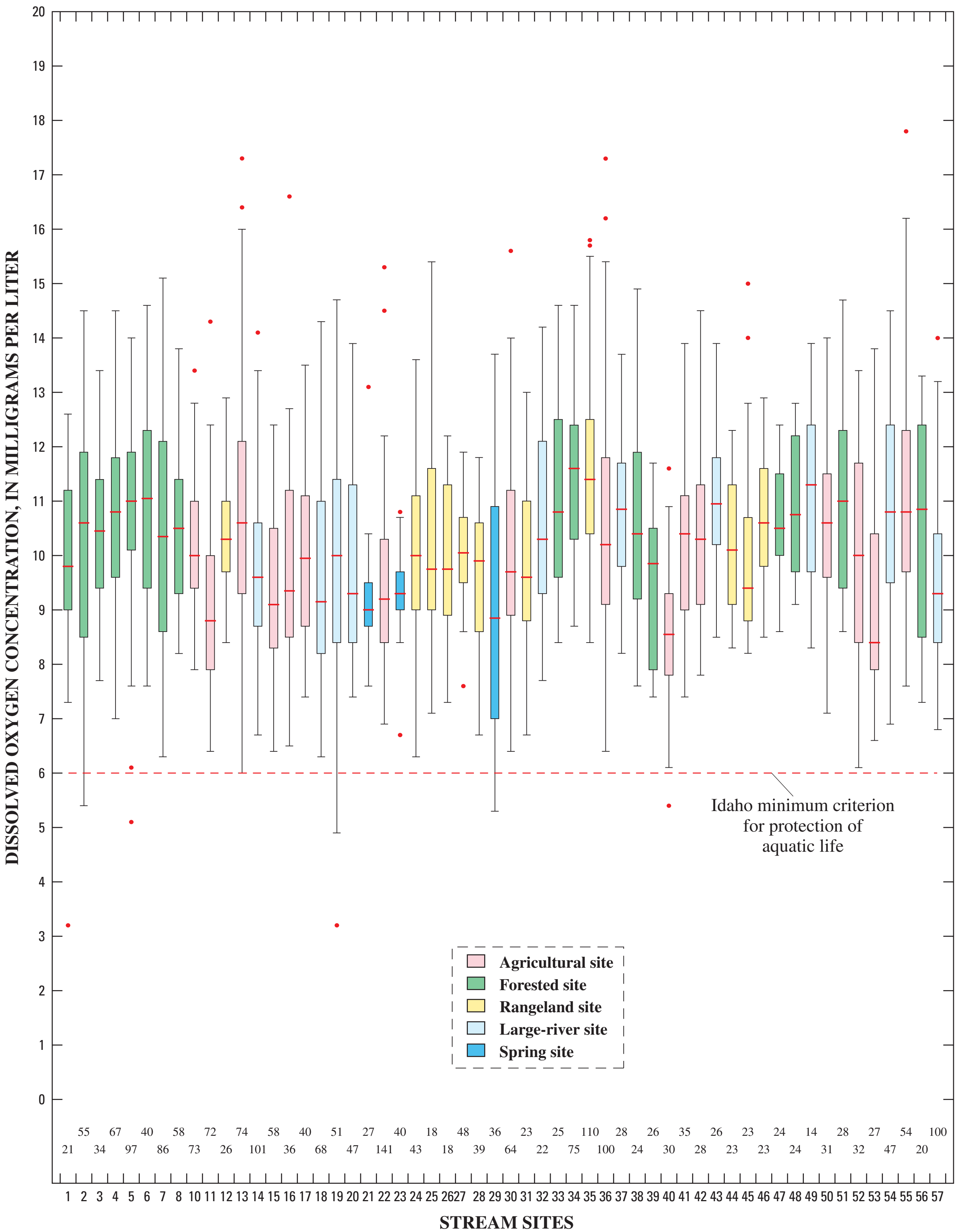


Figure 15. Dissolved-oxygen concentrations and saturations at all sited in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1; Idaho minimum criterion from Idaho Department of Environmental Quality, **http://www2.state.isd.us/adm/adminrules/rules/idapa58/0102.pdf)**

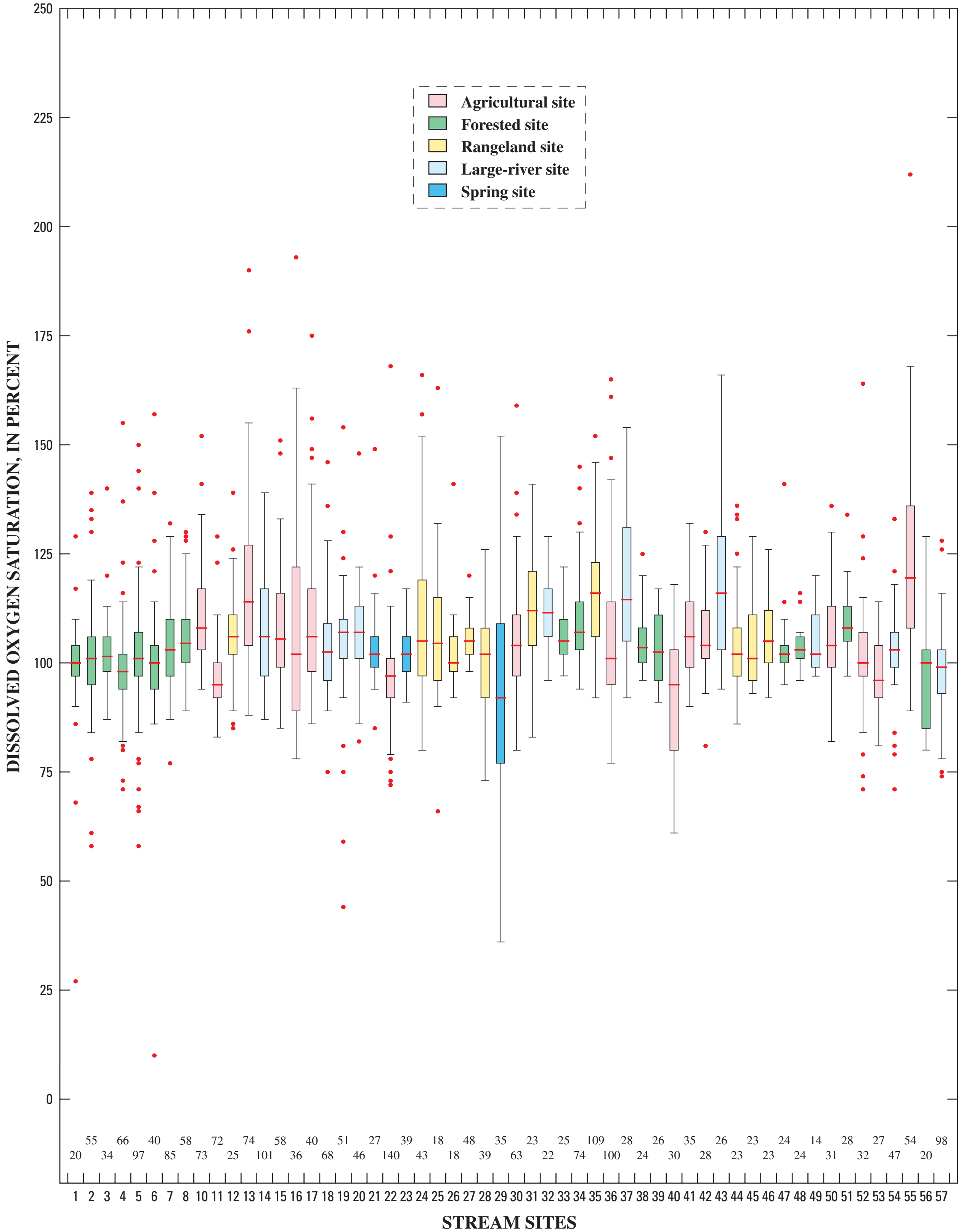


Figure 15. Dissolved-oxygen concentrations and saturations at all sited in the Idaho statewide surface-water-quality monitoring network, 1989–2002—Continued (Locations of sites shown on figure 1; Idaho minimum criterion from Idaho Department of Environmental Quality, http://www2.state.isd.us/adm/adminrules/rules/idapa58/0102.pdf)

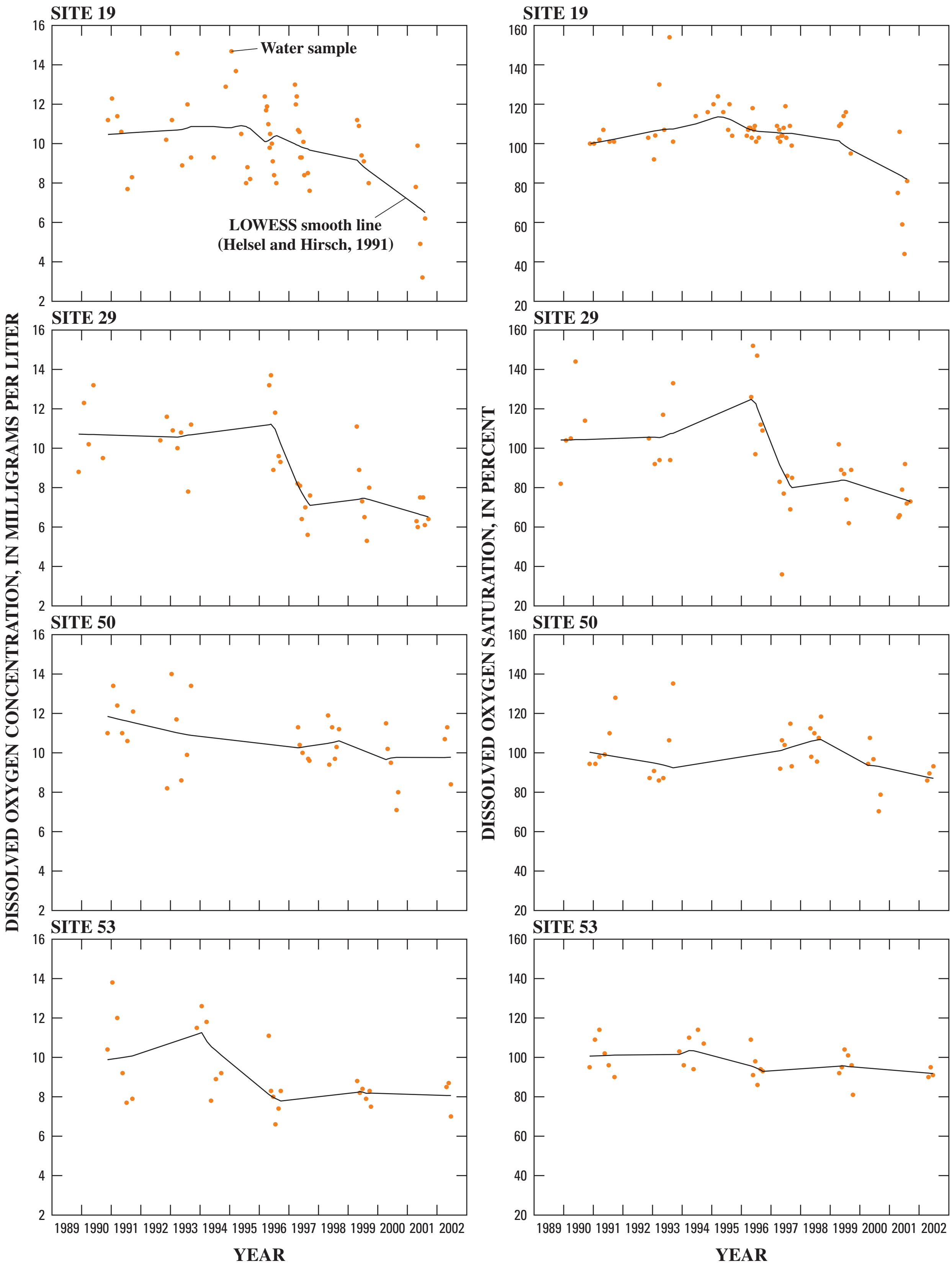


Figure 16. Dissolved-oxygen concentrations and saturations in relation to time at selected sites in the Idaho statewide suface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

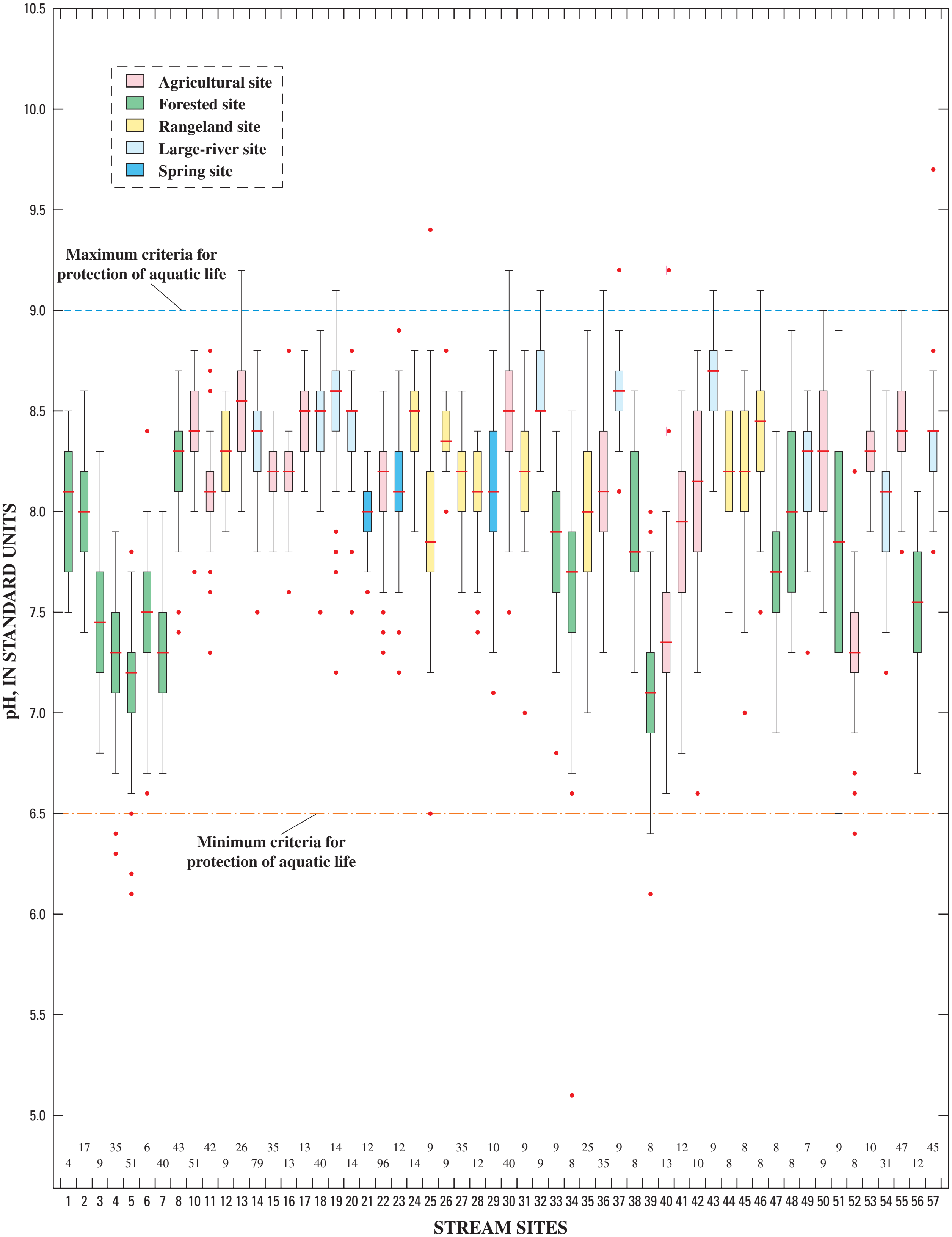


Figure 17. pH at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1; criteria from Idaho Department of Environmental Quality, **http://www2.state.isd.us/adm/adminrules/rules/idapa58/0102.pdf**)

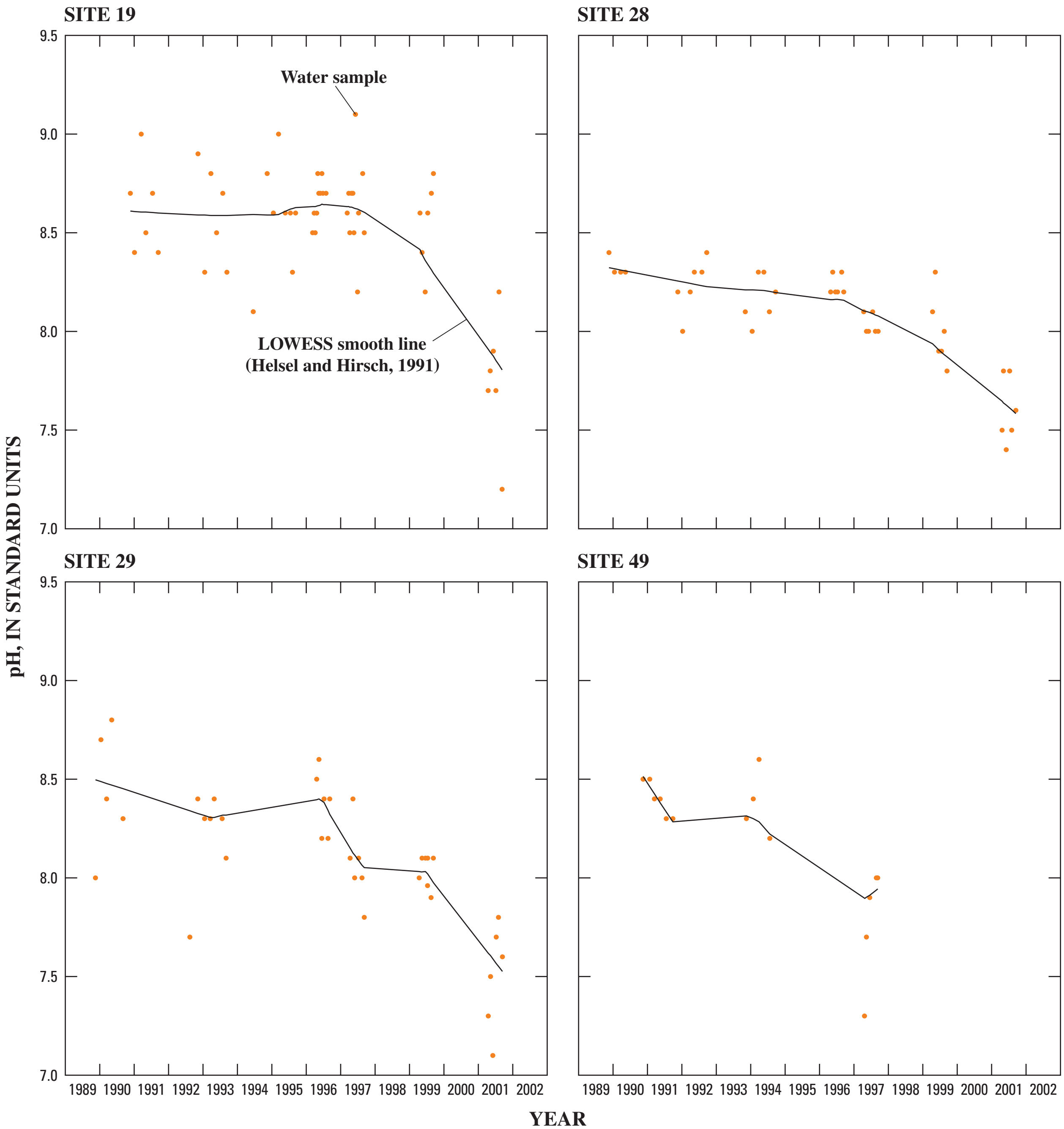


Figure 18. pH in relation to time at selected sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

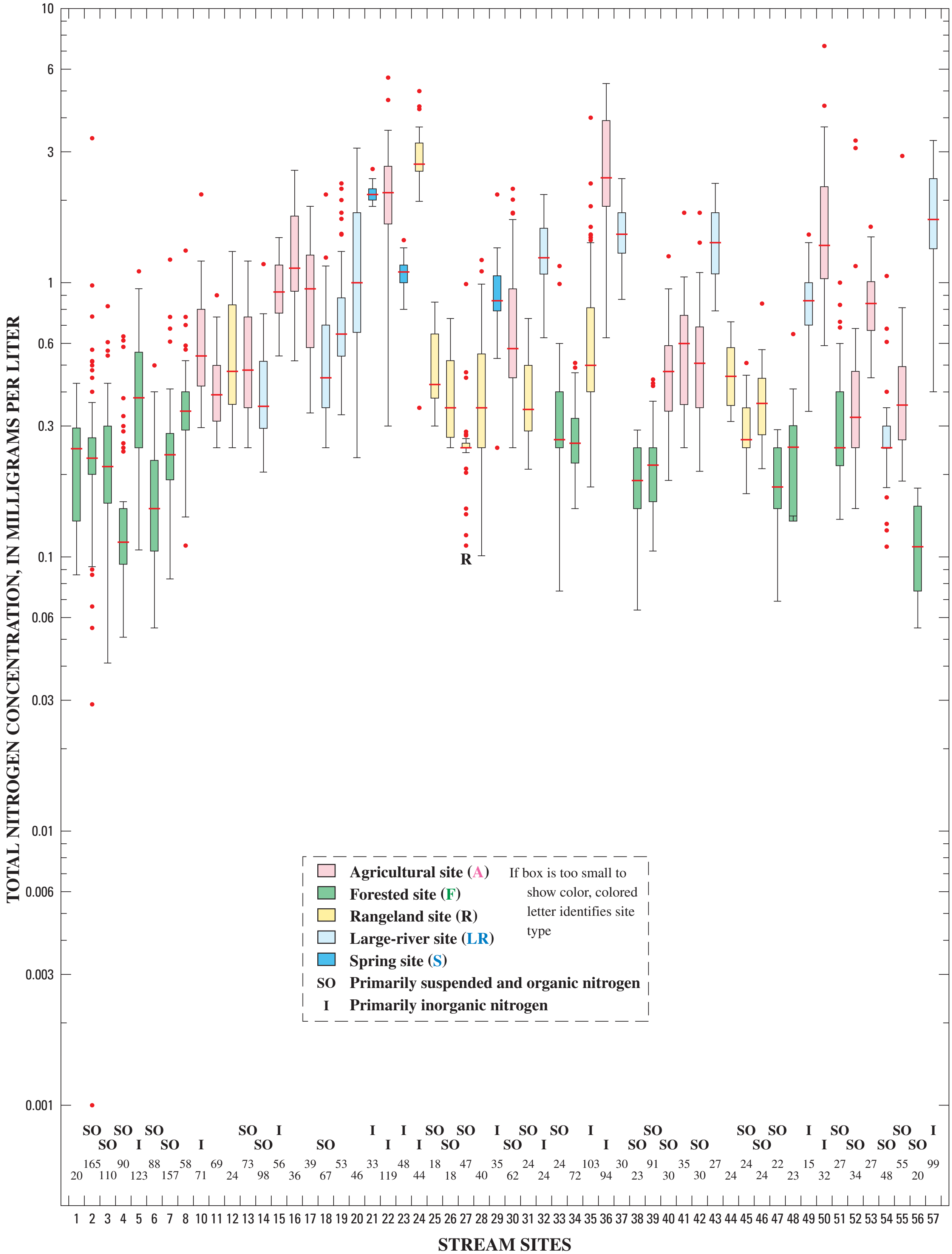


Figure 19. Total nitrogen concentrations at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

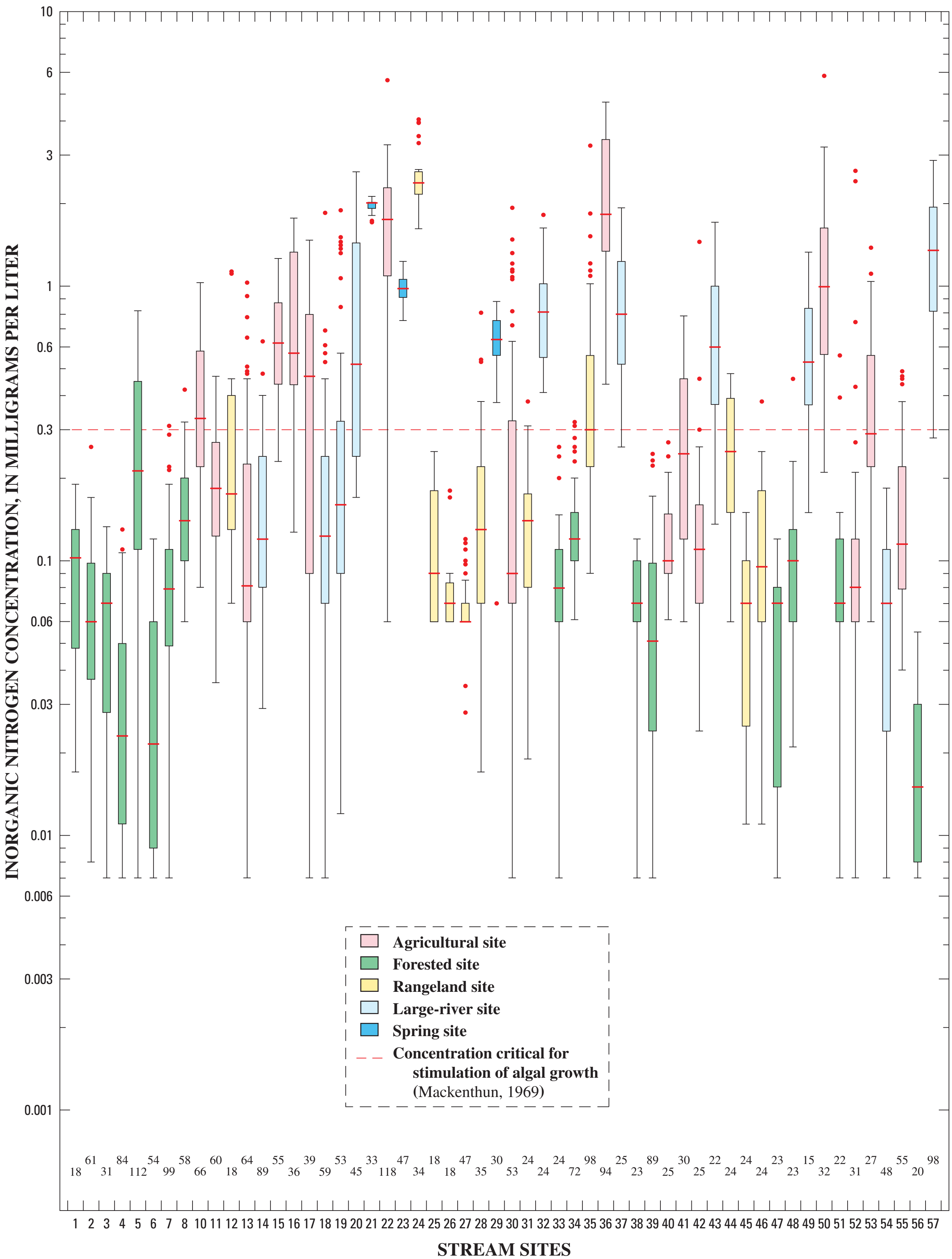


Figure 20. Inorganic nitrogen concentrations at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1; concentrations that plot at 0.007 could be less than or equal to that value)

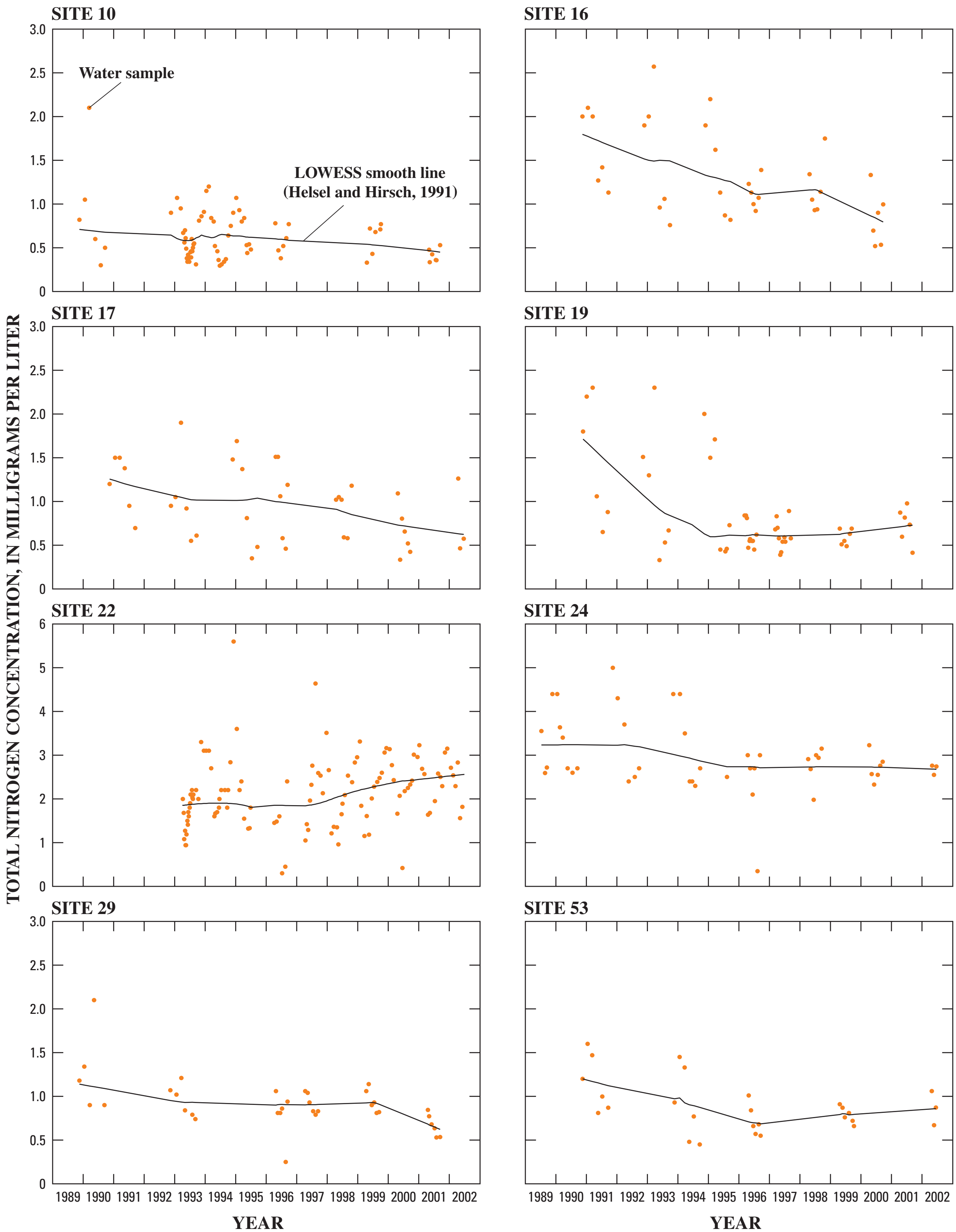


Figure 21. Total nitrogen concentrations in relation to time at selected sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

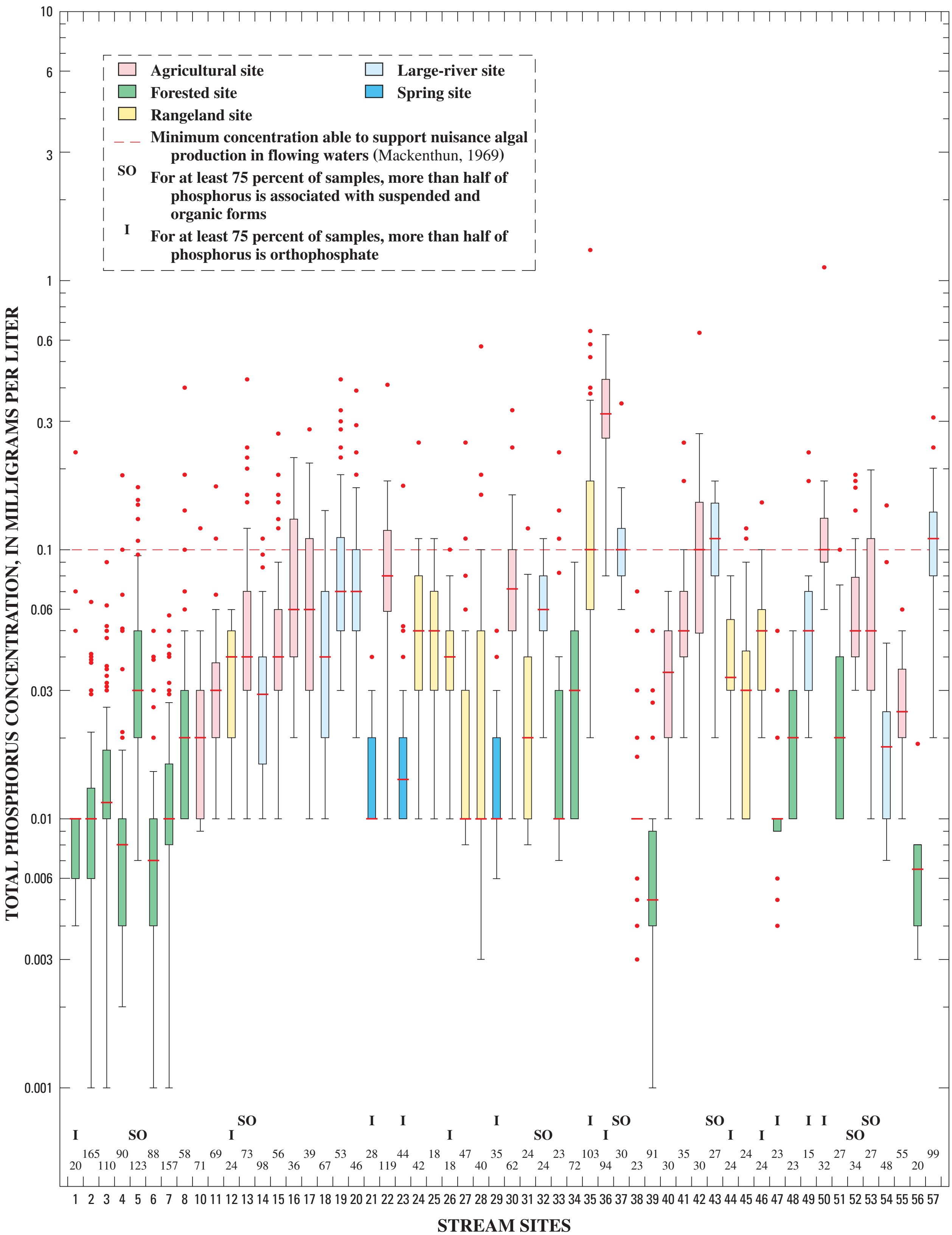


Figure 22. Total phosphorus concentrations at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1; concentrations that plot at 0.01 or 0.0001 could be less than or equal to those laboratory reporting levels)

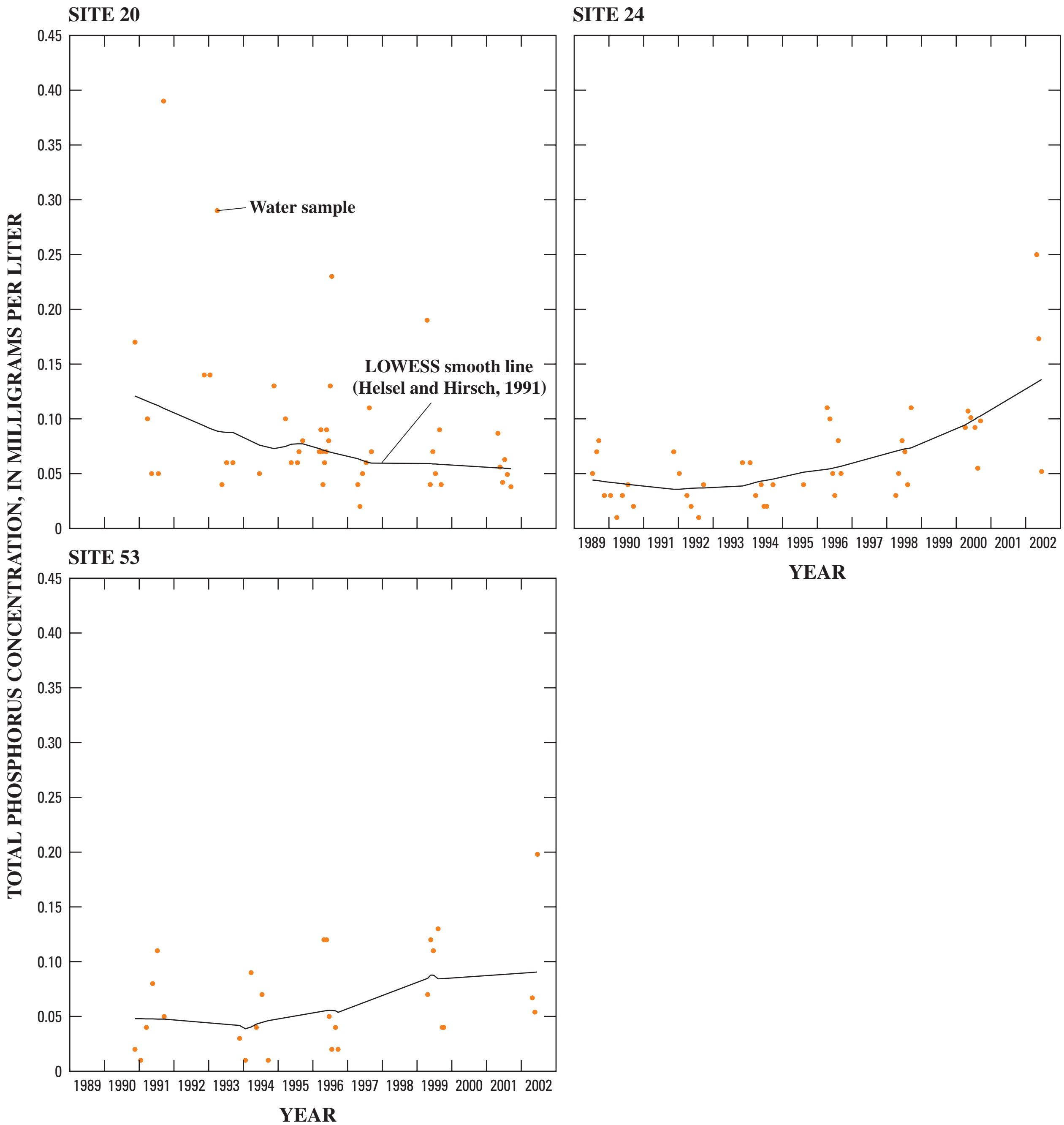


Figure 23. Total phosphorus concentrations in relation to time at selected sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

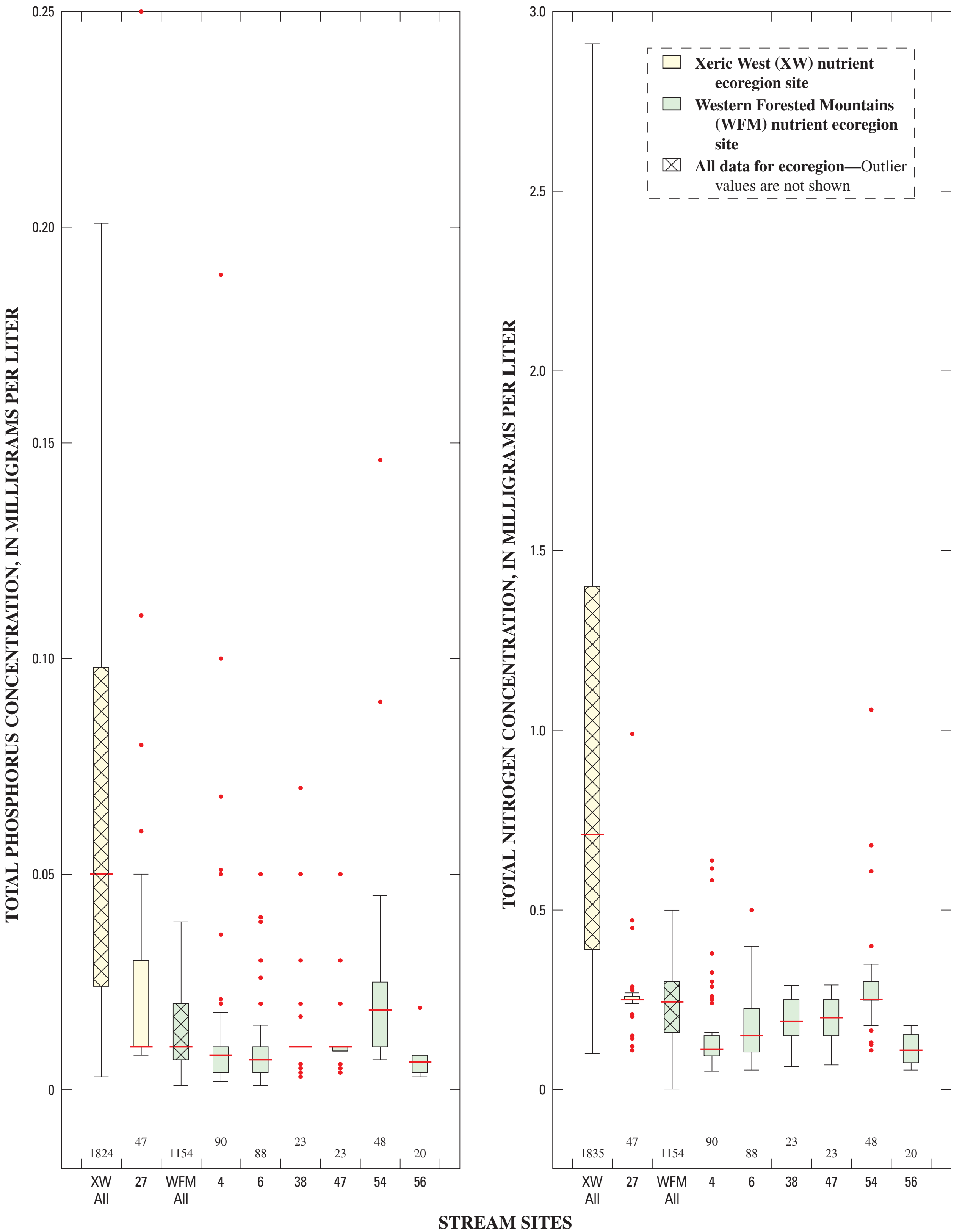


Figure 24. Total phosphorus and total nitrogen concentrations at proposed reference and combined nutrient ecoregion sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002

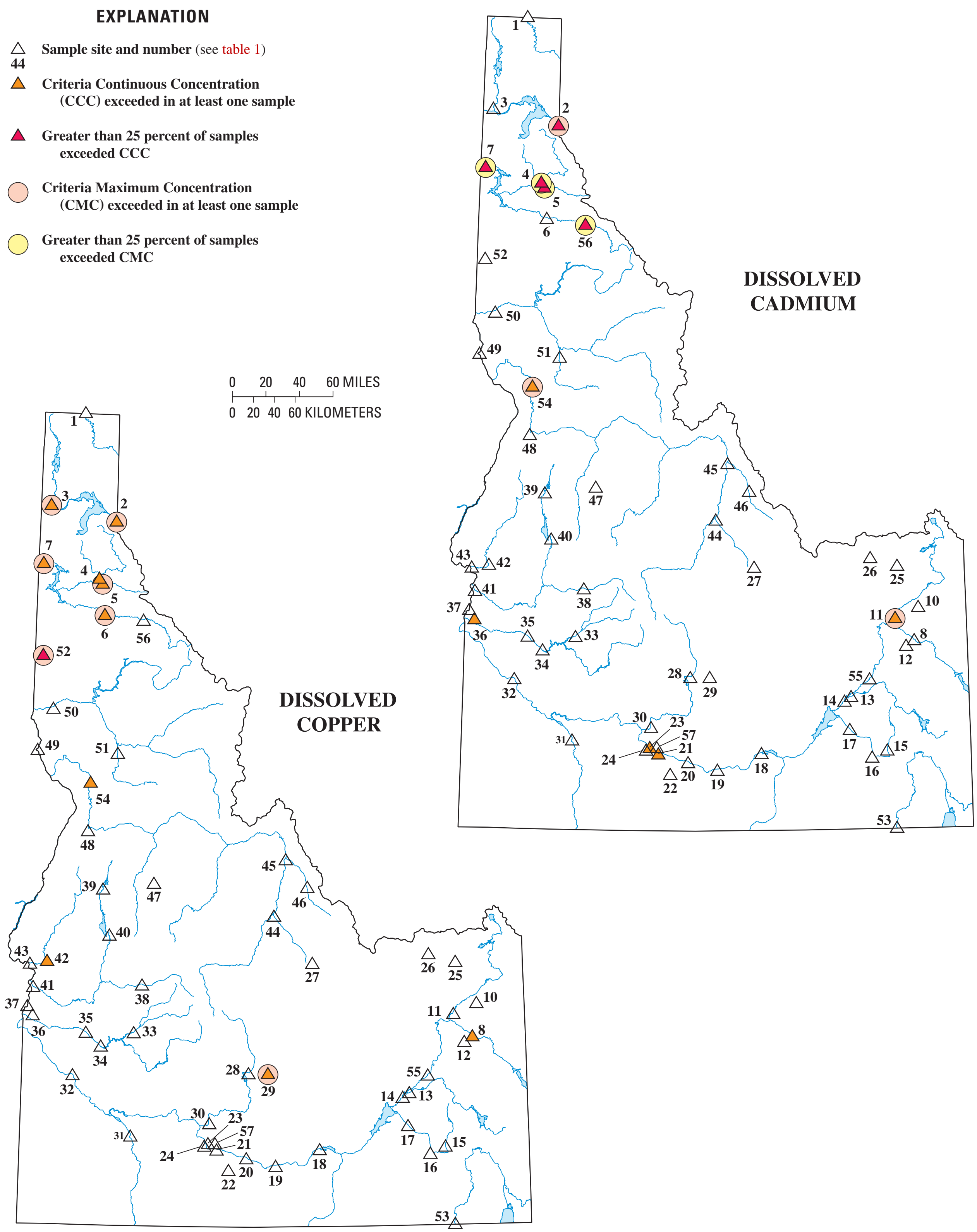


Figure 25. Sites in the Idaho statewide surface-water-quality monitoring network where concentrations of trace elements in water exceeded criteria, 1989–95 (CCC and CMC criteria from Idaho Department of Environmental Quality, **http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**)

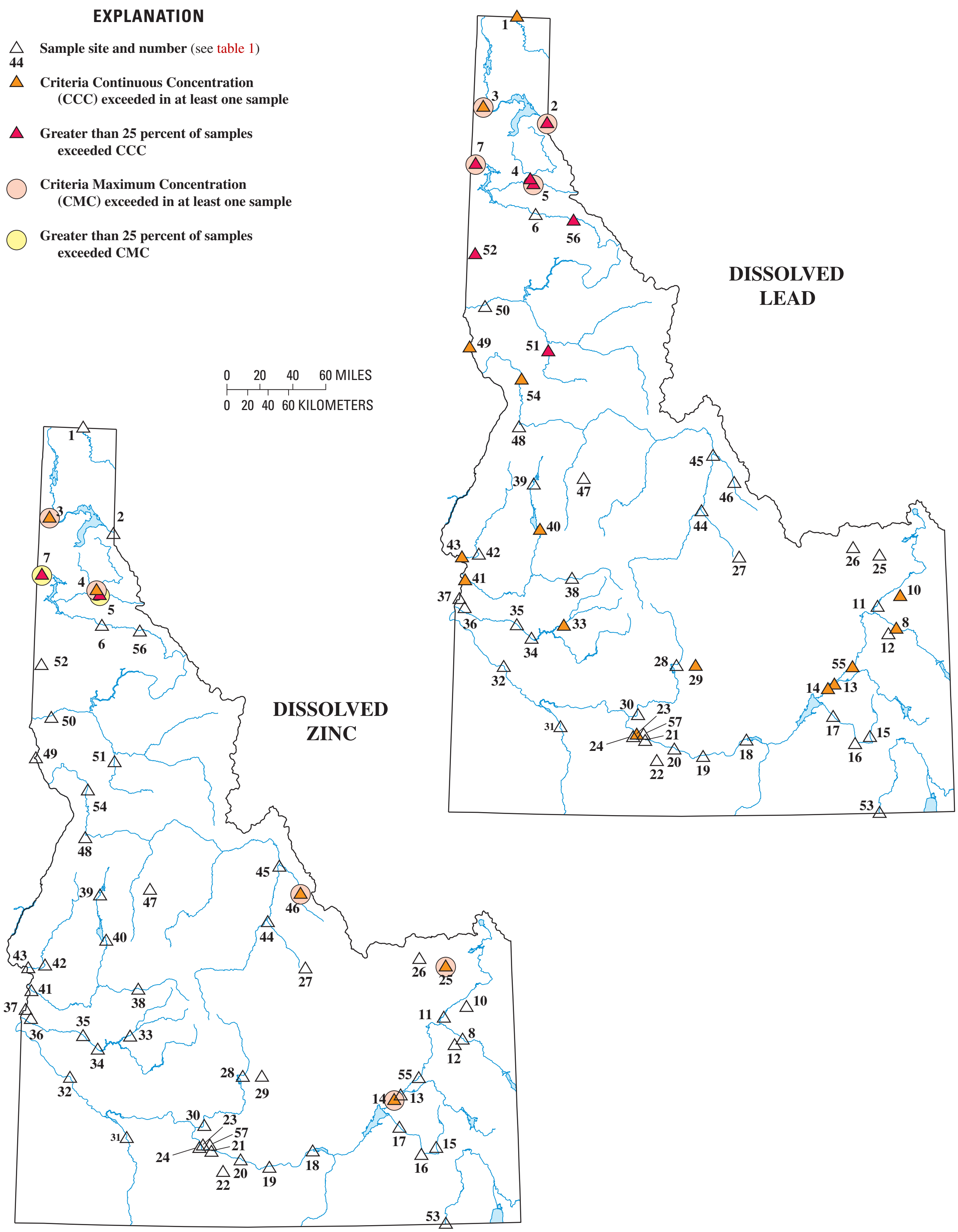


Figure 25. Sites in the Idaho statewide surface-water-quality monitoring network where concentrations of trace elements in water exceeded criteria, 1989–95 — Continued (CCC and CMC criteria from Idaho Department of Environmental Quality, http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf)

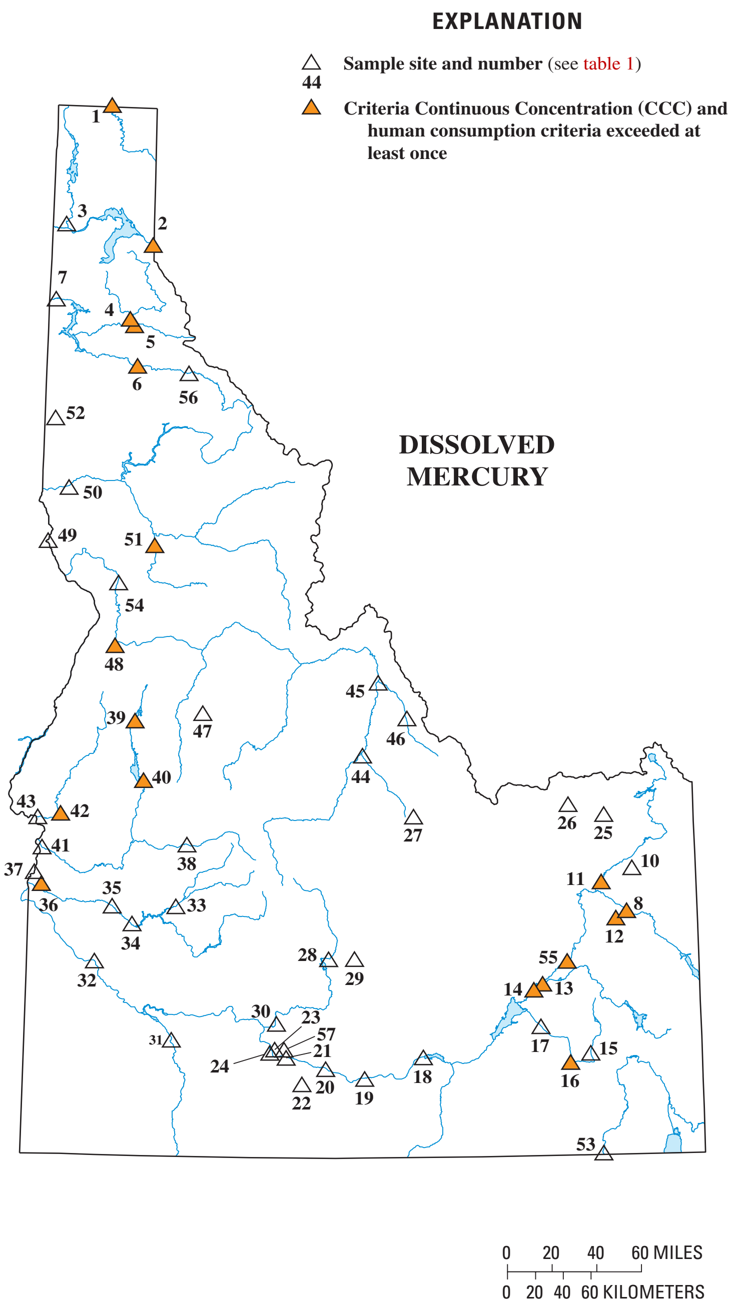


Figure 25. Sites in the Idaho statewide surface-water-quality monitoring network where concentrations of trace elements in water exceeded criteria, 1989-95 -- Continued (CCC and CMC criteria from Idaho Department of Environmental Quality, **http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**)

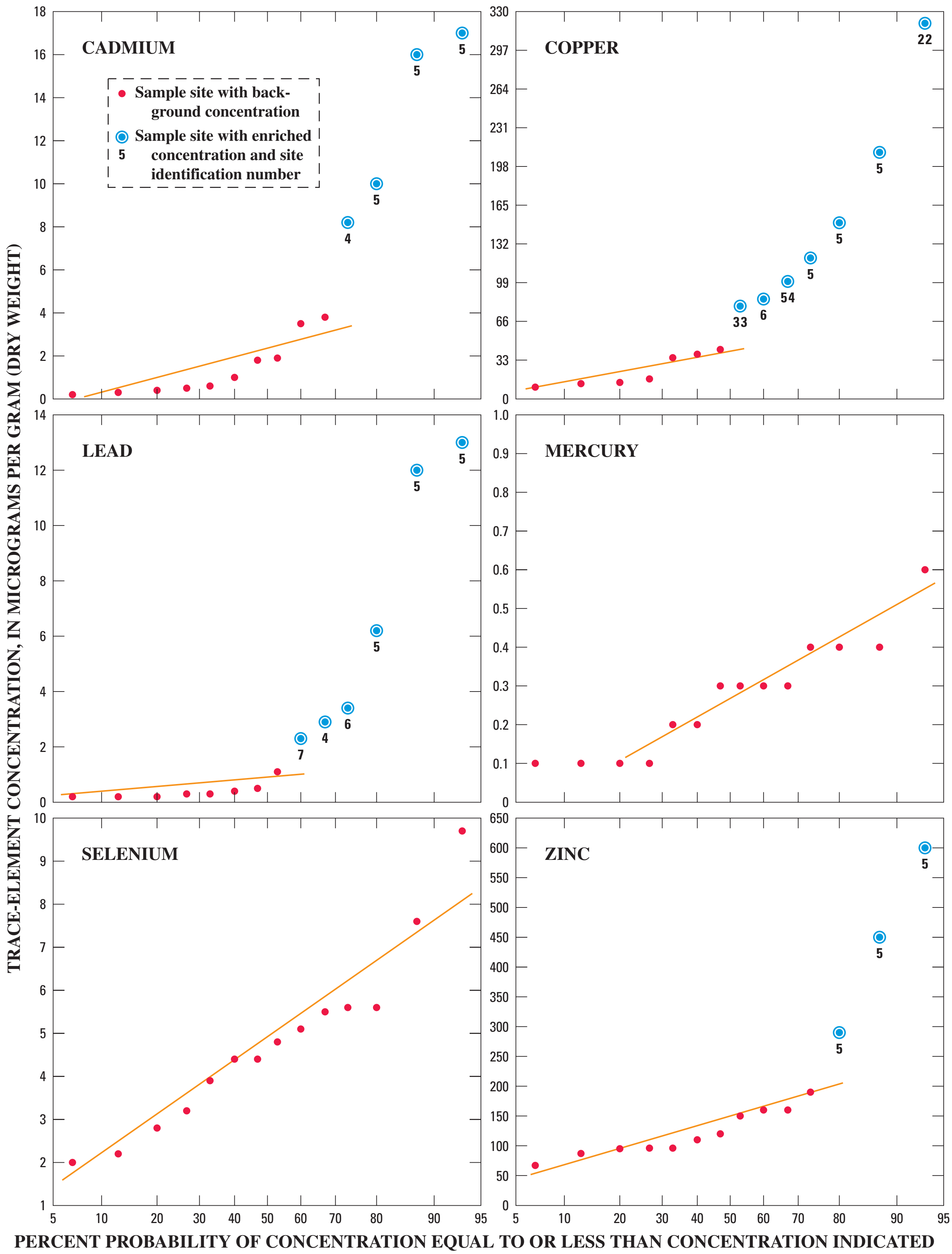


Figure 26. Concentrations of selected trace elements in livers of fish collected at selected sites in the Idaho statewide surface-water-quality monitoring network, 1996–2000 (Locations of sites shown on figure 1)

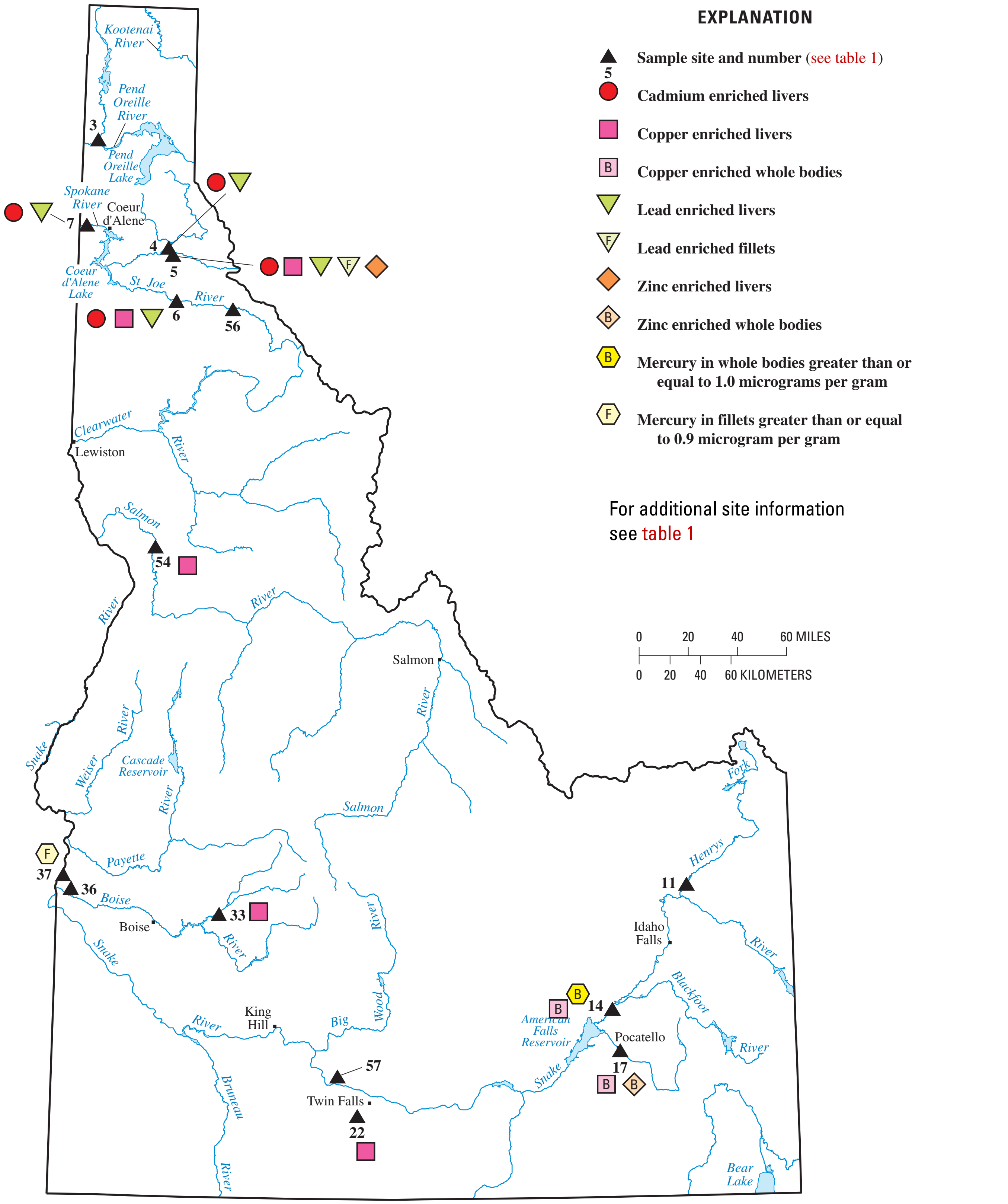


Figure 27. Sites in the Idaho statewide surface-water-quality monitoring network where concentrations of selected trace elements were enriched in fish tissue, 1996–2000

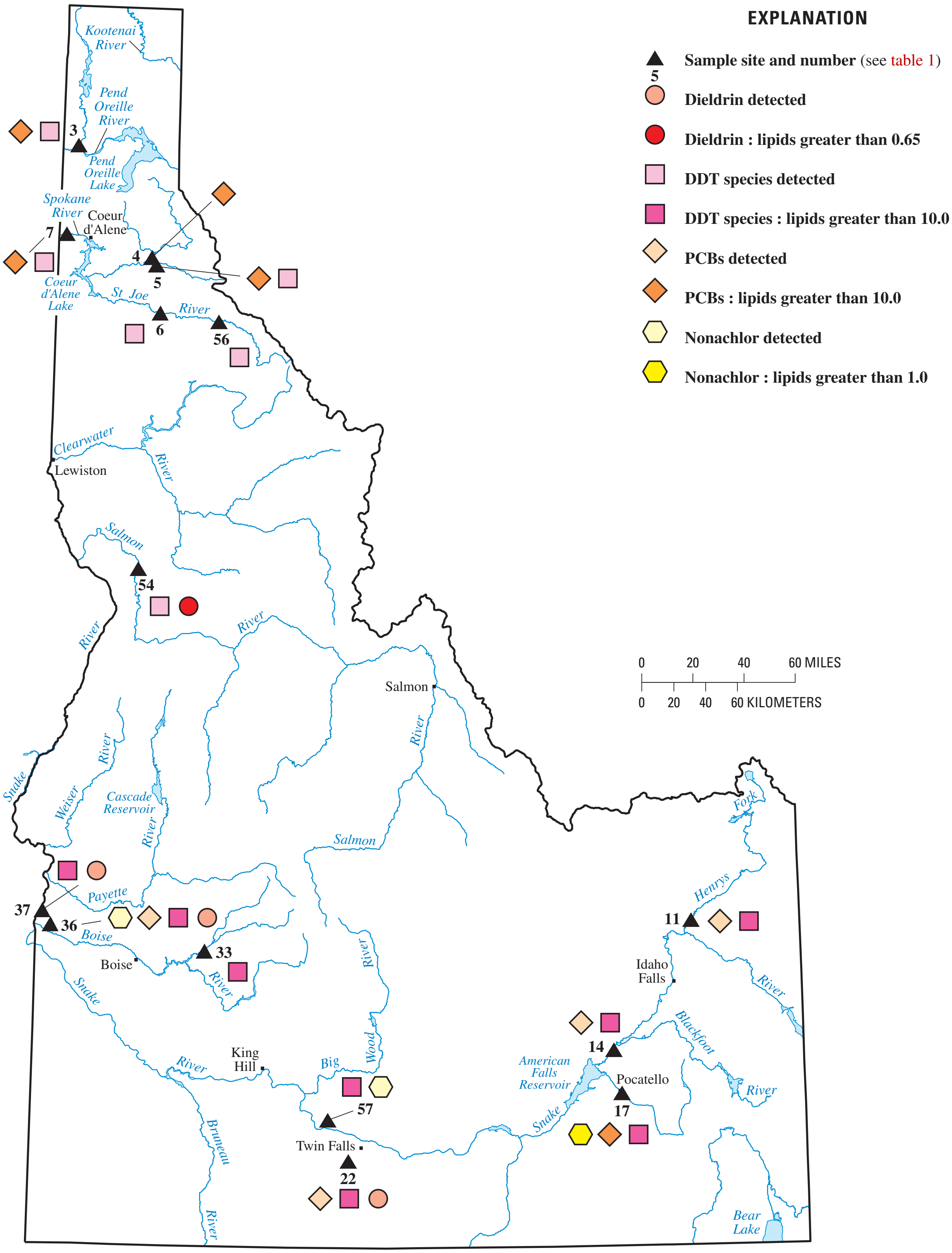


Figure 28. Ratios of selected organic compounds to lipids in whole fish collected at selected sites in the Idaho statewie surface-water-quality monitoring network, 1996–98

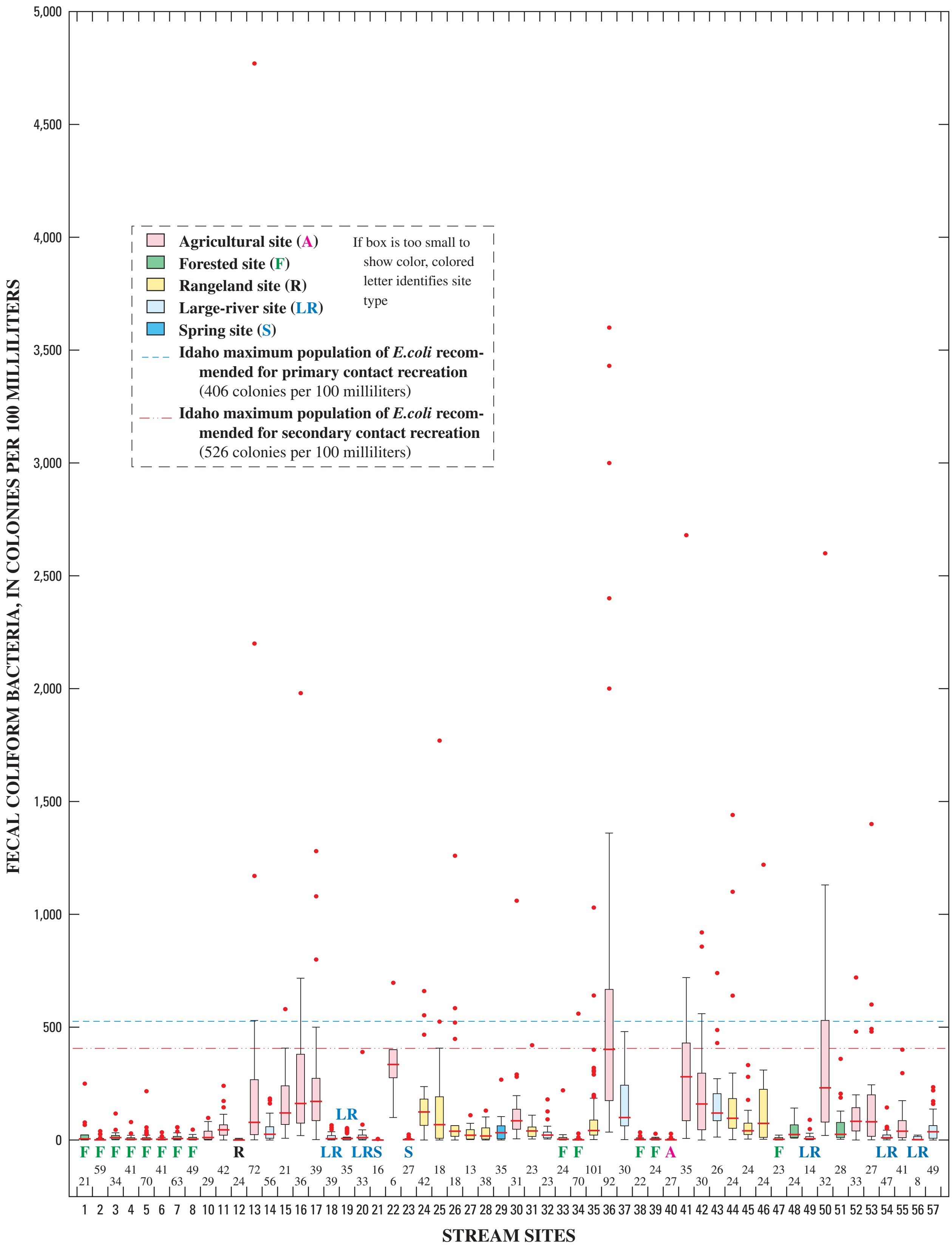


Figure 29. Fecal coliform populations at all sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002 (Locations of sites shown on figure 1)

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Tables 1–2, 6, 10

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Table 1. Basin and site characteristics for sites in the Idaho statewide surface-water-quality monitoring network, 1989-2002

[No., number; fig., figure; m, meters; km^2, square kilometers; %, pecent; R., river; Site type: F, forested; A, agricultural; R, rangeland; LR, large river; S, spring; Site type from Maret and others, 2001]

Site No. (fig. 1)	Site name	Latitude/Longitude	Site type	Elevation (m)	Stream order	Population (people/km^2)	Basin area (km^2)	Urban land (%)	Agricutural land (%)	Rangeland (%)	Forested land (%)	Other land (%)
1	Kootenai R. at Porthill	48°59'47"/116°30'22"	F	518	5	2.08	12,409	0.4	3	3	91.4	2.3
2	Clark Fork R. below Cabinet Gorge Dam	48°05'30"/116°07'00"	F	628	6	4.48	55,614	0.6	6.4	14.5	72.8	5.7
3	Priest R. near Priest R.	48°12'31"/116°54'49"	F	637	5	0.61	2,460	0.6	0.8	1.4	93.1	4
4	North Fork Coeur d'Alene R. at Enaville	47°34'21"/116°15'11"	F	640	5	0.36	2,325	0	0.2	1.8	97.6	0.3
5	South Fork Coeur d'Alene R. near Pinehurst	47°33'06"/116°14'13"	F	667	5	16.11	738	2.6	0.1	6.3	88.6	2.5
6	St. Joe R. at Calder	47°16'29"/116°11'17"	F	662	5	0.12	2,679	0	0	7.1	92.6	0.2
7	Spokane R. near Post Falls	47°42'11"/116°58'37"	F	625	6	0.09	10,162	0.4	0	9.7	81.5	8.4
8	Snake R. near Heise	43°36'45"/111°39'33"	F	1,528	6	1.28	14,841	0.3	5.9	25.3	60.5	8
10	Teton R. near St. Anthony	43°55'38"/111°36'55"	A	1,515	5	1.78	2,294	0.2	39.5	14.9	38.3	7
11	Henrys Fork near Rexburg	43°49'34"/111°54'15"	A	1,465	6	4.33	8,337	0.4	25.9	19.3	49.6	4.8
12	Willow Creek near Ririe	43°35'02"/111°44'44"	R	1,509	6	0.46	1,661	0	21.4	50.7	21.7	6.2
13	Blackfoot R. near Blackfoot	43°07'50"/112°28'35"	A	1,347	6	1.33	2,851	0.1	13.7	60.2	20.8	5.1
14	Snake R. near Blackfoot	43°07'31"/112°31'06"	LR	1,341	7	5.47	31,555	0.6	19.1	28.7	44.9	6.6
15	Portneuf R. at Topaz	42°37'30"/112°05'20"	A	1,499	5	1.03	1,520	0.2	33.6	53.3	11.5	1.4
16	Marsh Cr. near McCammon	42°37'48"/112°13'29"	A	1,405	5	1.86	885	1	52.1	32.3	14.4	0.2
17	Portneuf R. at Pocatello	42°52'20"/112°28'05"	A	1,347	6	8.53	3,292	1.3	36.2	51.2	10.5	0.8
18	Snake R. near Minidoka	42°40'23"/113°29'58"	LR	1,259	7	5.26	48,830	0.7	23	37.8	32.8	5.7
19	Snake R. at Milner	42°31'41"/114°01'04"	LR	1,238	7	5.1	57,826	0.7	22.9	39.2	29.8	7.6
20	Snake R. near Kimberly	42°35'28"/114°21'28"	LR	1,025	7	5.07	59,097	0.7	23.4	39.3	29.2	7.3
21	Blue Lakes Spring	42°36'53"/114°28'06"	S	1,006	1	0	3	0	0	100	0	0
22	Rock Creek at Daydream Ranch	42°33'47"/114°29'42"	A	1,106	5	11.36	623	1.8	22.8	52.4	22.9	0.1
23	Box Canyon Springs	42°42'29"/114°48'35"	S	920	1	0	3	0	0	100	0	0
24	Salmon Falls Creek near Hagerman	42°41'47"/114°51'15"	R	881	6	0.23	5,362	0	5.1	85.1	9.4	0.4
25	Camas Creek at Red Road	44°17'20"/111°53'31"	R	1,457	4	0	660	0	17.5	40.9	40.5	1.2
26	Beaver Creek at Spencer	44°21'20"/112°10'45"	R	1,783	4	0.03	328	0.2	0	68.8	29.7	1.4
27	Big Lost R. near Chilly	43°59'54"/114°01'12"	R	2,018	5	0.4	1,141	0	0.2	48.9	31	19.8
28	Big Wood R. near Bellevue	43°19'40"/114°20'25"	R	1,469	5	5.73	2,128	0.9	5.1	45.2	41.1	7.8
29	Silver Creek near Picabo	43°19'22"/114°06'29"	S	1,478	4	1.21	152	0.1	35.6	63.6	0.7	0
30	Malad R. near Gooding	42°53'12"/114°48'08"	A	1,019	5	2.52	8,607	0.4	14.2	64.7	12.8	7.9
31	Bruneau R. near Hot Spring	42°46'16"/115°43'10"	R	792	6	0.1	6,766	0	0.4	90.4	8.9	0.3
32	Snake R. near Murphy	43°17'31"/116°25'12"	LR	692	7	4.29	129,052	0.6	19.8	54.2	19.7	5.7
33	Boise R. near Twin Springs	43°39'33"/115°43'34"	F	992	6	0.01	2,148	0	0	7.9	88	4.1
34	Boise R. below Diversion Dam	43°32'23"/116°05'37"	F	838	6	0.23	6,970	0	0.5	27.9	68.7	2.9
35	Boise R. at Glenwood Bridge	43°39'37"/116°16'41"	R	792	6	8.41	7,463	0.7	0.7	31.5	64.4	2.7
36	Boise R. near Parma	43°46'54"/116°58'17"	A	669	6	26.23	10,141	2.5	12.5	34.4	47.9	2.6
37	Snake R. at Nyssa, Oregon	43°52'34"/116°58'53"	LR	661	7	5.02	171,363	0.6	16.5	59.4	18.8	4.9
38	South Fork Payette R. at Lowman	44°05'07"/115°37'16"	F	1,155	5	0.16	1,157	0.1	0	8.8	83.8	7.3
39	North Fork Payette R. at McCall	44°54'27"/116°07'04"	F	1,514	4	4.07	379	1.9	0.2	2.5	88.9	6.5
40	North Fork Payette R. at Cascade	44°31'30"/116°02'45"	A	1,439	6	2.93	1,601	0.8	11.9	5.5	71.8	10
41	Payette R. near Payette	44°02'33"/116°55'27"	A	652	6	3.15	8,536	0.5	9.4	25.2	61.7	3.2
42	Weiser R. near Weiser	44°16'03"/116°46'16"	A	672	6	0.95	3,800	0.2	11.8	48.2	39.7	0.2
43	Snake R. at Weiser	44°14'44"/116°58'48"	LR	636	7	4.98	184,995	0.6	16.2	57.5	21.1	4.7
44	Pahsimeroi R. at Ellis	44°41'34"/114°02'51"	R	1,413	5	0.05	2,151	0	7.5	66.7	14.2	11.5
45	Salmon R. at Salmon	45°11'00"/113°53'40"	R	1,192	6	0.61	12,982	0.3	4.8	50.3	37	7.6
46	Lemhi R. near Lemhi	44°56'24"/113°38'16"	R	1,512	5	0.25	2,349	0.1	8.6	60.5	24.9	5.9
47	Johnson Creek at Yellow Pine	44°57'44"/115°29'58"	F	1,419	4	0	555	0	0	2.3	97.2	0.5
48	Little Salmon R. at Riggins	45°24'47"/116°19'29"	F	536	5	1.04	1,491	0.2	4.8	6	88.6	0.4
49	Snake R. near Anatone, Wash.	46°05'50"/116°58'36"	LR	246	8	3.83	258,802	0.5	13.8	52.1	29.2	4.4
50	Lapwai Creek near Lapwai	46°25'36"/116°48'15"	A	264	5	4.09	682	0.4	48.9	14	36.5	0.2
51	South Fork Clearwater R. at Stites	46°05'12"/115°58'32"	F	400	5	2.19	3,016	0.3	19	3.9	76.4	0.4
52	Palouse R. near Potlatch	46°54'55"/116°57'00"	A	748	4	3.02	822	0.4	23.6	0.9	75	0.1
53	Bear R. at Idaho-Utah State Line	42°00'47"/111°55'14"	A	1,845	6	3.59	5,139	0.6	29.5	37.1	23.3	9.7
54	Salmon River near White Bird	45°45'01"/116°19'26"	LR	430	7	0.36	35,095	0.1	2.2	25.7	68.4	3.6
55	Snake River near Shelley	43°24'48"/112°08'03"	A	1,402	6	5.57	25,356	0.6	18.4	26.1	48.5	6.5
56	St. Joe River at Red Ives Ranger Station	47°03'22"/115°21'08"	F	1,131	4	0	275	0	0	8.2	91	0.8
57	Snake R. near Buhl	42°39'58"/114°42'41"	LR	900	7	4.67	76,104	0.7	21.3	45.8	25.4	6.8

Table 2. Types of data and periods of data collection for sites in the Idaho statewide surface-water-quality monitoring network and for sites in other programs

[USGS, U.S. Geological Survey; ID, identification; periods of data collection by fiscal year from January 1, 1989 (partial 1989) through December 31, 2002 (partial 2002); R., river; Site types: F, forested; A, agricultural; R, rangeland; LR, large river; S
others, 2001]

		Types of data and periods of data collection, Idaho statewide network							Types of data and periods of data collection, other programs				
Site No. (fig. 1)	Site name	USGS site ID	Site type	Sediment	Onsite measurements	Major ions	Nutrients	Trace elements	Sediment	Onsite measure-ments	Major ions	Nutrients	Trace elements
1	Kootenai R. at Porthill	12322000	F	1989, 1992, 1995, 1998, 2001	1989, 1992, 1998, 2001	1992, 1995, 1998, 2001	1992, 1995, 1998, 2001	1992, 1995					
2	Clark Fork R. below Cabinet Gorge Dam	12391950	F	90-02	96-02	90-01	90-99, 02	90-94					
3	Priest R. near Priest R.	12395000	F	90, 92, 94, 96, 98, 00, 02	89, 90, 92, 94, 96, 98, 02	90, 92, 94, 96, 98, 00	89, 90, 92, 94, 96, 98, 00, 02	90, 92, 94					
4	North Fork Coeur d'Alene R. at Enaville	12413000	F	90, 93, 96, 98, 00, 01	89, 90, 93, 96, 98, 00, 01	90, 93, 96, 98-01	90, 93, 96, 98, 00, 01	90, 93	1999, 2002	1998-2002	1999	1998-2002	1998-2002
5	South Fork Coeur d'Alene R. near Pinehurst	12413470	F	89, 90-02	89-94, 96-02	90-02	89, 90-02		99, 02	98-02	99	98-02	98-02
6	St. Joe R. at Calder	12414500	F	89, 90, 93, 96, 98-01	89, 90, 93, 96, 98, 99-01	90, 93, 96, 98-01	89, 90, 93, 96, 98-01	90, 93	99	98-02	99	98-02	98-00
7	Spokane R. near Post Falls	12419000	F	89, 90-02	89-93, 96-02	90-02	89, 90-02	90-95	99	98-02	99, 01, 02	98-02	98-02
8	Snake R. near Heise	13037500	F	89, 96, 99, 02	89, 96, 99, 02	89, 96, 99	89, 96, 99, 02	89-92	94, 95	92, 94, 95	94, 95	92, 94, 95	94, 95
10	Teton R. near St. Anthony	13055000	A	90, 96, 99, 01	89, 90, 96, 99, 01	90, 93, 96, 99, 01	90, 96, 99, 01	90, 93	93-95	93-95	93-95	93-95	93-95
11	Henrys Fork near Rexburg	13056500	A	89, 90, 92, 96, 98, 00, 02	89, 90, 92, 96, 98, 00, 02	90, 92, 96, 98, 00	89, 90, 96, 98, 00, 02	90, 92, 94	93-95	92-95	93-95	93-95	93-95
12	Willow Creek near Ririe	13058000	R	93, 96, 99	89, 90, 92, 93, 96	90, 93, 96, 99	90, 93, 96, 99	90, 93					
13	Blackfoot R. near Blackfoot	13068500	A	89, 90-02	89-97, 99-02	90-97, 99-01	89-97, 99-02	90-95	94	94		94	
14	Snake R. near Blackfoot	13069500	LR	89, 90, 92, 96, 98, 00, 02	89, 90, 92, 96, 98, 00-02	90, 92, 96, 98, 00, 01	89, 90, 92, 96, 98, 00-02	90, 92, 94	93-95	92-95	93-95	93-95	93-95
15	Portneuf R. at Topaz	13073000	A	96, 98, 00, 02	89, 96, 98, 00, 02	96, 98, 00	96, 98, 00, 02		93-95	92-95	93-95	93-95	93-95
16	Marsh Creek near McCammon	13075000	A	91, 93, 95, 96, 98, 00	89, 91, 93, 95, 96, 98, 00	91, 93, 95, 96, 98, 00	91, 93, 95, 96, 98, 00	91, 93, 95					
17	Portneuf R. at Pocatello	13075500	A	91, 93, 95, 96, 98, 00, 02	89, 91, 93, 95, 96, 98, 00, 02	91, 93, 95, 96, 98, 00	89, 91, 93, 95, 96, 98, 00, 02	91, 93, 95		92			
18	Snake R. near Minidoka	13081500	LR	89, 90, 92, 96, 98, 00, 02	89, 90, 92, 96, 98, 00, 02	90, 92, 96, 98, 00	90, 92, 96, 98, 00, 02	90, 92, 94	93-95	92-95	93-95	93-95	93-95
19	Snake R. at Milner	13087995	LR	91, 93, 95, 96, 99	89, 91, 93, 97, 99, 01	91, 93, 95, 97, 99, 01	91, 93, 95, 97, 99, 01	91, 93 95	94, 95	94, 95	94, 95	94, 95	
20	Snake R. near Kimberly	13090000	LR	91, 93, 95, 97, 99	89, 91, 93, 95, 97, 99, 01	91, 93, 95, 97, 99, 01	91, 93, 95, 97, 99, 01	91, 93, 95	94, 95	92, 94, 95		94, 95	
21	Blue Lakes Spring	13091000	S	91	89, 91-94, 96	90, 96	91, 94, 96	91, 94		94-99	94, 96	94-99	
22	Rock Creek at Daydream Ranch	13092747	A	96	00	00	97		93-02	92-02	93-02	93-02	93-01
23	Box Canyon Springs	13095500	S	91, 02	89-94, 97, 99, 02	89, 91-94, 97, 99, 01	91-94, 97, 99, 02	91, 94		94-02	94	94-02	
24	Salmon Falls Creek near Hagerman	13108150	R	90, 92, 94, 96, 98, 00, 02	89, 90, 92, 94, 96, 98, 00, 02	90, 92, 94, 96, 98, 00	89, 90, 92, 94, 96, 98, 00, 02	90, 92, 94	94, 95	94, 95		94, 95	
25	Camas Creek at Red Road	13108900	R	92, 95, 97	89, 91, 94, 97	91, 94, 97	91, 94, 97	91, 94					
26	Beaver Creek at Spencer	13113000	R	95, 97	89, 92, 95, 97	92, 95, 97	92, 95, 97	92, 95					
27	Big Lost R. near Chilly	13120500	R	96, 99, 02	89, 96, 99, 02	96, 99	96, 99, 02		93-95	93-95	93-95	93-95	93-95
28	Big Wood R. near Bellevue	[1]13140800	R	90, 92, 94, 96, 97, 99, 01	89, 90, 92, 94, 96, 97, 99, 01	90, 92, 94, 96, 97, 00, 01	90, 92, 94, 93, 96-97, 99, 01	90, 92, 93, 94					
29	Silver Creek near Picabo	13150430	S	90, 93, 96, 97, 99, 01	89, 90, 93, 96, 97, 99, 01	90, 93, 96, 97, 99, 01	90, 92, 94, 93, 96-97, 99, 01	90, 93		92			
30	Malad R. near Gooding	13152500	A	89, 90, 93, 96, 97, 00	89, 90, 93, 96, 97, 01	89, 90, 96, 97, 00	89, 90, 96, 97, 00	90, 93	93-95	92-95	93-95	93-95	93-95
31	Bruneau R. near Hot Spring	13168500	R	91, 94, 97, 00	89, 91, 94, 97, 00	91, 94, 97, 00	91, 94, 97, 00	91, 94					
32	Snake R. near Murphy	13172500	LR	91, 94, 97, 00	89, 91, 94, 97, 00	91, 94, 97, 00	91, 94, 97, 00	91, 94					
33	Boise R. near Twin Springs	13185000	F	91, 94, 96, 97, 00	89, 91, 94, 97, 00	91, 94, 97, 99, 00	91, 94, 97, 00	91, 94					
34	Boise R. below Diversion Dam	13203510	F	91, 94, 97, 99	89, 91, 94, 95, 97, 99	91, 94, 99	91, 94, 95, 97, 99	91, 94	93-02	93-02	99	94-02	99
35	Boise R. at Glenwood Bridge	13206000	R	90-01	89-01	90-01	90-01	90-95	94-02	93-02	97	95-02	
36	Boise R. near Parma	13213000	A	89, 96, 97, 99	89, 96, 97, 99	89, 97, 99	89, 96, 97, 99	89	93-02	93-02	94	93	94
37	Snake R. at Nyssa, Oregon	13213100	LR	90, 93, 96, 97, 00	89, 90, 93, 96, 97, 00	90, 93, 96, 97, 00	90, 93, 96, 97, 00	90, 93					
38	South Fork Payette R. at Lowman	13235000	F	92, 95, 98, 01	89,92, 95, 98, 01	92, 95, 98, 01	92, 95, 98, 01	92, 95					
39	North Fork Payette R. at McCall	13239000	F	92, 95, 98, 02	89,92, 95, 98, 02	92, 95, 98	92, 95, 98, 02	92, 95	94, 98, 02	94-02		94	
40	North Fork Payette R. at Cascade	13245000	A	90, 92, 94, 96, 98,	89, 90, 92, 94, 96, 98	90, 92, 94, 96, 98	90, 92, 94, 96, 98	90, 92, 94					
41	Payette R. near Payette	13251000	A	90, 93, 96, 97, 99, 02	89, 90, 93, 96, 97, 99, 02	90, 93, 96, 97, 99	90, 93, 96, 97, 99, 02	90, 93					
42	Weiser R. near Weiser	13266000	A	90, 93, 96, 97, 00	89, 90, 93, 96, 97, 00	90, 93, 96, 97, 00	90, 93, 96, 97, 99	90, 93					
43	Snake R. near Weiser	13269000	LR	90, 93, 96, 99, 02	89, 90, 93, 96, 99, 02	90, 93, 96, 99	90, 93, 96, 99, 02	90, 93					
44	Pahsimeroi R. at Ellis	13302005	R	92, 95, 98, 01	89, 92, 95, 98, 01	92, 95, 98, 01	92, 95, 98, 01	92, 95					
45	Salmon R. at Salmon	13302500	R	92, 95, 98, 01	89, 92, 95, 98, 01	92, 95, 98, 01	92, 95, 98, 01	92, 95					
46	Lemhi R. near Lemhi	13305000	R	92, 95, 98, 01	89, 92, 95, 98, 01	92, 95, 98, 01	92, 95, 98, 01	92, 95					
47	Johnson Creek at Yellow Pine	13313000	F	92, 95, 98, 01	89, 92, 95, 98, 01	92, 95, 98, 01	92, 95, 98, 01	92, 95					
48	Little Salmon R. at Riggins	13316500	F	92, 95, 98, 01	89, 92, 95, 98, 01	92, 95, 98, 01	92, 95, 98, 01	92, 95					
49	Snake R. near Anatone, Wash.	13334300	LR	91, 94, 97	89, 91, 94, 97	91, 94, 97	91, 94, 97	91-94					
50	Lapwai Creek near Lapwai	13342450	A	91, 93, 95, 97, 98, 00, 02	89, 91, 93, 95, 97, 98, 00, 02	91, 93, 95, 97, 98, 00	91, 93, 95, 97, 98, 00, 02	91, 93, 95					
51	South Fork Clearwater R. at Stites	13338500	F	90, 93, 96, 98, 01	89, 90, 93, 96, 98, 01	90, 93, 96, 98, 01	90, 93, 96, 98, 01	90, 93					
52	Palouse R. near Potlatch	13345000	A	89, 91, 93, 95, 97, 98, 00, 02	89, 91, 93, 95, 97, 98, 00, 02	91, 93, 95, 97, 98, 00	89, 91, 93, 95, 97, 98, 00, 02	91, 93, 95					
53	Bear R. at Idaho-Utah State line	10092700	A	91, 94, 96, 99, 02	91, 94, 96, 99, 02	91, 94, 96, 99	91, 94, 96, 99, 02	91, 94					
54	Salmon R. near White Bird	13317000	LR	89, 00-02	89, 94, 00-02	89, 94, 00, 01	89, 94, 00-02	89, 94					
55	Snake R. near Shelley	13060000	A	91, 93, 95, 02	89, 91, 93, 95, 00-02	91, 93, 95, 01	91, 93, 95, 01, 02	91, 93, 95	94	94		94	
56	St. Joe R. at Red Ives Ranger Station	12413875	F	00-02	00-02	01	01, 02						
57	Snake R. near Buhl	13094000	LR	91, 97-02	89, 91, 97-02	91, 97-01	91, 97-02	91, 93, 95	93-97	92-97	93-96	93-97	93-96

[1]Also under site ID 13141000. Site moved about 1.6 kilometers upstream because of gage-operation problems at old location. Data from both locations combined for analysis.

Table 6. Sites in the Idaho statewide surface-water-quality monitoring network where concentrations of selected trace elements exceeded Idaho criteria, 1989–95

[Where appropriate, criteria are based on lowest hardness measured at each site; locations of sites shown on figure 1; CCC, criterion continuous concentration; criteria from Idaho Department of Environmental Quality, **http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf**; CMC, criterion maximum concentration; HC water+orgs, human consumption of water and organisms; HCorgs, human consumption of organisms only; X, fewer than 25 percent of measurements; <, greater than; %, percent]

	Cadmium		Copper		Lead		Zinc		Mercury			
Site No	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	HCwater+orgs	HCorgs
1						X				X	X	X
2	X	>25%	X	X	X	>25%				X	X	X
3			X	X	X	X	X	X				
4	>25%	>25%		X		>25%	X	X		X	X	X
5	100%	100%	X	X	X	100%	100%	100%		X	X	X
6			X	X						X	X	X
7	>25%	>25%	X	X	X	>50%	>75%	>75%				
8				X		X				X	X	X
10						X						
11	X	X								X	X	X
12										X	X	X
13						X				X	X	X
14						X	X	X		X	X	X
16										X	X	X
21		X										
23		X				X						
25							X	X				
29			X	X		X						
33						X						
36		X								X	X	X
39										X	X	X
40						X				X	X	X
41						X						
42				X						X	X	X
43						X						
46							X	X				
48										X	X	X
49						X						
51						100%				X	X	X
52			X	>25%		>75%						
54	X	X		X		X						
55						X				X	X	X
56	>25%	>25%				>50%						

Table 10. Major network and water-quality issues for sites in the Idaho statewide surface-water-quality monitoring network, 1989–2002

[Locations of sites shown on figure 1; No., number; fig., figure; >, greater than; <, less than; NTU, nephelometric turbidity units; DO, dissolved oxygen; %, percent; N, nitrogen; P, phosphorus; mg/L, milligrams per liter; TE, trace elements; FC, fecal coliform bacteria; *E. coli*, *Escherichia coliform* bacteria; criteria from Idaho Department of Environmental Quality, http://www2.state.id.us/adm/adminrules/rules/idapa58/0102.pdf]

Site No.	Sampling a wider range of flows is desirable	Water temperatures > Idaho criteria	Turbidity > 50 NTU	DO < Idaho criteria	DO saturation > 170%	pH < 6.5	pH > 9.0	More than 25% inorganic N > 0.3 mg/L	More than 25% total P > 0.1 mg/L	Candidate for nutrient reference site	TE in water > Idaho criteria	TE enriched in fish	Organic compounds detected	FC > Idaho *E. coli* criteria
1	x	x		x							x			
2	x	x		x							x			
3		x									x		x	
4		x				x				x	x	x	x	
5				x		x		x			x	x	x	
6		x									x	x	x	
7		x									x	x	x	
8											x			
10	x	x						x			x			
11		x									x		x	
12	x							x			x			
13	x	x	x		x		x				x			x
14	x	x									x	x	x	
15	x	x	x					x						x
16		x	x		x			x	x		x			x
17		x	x		x			x	x			x	x	x
18	x	x												
19	x	x		x			x		x					
20		x						x	x					
21								x			x			
22		x						x	x			x	x	x
23								x			x			
24	x	x						x						x
25	x	x					x				x			x
26	x													x
27			x							x				
28	x	x	x											
29		x		x				x			x			
30		x					x	x	x					x
31		x												x
32	x	x					x	x						
33											x	x	x	
34						x								x
35		x						x	x					x
36		x					x	x	x		x		x	x
37		x	x				x	x	x			x	x	x
38	x	x								x				
39	x	x				x					x			
40	x	x		x			x				x			
41		x	x					x			x			x
42		x	x						x		x			x
43		x	x				x	x	x		x			x
44	x							x						x
45		x												
46	x						x				x			x
47										x				
48		x									x			
49		x						x			x			
50		x	x				x	x	x					x
51		x									x			
52		x	x			x					x			x
53	x	x	x					x	x					x
54		x								x	x	x	x	
55		x			x		x				x			
56										x	x		x	
57		x					x	x	x				x	

Appendix A. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989-2002

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Appendix A-1. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

MAXIMUM WATER TEMPERATURE (degrees Celsius)

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	1,730	-3.9	20.6	3.6	5.4	9.1	14.8	17.5
2	591	2.4	22.0	3.8	7.8	13.2	17.6	20.0
3	371	0.9	25.3	2.0	5.4	14.6	19.2	22.3
4	596	6.0	21.9	9.5	12.4	15.7	18.4	19.6
5	1,076	2.0	22.5	4.1	5.4	9.1	14.9	19.3
6	444	5.8	24.5	8.4	10.4	15.8	19.5	21.7
7	1,099	1.8	27.1	3.6	5.9	15.5	21.2	23.6
8	275	6.8	16.9	10.7	11.7	13.1	14.4	16.3
10	398	6.8	21.0	10.9	13.3	15.3	17.8	19.5
11	598	0.8	25.6	9.6	13.2	17.3	20.2	22.2
12	35	11.2	16.0	11.6	11.9	12.3	13.1	14.6
13	712	0.0	34.1	0.1	12.1	19.6	23.2	25.9
14	580	6.2	36.7	12.4	14.6	17.2	20.2	21.8
15	770	2.3	24.9	8.0	13.5	18.5	21.5	23.0
16	430	9.5	24.4	14.8	17.0	19.7	21.5	22.5
17	754	0.1	27.8	1.9	11.6	17.8	21.6	23.6
18	450	1.9	23.6	7.5	14.4	18.2	21.3	22.6
19	224	9.8	28.0	15.1	18.5	21.8	23.1	24.8
20	277	11.9	24.0	16.7	18.0	19.9	21.1	22.2
21	249	15.7	17.8	15.8	16.0	16.2	16.5	16.7
22	396	11.5	22.9	14.6	17.0	18.5	20.1	21.1
23	277	14.3	15.4	14.5	14.7	14.8	14.9	15.0
24	664	5.1	27.9	8.4	13.7	18.4	21.7	23.7
25	129	8.7	22.9	14.1	16.9	19.0	20.5	21.4
26	130	8.7	21.4	12.5	14.9	16.7	18.0	19.4
27	577	0.0	20.0	0.1	5.6	11.9	14.9	16.8
28	322	8.7	22.9	13.1	15.0	18.2	20.3	21.6
29	366	2.9	28.2	9.6	15.5	20.1	24.2	26.0
30	422	9.6	22.7	14.2	16.2	18.4	20.2	21.2
31	127	18.8	31.6	22.5	24.8	26.8	29.4	30.7
32	272	9.7	36.0	14.5	18.0	21.0	23.2	25.0
33	146	9.6	24.1	13.1	16.4	19.2	20.8	22.3
34	375	2.4	18.4	5.6	8.8	11.5	15.3	17.4
35	936	1.6	22.0	5.5	7.7	12.1	17.9	19.4
36	712	0.3	25.1	5.3	7.4	13.4	19.9	22.6
37	320	13.2	26.9	17.5	19.3	22.3	24.0	25.5
38	249	7.0	22.7	11.5	13.8	16.3	19.0	20.7
39	469	1.4	25.2	2.2	4.1	11.9	20.8	23.7
40	85	17.2	23.5	18.4	20.1	21.1	22.5	22.8
41	578	1.2	28.4	3.5	11.0	18.6	23.1	25.0
42	348	9.3	29.0	14.6	17.5	23.2	24.9	26.0
43	481	0.4	29.3	2.0	7.1	15.8	22.2	25.2
44	428	5.4	20.1	10.6	13.0	14.4	16.3	17.8
45	268	10.1	23.1	12.1	14.8	16.2	19.0	20.9
46	356	2.2	19.3	8.4	11.1	14.2	16.6	17.7
47	270	4.1	19.0	8.0	11.1	14.0	16.1	17.4
48	326	7.6	23.4	11.3	14.7	17.6	19.3	20.2
49	2,073	1.0	25.5	4.0	6.5	11.5	18.5	22.5
50	647	2.8	29.1	6.0	12.0	18.7	23.0	25.7
51	390	6.6	28.0	10.4	14.4	20.6	24.0	25.9
52	610	0.0	29.3	1.1	7.0	16.3	21.6	25.4
53	314	0.1	25.3	0.2	3.4	13.4	19.7	23.2
54	703	0.1	26.0	2.5	9.1	12.8	19.6	22.5
55	326	6.3	24.3	12.0	14.2	17.5	20.7	21.8
56	459	0.0	22.0	0.0	0.2	7.4	14.9	17.5
57	1,215	3.9	23.2	9.2	14.5	17.8	19.9	21.1

Appendix A-2. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002								
MINIMUM WATER TEMPERATURE (degrees Celsius)								
	No. of			Percentiles				
Site No.	obs.	Minimum	Maximum	10	25	50	75	90
1	1730	-3.9	19.7	3.1	5.1	9.8	14.6	17.2
2	591	1.4	20.6	2.0	6.7	12.7	16.3	18.7
3	371	0.1	22.0	5.0	9.4	12.9	115.3	16.9
4	596	4.7	18.5	3.0	4.7	8.7	13.1	15.0
5	1,076	0.4	16.5	2.8	4.4	7.6	12.6	15.3
6	444	4.2	20.2	3.8	6.7	13.6	18.5	21.5
7	1,099	1.4	25.9	3.4	6.9	13.0	18.6	21.8
8	275	4.0	14.3	8.3	10.5	12.6	14.1	15.8
10	398	5.1	18.1	8.2	11.2	13.9	16.7	18.5
11	598	0.7	22.0	8.2	10.9	14.7	17.6	19.1
12	35	9.6	14.5	0.0	8.4	14.1	17.1	18.6
13	712	0.0	22.8	5.2	10.9	14.6	17.4	18.9
14	580	5.3	20.8	7.8	11.5	15.0	17.7	19.0
15	770	0.1	21.9	7.8	12.0	15.4	17.5	18.7
16	430	6.1	19.9	4.5	11.2	15.3	17.5	19.3
17	754	0.0	23.3	3.5	10.7	16.0	19.1	20.7
18	450	0.8	22.8	10.9	14.4	18.2	20.5	21.6
19	224	9.0	23.8	14.9	16.6	19.0	20.4	21.0
20	277	10.8	21.3	15.3	15.5	15.6	18.9	20.5
21	249	15.2	15.7	12.9	14.6	15.4	15.6	16.4
22	396	9.7	18.2	13.0	14.1	14.5	15.3	16.4
23	277	14.0	14.5	8.2	12.6	14.3	16.5	18.8
24	664	4.0	21.9	7.1	11.0	14.7	17.0	19.1
25	129	6.0	18.2	9.5	11.5	13.1	14.5	15.8
26	130	6.1	15.7	0.0	2.3	7.1	10.1	12.4
27	577	0.0	14.1	0.0	4.3	8.5	10.9	13.2
28	322	5.6	15.5	8.4	10.6	13.5	17.9	21.5
29	366	0.2	24.2	9.3	12.6	15.5	17.7	20.9
30	422	5.5	20.1	10.7	13.1	15.6	17.6	21.8
31	126	15.3	26.3	13.1	17.2	20.5	21.9	23.5
32	272	6.0	24.0	10.6	14.4	17.2	20.7	22.1
33	146	7.3	20.1	5.6	8.6	12.8	15.2	16.7
34	375	1.8	17.0	3.5	5.9	9.5	14.1	15.7
35	936	0.0	18.9	3.7	5.7	9.8	14.8	17.8
36	712	-0.1	21.2	4.8	8.9	15.4	19.4	20.9
37	320	11.2	24.3	9.1	12.4	15.8	20.4	22.2
38	249	3.1	17.7	1.6	5.4	11.2	15.8	19.7
39	469	0.6	23.2	1.2	3.7	14.1	19.2	21.3
40	85	15.8	22.3	2.3	8.7	15.8	19.8	21.1
41	578	0.0	24.5	3.5	10.9	16.1	19.4	20.8
42	348	7.3	23.7	1.9	9.8	16.1	19.6	21.5
43	481	0.3	26.6	2.3	8.1	11.0	14.2	20.8
44	428	1.8	14.2	7.9	9.6	11.9	14.8	16.3
45	268	6.9	19.3	6.3	8.8	11.8	15.2	16.4
46	356	0.1	13.6	4.5	7.1	10.0	11.6	12.4
47	270	1.4	14.7	6.3	8.8	11.5	13.6	14.8
48	326	4.3	17.2	4.0	6.5	11.5	16.0	21.0
49	2,070	0.5	24.0	3.5	6.0	11.5	16.0	20.5
50	647	0.4	20.1	4.9	9.1	13.3	16.1	18.5
51	390	4.0	21.6	1.1	8.7	14.6	18.4	20.4
52	610	0.0	25.8	0.1	3.9	12.4	18.2	21.0
53	314	0.0	23.1	1.7	7.4	12.1	19.0	21.7
54	703	0.1	26.0	3.5	10.0	14.5	18.7	21.6
55	326	3.7	20.1	0.0	2.9	9.6	14.2	17.8
56	459	0.0	14.2	2.1	8.0	13.8	17.4	19.0
57	1,214	3.2	21.2	8.4	12.9	16.0	18.1	19.2

Appendix A-3. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

MEAN WATER TEMPERATURE (degrees Celsius)

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	1,730	2.0	20.0	3.8	5.3	8.9	14.4	17.1
2	591	1.9	21.3	2.9	7.6	13.0	17.2	19.4
3	371	0.4	23.5	1.6	4.9	13.4	17.5	20.6
4	596	5.3	20.1	8.5	11.2	14.2	16.7	17.9
5	1,076	1.2	19.0	3.2	4.7	7.3	12.5	16.1
6	444	4.7	21.7	7.1	9.2	14.2	17.8	19.7
7	1,099	1.6	26.3	3.5	5.8	15.0	20.6	22.7
8	275	5.8	15.3	9.4	10.8	12.7	14.0	14.8
10	398	5.9	19.3	9.5	12.1	14.1	16.5	17.9
11	598	0.8	23.6	8.8	12.2	16.1	19.0	20.6
12	35	10.4	14.6	10.5	10.6	11.0	12.4	14.2
13	712	0.0	27.5	0.0	9.8	16.9	19.9	21.6
14	580	5.7	24.2	11.4	13.6	16.0	18.9	20.3
15	770	1.0	22.2	6.6	12.1	16.8	19.7	20.8
16	430	8.4	21.7	13.1	15.2	17.6	19.3	20.1
17	754	0.0	25.5	1.0	10.4	16.4	19.9	21.8
18	450	1.2	23.2	7.2	13.7	17.7	20.7	22.1
19	224	9.5	25.5	14.7	17.4	20.6	21.8	22.8
20	277	11.4	22.1	16.1	17.5	19.4	20.7	21.1
21	249	15.4	16.1	15.5	15.6	15.7	15.9	16.0
22	396	10.8	20.4	13.5	15.5	16.8	17.9	18.6
23	277	14.1	14.7	14.3	14.4	14.5	14.6	14.6
24	664	4.5	24.4	7.6	12.0	16.7	19.5	21.4
25	129	7.4	20.2	11.4	14.6	16.5	18.2	18.9
26	130	7.3	17.4	11.1	13.1	14.5	15.6	16.6
27	577	0.0	16.6	0.0	3.1	8.9	11.9	13.4
28	322	7.1	18.1	10.7	12.2	14.5	16.4	17.2
29	366	1.7	25.9	8.7	14.4	18.6	22.2	24.1
30	422	7.9	21.0	12.2	14.1	16.5	18.2	19.1
31	127	17.5	28.0	19.6	22.4	23.7	26.1	27.0
32	272	8.6	25.2	12.5	17.0	19.8	22.1	24.0
33	146	9.0	22.3	11.6	14.8	17.4	18.9	20.1
34	375	2.2	17.4	5.3	8.0	10.9	14.5	16.4
35	936	0.9	20.2	4.5	6.5	10.4	15.9	17.4
36	488	0.0	22.5	5.1	8.0	14.8	19.0	20.8
37	320	12.5	25.5	16.3	18.1	21.1	22.7	24.3
38	249	5.2	19.7	9.3	11.7	14.2	16.2	17.6
39	469	1.1	24.0	1.5	3.5	11.0	19.4	22.0
40	85	16.9	23.1	17.6	19.5	20.7	21.6	22.2
41	578	0.8	26.4	2.8	9.5	16.7	21.1	22.8
42	348	8.3	26.4	12.8	15.9	20.8	22.1	23.2
43	481	0.3	28.0	1.5	6.6	14.3	20.8	23.6
44	428	3.9	16.6	8.8	11.4	12.5	13.5	14.9
45	268	8.8	21.1	11.8	14.0	15.9	17.3	19.3
46	356	1.1	16.1	6.7	9.2	11.9	14.1	15.0
47	270	3.2	16.7	6.3	9.4	12.3	14.0	14.8
48	326	6.4	19.2	9.3	12.7	15.4	16.7	17.6
49	1,066	2.5	23.5	4.0	6.0	11.5	18.0	21.5
50	647	1.8	23.8	5.0	10.1	15.6	18.5	20.7
51	390	5.7	24.8	9.1	13.0	18.2	20.8	22.7
52	610	0.0	27.3	0.6	5.8	15.0	20.0	23.6
53	314	0.0	24.1	0.1	2.2	12.1	17.8	21.6
54	703	0.1	23.7	2.0	8.5	12.2	18.8	21.6
55	326	5.2	21.7	10.6	13.0	16.1	19.0	19.8
56	459	0.0	17.2	0.0	0.0	5.1	11.9	13.9
57	1,215	3.6	22.2	8.7	13.7	17.0	19.0	20.1

Appendix A-4. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

SUSPENDED SEDIMENT, milligrams per liter (mg/L)

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	23	1	25	1	2	3	6	9
2	51	1	94	1	2	5	14	21
3	29	1	49	2	3	7	13	19
4	112	< 1	220	1	1	2	7	32
5	281	< 1	302	2	3	5	10	27
6	37	< 1	15	< 1	1	2	3	6
7	79	1	8	1	1	2	2	4
8	52	1	75	3	4	8	15	31
10	70	1	57	2	4	8	15	27
11	66	3	219	6	8	14	26	42
12	16	1	19	2	2	4	8	10
13	63	3	1,930	5	13	38	80	248
14	97	< 1	94	4	8	14	25	40
15	55	5	1,750	19	30	55	82	144
16	30	7	851	12	17	47	127	191
17	32	13	445	16	24	59	159	301
18	63	1	32	3	5	7	10	14
19	47	1	274	7	12	17	28	36
20	42	3	231	6	12	18	25	41
21	1	1	1	1	1	1	1	1
22	115	3	648	10	21	52	101	161
23	1	2	2	2	2	2	2	2
24	38	4	103	10	18	33	52	72
25	12	4	89	4	7	12	26	49
26	17	4	48	4	7	12	22	40
27	47	1	198	1	2	5	41	114
28	33	1	359	1	3	5	12	207
29	32	< 1	76	1	3	5	12	28
30	59	2	162	7	12	21	36	54
31	20	1	164	2	4	21	31	100
32	20	6	81	9	12	16	23	74
33	77	1	958	3	5	17	65	258
34	78	< 1	41	< 1	2	3	6	9
35	114	< 1	120	< 1	3	5	11	27
36	112	< 1	245	< 1	17	39	62	92
37	27	14	211	22	35	48	61	82
38	75	1	692	3	6	13	78	131
39	23	< 1	2	< 1	1	1	1	2
40	24	1	5	1	1	3	4	5
41	31	6	118	13	19	25	39	56
42	27	2	486	4	13	18	65	138
43	24	4	437	22	37	50	65	94
44	20	3	29	3	5	9	14	20
45	19	2	149	3	9	13	29	44
46	20	7	113	8	9	13	15	29
47	73	< 1	36	< 1	2	3	9	13
48	21	2	63	2	3	5	10	24
49	10	2	427	5	6	11	24	130
50	28	3	1,420	6	11	18	27	47
51	26	1	410	2	3	7	14	37
52	30	1	121	6	7	12	19	45
53	24	7	198	15	28	62	102	135
54	46	1	189	2	3	5	13	37
55	51	< 1	41	2	3	5	11	14
56	19	1	17	1	1	2	3	6
57	97	5	283	13	17	29	48	68

Appendix A-5. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

TURBIDITY, nephelometric turbidity units (NTU)

Site No.	No. of obs.	Minimum	Maximum	Percentiles				
				10	25	50	75	90
1	9	0.5	24	0.9	1.0	1.5	2.0	6.7
2	42	0.2	15	0.4	0.5	0.9	2.0	5.5
3	25	0.5	11	0.6	1.0	1.5	2.2	3.4
4	30	0.2	18	0.2	0.3	0.4	1.0	1.9
5	47	0.3	48	0.5	0.6	1.1	1.8	4.4
6	28	0.2	17	0.3	0.3	0.5	1.0	1.5
7	44	0.2	15	0.3	0.4	0.7	1.7	2.2
8	47	0.2	14	0.5	0.8	1.2	2.2	8.4
10	20	0.3	28	0.5	0.8	1.5	4.6	6.4
11	28	0.5	14	0.8	1.3	2.0	3.1	4.9
12	19	0.4	10	0.6	1.1	1.4	2.2	2.6
13	47	0.6	84	1.4	2.4	6.5	22.5	46.4
14	34	0.3	19	0.5	1.0	2.2	3.5	5.6
15	17	1.4	71	1.8	2.0	3.8	17.0	29.8
16	29	0.5	170	2.0	3.0	6.1	25.0	36.8
17	29	1.5	97	2.3	2.8	20.0	32.0	40.8
18	28	0.6	16	1.1	1.6	2.3	3.6	6.9
19	23	2.5	15	3.0	3.7	4.5	6.4	9.8
20	23	1.2	28	2.3	3.1	4.3	7.4	13.9
21	14	< 0.1	17	0.1	0.1	0.2	0.3	0.4
22	7	3	31	5.6	7.9	12.0	25.5	28.0
23	19	< 0.1	8	< 0.1	0.1	0.2	0.5	1.4
24	29	0.4	25	1.1	2.7	5.9	8.5	15.0
25	13	1.7	44	1.8	2.5	4.3	9.7	13.8
26	14	0.7	8.3	0.8	1.6	2.0	3.8	5.5
27	9	0.3	55	0.5	0.5	1.3	9.5	23.8
28	29	0.1	120	0.3	0.4	0.6	1.6	10.8
29	25	0.2	10	0.3	0.4	0.5	1.6	3.6
30	25	1.3	28	2.6	3.0	4.8	10.0	16.4
31	20	0.2	33	0.4	0.8	1.8	15.0	22.6
32	20	1	14	1.1	1.9	2.7	5.0	5.7
33	20	0.2	42	0.3	0.5	0.9	2.5	18.6
34	13	0.4	11	0.8	1.0	1.2	2.1	9.7
35	52	0.4	13	0.6	1.1	1.8	3.0	5.1
36	44	0.8	37	3.1	4.0	8.1	19.3	28.7
37	25	2	61	4.2	6.0	10.0	16.0	23.6
38	14	0.2	5.8	0.3	0.6	1.1	2.1	3.4
39	20	0.2	0.7	0.2	0.3	0.3	0.5	0.6
40	24	0.3	4	0.4	0.6	1.1	1.7	2.1
41	28	1.5	58	1.8	3.6	4.6	10.0	12.0
42	26	0.9	85	2.1	3.2	19.0	36.0	42.5
43	20	1.6	77	3.5	5.8	8.8	17.0	18.0
44	13	0.4	5.3	0.5	0.9	2.0	3.7	4.4
45	13	0.6	28	0.9	1.4	2.4	3.7	5.0
46	13	1.1	20	1.5	2.2	2.3	3.5	6.2
47	14	0.2	1.3	0.2	0.3	0.4	0.5	1.2
48	14	0.4	4.3	0.5	0.6	1.5	2.7	3.9
49	11	0.5	46	0.5	1.0	2.0	6.7	28.0
50	24	0.6	140	1.1	1.6	3.0	15.5	21.7
51	17	0.2	13	0.3	1.1	1.9	7.5	11.4
52	23	0.4	52	1.8	2.6	4.8	14.5	29.0
53	20	1.1	75	1.9	2.9	6.1	16.0	26.5
54	37	0.2	6.1	0.3	0.6	1.0	1.8	3.7
55	24	0.5	15	0.6	1.0	1.9	3.6	6.7
56	0							
57	33	1.9	28	4.0	5.0	6.0	10.0	15.8

Appendix A-6. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

SPECIFIC CONDUCTANCE, microsiemens per centimeter (µS/cm)

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	62	95	256	129.1	180	205.5	227	240.8
2	176	108	243	140.5	152	173	183.25	193.5
3	126	40	126	44.5	47	54	65	77
4	147	10	79	32	38	45	51	54
5	177	40	451	73	105	175	258	314
6	109	30	75	37	44	53	60	64
7	172	39	71	45	48	52	55	59.9
8	112	254	640	306	336.25	399.5	501	529.7
10	104	93	1,200	137	172	192	201	209.7
11	122	125	362	197.1	220	265.5	320.75	338
12	73	357	557	413.2	425	456	477	533.8
13	137	195	521	301.6	329	343	362	395.4
14	102	277	768	325.6	348	384.5	485.75	604.5
15	114	295	965	606.6	669.5	804	870	887.7
16	89	537	958	703.8	776	829	870	898
17	87	263	800	517.2	556.5	677	748.5	770
18	110	112	594	408.5	429	461	492.75	521.4
19	99	303	660	359.2	415.5	456	511	574
20	60	352	688	387	429	513.5	603.75	655
21	75	594	668	608.6	620	632	643.5	650.6
22	145	249	821	367.2	513	680	725	777.6
23	94	378	607	392.3	406	414.5	420	426
24	69	607	964	670.6	704	759	853	879.4
25	44	91	182	125.8	140.25	153.5	168.25	173
26	60	147	508	321.7	383	416.5	442.5	451.2
27	101	94	233	121	160	190	204	210
28	90	160	407	240.3	295.25	334	352.75	365.2
29	96	103	506	265.5	339.75	395.5	438	461.5
30	82	281	464	333	360.25	381.5	391	404
31	78	73	420	106.4	159	189.5	239.75	272.5
32	76	185	814	419.5	447.75	486	521	542
33	136	<1	106	37	47	56.5	81.25	93
34	103	51	121	61.2	70	79	92	102
35	142	52	274	73.1	82	102.5	138	157
36	124	128	640	165.4	316.75	449	515.75	558.1
37	66	205	627	372	451.25	509	560.75	586.5
38	115	36	108	46	52	66	88.5	96
39	131	16	25	18	19	20	21	22
40	81	31	67	33	36	38	41	44
41	68	50	384	68.7	98	156	190.5	254
42	74	64	258	74.6	87.25	128.5	150	174.4
43	73	95	543	127.6	229	349	440	510.4
44	78	233	553	327.7	341	371	395.75	413.6
45	68	111	352	147.7	169.75	234	266.25	298.9
46	79	222	567	302.2	364.5	413	462	511.6
47	130	29	105	33.9	40	52	82.75	95
48	54	46	170	55.3	71.25	122	139.75	147.8
49	31	114	441	156	214	310	378	413
50	75	103	370	139.8	176.5	233	281	307.2
51	61	25	119	34	43	55	64	76
52	77	16	104	36	50	66	75	84.4
53	27	541	1,330	603	757	883	994.5	1084
54	70	51	194	63.8	95.5	150	170	182
55	116	120	462	286	300.75	323.5	344	364.5
56	20	27	53	28.8	32.5	42.5	49.5	52.1
57	127	383	726	450.2	517	590	654.5	687.4

Appendix A-7. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

HARDNESS, milligrams per liter (mg/L) as calcium carbonate

Site No.	No. of obs.	Minimum	Maximum	PERCENTILES 10	25	50	75	90
1	6	64	120	78	96	110	110	110
2	38	64	97	71	77	90	93	96
3	12	20	33	21	23	24	27	32
4	89	10	25	13	16	19	22	23
5	102	17	190	27	39	64	96	120
6	26	14	32	18	22	23	26	30
7	85	16	29	17	19	21	22	23
8	44	120	270	140	160	200	223	240
10	53	67	180	87	110	130	160	180
11	45	34	95	52	61	67	71	75
12	10	190	210	190	190	195	200	210
13	29	120	340	148	160	190	260	280
14	47	81	170	130	140	150	155	160
15	37	230	410	270	290	360	380	390
16	15	250	350	304	320	340	340	350
17	15	170	340	206	275	300	305	320
18	42	150	210	161	180	190	200	210
19	15	140	230	154	175	180	200	220
20	15	150	240	174	190	210	215	230
21	16	220	240	220	220	230	240	240
22	98	91	340	137	213	270	290	310
23	19	150	170	158	160	160	160	170
24	15	240	330	260	265	280	300	312
25	9	57	82	64	69	73	77	80
26	9	180	230	188	210	210	230	230
27	36	44	110	52	68	91	95	98
28	15	160	190	160	160	170	175	180
29	12	190	210	190	190	190	200	209
30	40	71	210	119	148	170	180	200
31	10	25	59	29	41	47	48	51
32	10	170	210	170	190	190	200	210
33	10	18	34	21	28	34	34	34
34	10	22	39	23	29	34	35	39
35	29	25	55	28	31	39	45	52
36	36	52	170	97	130	150	160	170
37	11	110	210	130	165	180	190	190
38	10	21	39	21	35	37	39	39
39	9	6	7	6	7	7	7	7
40	14	10	14	11	11	12	13	14
41	13	19	81	29	36	51	63	72
42	11	24	73	32	39	51	58	59
43	10	78	190	83	101	155	180	190
44	10	160	200	160	170	180	188	191
45	10	42	140	63	100	115	128	131
46	10	130	240	148	180	200	225	231
47	10	12	44	12	35	39	42	43
48	10	18	74	23	36	55	61	70
49	7	89	150	102	110	120	140	150
50	11	54	150	54	64	110	120	130
51	10	11	22	15	16	20	21	21
52	10	14	33	16	20	24	27	31
53	10	300	390	300	313	330	330	354
54	33	23	80	28.6	43	63	69	73.8
55	13	69	160	101.2	130	130	140	158
56	13	13	24	14	16	18	22	22.8
57	48	170	260	197	210	220	240	250

Appendix A-8. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

Calcium-Magnesium ratio

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	6	2.12	2.37	2.14	2.17	2.24	2.34	2.37
2	38	2.09	2.53	2.19	2.25	2.3	2.35	2.41
3	12	2.09	2.86	2.1	2.22	2.34	2.5	2.74
4	89	1.45	1.94	1.5	1.53	1.56	1.61	1.65
5	102	1.4	2.86	1.73	1.8	1.93	2.06	2.25
6	26	2.58	3.17	2.67	2.71	2.77	2.87	2.94
7	85	1.75	2.55	1.89	1.94	2.02	2.08	2.15
8	44	2.12	2.79	2.29	2.38	2.47	2.54	2.63
10	53	1.64	2.55	1.91	2.04	2.1	2.24	2.44
11	45	1.81	2.46	1.99	2.02	2.1	2.19	2.34
12	10	1.69	2.52	1.72	1.85	1.93	2.01	2.36
13	29	1.27	2.63	1.46	1.65	1.85	1.97	2.25
14	47	2.14	2.73	2.21	2.25	2.31	2.4	2.57
15	37	1.16	2.06	1.64	1.42	1.49	1.63	1.75
16	15	1.2	1.76	1.22	1.29	1.37	1.42	1.49
17	15	1.07	2.1	1.19	1.29	1.32	1.53	1.69
18	42	1.5	2.12	1.6	1.68	1.82	1.86	1.95
19	15	0.98	2.04	1.48	1.64	1.78	1.86	1.95
20	15	1.23	2.01	1.28	1.43	1.6	1.71	1.74
21	16	1.65	1.85	1.68	1.73	1.76	1.76	1.8
22	98	0.64	2.26	1.53	1.59	1.66	1.79	2.01
23	19	1.32	1.59	1.32	1.33	1.39	1.4	1.47
24	15	1.52	1.8	1.59	1.65	1.72	1.74	1.77
25	9	2.31	2.7	2.32	2.45	2.52	2.62	2.65
26	9	2.52	2.94	2.54	2.61	2.68	2.89	2.91
27	36	2.52	3.27	2.68	2.74	2.82	2.9	3.03
28	15	2.98	3.4	3.02	3.05	3.12	3.19	3.28
29	12	2.03	2.66	2.31	2.4	2.47	2.53	2.61
30	40	1.35	2.61	1.57	1.69	1.94	2.26	2.38
31	10	3.41	4.33	3.62	3.75	3.93	4.15	4.28
32	10	1.3	1.62	1.32	1.4	1.42	1.45	1.56
33	10	6.88	8.46	6.94	7.15	7.58	7.88	8.38
34	10	4.9	6.07	5.06	5.16	5.37	5.59	5.65
35	29	4.12	5.63	4.33	4.55	4.89	5.2	5.52
36	36	2.05	3.24	2.15	2.17	2.23	2.35	2.62
37	11	1.31	1.82	1.32	1.41	1.52	1.58	1.76
38	10	8.05	9.73	8.17	8.29	8.56	8.74	9.1
39	9	3.71	5.13	3.93	3.98	4.04	4.06	4.35
40	14	2.71	3.5	2.96	3	3.13	3.3	3.39
41	13	2.64	3.96	2.47	2.55	2.84	3.18	3.68
42	11	1.39	1.6	1.41	1.45	1.46	1.49	1.58
43	10	0.65	1.78	1.31	1.41	1.49	1.62	1.67
44	10	1.74	1.99	1.79	1.82	1.83	1.86	1.91
45	10	2.33	3.29	2.46	2.5	2.58	2.68	3.28
46	10	1.3	1.85	1.54	1.67	1.71	1.78	1.82
47	10	3.58	5.26	3.62	3.66	3.88	4.22	4.53
48	10	2.4	3.81	2.76	2.91	3.33	3.52	3.62
49	7	1.35	1.81	1.48	1.58	1.71	1.74	1.78
50	11	1.6	1.9	1.68	1.72	1.76	1.84	1.89
51	10	1.93	2.38	2.05	2.09	2.23	2.27	2.32
52	10	1.92	2.33	2.07	2.16	2.22	2.29	2.32
53	10	0.56	1.36	0.68	0.87	1	1.16	1.24
54	33	1.97	4.58	2.45	2.54	2.82	3.11	3.36
55	13	2.26	2.7	2.3	2.36	2.37	2.43	2.58
56	13	2.72	2.95	2.73	2.79	2.86	2.88	2.93
57	48	1.4	1.83	1.44	1.46	1.56	1.63	1.69

Appendix A-9. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

DISSOLVED OXYGEN, milligrams per liter (mg/L)

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	21	3.2	12.6	8.0	9.0	9.8	11.0	11.5
2	55	5.4	14.5	7.7	8.7	10.6	11.8	12.8
3	34	7.7	13.4	8.6	9.4	10.5	11.4	12.2
4	67	7.0	14.5	8.5	9.7	10.8	11.8	12.4
5	97	5.1	14.0	8.8	10.1	11.0	11.9	12.4
6	40	7.6	14.6	8.4	9.4	11.1	12.2	12.5
7	86	6.3	15.1	7.9	8.7	10.4	12.1	13.1
8	58	8.2	13.8	8.4	9.3	10.5	11.4	12.8
10	73	7.9	13.4	9.0	9.4	10.0	11.0	12.1
11	72	6.4	14.3	7.1	7.9	8.8	10.0	11.2
12	25	8.4	12.9	9.4	9.7	10.3	11.0	11.6
13	74	6.0	17.3	8.5	9.3	10.6	12.1	12.9
14	101	6.7	14.1	8.0	8.7	9.6	10.6	12.4
15	58	6.4	12.4	7.7	8.3	9.1	10.5	11.0
16	36	6.5	16.6	8.0	8.5	9.4	11.0	11.8
17	40	7.4	13.5	8.0	8.8	10.0	10.9	12.2
18	68	6.3	14.3	7.7	8.3	9.2	11.0	12.0
19	51	3.2	14.7	7.8	8.5	10.0	11.3	12.4
20	47	7.4	13.9	8.0	8.5	9.3	11.3	12.7
21	27	7.6	13.1	8.4	8.7	9.0	9.5	9.9
22	141	6.9	15.3	7.9	8.4	9.2	10.2	11.1
23	40	6.7	10.8	8.6	9.0	9.3	9.6	10.2
24	43	6.3	13.6	7.9	9.0	10.0	11.1	12.1
25	18	7.1	15.4	7.5	9.1	9.8	11.6	12.2
26	18	7.3	12.2	7.9	9.0	9.8	11.2	11.5
27	48	7.6	11.9	9.3	9.5	10.1	10.7	11.6
28	39	6.7	11.8	7.8	8.6	9.9	10.6	11.2
29	36	5.3	13.7	6.2	7.2	8.9	10.8	12.1
30	64	6.4	15.6	7.9	8.9	9.7	11.1	12.8
31	23	6.7	13.0	8.1	8.8	9.6	10.8	11.8
32	22	7.7	14.2	8.6	9.3	10.3	12.0	12.4
33	25	8.4	14.6	8.9	9.6	10.8	12.0	12.9
34	75	8.7	14.6	9.3	10.4	11.6	12.4	13.4
35	110	8.4	15.8	10.0	10.4	11.4	12.5	13.7
36	100	6.4	17.3	8.3	9.1	10.2	11.7	13.7
37	28	8.2	13.7	9.4	10.0	10.9	11.6	12.3
38	24	7.6	14.9	8.9	9.8	10.4	11.7	12.7
39	26	7.4	11.7	7.6	7.9	9.9	10.5	10.9
40	30	5.4	11.6	6.7	7.8	8.6	9.3	9.8
41	35	7.4	13.9	8.5	9.1	10.4	11.1	12.0
42	28	7.8	14.5	8.6	9.1	10.3	11.2	11.7
43	26	8.5	13.9	9.8	10.2	11.0	11.7	12.7
44	23	8.3	12.3	8.6	9.2	10.1	11.3	11.8
45	23	8.2	15.0	8.6	9.1	9.4	10.5	12.7
46	23	8.5	12.9	9.0	9.9	10.6	11.5	12.0
47	24	8.6	12.4	9.2	10.0	10.5	11.5	12.2
48	24	9.1	12.8	9.4	9.8	10.8	11.9	12.4
49	14	8.3	13.9	8.6	9.9	11.3	12.4	13.3
50	31	7.1	14.0	8.4	9.7	10.6	11.4	12.4
51	28	8.6	14.7	9.2	9.8	11.0	12.1	13.3
52	32	6.1	13.4	7.7	8.6	10.0	11.6	12.6
53	27	6.6	13.8	7.5	7.9	8.4	9.8	11.9
54	47	6.9	14.5	8.6	9.6	10.8	12.4	13.7
55	54	7.6	17.8	9.3	9.7	10.8	12.3	13.5
56	20	7.3	13.3	7.9	9.0	10.9	12.4	12.7
57	100	6.8	14.0	7.9	8.4	9.3	10.4	11.9

Appendix A-10. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002								
DISSOLVED OXYGEN, percent saturation								
	No. of			Percentiles				
Site No.	obs.	Minimum	Maximum	10	25	50	75	90
1	20	27	129	84.2	97.75	100	104	110.7
2	55	58	139	91	95	101	106	116.2
3	34	87	140	96.3	98	101.5	105.75	111.1
4	66	71	155	87.5	94	98	101.75	109.5
5	97	58	150	89.8	97	101	106	114.4
6	40	10	157	88.8	94	100	104	114.7
7	85	77	132	93	97	103	110	117.2
8	58	87	130	95	100.25	104.5	110	119
10	73	94	152	98.2	103	108	116	121
11	72	83	129	88.1	92	95	100	106.8
12	25	85	139	91.4	102	106	110	119.2
13	74	88	190	97.3	104	114	126.75	143.4
14	101	87	139	93	97	106	116	128
15	58	85	151	92.7	99	105.5	115.5	120.9
16	36	78	193	82.5	89.75	102	121.25	143
17	40	86	175	94.9	98	106	114.75	141.6
18	68	75	146	90.7	96	102.5	109	116.3
19	51	44	154	95	101	107	109.5	119
20	46	82	148	97.5	101.5	107	112.75	119
21	27	85	149	96	99	102	106	112.4
22	140	72	168	87	92	97	101	105.1
23	39	91	117	94.8	98.5	102	105.5	112
24	43	79	166	91.4	97	105	118	134.4
25	18	66	163	91.4	96	104.5	114.25	129.2
26	18	92	141	92.7	98.25	100	106	108.9
27	48	98	120	100.7	102	105	107.25	111.3
28	39	73	126	87	92	102	108	113
29	35	36	152	67.2	78	92	107	130.2
30	63	80	159	94	98	104	111	121.4
31	23	83	141	101.2	104.5	112	120	122.8
32	22	96	129	102.2	106.5	111.5	116.75	121.6
33	25	97	122	98.4	102	105	110	115
34	74	94	145	100.3	103.25	107	113.75	120
35	109	92	152	101	106	116	123	130
36	100	77	165	90	95	101	113.25	129.3
37	28	92	154	99	106.5	114.5	130.25	142.6
38	24	96	125	99.3	100	103.5	106.5	116.1
39	26	91	117	94	96.25	102.5	110	113
40	30	61	118	69	81.25	95	102.5	111.3
41	35	90	132	94	99	106	112.5	119.8
42	28	81	130	95.7	101.75	104	112	123.2
43	26	94	166	97	103.25	116	128.75	141
44	23	86	136	94	97	102	107.5	131.4
45	23	93	129	94.2	96.5	101	110.5	116.8
46	23	92	126	95.6	101	105	111.5	117.8
47	24	95	141	99	100	102	104	108.5
48	24	96	116	100.3	101.75	103	106	106.7
49	14	97	120	97.3	99.25	102	110.25	112.4
50	31	82	136	95	99.5	104	113	119
51	28	97	134	98	105.75	108	112.25	115.9
52	32	71	164	84.2	97	100	107	115
53	27	81	114	90	92.5	96	103.5	109.4
54	47	71	133	95.6	99	103	107	114.8
55	54	89	212	102.3	108.25	119.5	136	148.7
56	20	80	129	81.9	85	100	103	110
57	98	74	128	89.7	93	99	102.75	108

Appendix A-11. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

pH (units)

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	21	7.5	8.5	7.6	7.7	8.1	8.3	8.3
2	72	7.4	8.6	7.6	7.8	8.0	8.2	8.3
3	34	6.8	8.3	7.2	7.2	7.5	7.7	7.8
4	101	6.3	7.9	6.8	7.1	7.3	7.5	7.6
5	126	6.1	7.8	6.9	7.0	7.2	7.3	7.5
6	63	6.6	8.4	7.0	7.3	7.5	7.7	7.9
7	110	6.7	8.0	7.0	7.1	7.3	7.5	7.7
8	59	7.4	8.7	7.9	8.1	8.3	8.4	8.5
10	73	7.7	8.8	8.2	8.3	8.4	8.6	8.7
11	73	7.3	8.8	7.7	8.0	8.1	8.2	8.3
12	25	7.9	8.6	8.0	8.1	8.3	8.4	8.5
13	74	8.0	9.2	8.2	8.3	8.6	8.7	8.9
14	101	7.5	8.8	8.0	8.2	8.4	8.5	8.7
15	58	7.8	8.5	8.0	8.1	8.2	8.3	8.4
16	36	7.6	8.8	8.0	8.1	8.2	8.3	8.4
17	40	8.1	8.8	8.3	8.4	8.5	8.6	8.7
18	68	7.5	8.9	8.2	8.4	8.5	8.6	8.7
19	53	7.2	9.1	8.1	8.4	8.6	8.7	8.8
20	46	7.5	8.8	8.2	8.3	8.5	8.5	8.6
21	43	7.6	8.3	7.8	7.9	8.0	8.1	8.2
22	144	7.3	8.6	7.8	8.0	8.2	8.3	8.4
23	68	7.2	8.9	7.8	8.0	8.1	8.2	8.5
24	44	7.9	8.8	8.0	8.3	8.5	8.5	8.6
25	18	6.5	9.4	7.3	7.7	7.9	8.2	8.7
26	18	8.0	8.8	8.2	8.3	8.4	8.5	8.6
27	48	7.6	8.6	7.9	8.1	8.2	8.3	8.4
28	40	7.4	8.4	7.8	8.0	8.1	8.3	8.3
29	36	7.1	8.8	7.7	8.0	8.1	8.4	8.5
30	64	7.5	9.2	8.1	8.3	8.5	8.7	8.8
31	24	7.0	8.8	7.8	8.0	8.2	8.4	8.7
32	24	8.2	9.1	8.5	8.5	8.5	8.7	8.8
33	25	6.8	8.4	7.3	7.6	7.9	8.0	8.1
34	76	5.1	8.5	7.1	7.4	7.7	7.8	8.1
35	109	7.0	8.9	7.4	7.7	8.0	8.3	8.6
36	99	7.3	9.1	7.7	7.9	8.1	8.4	8.5
37	30	8.1	9.2	8.4	8.5	8.6	8.7	8.9
38	23	7.2	8.6	7.4	7.7	7.8	8.2	8.4
39	48	6.1	8.0	6.7	6.9	7.1	7.3	7.6
40	30	6.6	9.2	7.0	7.2	7.4	7.6	8.0
41	34	6.8	8.6	7.3	7.6	8.0	8.2	8.3
42	30	6.6	8.8	7.2	7.8	8.2	8.5	8.7
43	27	8.1	9.1	8.5	8.6	8.7	8.8	8.9
44	24	7.5	8.8	7.9	8.0	8.2	8.4	8.6
45	24	7.0	8.7	7.5	8.0	8.2	8.5	8.6
46	24	7.5	9.1	7.9	8.3	8.5	8.6	8.6
47	22	6.9	8.4	7.3	7.5	7.7	7.9	8.2
48	23	7.3	8.9	7.4	7.7	8.0	8.3	8.9
49	15	7.3	8.6	7.8	8.0	8.3	8.4	8.5
50	32	7.5	9.0	7.8	8.1	8.3	8.5	8.8
51	28	6.5	8.9	7.1	7.4	7.9	8.3	8.6
52	34	6.4	8.2	6.9	7.2	7.3	7.5	7.7
53	27	7.9	8.7	8.1	8.2	8.3	8.4	8.5
54	49	7.2	8.6	7.7	7.8	8.1	8.2	8.3
55	55	7.8	9.0	8.2	8.3	8.4	8.6	8.8
56	20	6.7	8.1	7.2	7.3	7.6	7.8	7.9
57	100	7.8	9.7	8.1	8.2	8.4	8.4	8.5

Appendix A-12. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002								
INORGANIC NITROGEN, milligrams per liter (mg/L) as nitrogen								
	No. of			**Percentiles**				
Site No.	**obs.**	**Minimum**	**Maximum**	**10**	**25**	**50**	**75**	**90**
1	18	0.02	0.19	0.03	0.05	0.10	0.13	0.15
2	61	0.01	0.26	0.02	0.04	0.06	0.10	0.12
3	31	< 0.007	0.13	< 0.007	0.03	0.07	0.09	0.09
4	84	< 0.007	0.13	< 0.007	0.01	0.02	0.05	0.07
5	112	< 0.007	0.81	0.07	0.11	0.21	0.44	0.61
6	54	< 0.007	0.12	< 0.007	0.01	0.02	0.06	0.10
7	99	< 0.007	0.31	0.03	0.05	0.08	0.11	0.16
8	58	0.06	0.42	0.08	0.10	0.14	0.20	0.23
10	66	0.08	1.03	0.16	0.22	0.33	0.58	0.72
11	60	0.04	0.47	0.09	0.13	0.18	0.27	0.35
12	18	0.07	1.13	0.09	0.13	0.18	0.36	1.12
13	64	< 0.007	1.03	0.02	0.06	0.08	0.21	0.49
14	89	0.03	0.63	0.06	0.08	0.12	0.23	0.32
15	55	0.23	1.26	0.38	0.45	0.62	0.87	1.07
16	36	0.13	1.77	0.35	0.47	0.57	0.89	1.60
17	39	< 0.007	1.47	0.05	0.10	0.47	0.79	1.02
18	59	< 0.007	1.85	0.06	0.07	0.12	0.24	0.47
19	53	0.01	1.89	0.07	0.09	0.16	0.32	1.27
20	45	0.17	2.61	0.18	0.24	0.52	1.42	1.91
21	33	1.71	2.12	1.85	1.92	2.01	2.02	2.09
22	118	0.06	5.62	0.81	1.10	1.75	2.28	2.77
23	47	0.75	1.23	0.87	0.92	0.98	1.05	1.13
24	34	1.62	4.05	1.91	2.17	2.38	2.61	3.81
25	18	0.06	0.25	0.06	0.06	0.09	0.18	0.20
26	18	0.06	0.18	0.06	0.06	0.07	0.08	0.17
27	47	0.03	0.12	0.06	0.06	0.06	0.07	0.09
28	35	0.02	0.80	0.03	0.07	0.13	0.20	0.35
29	30	0.07	0.88	0.43	0.57	0.64	0.75	0.85
30	53	< 0.007	1.93	0.06	0.07	0.09	0.31	1.12
31	24	0.02	0.38	0.07	0.09	0.14	0.17	0.27
32	24	0.41	1.82	0.53	0.57	0.81	1.01	1.52
33	24	< 0.007	0.26	0.02	0.06	0.08	0.10	0.18
34	72	0.06	0.32	0.08	0.10	0.12	0.15	0.20
35	98	0.09	3.25	0.19	0.22	0.30	0.56	0.91
36	94	0.44	4.68	0.77	1.36	1.83	3.41	4.16
37	25	0.26	1.93	0.39	0.52	0.79	1.05	1.44
38	23	< 0.007	0.12	0.02	0.06	0.07	0.10	0.11
39	89	< 0.007	0.25	< 0.007	0.02	0.05	0.10	0.14
40	25	0.06	0.27	0.08	0.09	0.10	0.14	0.21
41	30	0.06	0.78	0.10	0.12	0.25	0.46	0.67
42	25	0.02	1.45	0.06	0.07	0.11	0.14	0.28
43	22	0.14	1.71	0.21	0.39	0.60	0.98	1.46
44	24	0.06	0.48	0.14	0.15	0.25	0.38	0.42
45	24	0.01	0.15	0.01	0.05	0.07	0.09	0.11
46	24	0.01	0.38	0.04	0.06	0.10	0.17	0.22
47	23	< 0.007	0.12	< 0.009	0.04	0.07	0.08	0.10
48	23	0.02	0.46	0.05	0.06	0.10	0.13	0.15
49	15	0.15	1.33	0.24	0.38	0.53	0.81	1.09
50	32	0.21	5.83	0.44	0.68	1.00	1.60	2.44
51	22	< 0.007	0.56	< 0.009	0.06	0.07	0.12	0.15
52	31	< 0.007	2.63	0.02	0.06	0.08	0.12	0.43
53	27	0.06	1.38	0.15	0.22	0.29	0.55	1.00
54	48	< 0.007	0.18	< 0.01	0.02	0.07	0.11	0.12
55	55	0.04	0.49	0.06	0.08	0.12	0.22	0.34
56	20	< 0.007	0.06	< 0.007	< 0.008	0.02	0.03	0.05
57	98	0.28	2.87	0.44	0.81	1.35	1.94	2.20

Appendix A-13. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002								
TOTAL NITROGEN, milligrams per liter (mg/L) as nitrogen								
	No. of			Percentiles				
Site No.	obs.	Minimum	Maximum	10	25	50	75	90
1	20	0.09	0.43	0.12	0.14	0.25	0.28	0.31
2	165	< 0.001	3.36	0.14	0.20	0.23	0.27	0.33
3	110	0.04	0.82	0.11	0.16	0.21	0.30	0.37
4	90	0.05	0.64	0.07	0.09	0.11	0.15	0.30
5	123	0.11	1.10	0.16	0.25	0.38	0.54	0.72
6	88	0.06	0.50	0.08	0.11	0.15	0.22	0.27
7	157	0.08	1.21	0.14	0.19	0.24	0.28	0.33
8	58	0.11	1.31	0.26	0.29	0.34	0.40	0.51
10	71	0.30	2.10	0.34	0.42	0.54	0.79	0.93
11	69	0.25	0.90	0.30	0.31	0.39	0.49	0.57
12	24	0.25	1.30	0.35	0.37	0.48	0.73	1.18
13	73	0.25	1.20	0.31	0.35	0.48	0.71	0.84
14	98	0.20	1.17	0.26	0.29	0.35	0.52	0.66
15	56	0.54	1.46	0.66	0.78	0.93	1.15	1.37
16	36	0.52	2.57	0.79	0.94	1.13	1.65	2.00
17	39	0.34	1.90	0.46	0.58	0.95	1.23	1.50
18	67	0.25	2.10	0.31	0.35	0.45	0.69	0.87
19	53	0.33	2.30	0.45	0.54	0.65	0.87	1.67
20	46	0.23	3.10	0.53	0.67	1.00	1.80	2.33
21	33	1.90	2.60	1.90	2.00	2.10	2.20	2.28
22	119	0.30	5.60	1.26	1.65	2.13	2.63	3.10
23	48	0.80	1.43	0.92	1.00	1.10	1.15	1.23
24	44	0.35	5.00	2.35	2.55	2.71	3.17	4.37
25	18	0.30	0.85	0.36	0.38	0.43	0.61	0.78
26	18	0.25	0.74	0.25	0.28	0.35	0.52	0.59
27	47	0.11	0.99	0.21	0.25	0.25	0.26	0.28
28	40	0.10	1.21	0.15	0.25	0.35	0.54	0.79
29	35	0.25	2.10	0.65	0.80	0.86	1.05	1.16
30	62	0.25	2.20	0.35	0.45	0.58	0.95	1.53
31	24	0.21	0.74	0.26	0.29	0.35	0.48	0.56
32	24	0.63	2.10	0.94	1.13	1.23	1.57	1.70
33	24	0.08	1.15	0.11	0.25	0.27	0.38	0.57
34	72	0.15	0.51	0.19	0.22	0.26	0.32	0.40
35	103	0.18	4.00	0.35	0.40	0.50	0.81	1.30
36	94	0.63	5.33	1.18	1.93	2.42	3.90	4.56
37	30	0.87	2.40	1.02	1.30	1.51	1.80	2.11
38	23	0.06	0.29	0.09	0.15	0.19	0.25	0.27
39	91	0.11	0.44	0.14	0.16	0.22	0.25	0.30
40	30	0.19	1.25	0.25	0.34	0.47	0.58	0.77
41	35	0.25	1.80	0.29	0.37	0.60	0.75	1.02
42	30	0.21	1.80	0.25	0.35	0.51	0.68	1.01
43	27	0.79	2.30	0.86	1.13	1.40	1.78	2.00
44	24	0.31	0.72	0.34	0.37	0.46	0.57	0.65
45	24	0.17	0.51	0.22	0.25	0.27	0.35	0.43
46	24	0.21	0.84	0.25	0.29	0.36	0.44	0.54
47	22	0.07	0.29	0.12	0.15	0.18	0.25	0.25
48	23	0.14	0.65	0.17	0.21	0.25	0.29	0.33
49	15	0.34	1.50	0.50	0.73	0.86	0.99	1.32
50	32	0.59	7.30	0.65	1.05	1.37	2.21	3.25
51	27	0.14	1.00	0.18	0.22	0.25	0.40	0.70
52	34	0.15	3.30	0.20	0.25	0.32	0.47	0.66
53	27	0.45	1.60	0.56	0.68	0.84	1.00	1.38
54	48	0.11	1.06	0.19	0.25	0.25	0.30	0.40
55	55	0.19	2.90	0.23	0.27	0.36	0.49	0.56
56	20	< 0.06	0.18	0.06	0.08	0.11	0.14	0.16
57	99	0.40	3.30	0.86	1.36	1.70	2.37	2.60

Appendix A-14. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

TOTAL PHOSPHORUS, milligrams per liter (mg/L) as phosphorus

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	20	0.004	0.23	0.005	0.006	< 0.01	< 0.01	0.05
2	165	< 0.001	0.06	0.003	0.01	< 0.01	0.01	0.02
3	110	< 0.001	0.09	0.006	< 0.01	0.011	0.02	0.03
4	90	0.002	0.19	0.003	0.004	0.008	0.01	0.02
5	123	0.007	0.17	0.01	0.02	0.03	0.05	0.08
6	88	< 0.001	0.05	0.003	0.004	0.007	< 0.01	0.01
7	157	< 0.001	0.06	0.005	0.008	0.01	0.02	0.03
8	58	< 0.01	0.40	< 0.01	< 0.01	0.02	0.03	0.06
10	71	< 0.01	0.12	< 0.01	< 0.01	0.02	0.03	0.04
11	69	< 0.01	0.17	< 0.01	0.02	0.03	0.04	0.05
12	24	0.01	0.06	0.01	0.02	0.04	0.05	0.06
13	73	< 0.01	0.43	0.01	0.03	0.04	0.06	0.12
14	98	< 0.01	0.11	0.01	0.02	0.03	0.04	0.05
15	56	< 0.01	0.27	0.02	0.03	0.04	0.06	0.11
16	36	0.02	0.22	0.03	0.04	0.06	0.13	0.16
17	39	< 0.01	0.28	0.02	0.03	0.06	0.11	0.14
18	67	< 0.01	0.14	< 0.01	0.02	0.04	0.07	0.08
19	53	0.03	0.43	0.04	0.05	0.07	0.11	0.21
20	46	0.02	0.39	0.04	0.05	0.07	0.10	0.16
21	28	< 0.01	0.04	< 0.01	< 0.01	0.01	0.02	0.02
22	119	< 0.01	0.41	0.04	0.06	0.08	0.12	0.15
23	44	< 0.01	0.17	< 0.01	< 0.01	0.014	0.02	0.05
24	42	< 0.01	0.25	0.02	0.03	0.05	0.08	0.10
25	18	0.01	0.11	0.02	0.03	0.05	0.07	0.07
26	18	< 0.01	0.10	0.02	0.03	0.04	0.05	0.08
27	47	0.008	0.25	< 0.01	< 0.01	0.01	0.03	0.05
28	40	0.003	0.57	< 0.01	< 0.01	< 0.01	0.05	0.10
29	35	< 0.01	0.05	< 0.01	< 0.01	< 0.01	0.02	0.05
30	62	< 0.01	0.33	0.03	0.05	0.07	0.10	0.12
31	24	0.008	0.12	< 0.01	0.01	0.02	0.04	0.07
32	24	0.02	0.11	0.04	0.05	0.06	0.08	0.08
33	23	0.007	0.23	0.008	< 0.01	< 0.01	0.02	0.10
34	72	0.01	0.09	< 0.01	0.01	0.03	0.05	0.06
35	103	0.02	1.3	0.04	0.06	0.10	0.18	0.30
36	94	0.08	0.63	0.17	0.26	0.32	0.43	0.49
37	30	0.06	0.35	0.07	0.08	0.10	0.12	0.16
38	23	0.003	0.07	0.004	< 0.01	< 0.01	0.01	0.03
39	91	0.001	< 0.05	0.003	0.004	0.005	0.009	< 0.01
40	30	< 0.01	0.07	< 0.01	0.02	0.04	0.05	0.05
41	35	0.02	0.25	0.03	0.04	0.05	0.07	0.09
42	30	< 0.01	0.64	0.02	0.05	0.10	0.15	0.22
43	27	0.02	0.18	0.06	0.08	0.11	0.15	0.16
44	24	< 0.01	0.08	0.02	0.03	0.03	0.05	0.07
45	24	< 0.01	0.12	< 0.01	< 0.01	0.03	0.04	0.08
46	24	0.02	0.15	0.02	0.03	0.05	0.06	0.06
47	23	0.004	< 0.05	0.005	0.009	< 0.01	0.01	0.02
48	23	< 0.01	0.05	< 0.01	< 0.01	0.02	0.03	0.04
49	15	0.02	0.23	0.02	0.04	0.05	0.07	0.14
50	32	0.06	1.12	0.08	0.09	0.10	0.13	0.15
51	27	< 0.01	0.10	< 0.01	0.01	0.02	0.04	0.07
52	34	0.03	0.19	0.04	0.04	0.05	0.08	0.13
53	27	< 0.01	0.20	0.02	0.04	0.05	0.10	0.12
54	48	0.007	0.15	< 0.01	0.01	0.02	0.02	0.04
55	55	< 0.01	0.06	0.02	0.02	0.03	0.04	0.04
56	20	0.003	0.02	0.003	0.004	0.007	0.008	0.008
57	99	0.02	0.31	0.06	0.08	0.11	0.13	0.17

Appendix A-15. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

DISSOLVED CADMIUM, micrograms per liter (µg/L)

Site No.	No. of obs.	Minimum	Maximum	Percentiles 10	25	50	75	90
1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2	33	< 0.02	2	< 0.02	< 0.02	< 0.04	< 1	1
3	9	< 1	1	< 1	< 1	< 1	< 1	1
4	79	< 0.02	2	< 0.04	< 0.04	< 1	< 1	1
5	96	1.48	18.2	2.6	4.4	7.1	9.2	12
6	22	< 1	< 1	< 1	< 1	< 1	< 1	< 1
7	78	< 1	2	< 1	< 1	< 1	< 1	1
8	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1
10	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
11	11	< 1	2	< 1	< 1	< 1	< 1	< 1
12	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
13	24	< 1	1	< 1	< 1	< 1	< 1	< 1
14	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
15	0							
16	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
17	12	< 1	1	< 1	< 1	< 1	< 1	1
18	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
19	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
20	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
21	10	< 1	2	< 1	< 1	< 1	< 1	1
22	0							
23	12	< 1	2	< 1	< 1	< 1	< 1	1
24	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
25	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
26	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
27	0							
28	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
29	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
30	8	< 1	1	< 1	< 1	< 1	< 1	1
31	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
32	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
33	9	< 1	1	< 1	< 1	< 1	< 1	1
34	8	< 1	1	< 1	< 1	< 1	< 1	1
35	23	< 1	< 1	< 1	< 1	< 1	< 1	< 1
36	15	< 1	2	< 1	< 1	< 1	< 1	1
37	8	< 1	1	< 1	< 1	< 1	< 1	1
38	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
39	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
40	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
41	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
42	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
43	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
44	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
45	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
46	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
47	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
48	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
49	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1
50	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
51	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
52	7	< 1	< 1	< 1	< 1	< 1	< 1	< 1
53	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
54	18	< 1	2	< 1	< 1	< 1	< 1	1
55	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
56	13	< 0.02	< 1	0.04	0.04	< 1	< 1	< 1
57	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1

Appendix A-16. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

DISSOLVED COPPER, micrograms per liter (µg/L)

Site No.	No. of obs.	Minimum	Maximum	PERCENTILES				
				10	25	50	75	90
1	4	2	3	2	2	2	2	3
2	33	0.2	38	0.2	0.2	0.7	3	8
3	9	< 1	5	< 1	< 1	1	3	3.4
4	29	< 0.2	4	< 1	< 1	< 1	1	3
5	47	< 1	11	< 1	< 1	1	2	4
6	6	1	5	1	1	2	2	4
7	36	< 1	11	< 1	< 1	< 1	2	5
8	15	< 1	13	1	2	3	3	5
10	8	< 1	2	< 1	< 1	2	2	2
11	11	< 1	2	< 1	< 1	1	2	2
12	8	1	5	1	1	2	3	5
13	24	< 1	3	< 1	< 1	< 1	1	1
14	11	< 1	2	< 1	< 1	1	2	2
15	0							
16	13	< 1	3	< 1	< 1	1	2	3
17	11	< 1	5	< 1	< 1	1	3	5
18	11	< 1	5	< 1	< 1	1	2	2
19	12	< 1	7	< 1	1	1	2	4
20	12	< 1	5	< 1	< 1	2	2	3
21	10	< 1	3	< 1	< 1	1	1	2
22	0							
23	12	< 1	4	< 1	< 1	< 1	< 1	2
24	12	< 1	2	< 1	< 1	< 1	2	2
25	8	< 1	5	< 1	< 1	< 1	2	4
26	8	< 1	1	< 1	< 1	< 1	1	1
27	0							
28	11	< 1	1	< 1	< 1	< 1	< 1	1
29	8	< 1	40	< 1	< 1	< 1	1	13
30	8	< 1	4	< 1	< 1	1	2	4
31	8	< 1	2	< 1	< 1	< 1	< 1	1
32	8	< 1	2	< 1	< 1	1	1	2
33	17	< 1	2	< 1	< 1	< 1	1	1
34	8	< 1	1	< 1	< 1	1	1	1
35	23	< 1	3	< 1	< 1	1	1	2
36	15	< 1	6	< 1	1	1	2	3
37	8	< 1	5	< 1	< 1	1	2	3
38	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
39	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
40	12	< 1	1	< 1	< 1	< 1	1	1
41	11	< 1	2	< 1	< 1	1	2	2
42	8	< 1	4	1	1	1	2	3
43	8	< 1	4	< 1	< 1	3	3	3
44	8	< 1	3	< 1	< 1	< 1	1	2
45	8	< 1	3	< 1	< 1	2	2	2
46	8	< 1	2	< 1	< 1	< 1	1	1
47	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
48	8	< 1	1	< 1	< 1	< 1	1	1
49	18	1	4	1	1	2	2	3
50	8	< 1	2	< 1	< 1	2	2	2
51	8	1	2	1	1	2	2	2
52	7	1	10	2	3	3	4	6
53	8	< 1	11	< 1	< 1	<1	2	5
54	6	2	4	2	2	2	3	4
55	12	< 1	13	< 1	< 1	2	4	5
56	12	0.2	< 1	0.2	0.4	< 1	< 1	< 1
57	12	< 1	6	< 1	< 1	1	4	5

Appendix A-17. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

DISSOLVED LEAD, micrograms per liter (µg/L)

Site No.	No. of obs.	Minimum	Maximum	PERCENTILES 10	25	50	75	90
1	12	< 1	6	< 1	< 1	< 1	< 1	< 1
2	15	< 1	60	< 1	< 1	< 1	2	8
3	9	< 1	20	< 1	< 1	1	1	5
4	79	< 0.04	2	< 0.08	< 1	< 1	< 1	1
5	96	1	420	2	3	4	6	8
6	22	< 1	1	< 1	< 1	< 1	< 1	1
7	77	< 0.04	14	0.16	0.42	< 1	< 1	1
8	15	< 0.04	6	< 1	< 1	< 1	2	4
10	8	< 1	3	< 1	< 1	< 1	< 1	2
11	11	< 1	1	< 1	< 1	< 1	< 1	1
12	8	< 1	1	< 1	< 1	< 1	< 1	1
13	24	< 1	< 10	< 1	< 1	< 1	< 1	1
14	11	< 1	< 10	< 1	< 1	< 1	1	1
15	0							
16	12	< 1	1	< 1	< 1	< 1	< 1	1
17	12	< 1	1	< 1	< 1	< 1	< 1	1
18	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
19	12	< 1	1	< 1	< 1	< 1	< 1	1
20	12	< 1	1	< 1	< 1	< 1	< 1	1
21	10	< 1	1	< 1	< 1	< 1	< 1	1
22	0							
23	12	< 1	10	< 1	< 1	< 1	< 1	1
24	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
25	8	< 1	1	< 1	< 1	< 1	< 1	1
26	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
27	0							
28	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
29	8	< 1	40	< 1	< 1	< 1	< 1	13
30	8	< 1	1	< 1	< 1	< 1	< 1	1
31	8	< 1	1	< 1	< 1	< 1	< 1	1
32	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
33	9	< 1	2	< 1	< 1	< 1	< 1	1
34	8	< 1	1	< 1	< 1	< 1	< 1	1
35	23	< 1	1	< 1	< 1	< 1	< 1	< 1
36	15	< 1	2	< 1	< 1	< 1	< 1	1
37	8	< 1	2	< 1	< 1	< 1	< 1	1
38	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
39	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
40	12	< 1	2	< 1	< 1	< 1	< 1	1
41	11	< 1	2	< 1	< 1	< 1	1	1
42	7	< 1	1	< 1	< 1	< 1	< 1	1
43	8	< 1	3	< 1	< 1	< 1	< 1	2
44	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
45	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
46	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
47	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
48	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
49	6	< 1	7	< 1	< 1	< 1	1	4
50	8	< 1	1	< 1	< 1	< 1	< 1	1
51	8	< 1	3	< 1	< 1	< 1	1	2
52	7	< 1	3	< 1	< 1	1	3	3
53	12	< 1	6	< 1	< 1	< 1	< 1	1
54	18	< 1	3	< 1	< 1	< 1	1	1
55	12	< 1	8	< 1	< 1	< 1	< 1	1
56	13	0.08	< 1	< 0.08	0.08	< 1	< 1	< 1
57	12	< 1	1	< 1	< 1	< 1	< 1	1

Appendix A-18. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

DISSOLVED MERCURY, micrograms per liter (µg/L)

Site No.	No. of obs.	Minimum	Maximum	PERCENTILES 10	25	50	75	90
1	4	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.2
2	15	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.1
3	9	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4	9	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.1
5	17	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.1
6	6	< 0.1	0.2	< 0.1	< 0.1	< 0.1	0.1	0.2
7	14	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
8	16	< 0.1	0.3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
10	8	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
11	11	< 0.1	1	< 0.1	< 0.1	< 0.1	< 0.1	0.3
12	8	< 0.1	0.2	< 0.1	< 0.1	< 0.1	0.1	0.2
13	24	< 0.1	0.3	< 0.1	< 0.1	< 0.1	< 0.1	0.1
14	11	< 0.1	0.3	< 0.1	< 0.1	< 0.1	0.1	0.2
15	0							
16	12	< 0.1	0.3	< 0.1	< 0.1	< 0.1	< 0.1	0.1
17	12	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
18	11	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
19	12	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
20	12	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
21	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
22	0							
23	9	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
24	12	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
25	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
26	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
27	0							
28	11	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
29	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
30	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
31	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
32	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
33	9	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
34	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
35	23	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
36	15	< 0.1	0.8	< 0.1	< 0.1	< 0.1	< 0.1	0.2
37	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
38	8	< 0.1	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1
39	7	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.1
40	12	< 0.1	0.5	< 0.1	< 0.1	< 0.1	< 0.1	0.2
41	11	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
42	8	< 0.1	0.3	< 0.1	< 0.1	< 0.1	< 0.1	0.2
43	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
44	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
45	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
46	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
47	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
48	8	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.1
49	6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
50	8	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
51	8	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.1
52	7	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
53	8	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
54	18	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
55	12	< 0.1	1.6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
56	0							
57	12	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1

Appendix A-19. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002								
DISSOLVED SELENIUM, micrograms per liter (µg/L)								
	No. of			PERCENTILES				
Site No.	obs.	Minimum	Maximum	10	25	50	75	90
1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1
2	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1
3	9	< 1	< 1	< 1	< 1	< 1	< 1	< 1
4	22	< 0.7	< 2	< 1	< 1	< 1	< 1	< 2
5	40	< 0.7	< 2	< 0.7	< 1	< 1	< 1	< 2
6	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1
7	29	< 0.7	< 2	< 0.7	< 0.7	< 1	< 1	< 1
8	24	< 1	< 1	< 1	< 1	< 1	< 1	< 1
10	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
11	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
12	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
13	24	< 1	1	< 1	< 1	< 1	< 1	1
14	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
15	0							
16	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
17	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
18	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
19	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
20	12	< 1	1	< 1	< 1	< 1	< 1	1
21	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
22	0							
23	9	< 1	< 1	< 1	< 1	< 1	< 1	< 1
24	12	< 1	1	< 1	< 1	< 1	1	1
25	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
26	8	< 1	1	< 1	< 1	< 1	< 1	1
27	0							
28	11	< 1	1	< 1	< 1	< 1	1	1
29	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
30	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
31	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
32	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
33	9	< 1	< 1	< 1	< 1	< 1	< 1	< 1
34	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
35	23	< 1	< 1	< 1	< 1	< 1	< 1	< 1
36	26	< 1	< 1	< 1	< 1	< 1	< 1	< 1
37	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
38	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
39	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
40	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
41	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
42	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
43	8	< 1	1	< 1	< 1	< 1	< 1	1
44	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
45	8	< 1	< 2	< 1	< 1	< 1	< 1	< 2
46	8	< 1	1	< 1	< 1	< 1	1	1
47	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
48	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
49	6	< 1	< 1	< 1	< 1	< 1	< 1	< 1
50	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
51	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
52	7	< 1	< 1	< 1	< 1	< 1	< 1	< 1
53	8	< 1	< 1	< 1	< 1	< 1	< 1	< 1
54	23	< 1	< 1	< 1	< 1	< 1	< 1	< 1
55	12	< 1	< 1	< 1	< 1	< 1	< 1	< 1
56	7	< 0.7	< 2	< 0.7	< 0.7	< 0.7	< 2	< 2
57	12	< 1	< 2	< 1	< 1	< 1	< 1	1

Appendix A-20. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

DISSOLVED ZINC, micrograms per liter (µg/L)

Site No.	No. of obs.	Minimum	Maximum	PERCENTILES				
				10	25	50	75	90
1	4	7	77	7	8	10	10	57
2	27	1	28	1	3	6	13	22
3	9	< 3	40	< 3	4	13	17	24
4	79	< 3	66	< 3	4	5	13	20
5	87	227	2,100	376	576	1,060	1,400	1,695
6	22	< 1	26	< 1	< 1	8	< 20	20
7	78	29	140	38	48	63	78	91
8	15	4	40	5	9	10	15	20
10	8	< 3	28	3	4	7	10	16
11	11	< 3	12	< 3	< 3	6	9	9
12	8	3	23	4	7	10	12	18
13	24	< 3	21	< 3	< 3	< 3	6	11
14	11	< 3	320	< 3	< 3	4	13	16
15	0							
16	12	< 3	140	< 3	4	11	15	101
17	12	< 3	15	< 3	5	7	10	13
18	11	< 3	11	< 3	< 3	6	8	9
19	12	< 3	9	< 3	< 3	4	6	7
20	12	< 3	8	< 3	3	5	6	7
21	10	< 3	11	< 3	4	5	8	9
22	0							
23	12	< 3	20	< 3	< 3	5	9	14
24	12	< 3	22	< 3	< 3	5	8	10
25	8	< 3	100	3	4	6	25	59
26	8	< 3	10	< 3	< 3	< 3	7	8
27	0							
28	11	< 3	10	3	4	5	8	10
29	8	< 3	17	< 3	4	7	13	14
30	8	< 3	12	< 3	< 3	6	10	11
31	8	< 3	7	< 3	4	5	5	6
32	8	< 3	12	< 3	< 3	< 3	7	9
33	9	< 3	8	< 3	< 3	< 3	7	7
34	8	< 3	7	< 3	< 3	4	6	6
35	23	< 3	7	< 3	< 3	5	6	6
36	15	< 3	25	< 3	4	7	10	16
37	8	< 3	8	< 3	< 3	4	6	7
38	8	< 3	13	< 3	< 3	< 3	< 3	6
39	9	< 3	6	< 3	< 3	< 3	4	4
40	11	< 3	24	< 3	< 3	4	8	10
41	11	< 3	21	< 3	< 3	6	8	9
42	8	< 3	9	< 3	4	6	8	8
43	8	< 3	5	< 3	< 3	< 3	4	4
44	8	< 3	4	< 3	< 3	< 3	4	4
45	8	< 3	16	< 3	< 3	4	12	13
46	8	< 3	210	< 3	< 3	5	6	67
47	8	< 3	20	< 3	< 3	< 3	5	10
48	8	< 3	7	< 3	< 3	< 3	< 3	4
49	6	< 3	7	3	5	6	7	7
50	8	< 3	4	< 3	< 3	< 3	4	4
51	8	< 3	5	< 3	< 3	3	4	4
52	7	9	21	9	11	12	15	16
53	8	< 3	170	4	6	7	53	97
54	18	< 3	24	< 3	< 3	5	10	10
55	12	< 3	19	< 3	< 3	6	9	10
56	13	< 1	4	< 1	< 1	< 1	2	4
57	12	< 3	80	< 3	< 3	5	13	14

Appendix A-21. Selected water-quality data collected at sites in the Idaho statewide surface-water-quality monitoring network, 1989 – 2002

FECAL COLIFORM BACTERIA,colonies per 100 milliliters

Site No.	No. of obs.	Minimum	Maxinum	PERCENTILES 10	25	50	75	90
1	21	< 1	250	< 1	1	5	13	67
2	59	< 1	39	< 1	< 1	1	3	7
3	34	1	117	2	4	11	20	31
4	41	< 1	80	1	1	3	8	14
5	70	< 1	216	1	1	4	10	24
6	41	< 1	34	< 1	1	3	5	10
7	63	< 1	57	2	3	7	16	28
8	49	< 1	46	< 1	1	4	12	17
10	29	< 1	98	< 1	3	11	33	53
11	42	< 1	240	2	21	45	66	112
12	24	< 1	8	< 1	< 1	< 1	3	6
13	72	1	4770	7	28	79	242	404
14	56	< 1	184	4	8	26	54	111
15	21	8	580	12	69	120	188	330
16	36	20	1980	56	79	162	304	570
17	39	2	1280	35	87	171	262	458
18	39	< 1	66	2	4	6	19	35
19	35	< 1	53	< 1	1	7	11	40
20	33	< 1	390	2	4	11	20	37
21	16	< 1	5	< 1	< 1	< 1	1	3
22	6	100	697	188	288	335	387	549
23	27	< 1	25	1	2	2	4	10
24	42	< 1	660	19	66	125	181	235
25	18	< 1	1770	3	9	69	191	442
26	18	< 1	1260	< 1	17	39	63	539
27	13	2	110	2	4	21	26	68
28	38	< 1	130	1	4	18	54	75
29	35	1	267	2	6	32	57	91
30	31	5	1060	8	49	85	129	197
31	23	4	420	13	17	40	58	97
32	23	4	180	7	11	22	35	86
33	24	< 1	220	1	3	4	10	14
34	70	< 1	560	< 1	< 1	1	2	4
35	101	2	1030	9	22	42	76	190
36	92	35	3600	81	183	402	647	1078
37	30	2	480	22	64	100	239	305
38	22	< 1	34	< 1	< 1	2	5	15
39	24	< 1	28	< 1	< 1	4	8	12
40	27	< 1	28	< 1	< 1	1	2	7
41	35	7	2680	36	100	280	415	496
42	30	< 1	920	11	47	160	295	499
43	26	13	740	42	90	120	204	351
44	24	2	1440	41	58	96	161	537
45	24	4	332	9	27	41	66	164
46	24	3	1220	7	18	74	165	291
47	23	< 1	22	< 1	1	3	11	19
48	24	8	142	8	14	24	57	82
49	14	1	90	1	2	6	14	43
50	32	20	2600	46	87	231	523	1010
51	28	3	360	7	12	25	53	146
52	33	< 1	720	9	40	83	140	191
53	27	1	1400	8	21	81	193	485
54	47	1	144	3	7	10	22	40
55	41	< 1	400	2	10	39	76	116
56	8	< 1	22	< 1	< 1	2	6	18
57	49	< 1	234	4	8	37	63	111

Appendix B. Concentrations of selected trace elements in tissue of fish collected at selected sites in the Idaho statewide surface-water-quality monitoring network, 1996-2000

[Site locations shown in figure 1; No., number; µg/g, micrograms per gram; <, less than]

Site No.	Date	Cadmium, biota, tissue, recoverable dry weight (µg/g)	Copper, biota, tissue, recoverable dry weight (µg/g)	Lead, biota, tissue, recoverable dry weight (µg/g)	Mercury biota, tissue recoverable dry weight (µg/g)	Selenium, biota, tissue, recoverable dry weight (µg/g)	Zinc, biota, tissue, recoverable dry weight (µg/g)
Fish liver							
3	09/10/98	1.0	42	0.3	0.2	3.2	110
4	06/16/98	8.2	13	2.9	0.6	7.6	96
5	09/14/00	16	120	6.2	0.1	2	450
	06/17/98	10	150	12	0.3	4.8	290
	08/17/99	17	210	13	0.3	5.6	600
6	07/08/98	3.8	85	3.4	0.4	3.9	160
7	07/12/99	3.5	35	2.3	0.1	4.4	150
22	07/29/96	0.4	14	0.5	0.3	5.1	67
	07/22/97	<.3	320	<.3	0.1	9.7	120
33	09/04/97	1.8	79	1.1	0.4	2.8	160
37	08/06/97	0.6	38	<.2	0.2	4.4	96
54	08/14/97	1.9	100	0.4	0.4	5.5	190
56	09/13/00	<.2	10	<.2	0.1	2.2	95
	09/01/99	0.5	17	<.2	0.3	5.6	87
Fish fillet							
4	06/16/98	<.1	1.5	0.7	0.1	0.8	20
5	06/17/98	0.6	1.8	1.7	0.1	1.1	36
	08/17/99	0.2	1.8	2.1	0.1	1.4	45
6	07/08/98	<.2	1.5	<.2	0.2	1	16
37	08/06/97	<.2	1.3	<.2	0.9	1	25
Whole-body fish							
11	08/06/96	0.5	50	<.2	0.3	3.3	100
14	09/10/96	1.6	87	<.2	1	5.3	170
17	09/09/96	1.2	88	<.3	0.2	5.4	240
36	12/11/96	0.3	27	<.1	<.1	1.7	110
57	07/23/96	0.4	31	<.2	0.2	5.1	100

Appendix C. Concentrations of organochlorine compounds and lipids in whole-body fish collected at selected sites in the Idaho statewide surface-water-quality monitoring network, 1996-1999

[Site locations shown in figure 1; µg/kg, micrograms per kilogram; <, less than; E, estimate; –, no data]

Site No.	Date	Aldrin, biota, whole organism, wet weight, (µg/kg)	alpha-HCH, biota, whole organism, wet weight, (µg/kg)	beta-HCH, biota, whole organism, wet weight, (µg/kg)	cis-Chlordane biota, whole organism, wet weight, (µg/kg)	cis-Nonachlor, biota, whole organism, wet weight, (µg/kg)	DCPA, biota, whole organism, wet weight, (µg/kg)	delta-HCH, biota, whole organism, wet weight, (µg/kg)	Dieldrin, biota, whole organism, wet weight, (µg/kg)	Endrin, biota, whole organism, wet weight, (µg/kg)	Heptachlor, epoxide, biota, whole organism, wet weight, (µg/kg)	Heptachlor, biota, whole organism, wet weight, (µg/kg)	Hexachloro-benzene, biota, whole organism, wet weight (µg/kg)	Lindane, biota, whole organism, wet weight (µg/kg)	Lipids, biota, whole organism, wet weight, percent
3	09/10/98	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	3.4
4	06/16/98	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	9.4
5	06/17/98	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	7.1
	08/17/99	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	11
6	07/08/98	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	3.9
56	07/07/98	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	8.9
	09/01/99	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	5.8
7	07/12/99	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	3
11	08/06/96	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	13
14	09/10/96	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	16
17	09/09/96	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	4.2
22	07/29/96	<5	<5	–	–	–	–	–	–	<28	–	–	–	–	5.3
	07/22/97	<5	<5	<5	<5	<5	<5	<5	E5	<5	<5	<5	<5	<5	9.2
57	07/23/96	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	6.4
33	09/04/97	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	3
36	12/11/96	<5	<7	<5	<10	<10	<5	<8	<14	<16	<10	<5	<5	<5	22
37	08/06/97	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	10
54	08/14/97	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	5.5

Appendix C. Concentrations of organochlorine compounds and lipids in whole-body fish collected at selected sites in the Idaho statewide surface-water-quality monitoring network, 1996-1999--Continued

Site No.	Date	Mirex, biota, whole organism, wet weight (µg/kg)	o,p'-DDE, biota, whole organism, wet weight (µg/kg)	o,p'-DDE, biota, whole organism, wet weight (µg/kg)	o,p'-DDT, biota, whole organism, wet weight (µg/kg)	o,p'-Methoxy chlor, biota, whole organism, wet weight (µg/kg)	Oxychlor-dane, biota, whole organism, wet weight (µg/kg)	p,p'-DDD, biota, whole organism, wet weight (µg/kg)	p,p'-DDE, biota, whole organism, wet weight (µg/kg)	p,p'-DDT, biota, whole organism, wet weight (µg/kg)	p,p'-Methoxy chlor, biota, whole organism, wet weight (µg/kg)	PCBs, biota, whole organism, wet weight (µg/kg)	Penta-chloro-anisole, biota, whole organism, wet weight (µg/kg)	Toxa-phene, biota, whole organism, wet weight (µg/kg)	Trans-Chlor-dane, biota, whole organism, wet weight, (µg/kg)	Trans-Nona-chlor, biota, whole organism, wet weight, (µg/kg)
3	09/10/98	<5	<5	<5	<5	<5	<5	<5	11	<5	<5	60	<5	<200	<5	<5
4	06/16/98	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	150	<5	<200	<5	<5
5	06/17/98	<5	<5	<5	<5	<5	<5	<5	14	<5	<5	310	<5	<200	<5	<5
	08/17/99	<5	<5	<5	<5	<5	<5	<5	9	<5	<5	200	<5	<200	<5	<5
6	07/08/98	<5	<5	<5	<5	<5	<5	<5	10	<5	<5	<50	<5	<200	<5	<5
56	07/07/98	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<200	<5	<5
	09/01/99	<5	<5	<5	<5	<5	<5	<5	5	<5	<5	<50	<5	<200	<5	<5
7	07/12/99	<5	<5	<5	<5	<5	<5	<5	11	<5	<5	270	<5	<200	<5	<5
11	08/06/96	<5	<5	<5	<5	<5	<5	E16	290	17	<5	50	<5	<200	<5	<5
14	09/10/96	<5	<5	<5	<5	<5	<5	E17	250	13	<5	60	<5	<200	<5	<5
17	09/09/96	<5	<5	<5	<5	<5	<5	<5	47	E13	<5	240	<5	<200	<5	6
22	07/29/96	–	–	–	<8	–	–	E16	650	38	<7	50	–	–	–	–
	07/22/97	<5	<5	<5	<5	<5	<5	8	68	6	<5	60	<5	<200	<5	<5
57	07/23/96	<5	<5	<5	<5	<5	<5	E17	470	E11	<5	<50	<5	<200	<5	5
33	09/04/97	<5	<5	<5	<5	<5	<5	5	79	14	<5	<50	<5	<200	<5	<5
36	12/11/96	<5	<5	<5	<5	<5	<5	52	770	E60	<10	100	<5	<200	<5	E13
37	08/06/97	<5	<5	<5	<5	<5	<5	24	810	50	<5	<50	<5	<200	<5	<5
54	08/14/97	<5	<5	<5	<5	<5	<5	<5	33	6	<5	<50	<5	<200	<5	<5

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