

Prepared in cooperation with the North Dakota State Water Commission and the North Dakota Department of Health

Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970–2008



Scientific Investigations Report 2012–5216

Cover photograph. Short Creek (a tributary to the Souris River) below the International Boundary near Roche Percee, Saskatchewan (photograph by Laurel Cottengaim, U.S. Geological Survey, 2008).

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By Joel M. Galloway, Aldo V. Vecchia, Kevin C. Vining, Brenda K. Densmore, and
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Conversion Factors and Datums

Multiply	By	To obtain
Length		
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
Area		
acre	4,047	square meter (m ²)
square foot (ft ²)	0.09290	square meter (m ²)
square inch (in ²)	6.452	square centimeter (cm ²)
square mile (mi ²)	2.590	square kilometer (km ²)
Volume		
cubic foot (ft ³)	0.02832	cubic meter (m ³)
cubic foot per second (ft ³ /s)	0.02832	cubic meter per second (m ³ /s)
Mass		
pound, avoirdupois (lb)	0.4536	kilogram (kg)
pounds per year per square mile (lbs/yr/mi ²)		kilograms per year per square kilometer
ton, short (2,000 lb)	0.9072	megagram (mg)

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

$$^{\circ}\text{F}=(1.8\times^{\circ}\text{C})+32$$

Vertical coordinate information is referenced to North American Vertical Datum of 1988 (NAVD 88)

Horizontal coordinate information is referenced to North American Datum of 1983 (NAD 83)

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (μS/cm at 25°C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (μg/L).

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Abstract

In response to the need to examine the large amount of historic water-quality data comprehensively across North Dakota and evaluate the efficiency of the State-wide sampling programs, a study was done by the U.S. Geological Survey in cooperation with the North Dakota State Water Commission and the North Dakota Department of Health to describe the water-quality data collected for the various programs and determine an efficient State-wide sampling design for monitoring future water-quality conditions. Although data collected for the North Dakota State Water Commission High-Low Sampling Program, the North Dakota Department of Health Ambient Water-Quality Network, and other projects and programs provide valuable information on the quality of water in streams in North Dakota, the objectives vary among the programs, some of the programs overlap spatially and temporally, and the various sampling designs may not be the most efficient or relevant to the objectives of the individual programs as they have changed through time.

Median concentrations of water-quality constituents at sampling locations in North Dakota were determined for the period of record. In general, median sulfate concentrations tended to be higher in the southwest part of the State compared to the northeast part of North Dakota in the Red River of the North Basin. Median chloride concentrations tended to be lower in the southwest and higher in the northeast parts of the State, nearly the opposite of the pattern seen in median sulfate concentrations. In general, median total dissolved solid concentrations tended to be lower for sites in the Red River of the North, Souris River, and James River Basins compared to sites in southwest North Dakota.

In general, overall median ammonia concentrations were spatially variable across the State. The highest overall median nitrate plus nitrite concentrations tended to occur in the Red River of the North Basin. Median dissolved and total phosphorus concentrations across North Dakota generally were higher for the Red, Souris, and James River Basins than river basins in the southwest part of the State. Median dissolved and total organic carbon concentrations tended to be the lowest at sites located in the eastern part of the State compared to sites throughout the remainder of the State.

Median total aluminum concentrations generally were higher in samples from sites in the southern and eastern parts of the State compared to other parts of the State. Median total arsenic concentrations in North Dakota were the lowest mostly in the southwestern parts of the State, and highest mostly in the eastern parts of the State. Median total chromium concentrations across North Dakota generally were higher in the far eastern and western areas of the State. Median total iron concentrations in North Dakota were lowest in the Souris, Sheyenne, and James River Basins compared to sites in other parts of North Dakota. Median total lead concentrations were highest at sites scattered across North Dakota. Median total nickel concentrations were higher at a few sites in the southwest and eastern parts of North Dakota compared to other sites. Median suspended-sediment concentrations and total suspended solids in water samples obtained across North Dakota were higher at sites located in parts of southwestern and eastern North Dakota compared to sites located in other areas of the State.

Normalized annual loads and yields were estimated for selected constituents at 34 sites across North Dakota. Normalized annual sulfate yields ranged from 9,250 to 56,200 pounds per year per square mile in the Missouri River Basin and from 4,680 to 72,500 pounds per year per square mile in the Red River of the North Basin. Total dissolved solids yields ranged from 30,400 to 119,000 pounds per year per square mile in the Missouri River Basin and from 13,000 to 169,000 pounds per year per square mile in the Red River of the North Basin. Nitrate plus nitrite yields ranged from 24 to 120 pounds per year per square mile as nitrogen in the Missouri River Basin and from 2 to 1,260 pounds per year per square mile as nitrogen in the Red River of the North Basin. Normalized annual total phosphorus yields ranged from less than 1 to 167 pounds per year per square mile as phosphorus in the Missouri River Basin and from 6 to 76 pounds per year per square mile as phosphorus in the Red River of the North Basin. Suspended-sediment yields ranged from 519 to 622,000 pounds per year per square mile in the Missouri River Basin and from 1,500 to 78,800 pounds per year per square mile in the Red River of the North Basin.

Ten sites were selected for trend analysis for sulfate, total dissolved solids, nitrate plus nitrite, and total phosphorus. The fitted trends for standardized sulfate concentrations indicated significant increases in concentration at five sites and

a significant decrease in concentration at one site from 1975 through 2008. Median standardized sulfate concentrations increased from about 55 to 106 milligrams per liter for the Red River of the North at Grand Forks, North Dakota, 262 to 308 milligrams per liter for the Souris River near Sherwood, North Dakota, 455 to 506 milligrams per liter for Spring Creek at Zap, North Dakota, 440 to 520 milligrams per liter for the Knife River at Hazen, North Dakota, and 380 to 435 milligrams per liter for the Heart River near Mandan, North Dakota. The fitted trend for the Little Missouri River near Watford City, North Dakota indicated a decrease in median standardized concentration from about 492 to 417 milligrams per liter. The fitted trends for standardized total dissolved solid concentrations indicated significant increases in concentration at five sites from 1975 through 2008, including the Heart River near Mandan, North Dakota, Knife River at Hazen, North Dakota, Spring Creek at Zap, North Dakota, and the Red River of the North at Grand Forks, North Dakota. The greatest increase in median standardized total dissolved solid concentrations was detected for the Wild Rice River near Abercrombie, North Dakota, where median concentrations increased from about 690 to 1,120 milligrams per liter from 1975 through 2008.

The fitted trends for standardized nitrate plus nitrite concentrations indicated no significant increases or decreases in concentration for 7 of the 8 sites analyzed for trends; however, median standardized nitrate plus nitrite concentrations for the Red River of the North near Grand Forks, North Dakota increased from about 0.26 to 0.45 milligrams per liter as nitrogen during 1990 to 2008. The fitted trends for standardized total phosphorus concentrations indicated significant decreases in concentration at 4 sites and a significant increase at 1 out of the 10 sites analyzed for trends. All of the significant decreases were for sites in western North Dakota, including decreases in median standardized total phosphorus concentration for the Cannonball River at Breien, North Dakota, Heart River near Mandan, North Dakota, Knife River at Hazen, North Dakota, and Spring Creek at Zap, North Dakota. Conversely, median standardized total phosphorus concentrations for the Red River of the North at Grand Forks, North Dakota increased from about 0.10 to 0.16 milligrams per liter from 1990 through 2008.

One objective of a State-wide sampling program was to evaluate ways to describe the spatial variability of water-quality conditions across the State in the most efficient manner. Weighted least-squares regression analysis was used to relate the average absolute difference between paired downstream and upstream concentrations, expressed as a percent of the average downstream concentration, to the average absolute difference in daily flow between the downstream and upstream pairs, expressed as a percent of the average downstream flow. The analysis showed that a reasonable spatial network would consist of including the most downstream sites in large basins first, followed by the next upstream site(s) that roughly bisect the downstream flows at the first sites, followed by the next upstream site(s) that roughly bisect flows for the second

sites. Sampling sites to be included in a potential State-wide network were prioritized into 3 design levels: level 1 (highest priority), level 2 (second priority), and level 3 (third priority). The level-1 sites included most of the 34 active Ambient Water-Quality Network sites plus two additional Canadian/U.S. border sites in the Souris River Basin. The level-2 sites were selected from among the active High-Low Sampling Program sites to fill major gaps in coverage of the level-1 sites while minimizing redundancy of the network. The level-2 sites generally were well upstream of the level-1 sites or on large tributaries with no level-1 sites. The level-3 sites were selected from among active High-Low Sampling Program sites to fill gaps in coverage remaining after inclusion of the level-1 and level-2 sites. The level-3 sites generally were on smaller tributaries with no level-1 or level-2 sites or in larger basins well upstream of the level-1 or level-2 sites. In all, the potential network consists of 81 sites, with 34 level-1 sites, 21 level-2 sites, and 26 level-3 sites.

Given the spatial distribution and priority designation (levels 1–3) of sites in the potential spatial network, the next consideration was to determine the appropriate temporal sampling frequency to use for monitoring future water-quality conditions. The time-series model used to detect concentration trends for this report also was used to evaluate sampling designs to monitor future water-quality trends. Sampling designs were evaluated with regard to their sensitivity to detect seasonal trends that occurred during three 4-month seasons—March through June, July through October, and November through February. Unlike sample designs for detecting trends that are targeting flow-adjusted concentration through time, sample designs for the estimation of constituent loads should focus on the main contributing factor that can affect the annual load, which are changes in concentration with streamflow.

For the 34 level-1 sites, samples would be collected for major ions, trace metals, nutrients, bacteria, and sediment eight times per year, with samples in January, April (2 samples), May, June, July, August, and October. For the 21 level-2 sites, samples would be collected for major ions, trace metals, and nutrients six times per year (January, April, May, June, August, and October), and for the 26 level-3 sites, samples would be collected for these constituents four times per year (April, June, August, and October).

Introduction

Various agencies have conducted water-quality sampling programs and projects for streams in North Dakota for numerous years for several purposes. Various programs and projects have different sampling designs, different selected water-quality constituents, and different laboratories that completed the sample analyses based on the program objectives. Some of the data from these programs have been used for regulation of water-quality standards, some have been described in numerous reports with different objectives, and some of the data

have not been evaluated at all. Two of the major programs that have provided a large amount of data across North Dakota are the North Dakota State Water Commission (NDSWC) High-Low Flow Sampling Program (HLSP) and the North Dakota Department of Health (NDDH) Ambient Water-Quality Network (hereafter referred to as ambient network)(fig. 1).

The U.S. Geological Survey (USGS), in cooperation with the NDSWC, currently (2010) collects 162 water-quality samples per year at 81 HLSP sites throughout North Dakota (fig. 1). Some of these HLSP sites are colocated with sites that are sampled as part of other sampling programs described later. The program began in the late 1960s with collecting samples every time a streamflow measurement was made or approximately monthly at about 12–15 stations throughout the state. These stations were rotated to obtain data from across North Dakota. The purpose was to begin collecting enough water-quality information to help understand the water quality of North Dakota streams. Monthly sampling ended about 1971. In 1972, a water-quality program was started in which water samples were collected at most of the streamflow-gaging stations that did not have another water-quality sampling program. This program, which started with only one sample at each gaging station in 1972, evolved to the current program (2010) that consists of collecting two samples each year—one during high-flow conditions, which is usually during snowmelt runoff (March through May), and one during low-flow conditions, which is usually during middle to late summer (August through October). The NDSWC laboratory in Bismarck, N. Dak. analyzed HLSP samples until June 2003 when the laboratory closed, and the NDDH laboratory in Bismarck, N. Dak. began analyzing the samples after that time. Samples collected for the HLSP are analyzed for major ions and selected trace metals.

NDSWC water-resource managers have indicated the HLSP data are used to make management decisions that were never anticipated when the HLSP began; however, after 35 years of sampling program operation, the NDSWC recognize that the goals, objectives, and uses of the data need to be more clearly identified and prioritized. For example, the temporal and spatial distribution of the 162 samples that are currently (2010) collected per year would probably include different sites and temporal allocation if the emphasis is on evaluating time trends or estimating loads rather than characterizing concentrations during high- or low-flow conditions.

Currently, in 2010, the NDDH ambient network consists of 34 monitoring stations located on 19 rivers (fig. 1). Samples are collected by the NDDH at 26 sites and by the USGS at eight sites. The primary purpose of this network was to provide data for trend analysis, general water-quality characterization, determination of compliance of water-quality standards, and pollutant loading calculations. Samples are analyzed for major ions, nutrients, trace metals, total suspended solids, total and dissolved organic carbon, and fecal indicator bacteria by the NDDH Laboratory in Bismarck, N. Dak. Early water-quality data collection by the NDDH began in the 1960's with a statewide monitoring program consisting

of a network of stations that were located immediately below point source discharges or near the confluences of major rivers (North Dakota Department of Health, 2005). The primary purpose of the historic monitoring program was to assess the general chemical character of the state's rivers and streams and, to the extent practical, assess point source discharge compliance with state water-quality standards. In 1972, Congress passed the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (U.S. Environmental Protection Agency, 1972) that directed States to submit biennial reports to the U.S. Environmental Protection Agency (USEPA) and Congress that includes a comprehensive water-quality assessment [305(b) report] and listing of water-quality impaired (degraded) streams or stream segments [303(d) report] within the States (Pope and others, 2004). In response to the provisions of the Clean Water Act, states established, modified, or enhanced their ambient stream-water-quality monitoring networks to provide the data necessary to assess stream water quality relative to state-established water-quality standards. By 1993, the NDDH had a monitoring network that included 61 ambient monitoring stations on 31 rivers and streams. Through time, as budgetary considerations and program needs changed, the program was reduced to the current (2010) network of 34 stations (fig. 1). Ambient network stations that are not currently active are designated as "other" in figure 1.

In 2010, the frequency of sampling for the NDDH ambient network was eight samples collected from each station per year (4 during April–June, 3 during July–October, and 1 during November–March). This design was selected for estimating average annual loads during a 5- to 10-year period (NDDH, 2005); however, the data have not been fully evaluated to determine if they provide an efficient design for estimating average annual loads or monitoring long-term trends.

The USGS has maintained other long-term stream sampling networks in North Dakota, particularly in the Souris and James River Basins. The USGS, in cooperation with U.S. Army Corps of Engineers and the City of Minot, have sampled as many as five sites on the Souris River (sites 82, 83, 85, 87, and 98 on fig. 1), two of which have a complete period of record from 1972 through present (2010). Two of the sites (Souris River near Sherwood, N. Dak. and near Westhope, N. Dak.; sites 82 and 98 on fig. 1) are located near the U.S.–Canada border and are maintained as part of the International Souris River Board mandate to monitor aquatic ecosystem health at the International border (International Souris River Board, 2009). Samples are currently collected seven times per year at three sites (Souris River near Sherwood, Minot, and Verendrye, N. Dak.; sites 82, 85, and 87 on fig. 1) and are analyzed for nutrient, major ion, and trace-metal constituents. Although USGS discontinued sampling the Souris River near Westhope, N. Dak. in 1995, Environment Canada has continued sampling that site eight times per year. Two sites have been sampled by the USGS in cooperation with the U.S. Bureau of Reclamation on the James River and the Arrowwood National Wildlife Refuge as part of its refuge-monitoring program and as part of an environmental impact statement

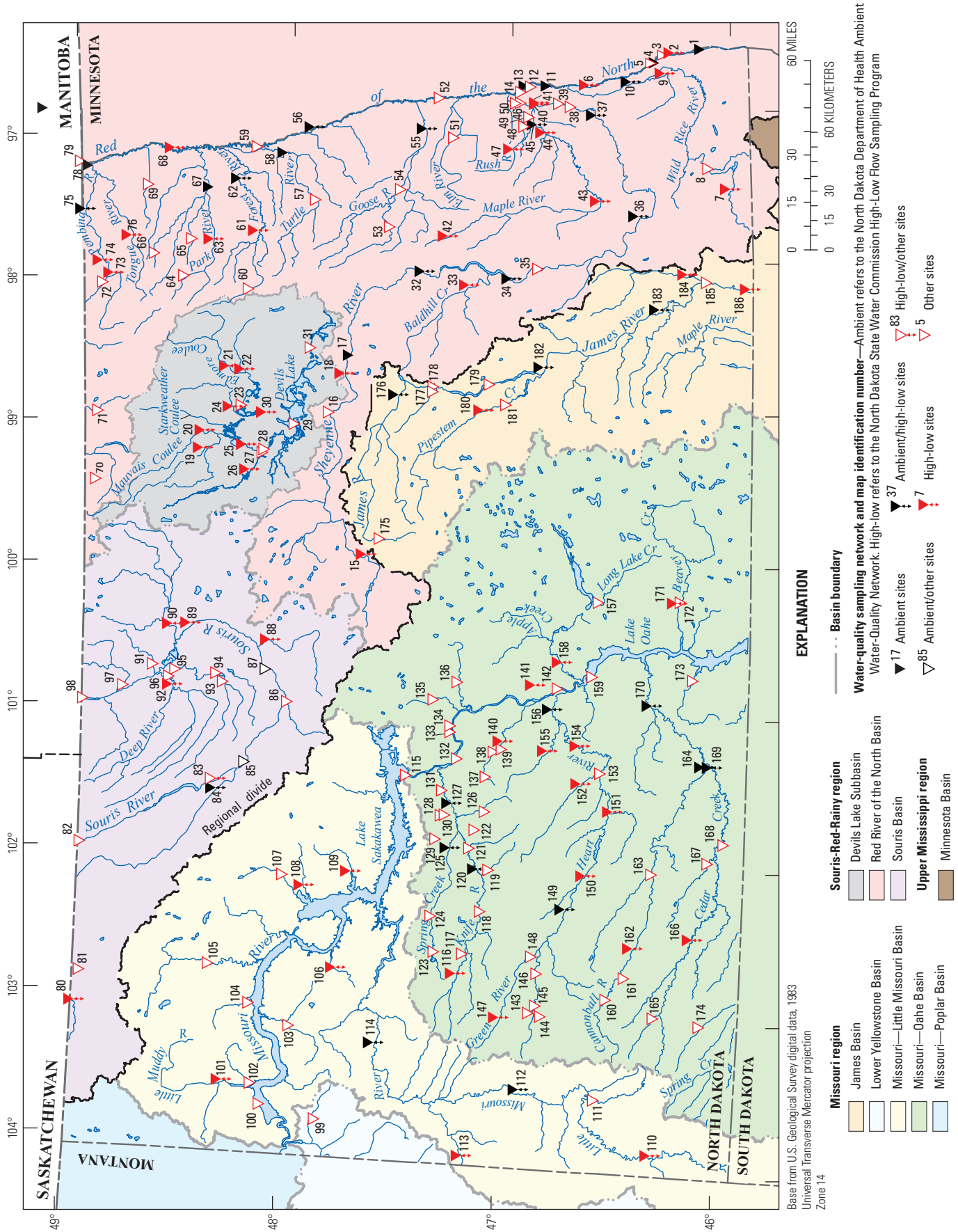


Figure 1. Selected stream water-quality sample collection sites in North Dakota, 1970–2008.

commitment for various periods between 1987 and present (2010) (Ryberg and Hiemenz, 2009) (sites 177 and 179 on fig. 1). Currently (2010), samples are collected at the two sites five times per year and are analyzed for nutrients, major ions, and suspended-sediment concentration.

Although data collected for the NDSWC HLSP, NDDH ambient network, and other projects and programs provide valuable information on the quality of water in streams of the State, the objectives vary among the programs; some of the programs overlap spatially and temporally, and the various sampling designs may not be the most efficient or relevant to the objectives of the individual programs as they have changed through time. In response to the need to comprehensively examine the large amount of historic water-quality data across North Dakota and evaluate the efficiency of the State-wide sampling program, a study was conducted by the USGS in cooperation with the NDSWC and the NDDH to describe the water-quality data collected for the various programs and determine an efficient State-wide sampling design for monitoring future water-quality conditions.

Purpose and Scope

The purpose of this report is to provide descriptive statistics and graphical summaries of water-quality data from sites throughout the State, determine annual loads and yields and trends in concentration for selected constituents and sites with sufficient concentration and streamflow data, and determine an efficient potential State-wide network sampling design for monitoring future water-quality conditions. All data from streams throughout North Dakota collected as part of various NDDH, NDSWC, and USGS water-quality programs and projects from 1970 to 2008 were evaluated. For most constituents, data from the entire historical period (1970–2008) were used in the evaluations, however, trace-metal data collected before 1993 were not included.

Methods

This section describes the methods used for site selection, water-quality data preparation, computation of descriptive statistics, load and yield estimation, trend analysis, and sampling design analysis. Water-quality and streamflow data for North Dakota were obtained from the USGS National Water Information System (NWIS) database (<http://nwis.waterdata.usgs.gov/nd/nwis/>), the USEPA STORET database (http://www.epa.gov/storet/dw_home.html), and electronic files from the NDDH (Joe Gross, North Dakota Department of Health, written commun., 2010).

Site Selection and Water-Quality Data Screening

Water-quality data from the various databases were screened to develop a data set that could be used to describe water-quality conditions across North Dakota in terms of spatial and temporal variability. Data from 1970 through 2008 were initially considered for all monitored constituents except for trace metals. Only trace-metal data collected from 1993 through 2008 were considered for this report because there were substantial changes in sample collection and analysis methods for trace metals beginning in 1993 (U.S. Geological Survey, 1992 and 1993). The first level of site selection involved removing sites that had fewer than 10 samples for all of the constituents, which resulted in 186 sites across North Dakota available for evaluation (fig. 1 and table 1). Site selection criteria for determining loads and trends are described below.

Water-quality data were screened by eliminating certain constituents with large ranges of laboratory detection limits, highly variable field collection, and variable laboratory analysis methods that prevented comparability between data sets and the computation of descriptive statistics and other analyses. Some of these constituents included fecal indicator bacteria (*Escherichia coli*, fecal coliform, and fecal streptococci), phytoplankton, chlorophyll *a* and *b*, and organic compounds such as pesticides. Also, constituents that had more than 90 percent of the values less than the censoring level (the level below which concentrations could not be accurately quantified, determined as described next) were not evaluated.

Because water-quality analysis methods have varied for the various water-quality programs from 1970 to 2008 and were conducted by three different laboratories (NDDH Water-Quality Laboratory, NDSWC Water-Quality Laboratory, and the USGS National Water-Quality Laboratory), several of the constituents have a wide range in censoring levels. The censoring level is the “less-than” value reported when concentrations are too low to be accurately quantified. The censoring level can change through time and among laboratories because of changes in sensitivity of laboratory equipment or analytical methods or changes in protocol for determining the censoring level. The censoring level is generally higher than the method detection limit, which is the lowest concentration for which a compound can be detected (but not necessarily accurately quantified) (Childress and others, 1999). For comparability between data and for estimates of trends and loads, constituents were recensored to a single level. Generally, the highest censoring level for each constituent was used with a few exceptions. In some cases, some higher censoring levels were present in the data for only a few values. If there were less than 5 values for the higher censoring level in some cases, they were excluded from the data set (table 2). Fifty-nine constituents and physical measurements were included in the final list for analysis. The constituents included nutrients, major ions, trace metals, and suspended solids/sediment. Physical measurements included pH, dissolved oxygen, water

6 Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970–2008

Table 1. Selected stream water-quality sites for North Dakota from 1970 through 2008.

[ID, identification; USEPA, Environment Protection Agency; STORET, STORage and RETrieval; USGS, U.S. Geological Survey; HUC, hydrologic unit code; --, not available; Ambient, North Dakota Department of Health Ambient Water-Quality Network; High-Low, North Dakota State Water Commission High-Low Flow Sampling Program; other, sampled as part of various other programs]

Map ID number	USEPA STORET site ID number	USGS site ID number	Site name	Latitude, decimal degrees	Longitude, decimal degrees	Drainage area, square miles	Major river basin (8-digit HUC)	Sampling network
1	385055	--	Bois De Sioux River near Doran, Minn.	46.150	-96.570	--	09020101	Ambient
2	380001	05051500	Red River of the North at Wahpeton, N. Dak.	46.266	-96.598	4,010	09020104	High-low
3	380082	--	Red River of the North near Wahpeton, N. Dak.	46.280	-96.590	--	09020104	Other
4	380083	--	Red River of the North at Brushville, Minn.	46.360	-96.650	--	09020104	Ambient
5	--	05051510	Red River of the North below Wahpeton, N. Dak.	46.375	-96.657	4,020	09020104	Other
6	--	05051522	Red River of the North at Hickson, N. Dak.	46.660	-96.796	4,300	09020104	High-low
7	--	05051600	Wild Rice River near Rutland, N. Dak.	46.022	-97.511	546	09020105	High-low
8	--	05051700	Wild Rice River near Cayuga, N. Dak.	46.125	-97.361	955	09020105	Other
9	--	05052500	Antelope Creek at Dwight, N. Dak.	46.311	-96.734	294	09020105	High-low
10	380031	05053000	Wild Rice River near Abercrombie, N. Dak.	46.468	-96.783	2,080	09020105	Ambient/ high-low
11	385414	05054000	Red River of the North at Fargo, N. Dak.	46.861	-96.783	6,800	09020104	Ambient
12	--	05054020	Red River of North below Fargo, N. Dak.	46.931	-96.785	6,820	9020104	Other
13	385040	--	Red River of the North at Harwood, N. Dak.	46.970	-96.820	--	09020104	Ambient
14	380084	05054200	Red River of the North near Harwood, N. Dak.	46.977	-96.821	--	09020104	Other
15	--	05054500	Sheyenne River above Harvey, N. Dak.	47.703	-99.949	424	09020202	High-low
16	--	05055520	Big Coulee near Fort Totten, N. Dak.	47.883	-98.967	23	09020203	Other
17	380010	--	Sheyenne River at Warwick, N. Dak.	47.790	-98.580	--	09020203	Ambient
18	385345	05056000	Sheyenne River near Warwick, N. Dak.	47.806	-98.716	2,070	09020203	High-low
19	--	05056060	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	48.458	-99.224	60	09020201	High-low
20	--	05056100	Mauvais Coulee near Cando, N. Dak.	48.448	-99.102	387	09020201	High-low
21	--	05056200	Edmore Coulee near Edmore, N. Dak.	48.337	-98.660	382	09020201	High-low
22	--	05056215	Edmore Coulee Tributary near Webster, N. Dak.	48.266	-98.681	148	09020201	High-low
23	--	05056225	Webster Coulee at Webster, N. Dak.	48.283	-98.919	670	09020201	Other
24	--	05056239	Starkweather Coulee near Webster, N. Dak.	48.321	-98.940	310	09020201	High-low
25	--	05056270	Big Coulee below Churchs Ferry, N. Dak.	48.259	-99.200	1,260	09020201	High-low
26	--	05056340	Little Coulee near Leeds, N. Dak.	48.243	-99.373	320	09020201	High-low

Table 1. Selected stream water-quality sites for North Dakota from 1970 through 2008.—Continued

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Map ID number	USEPA STORET site ID number	USGS site ID number	Site name	Latitude, decimal degrees	Longitude, decimal degrees	Drainage area, square miles	Major river basin (8-digit HUC)	Sampling network
27	--	05056390	Little Coulee near Brinsmade, N. Dak.	48.188	-99.243	350	09020201	Other
28	--	05056400	Big Coulee near Churchs Ferry, N. Dak.	48.178	-99.221	1,620	09020201	Other
29	--	05056405	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	48.040	-99.047	--	09020201	Other
30	--	05056410	Channel A near Penn, N. Dak.	48.167	-98.980	930	09020201	High-low
31	--	05056636	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	47.965	-98.525	--	09020201	High-low
32	380009	05057000	Sheyenne River near Cooperstown, N. Dak.	47.433	-98.027	6,470	09020203	Ambient/ high-low
33	380033	05057200	Baldhill Creek near Dazey, N. Dak.	47.229	-98.124	691	09020203	High-low
34	380153	05058000	Sheyenne River below Baldhill Dam, N. Dak.	47.034	-98.083	7,470	09020104	Ambient/ high-low
35	380008	05058500	Sheyenne River at Valley City, N. Dak.	46.914	-98.008	7,810	09020204	Other
36	380007	05058700	Sheyenne River at Lisbon, N. Dak.	46.447	-97.679	8,190	09020204	Ambient/ high-low
37	385001	05059000	Sheyenne River near Kindred, N. Dak.	46.632	-97.000	8,800	09020204	Ambient/ high-low
38	--	05059300	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	46.750	-96.926	8,840	09020204	High-low
39	--	05059400	Sheyenne River near Horace, N. Dak.	46.804	-96.904	8,850	09020204	Other
40	--	05059480	Sheyenne River Diversion at West Fargo, N. Dak.	46.891	-96.916	--	09020204	High-low
41	380155	05059500	Sheyenne River at West Fargo, N. Dak.	46.891	-96.907	8,870	09020204	High-low
42	--	05059600	Maple River near Hope, N. Dak.	47.325	-97.790	20	09020205	High-low
43	--	05059700	Maple River near Enderlin, N. Dak.	46.622	-97.574	843	09020205	High-low
44	--	05060000	Maple River near Mapleton, N. Dak.	46.866	-97.106	1,450	09020205	High-low
45	384155	05060100	Maple River below Mapleton, N. Dak.	46.905	-97.052	1,480	09020205	Ambient/ high-low
46	380076	05060400	Sheyenne River at Harwood, N. Dak.	46.980	-96.890	--	09020204	Other
47	--	05060500	Rush River at Amenia, N. Dak.	47.017	-97.214	116	09020204	High-low
48	--	05060550	Rush River near Prosper, N. Dak.	46.966	-97.051	170	09020204	Other
49	380035	05060570	Lower Branch Rush River near Prosper, N. Dak.	46.942	-96.988	36	09020204	Other
50	--	05060600	Sheyenne River near Harwood, N. Dak.	47.001	-96.894	10,700	09020204	Other
51	380036	05062200	Elm River near Kelso, N. Dak.	47.292	-97.114	199	09020107	Other
52	--	05064500	Red River of the North at Halstad, Minn.	47.352	-96.843	21,800	09020107	High-low
53	--	05064900	Beaver Creek near Finley, N. Dak.	47.595	-97.709	160	09020109	Other

8 Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970–2008

Table 1. Selected stream water-quality sites for North Dakota from 1970 through 2008.—Continued

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Map ID number	USEPA STORET site ID number	USGS site ID number	Site name	Latitude, decimal degrees	Longitude, decimal degrees	Drainage area, square miles	Major river basin (8-digit HUC)	Sampling network
54	--	05065500	Goose River near Portland, N. Dak.	47.539	-97.456	517	09020109	Other
55	380156	05066500	Goose River at Hillsboro, N. Dak.	47.410	-97.060	1,203	09020109	Ambient/ high-low
56	384156	05082500	Red River of the North at Grand Forks, N. Dak.	47.927	-97.029	30,100	09020301	Ambient/ high-low
57	--	05082625	Turtle River at Turtle River State Park near Arvilla, N. Dak.	47.932	-97.514	311	09020307	High-low
58	380037	05083000	Turtle River at Manvel, N. Dak.	48.079	-97.184	613	09020307	Ambient
59	--	05083500	Red River of the North at Oslo, Minn.	48.194	-97.140	31,200	09020306	Other
60	--	05083600	Middle Branch Forest River near Whitman, N. Dak.	48.247	-98.117	48	09020308	Other
61	--	05084000	Forest River near Fordville, N. Dak.	48.197	-97.730	456	09020308	High-low
62	380039	05085000	Forest River near Minto, N. Dak.	48.269	-97.369	740	09020308	Ambient/ high-low
63	--	05089000	South Branch Park River below Homme Dam, N. Dak.	48.402	-97.782	226	09020310	Other
64	--	05089100	Middle Branch Park River near Union, N. Dak.	48.542	-98.019	15	09020310	Other
65	--	05089130	Middle Branch Park River near Edinburg, N. Dak.	48.503	-97.765	84	09020310	Other
66	--	05089500	Cart Creek at Mountain, N. Dak.	48.677	-97.861	17	09020310	Other
67	380157	05090000	Park River at Grafton, N. Dak.	48.425	-97.412	695	09020310	Ambient/ high-low
68	380004	05092000	Red River of the North at Drayton, N. Dak.	48.572	-97.147	34,800	09020311	High-low
69	--	05092200	Pembina County Drain 20 near Glasston, N. Dak.	48.697	-97.384	80	09020313	Other
70	--	05098700	Hidden Island Coulee near Hansboro, N. Dak.	48.953	-99.426	38	09020313	Other
71	--	05098800	Cypress Creek near Sarles, N. Dak.	48.943	-98.951	71	09020313	Other
72	--	05099380	Pembina River near Vang, N. Dak.	48.917	-98.056	3,070	09020313	Other
73	--	05099400	Little South Pembina River near Walhalla, N. Dak.	48.865	-98.006	182	09020313	High-low
74	--	05099600	Pembina River at Walhalla, N. Dak.	48.913	-97.917	3,350	09020313	High-low
75	380158	05100000	Pembina River at Neche, N. Dak.	48.990	-97.557	3,410	09020313	Ambient/ high-low
76	380047	05101000	Tongue River at Akra, N. Dak.	48.778	-97.746	160	09020313	High-low
77	384157	--	Red River of the North at Pembina, N. Dak., site 1	48.970	-97.230	40,200	09020311	Other
78	--	05102490	Red River of the North at Pembina, N. Dak., site 2	48.974	-97.241	40,200	09020311	Ambient
79	--	05102500	Red River of the North at Emerson, Manitoba	49.008	-97.211	40,200	09020311	Other

Table 1. Selected stream water-quality sites for North Dakota from 1970 through 2008.—Continued

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Map ID number	USEPA STORET site ID number	USGS site ID number	Site name	Latitude, decimal degrees	Longitude, decimal degrees	Drainage area, square miles	Major river basin (8-digit HUC)	Sampling network
80	384135	05113600	Long Creek near Noonan, N. Dak.	48.981	-103.076	1,790	09010001	High-low
81	--	05113700	West Branch Short Creek near Columbus, N. Dak.	48.968	-102.851	167	09010001	Other
82	--	05114000	Souris River near Sherwood, N. Dak.	48.990	-101.958	8,940	09010001	Other
83	380100	05116000	Souris River near Foxholm, N. Dak.	48.372	-101.505	9,470	09010001	High-low/other
84	380021	05116500	Des Lacs River at Foxholm, N. Dak.	48.371	-101.570	939	09010002	Ambient/high-low
85	380161	05117500	Souris River above Minot, N. Dak.	48.246	-101.371	10,600	09010001	Ambient/other
86	--	05119410	Bonnes Creek near Velva, N. Dak.	48.058	-100.950	53	09010001	Other
87	380095	05120000	Souris River near Verendrye, N. Dak.	48.160	-100.729	11,300	09010003	Ambient/other
88	384107	05120500	Wintering River near Karlsruhe, N. Dak.	48.138	-100.539	705	09010003	High-low
89	380094	05122000	Souris River near Bantry, N. Dak.	48.506	-100.434	12,300	09010003	High-low
90	384132	05123400	Willow Creek near Willow City, N. Dak.	48.589	-100.442	1,160	09010004	High-low
91	--	05123500	Stone Creek near Kramer, N. Dak.	48.678	-100.711	168	09010003	Other
92	384133	05123510	Deep River near Upham, N. Dak.	48.584	-100.862	975	09010005	High-low
93	--	05123600	Egg Creek near Granville, N. Dak.	48.355	-100.822	289	09010005	Other
94	--	05123700	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	48.386	-100.767	534	09010005	Other
95	--	05123750	Cut Bank Creek at Upham, N. Dak.	48.575	-100.744	722	09010005	Other
96	--	05123760	Deep River below Cut Bank Creek near Upham, N. Dak.	48.604	-100.795	--	09010005	Other
97	--	05123900	Boundary Creek near Landa, N. Dak.	48.813	-100.863	230	09010003	Other
98	380090	05124000	Souris River near Westhope, N. Dak.	48.996	-100.958	16,900	09010003	Other
99	--	06329597	Charbonneau Creek near Charbonneau, N. Dak.	47.851	-103.794	149	10100004	Other
100	--	06330000	Missouri River near Williston, N. Dak.	48.108	-103.714	164,500	10110101	Other
101	380054	06331000	Little Muddy River below Cow Creek near Williston, N. Dak.	48.284	-103.573	875	10110102	High-low
102	--	06331570	Stony Creek near Williston, N. Dak.	48.154	-103.574	146	10110101	Other
103	--	06331680	Tobacco Garden Creek near Watford City, N. Dak.	47.993	-103.166	135	10110101	Other
104	--	06331850	Beaver Creek near Ray, N. Dak.	48.181	-103.024	102	10110101	Other
105	--	06332000	White Earth River at White Earth, N. Dak.	48.376	-102.767	780	10110101	Other
106	--	06332515	Bear Den Creek near Mandaree, N. Dak.	47.787	-102.768	74	10110101	High-low
107	--	06332520	Shell Creek near Parshall, N. Dak.	48.053	-102.136	465	10110101	Other

10 Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970–2008

Table 1. Selected stream water-quality sites for North Dakota from 1970 through 2008.—Continued

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Map ID number	USEPA STORET site ID number	USGS site ID number	Site name	Latitude, decimal degrees	Longitude, decimal degrees	Drainage area, square miles	Major river basin (8-digit HUC)	Sampling network
108	--	06332523	East Fork Shell Creek near Parshall, N. Dak.	47.949	-102.214	360	10110101	High-low
109	--	06332770	Deepwater Creek near Mandaree, N. Dak.	47.738	-102.107	220	10110101	High-low
110	385031	06335500	Little Missouri River at Marmarth, N. Dak.	46.298	-103.918	4,640	10110203	High-low
111	--	06335750	Deep Creek near Amidon, N. Dak.	46.577	-103.557	250	10110203	Other
112	380022	06336000	Little Missouri River at Medora, N. Dak.	46.919	-103.528	6,190	10110203	Ambient/ high-low
113	385030	06336600	Beaver Creek near Trotters, N. Dak.	47.163	-103.992	616	10110204	High-low
114	380059	06337000	Little Missouri River near Watford City, N. Dak.	47.596	-103.264	8,310	10110205	Ambient/ high-low
115	--	06338490	Missouri River at Garrison Dam, N. Dak.	47.502	-101.431	181,400	10110101	Other
116	--	06339100	Knife River at Manning, N. Dak.	47.236	-102.769	205	10130201	High-low
117	--	06339180	Stray Creek near Manning, N. Dak.	47.213	-102.623	30	10130201	Other
118	--	06339300	Knife River at Marshall, N. Dak.	47.138	-102.333	722	10130201	Other
119	--	06339490	Elm Creek near Golden Valley, N. Dak.	47.107	-102.051	82	10130201	Other
120	384131	06339500	Knife River near Golden Valley, N. Dak.	47.154	-102.059	1,230	10130201	Ambient/ high-low
121	--	06339550	Coyote Creek near Zap, N. Dak.	47.199	-101.912	65	10130201	Other
122	--	06339560	Brush Creek near Beulah, N. Dak.	47.179	-101.785	24	10130201	Other
123	380118	06339800	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	47.343	-102.618	116	10130201	Other
124	--	06339900	Spring Creek near Halliday, N. Dak.	47.366	-102.376	260	10130201	Other
125	380060	06340000	Spring Creek at Zap, N. Dak.	47.286	-101.925	549	10130201	Ambient/ high-low
126	--	06340200	West Branch Otter Creek near Beulah, N. Dak.	47.135	-101.660	27	10130201	Other
127	380087	06340500	Knife River at Hazen, N. Dak.	47.285	-101.622	2,240	10130201	Ambient/ high-low
128	--	06340520	Antelope Creek above Hazen, N. Dak.	47.335	-101.695	47	10130201	Other
129	--	06340528	West Branch Antelope Creek No. 4 near Zap, N. Dak.	47.356	-101.854	8	10130201	Other
130	--	06340540	West Branch Antelope Creek near Hazen, N. Dak.	47.317	-101.691	38	10130201	Other
131	--	06340580	Coal Creek near Stanton, N. Dak.	47.334	-101.527	16	10130201	Other
132	--	06340780	Alderin Creek near Fort Clark, N. Dak.	47.269	-101.309	22	10130101	Other
133	--	06340905	Coal Lake Coulee near Hensler, N. Dak.	47.303	-101.131	71	10130101	Other
134	--	06340930	Buffalo Creek near Washburn, N. Dak.	47.303	-101.089	57	10130101	Other

Table 1. Selected stream water-quality sites for North Dakota from 1970 through 2008.—Continued

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Map ID number	USEPA STORET site ID number	USGS site ID number	Site name	Latitude, decimal degrees	Longitude, decimal degrees	Drainage area, square miles	Major river basin (8-digit HUC)	Sampling network
135	--	06341410	Turtle Creek above Washburn, N. Dak.	47.385	-100.912	350	10130101	Other
136	--	06341800	Painted Woods Creek near Wilton, N. Dak.	47.275	-100.792	427	10130101	Other
137	--	06342040	Square Butte Creek near Hannover, N. Dak.	47.135	-101.425	17	10130101	Other
138	--	06342200	Square Butte Creek above Nelson Lake near Center N. Dak.	47.102	-101.256	76	10130101	Other
139	--	06342230	Hagel Creek near Center, N. Dak.	47.066	-101.236	46	10130101	Other
140	380103	06342260	Square Butte Creek below Center, N. Dak.	47.058	-101.195	146	10130101	High-low
141	--	06342450	Burnt Creek near Bismarck, N. Dak.	46.915	-100.813	108	10130101	High-low
142	380028	06342500	Missouri River at Bismarck, N. Dak.	46.814	-100.821	186,400	10130101	High-low
143	--	06342900	South Branch Heart River near South Heart, N. Dak.	46.840	-103.020	132	10130202	Other
144	--	06342970	North Creek near South Heart, N. Dak.	46.896	-102.999	41	10130202	Other
145	--	06343000	Heart River near South Heart, N. Dak.	46.866	-102.948	311	10130202	Other
146	380062	06344300	Heart River at Dickinson, N. Dak.	46.867	-102.735	440	10130202	Other
147	--	06344600	Green River near New Hradec, N. Dak.	47.028	-103.053	152	10130202	High-low
148	380063	06345000	Green River near Gladstone, N. Dak.	46.894	-102.624	356	10130202	Other
149	380160	06345500	Heart River near Richardton, N. Dak.	46.746	-102.308	1,240	10130202	Ambient/ high-low
150	--	06345780	Heart River above Lake Tschida near Glen Ullin, N. Dak.	46.657	-102.079	1,530	10130202	High-low
151	--	06347000	Antelope Creek near Carson, N. Dak.	46.545	-101.645	221	10130203	High-low
152	380065	06347500	Big Muddy Creek near Almont, N. Dak.	46.694	-101.467	456	10130203	High-low
153	--	06348000	Heart River near Lark, N. Dak.	46.610	-101.382	2,750	10130203	Other
154	--	06348300	Heart River at Stark Bridge near Judson, N. Dak.	46.703	-101.214	2,930	10130203	High-low
155	--	06348500	Sweetbriar Creek near Judson, N. Dak.	46.851	-101.253	157	10130203	High-low
156	380151	06349000	Heart River near Mandan, N. Dak.	46.834	-100.974	3,310	10130203	Ambient/ high-low
157	--	06349215	Long Lake Creek above Long Lake near Moffit, N. Dak.	46.633	-100.241	280	10130103	Other
158	380057	06349500	Apple Creek near Menoken, N. Dak.	46.794	-100.657	1,680	10130103	High-low
159	--	06349700	Missouri River near Schmidt, N. Dak.	46.656	-100.738	191,700	10130102	Other
160	385130	06349900	Cannonball River at New England, N. Dak.	46.543	-102.888	285	10130204	Other

12 Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970–2008

Table 1. Selected stream water-quality sites for North Dakota from 1970 through 2008.—Continued

[ID, identification; USEPA, Environment Protection Agency; STORET, STORage and RETrieval; USGS, U.S. Geological Survey; HUC, hydrologic unit code; --, not available; Ambient, North Dakota Department of Health Ambient Water-Quality Network; High-Low, North Dakota State Water Commission High-Low Flow Sampling Program; other, sampled as part of various other programs]

Map ID number	USEPA STORET site ID number	USGS site ID number	Site name	Latitude, decimal degrees	Longitude, decimal degrees	Drainage area, square miles	Major river basin (8-digit HUC)	Sampling network
161	--	06349930	Coal Bank Creek near Havelock, N. Dak.	46.464	-102.739	70	10130204	Other
162	--	06350000	Cannonball River at Regent, N. Dak.	46.427	-102.551	580	10130204	High-low
163	--	06351000	Cannonball River below Bentley, N. Dak.	46.358	-102.042	1,140	10130204	Other
164	380105	06351200	Cannonball River near Raleigh, N. Dak.	46.127	-101.333	1,640	10130204	Ambient/high-low
165	--	06351680	White Butte Fork Cedar Creek near Scranton, N. Dak.	46.322	-102.996	43	10130205	Other
166	--	06352000	Cedar Creek near Haynes, N. Dak.	46.155	-102.475	553	10130205	High-low
167	--	06352400	Timber Creek near Bentley, N. Dak.	46.101	-101.957	100	10130205	Other
168	--	06352500	Cedar Creek near Pretty Rock, N. Dak.	46.032	-101.832	1,340	10130205	Other
169	380077	06353000	Cedar Creek near Raleigh, N. Dak.	46.092	-101.333	1,750	10130205	Ambient/high-low
170	380067	06354000	Cannonball River at Breien, N. Dak.	46.376	-100.934	4,100	10130206	Ambient/high-low
171	380058	06354500	Beaver Creek near Linton, N. Dak.	46.258	-100.233	717	10130104	Other
172	--	06354580	Beaver Creek below Linton, N. Dak.	46.269	-100.251	765	10130104	High-low
173	--	06354815	Porcupine Creek near Fort Yates, N. Dak.	46.193	-100.751	220	10130102	Other
174	--	06355310	Buffalo Creek Tributary near Gascoyne, N. Dak.	46.111	-103.039	16	10130301	Other
175	384210	06467600	James River near Manfred, N. Dak.	47.644	-99.828	253	10160001	Other
176	384130	06468170	James River near Grace City, N. Dak.	47.558	-98.863	1,060	10160001	Ambient/high-low
177	384211	06468250	James River above Arrowwood Lake near Kensal, N. Dak.	47.400	-98.797	1,200	10160001	Other
178	--	06468300	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	47.401	-98.829	188	10160001	Other
179	--	06468500	James River near Pingree, N. Dak.	47.142	-98.783	1,670	10160001	Other
180	380152	06469400	Pipestem Creek near Pingree, N. Dak.	47.168	-98.969	700	10160002	High-low
181	380015	06469500	Pipestem Creek near Buchanan, N. Dak.	47.066	-98.919	758	10160002	Other
182	380013	06470000	James River at Jamestown, N. Dak.	46.890	-98.682	2,820	10160003	Ambient/high-low
183	380012	06470500	James River at Lamoure, N. Dak.	46.356	-98.304	4,390	10160003	Ambient/high-low
184	384215	06470800	Bear Creek near Oakes, N. Dak.	46.225	-98.071	357	10160003	High-low
185	380074	06470830	James River at Oakes, N. Dak.	46.139	-98.115	5,320	10160003	Other
186	384217	06470878	James River at N. Dak.-S. Dak. state line	45.936	-98.174	5,480	10160003	High-low

Table 2. Water-quality constituents and measurements selected for sites in North Dakota from 1970 through 2008.

[USGS, U.S. Geological Survey; NDDH, North Dakota Department of Health; *, less than 5 values in data set, values were excluded; µg/L, micrograms per liter; mg/L, milligrams per liter; --, not available; µS/cm, microsiemens per centimeter; C, Celsius]

Constituent	Analyzing agency	Original censoring levels	Recensored level	Units
Major cations and anions				
Boron	USGS, NDDH	1, 10, 20, 50, 110*	50	µg/L
Sodium	USGS, NDDH	3	3	mg/L
Magnesium	USGS, NDDH	1.0	1.0	mg/L
Potassium	USGS, NDDH	0.1, 1.0	1.0	mg/L
Calcium	USGS, NDDH	0.01	.01	mg/L
Manganese, total	USGS	0.04	.04	mg/L
Manganese, dissolved	USGS, NDDH	0.001, 0.002, 0.003, 0.004, 0.01, 0.02, 0.04	.04	mg/L
Chloride	USGS, NDDH	0.01, 0.1, 1.0, 4.0, 19.0*	4.0	mg/L
Sulfate	USGS, NDDH	0.1, 1, 4	4	mg/L
Total dissolved solids	USGS, NDDH	1	1	mg/L
Fluoride	USGS	0.01, 0.05, 0.10, 0.17, 0.7, 1.0	1.0	mg/L
Silica	USGS	0.01, 0.1, 0.2, 0.5, 1.0, 1.2*, 1.9*, 2.0*	1.0	mg/L
Carbonate	NDDH	1.0	1.0	mg/L
Bicarbonate	NDDH	--	none	mg/L
Alkalinity, total, as calcium carbonate	NDDH	--	none	mg/L
Alkalinity, incremental titration, dissolved as calcium carbonate	USGS	--	none	mg/L
Acid neutralizing capacity, total	USGS	--	none	mg/L
Hardness as calcium carbonate	NDDH	--	none	mg/L
Sodium adsorption ratio	NDDH	--	none	--
Nutrients				
Ammonia, dissolved and total as nitrogen	USGS, NDDH	0.002, 0.01, 0.015, 0.02, 0.03, 0.04, 0.041*, 0.06*, 0.10*, 0.87*	.04	mg/L
Nitrate + Nitrite dissolved and total as nitrogen	USGS, NDDH	0.01, 0.02, 0.03, 0.04, 0.047, 0.05, 0.06, 0.09, 0.10, 0.15*	.10	mg/L
Ammonia plus organic nitrogen, dissolved as nitrogen	USGS, NDDH	0.001, 0.02, 0.08, 0.10, 0.20	.20	mg/L
Total nitrogen, dissolved as nitrogen	USGS, NDDH	0.02	0.02	mg/L
Total nitrogen as nitrogen	USGS, NDDH	0.02	0.02	mg/L
Phosphorus, dissolved as phosphorus	USGS, NDDH	0.004, 0.006, 0.01, 0.038*, 0.04*, 0.05*, 0.06*, 0.20*	.01	mg/L
Phosphorus, total as phosphorus	USGS, NDDH	0.001, 0.004, 0.008, 0.01, 0.018*, 0.02*	.01	mg/L
Orthophosphate, dissolved as phosphorus	USGS	0.001, 0.002, 0.003, 0.004, 0.005, 0.006, 0.007, 0.009, 0.01, 0.018, 0.02	.02	mg/L
Organic carbon, total as carbon	USGS, NDDH	none	none	mg/L
Organic carbon, dissolved as carbon	USGS, NDDH	none	none	mg/L
Trace metals (1993–2008)				
Aluminum, total	USGS, NDDH	10, 28, 50, 100	100	µg/L
Arsenic, total	USGS, NDDH	1.0, 1.9*, 2.6*, 5.0*	1.0	µg/L
Arsenic, dissolved	USGS, NDDH	1.0, 2.0*, 4.0*, 15.0*	1.0	µg/L
Barium, total	USGS, NDDH	1, 100	100	µg/L

Table 2. Water-quality constituents and measurements selected for sites in North Dakota from 1970 through 2008.—Continued

[USGS, U.S. Geological Survey; NDDH, North Dakota Department of Health; *, less than 5 values in data set, values were excluded; µg/L, micrograms per liter; mg/L, milligrams per liter; --, not available; µS/cm, microsiemens per centimeter; C, Celsius]

Constituent	Analyzing agency	Original censoring levels	Recensored level	Units
Trace metals (1993–2008)—Continued				
Chromium, total	USGS, NDDH	0.4, 0.6, 0.8, 1, 1.2, 2*, 20*	1.2	µg/L
Copper, dissolved	USGS, NDDH	1.0, 2.0*, 3.0*, 10.0*, 20.0*, 25.0*	1.0	µg/L
Copper, total	USGS	1.0, 1.2*, 2.0*, 3.0*, 14.0*, 20.0*	1.0	µg/L
Iron, total	USGS, NDDH	0.01, 1, 7, 10, 16*	10	µg/L
Iron, dissolved	USGS	1, 3, 6, 6.4, 7, 8, 9, 10, 25, 30, 50	50	µg/L
Lead, total	USGS, NDDH	1.0, 2.0*, 30.0*, 50.0*, 200.0*	1.0	µg/L
Lithium, dissolved	USGS	1, 10	10	µg/L
Molybdenum, total	USGS	1.0, 1.5*, 2.0*	1.0	µg/L
Nickel, total	USGS, NDDH	1.0, 2.0*, 5.0*, 7.0*, 20.0*, 25.0*, 50.0*	1.0	µg/L
Nickel, dissolved	USGS, NDDH	1.0, 2.0, 5.0, 7.0, 10.0	10.0	µg/L
Selenium, total	USGS, NDDH	0.2, 0.4, 1.0, 2.0, 2.6, 3.0*, 14.0*	2.6	µg/L
Selenium, dissolved	USGS, NDDH	0.08, 0.1, 0.3, 0.4, 0.5, 1.0, 2.0, 2.4, 2.6, 4*, 10*, 25*, 100*	2.6	µg/L
Strontium, dissolved	USGS	1, 10*	1	µg/L
Zinc, total	NDDH	1, 2, 10, 25, 31, 40	40	µg/L
Other constituents or measurements				
Laboratory specific conductivity	USGS, NDDH	--	none	µS/cm at 25 degrees C
Field specific conductivity	USGS, NDDH	--	none	µS/cm at 25 degrees C
Field pH	USGS, NDDH	--	none	standard units
Laboratory pH	USGS, NDDH	--	none	standard units
Water temperature	USGS, NDDH	--	none	degrees C
Dissolved oxygen	USGS, NDDH	--	none	mg/L
Total suspended solids	USGS, NDDH	10	10	mg/L
Suspended-sediment concentration	USGS	--	none	mg/L

temperature, and specific conductivity (table 2). For two of the nutrients (ammonia and nitrate plus nitrite), dissolved and total concentrations were not substantially different and thus were combined to form a “dissolved and total” constituent concentration. The combined concentrations provided a more complete sampling record for analyzing loads and concentration trends than either the separate dissolved or total concentrations. On sampling dates for which both the dissolved and total concentrations were available, the dissolved concentration was used for the combined data.

Descriptive Statistics

Descriptive statistics (sample size, period of record, minimum, maximum, and median) were computed for each constituent and site included in the study (appendix tables 1–1 through 1–5). Median concentrations of selected water-quality constituents were mapped using Geographic Information Systems (GIS) to indicate the spatial distribution of constituent concentrations across the State. Median concentrations were determined for the period of record from 1970 through 2008 (1993 through 2008 for trace metals) and for the spring (March through June), summer (July through October), and winter (November through February) seasons at each sampling location. Median values were calculated with no consideration

for period of record, sampling dates, sampling times, or number of samples taken at each sampling location.

Load and Yield Estimation

Load and yield estimates for water-quality constituents were calculated for selected sites from constituent concentrations and streamflows measured at each site. Constituent load (L) is a function of the volumetric rate of water passing a point in the stream (Q) and the constituent concentration within the water (C). Constituent yield is a function of constituent load and the drainage area contributing to flow at the site. Sites and constituents used for the load and yield estimation were chosen on the basis of data availability and the importance of the constituent. Based on the availability of water-quality and streamflow data, 34 sites were determined to have adequate data (minimum of 20 samples) for the estimation of loads and yields for eight constituents.

Regression methods were used to estimate constituent loads. These methods use natural logarithm (\ln)-transformed relations between Q and C to estimate daily C (or L) for a particular constituent at a site (Cohn and others, 1989; Cohn and others, 1992; Cohn, 1995). The regression method can account for non-normal data distributions, seasonal and long-term cycles, censored data, biases associated with using logarithmic transformations, and serial correlations of the residuals (Cohn, 1995). Regression methods use discrete water-quality samples often collected over several years and a daily streamflow hydrograph. A regression model for estimating constituent load can be expressed as:

$$\ln(L) = \beta_0 + \beta_1 \ln(Q_d) + \beta_2 T + \beta_3 \sin(2\pi T) + \beta_4 \cos(2\pi T) + E \quad (1)$$

where

$\ln()$	represents the natural logarithm function;
$\beta_0, \beta_1, \beta_2, \beta_3,$ and β_4	are the coefficients of the model;
Q_d	is the daily mean discharge, in cubic feet per second;
T	is decimal time, in years; and
E	is the model error.

In this model, relations between discharge and load are identified by the β_1 coefficient, temporal trends are identified by β_2 , and seasonal effects are identified by β_3 and β_4 . Transforming the results of the model from logarithmic space to linear space was accomplished using an adjusted maximum likelihood estimator (AMLE) (Cohn and others, 1992). The AMLE method can also handle censored values.

Best-fit load models for all constituents at each of the 34 sites were determined using the S-LOADEST computer program (Runkel and others, 2004). Best-fit models were selected based on residual plots, significance of included variables, results of normality tests, and coefficient of determination of the regression. For example, if the seasonality variables (β_3 and β_4) were determined to be significant, they were included

in the model, if not, they were not used in the model. Some models may have only included a significant relation between load and discharge (β_1). Models were not determined if the calibration dataset was made up of more than 80 percent censored values. No minimum criteria for model performance were used; therefore, best-fit models of the group were selected even if the model was poor.

Normalized annual loads (tons per year) were calculated by creating a “reference” discharge period of 30 years of data around the median year of the model calibration dataset and using the average of the daily flows for the reference period to create a normalized set of daily flows (one for each day of the year). For each site, the calibration dataset, including all constituents, was reviewed to find the data range across time. The median of this range was used to select discharge data for that site, 15 years prior to the median date and 15 years after the median date was used. From this 30-year discharge record, the average of the mean daily discharge was calculated for each day of the year. These average daily values were grouped into a normalized discharge dataset spanning a full year, January 1 through December 31. This normalized discharge dataset for each site was used to calculate the normalized annual load from the best-fit model for each constituent. Normalized annual yields (pounds per year per square mile) for each constituent at each site were calculated by dividing the normalized annual loads by the drainage area (square miles) contributing to flow at the sampling site. Sites 45 and 112 (table 1) only had 15 and 16 years of streamflow data during the 30-year period, respectively; however, the sites were still included and the average flow data was calculated from the data available. Site 5 (Red River of the North below Wahpeton, N. Dak.) had no discharge record; however, discharge data were available at site 2, just upstream from site 5 (fig. 1), and was used in the normalized load calculation for site 5.

Trend Analysis

Sites and constituents used for the water-quality trend analysis were chosen on the basis of data availability and the importance of the constituent to aquatic health in the State. Ten sites were selected for trend analysis for sulfate, total dissolved solids (TDS), nitrate plus nitrite, and total phosphorus. The period of record chosen for the analysis was the 34-year period from 1975 through 2008. Concentration data for 1970 to 1974 were not used because the time-series model used in the trend analysis required 5 years of flow data prior to the first concentration sample.

A statistical time-series model for streamflow and constituent concentration developed by the USGS (Vecchia, 2000) was used in this report to detect water-quality trends. Other applications of the model include Jones and Armstrong (2001), Trench and Vecchia (2002), Vecchia (2003), and Vecchia (2005). Details on the theory and parameter estimation for the model are described in Vecchia (2005).

In the time-series model, concentration data were partitioned into several components according to equation 2:

$$\log(C) = M + ANN + SEAS + TREND + HFV \quad (2)$$

where

\log	denotes the base-10 logarithm;
C	is the concentration, in milligrams per liter;
M	is the long-term mean of the log-transformed concentration, as the base-10 logarithm of milligrams per liter;
ANN	is the annual concentration anomaly (dimensionless);
$SEAS$	is the seasonal concentration anomaly (dimensionless);
$TREND$	is the concentration trend (dimensionless); and
HFV	is the high-frequency variability of the concentration (dimensionless).

The procedure used to partition the data is described in detail in Vecchia (2005). In equation 2, the annual concentration anomaly (ANN), seasonal concentration anomaly ($SEAS$), and high-frequency variability (HFV) terms represent natural variability in concentration for different time scales. ANN is an estimate of the inter-annual variability in concentration that can be attributed to long-term variability in streamflow. Extended droughts and wet periods can change the chemical composition of streamflow by changing the degree of contact between surface runoff and soil particles, and changing the relative composition of runoff among groundwater, overland flow, and subsurface flow (Vecchia, 2005).

$SEAS$ is an estimate of the seasonal variability in concentration that can be attributed to seasonal variability in streamflow or to factors other than variability in streamflow. For example, the seasonal snow-accumulation and snowmelt cycle causes seasonal fluctuations in streamflow and water quality. Seasonal temperature differences also may affect the rate of chemical processes, such as reduction of ammonia, and thus cause seasonal differences in nutrient concentrations. Seasonality also may occur in the sources of chemical constituents (for example, fertilizer application or roadway deicing), independent of streamflow conditions (Vecchia, 2005).

$TREND$ is an estimate of the long-term systematic changes in concentration that are unrelated to long-term variability in streamflow. A statistically significant trend might indicate changes in human activities (such as land use, fertilizer application, and sewage treatment) that change the amount of a particular chemical constituent available for solution or suspension in surface water, or that change the rate at which the constituent reaches the surface water. For this report, a trend was defined as a statistically significant increase or decrease in median concentration for a period of 10 years or more. The methods used to detect the trends and evaluate their statistical significance are described in Vecchia (2005).

HFV is an estimate of the variability in concentration for time scales that are smaller than the seasonal time scale (time

scales of several days to several weeks). Thus, high-frequency variability is the variability that remains after the removal of seasonal and annual anomalies and trends. Day-to-day changes in meteorological conditions may cause high-frequency variability in streamflow and concentration. The high-frequency variability depends on a time-series model, called a periodic autoregressive moving average model, that accounts for the presence of serial correlation among concentrations (for example, the tendency for high or low values to persist for several days to several weeks before returning to normal levels) (Vecchia, 2005).

Two types of time-series plots are used in this report to illustrate long-term changes in concentration. The first type shows the measured log-transformed concentrations ($\log(C)$ in eq. 2) as well as the fitted annual median concentrations obtained by adding together the mean, annual anomaly, and trend in equation 3:

$$FAMC = M + ANN + TREND \quad (3)$$

where

$FAMC$	is the fitted annual median concentration, as the base-10 logarithm of milligrams per liter.
--------	--

Changes in $FAMC$ through time indicate long-term (inter-annual) changes in median concentration resulting from both streamflow-related variability and trend.

The second type of time-series plot illustrates the long-term changes in median concentration that are due just to the trend. Log-transformed concentrations that have both the seasonal and annual anomalies removed are referred to in this report as standardized concentrations. Using equation 2, the standardized concentration is defined as:

$$SC = \log(C) - ANN - SEAS = M + TREND + HFV \quad (4)$$

where

SC	is the standardized concentration, as the base-10 logarithm of milligrams per liter.
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The standardized concentrations defined by equation 4 are analogous to the flow-adjusted concentrations defined in previous publications as the residuals from a regression model that relates concentration to concurrent daily streamflow (Hirsch and others, 1982); however, the approach used for this report generally is more effective than a regression-based approach for removing streamflow-related variability (Vecchia, 2005). Time series plots showing the standardized concentrations along with the fitted trend ($M + TREND$) illustrate long-term changes in median concentration that are due to factors other than natural flow-related variability.

Sample Network Design

Design of an effective State-wide water-quality sampling network requires both a spatial component (where to sample) and a temporal component (how often to sample). An efficient design is one that accomplishes the objectives of the sampling programs with a minimum of spatial and temporal redundancy. For this study, three sampling program objectives were considered: characterizing spatial water-quality variability, detecting temporal trends in water quality, and estimating constituent loads. To simplify the design analysis, these three objectives were considered separately. Also, to simplify the analysis, the network design was evaluated using four key water-quality constituents: dissolved sulfate, TDS, nitrate plus nitrite, and total phosphorus. Although sampling designs were not explicitly evaluated for other constituents, it was expected that an efficient network for these constituents would be relatively efficient for other constituents as well.

To evaluate the first objective (characterizing spatial water-quality variability), all 186 sites (table 1) were used, regardless of whether a site was an active or discontinued sampling site. Sites were nested in downstream to upstream order. For each downstream/upstream pair and each water-quality sample for the downstream site, a concurrent water-quality sample for the upstream site was defined as the closest upstream sample (in time) to the downstream sample such that the upstream sample was taken within 1 week before or after the downstream sample. If there was no upstream sample taken within 1 week of the downstream sample, the concurrent upstream sample was defined as missing. Only downstream/upstream pairs with at least 10 concurrent samples defined in this manner were included. The average absolute difference between the paired downstream and upstream concentrations, expressed as a percent of the average downstream concentration, was related to the average absolute difference in daily flow between the downstream and upstream pairs, expressed as a percent of the average downstream flow. Relating the concentration differences to the flow differences provided information on redundancy of concentration values as the intervening flow between the downstream and upstream sites became small in relation to the downstream site. For example, if the upstream concentration had a 90 percent chance of being within 20 percent, on average, of the downstream concentration whenever the upstream flow was at least 80 percent, on average, of the downstream flow, water-quality samples at the upstream might be considered to be redundant given the downstream water-quality data.

To evaluate the second sampling objective (detecting temporal trends), the time-series model, described in the previous section for evaluating concentration trends, was used to evaluate the sensitivity of various temporal sampling designs for monitoring future concentration trends. The design methodology is described in Vecchia (2005). Temporal designs (specified by the number and timing of water-quality samples within each year) were evaluated with respect to their sensitivity to detect a trend within each of three seasons, a spring

high-flow season (March–June), a summer low-flow season (July–October), and a winter low-flow season (November–February). An efficient design is one that maximizes the sensitivity to detect trends in each season with the fewest number of samples. Sensitivity is measured by the characteristic trend, which is defined as the percent change in concentration that has an 80-percent chance of being detected after 5 years of sampling. An efficient design is one that has low characteristic trends (high sensitivity) for all of the constituents and all of the seasons subject to budgetary constraints.

To evaluate the third sampling objective (estimating constituent loads), the efficient designs described previously for detecting concentration trends were evaluated with respect to their ability to estimate loads. The accuracy of estimated loads is dependent on both flow and concentration, and adding extra samples during times of year when most of the load is expected to be transported can result in substantial improvements in the accuracy of estimated loads. Methods described by Gilroy and others (1990) were used to evaluate efficiency of the sampling designs for estimating loads during 5-year periods (the objective of the load component of the NDDH ambient program) and to determine if and when extra samples would be beneficial for estimating loads.

Median Concentrations of Selected Constituents

Median concentrations of water-quality constituents at sampling locations in North Dakota were determined for the period of record and for the spring (March through June), summer (July through October), and winter (November through February) seasons at each sampling location. Median values were calculated with no consideration for period of record, sampling dates, sampling times, or number of samples taken at each sampling location.

Major Ions and Total Dissolved Solids

Many water-quality samples were analyzed for several major ions included in this report; however, only the information on the concentrations of sulfate, chloride, and TDS are presented in this section. Period of record summary statistics for all of the constituents analyzed and seasonal medians for selected constituents in this report are presented in appendix 1 (tables 1–1 and 1–5).

Sulfur and chloride are naturally present in soils across North Dakota. Sulfur is readily oxidized to produce sulfate ions that are highly soluble (Hem, 1985). Sulfate in streams may be affected by land-use changes that can increase or decrease the exposure of naturally occurring sulfur to surface runoff. Human sources of sulfate, such as emissions from burning fossil fuels and wastewater discharge from mining and industrial operations, also may affect sulfate concentrations in

streams. Chloride also is highly soluble, but generally occurs in much smaller amounts in soils compared to sulfur. In contrast to other ions, most of the chloride content in streams is in the form of ionized chloride (Hem, 1992). Human activities such as roadway and driveway de-icing and industrial and municipal wastewater discharge also may introduce chloride to streams.

Dissolved solids in streams are composed of major ions (such as calcium, magnesium, sodium, potassium, sulfate, and chloride) and many other constituents that are present in small quantities. TDS concentrations may be affected by different constituents in different locations in the State.

In general, median sulfate concentrations tended to be greater in the southwest part of the State compared to the northeast part of the State in the Red River of the North Basin (fig. 2). Seasonal variations indicated lower median concentrations in samples collected during spring and higher concentrations from samples collected during winter at many locations. This seasonal pattern is likely due to the dilution effect of higher streamflows that occur during the spring compared to the lower streamflows that occur during winter. Median sulfate concentrations exceeded the USEPA secondary drinking water regulation of 250 milligrams per liter (mg/L) (U.S. Environmental Protection Agency, 2009) and the North Dakota sulfate numerical standard for class 1 streams of 250 mg/L (30-day arithmetic average; North Dakota Department of Health, 2010) at 86 out of 183 sites in North Dakota (fig. 2). The lowest median sulfate concentrations for the period of record at a sampling site was 20 mg/L at Big Coulee near Fort Totten, N. Dak. (site 16), and the highest median sulfate concentration for the period of record at a sampling site was 2,400 mg/L at Buffalo Creek tributary near Gascoyne, N. Dak. (site 174) (appendix table 1–5).

Median chloride concentrations tended to be lower in the southwest and higher in the northeast parts of the State (fig. 3), nearly the opposite of the pattern seen for median sulfate concentrations (fig. 2). Substantial differences in median chloride concentrations were not evident among samples collected during different seasons. Median chloride concentrations exceeded the North Dakota numerical standard of 175 mg/L (30-day arithmetic average) (North Dakota Department of Health, 2010) at 3 of 184 sites in North Dakota. The lowest median chloride concentrations for the period of record at a sampling site were less than 4.0 mg/L at West Branch Antelope Creek No. 4 near Zap, N. Dak. and Coal Lake Coulee near Hensler, N. Dak. (sites 129 and 133, respectively), and the highest median chloride concentration for the period of record at a sampling site was 446.5 mg/L at the Turtle River at Manvel, N. Dak. (site 58) (appendix table 1–5).

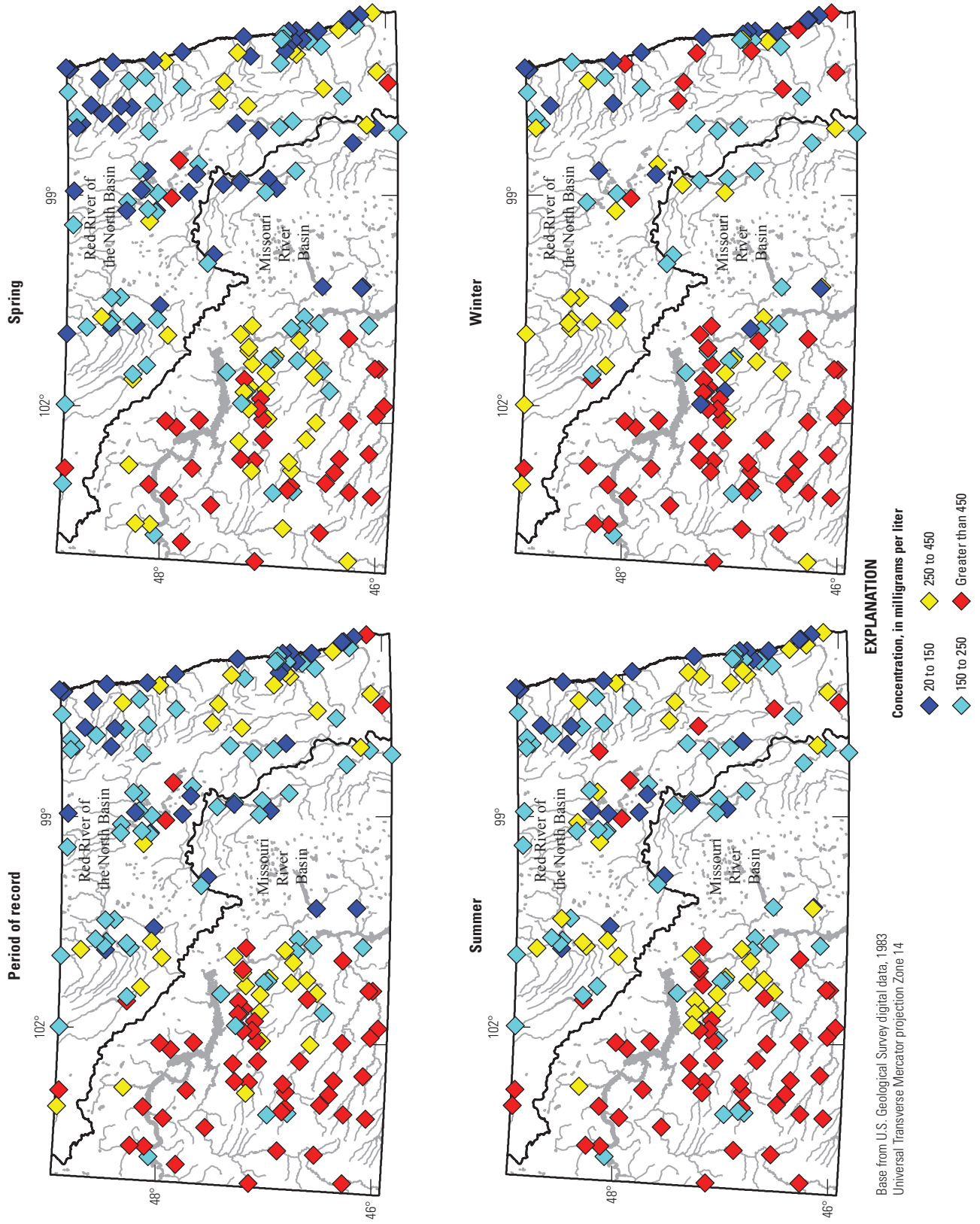
In general, median TDS concentrations tended to be lower for sites in the Red River of the North, Souris, and James River Basins compared to sites in southwest North Dakota (figs. 1 and 4). Like sulfate, median TDS concentrations at many locations tended to be lower in samples collected during spring compared to samples collected during the summer and winter, likely because of the dilution effect

of higher streamflows that occur during the spring compared to the lower streamflows that occur during other seasons. Median TDS concentrations exceeded the USEPA secondary drinking-water regulation for TDS of 500 mg/L (U.S. Environmental Protection Agency, 2009) at 136 out of 184 sites. The lowest median TDS concentration for the period of record at a sampling site was 172 mg/L at the Lower Branch Rush River near Prosper, N. Dak. (site 49), and the highest median TDS concentration for the period of record at a sampling site was 4,270 mg/L at Buffalo Creek tributary near Gascoyne, N. Dak. (site 174) (appendix table 1–5).

Nutrients

Nutrient dynamics are controlled by activities in the basin and processes that occur in the stream. Wastewater-treatment plant discharge can be a major point source of nitrogen (mainly nitrate), phosphorus, and organic material. Septic systems can act as point sources as nutrients migrate through the groundwater system into the stream. The influence of point sources usually is more evident during base-flow conditions in a stream because concentrations are less affected by dilution. Nonpoint sources of nitrogen, phosphorus, and organic carbon mainly are delivered during runoff events as rainfall washes material off the landscape into the stream, resulting in greater concentrations during high-flow conditions. Some nonpoint sources of nutrients include runoff from agricultural areas, where fertilizers are applied or livestock production occurs; runoff from urban areas, where fertilizers are applied to lawns, shrubs, and trees; and from atmospheric deposition of nitrogen. Natural sources of nitrogen and phosphorus include fixation of atmospheric nitrogen by plants and animals, dissolution of phosphorus-bearing rocks or minerals in the soil, and oxidation of organic matter, including soil organic matter and decaying plants and animals (Hem, 1985).

Instream processes also can affect nutrient concentrations (Allan, 1995). Aquatic vegetation, particularly algae, depends on nitrogen and phosphorus for its food supply. Nitrate is the most stable ion of nitrogen over a wide range of conditions and is readily assimilated by algae. Total phosphorus concentrations include inorganic phosphorus (in solution, complexed with iron or other trace elements, or adsorbed to sediment particles) and organic phosphorus. Sources of organic carbon in the water column can include those outside the aquatic system and within the aquatic system. Natural sources of organic carbon outside the aquatic system include soils and plants, and sources within the aquatic system include excretion from actively growing algae or the decomposition of dead algae and macrophytes. Anthropogenic (human influenced) sources of organic carbon include wastewater-treatment discharges, animal waste, and septic systems. Activities that cause land disturbance such as row-crop agriculture, animal grazing, timber harvesting, mining, road construction and maintenance, and urbanization also can result in increased stream concentrations of organic carbon (Allan, 1995).



Base from U.S. Geological Survey digital data, 1983
Universal Transverse Mercator projection Zone 14

Figure 2. Spatial distribution of median sulfate concentrations, in milligrams per liter, for selected stream sites in North Dakota for the period of record, spring (March through June), summer (July through October), and winter (November through February).

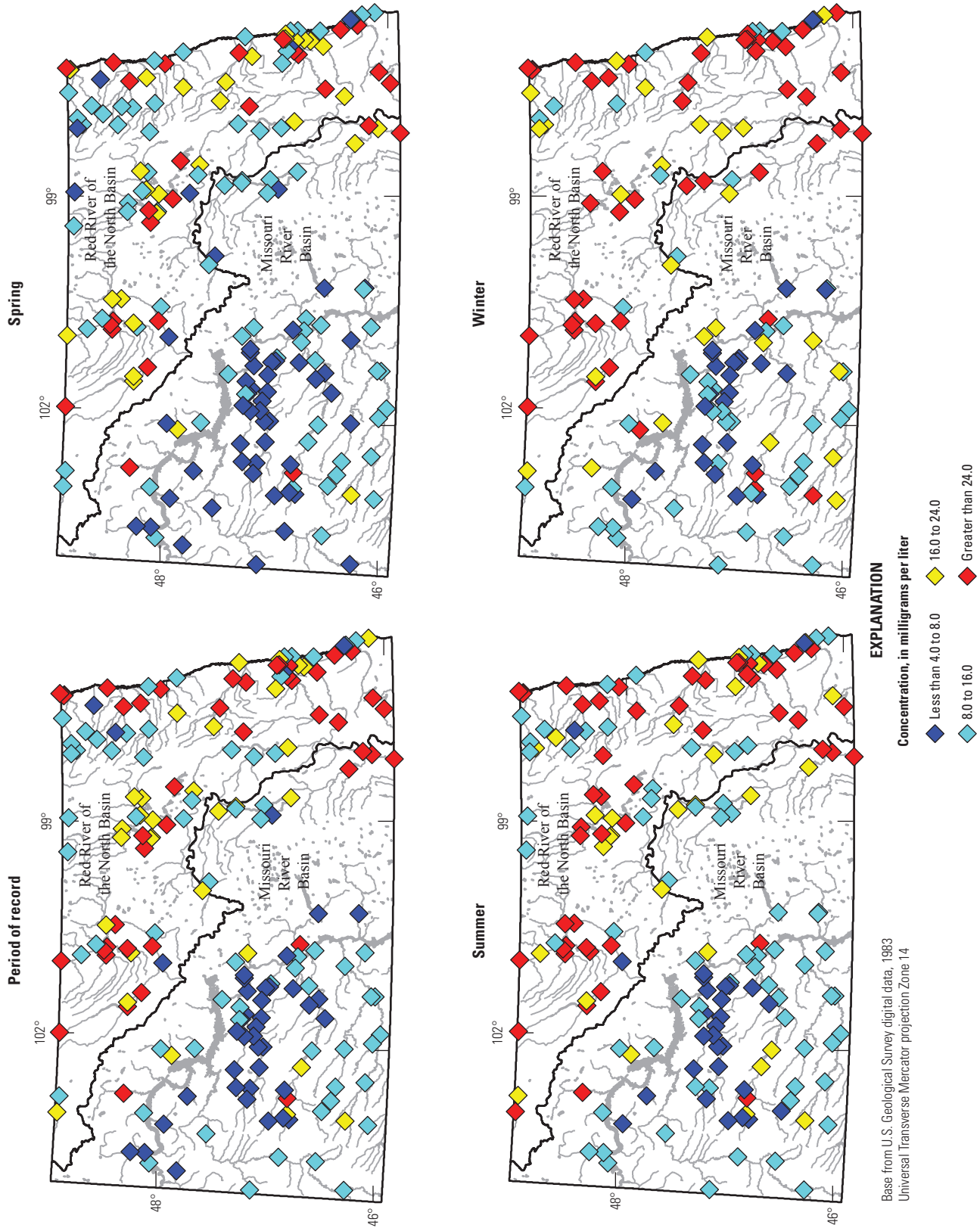


Figure 3. Spatial distribution of median chloride concentrations, in milligrams per liter, for selected stream sites in North Dakota for the period of record, spring (March through June), summer (July through October), and winter (November through February).

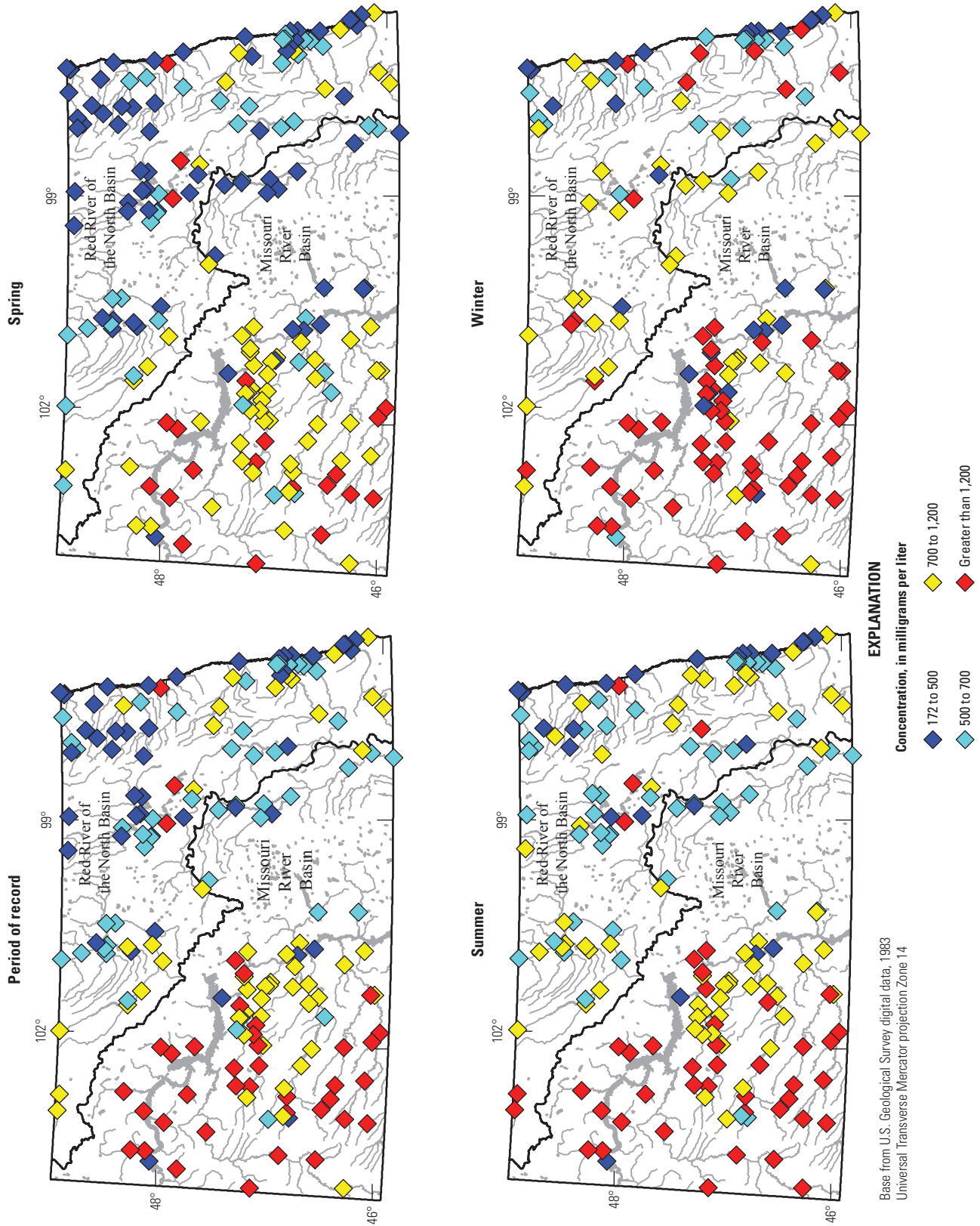


Figure 4. Spatial distribution of median total dissolved solids concentrations, in milligrams per liter, for selected stream sites in North Dakota for the period of record, spring (March through June), summer (July through October), and winter (November through February).

Water-quality samples at selected sites across the State were analyzed for various forms of nitrogen, phosphorus, and carbon. In this section, information describing concentrations of ammonia, nitrate plus nitrite, total nitrogen, dissolved phosphorus, total phosphorus, dissolved organic carbon, and total organic carbon are presented. Period of record summary statistics for all of the constituents analyzed and seasonal medians for selected constituents in this report are presented in appendix 1 (tables 1–2 and 1–5).

In general, overall median ammonia concentrations (total and dissolved) were spatially variable across the State (fig. 5). Seasonally, median ammonia concentrations generally were highest during winter and lowest in summer (fig. 5). No distinct national standards for ammonia exist and North Dakota State standards vary based on water temperature and pH (North Dakota Department of Health, 2010). Median ammonia concentrations for the period of record at all of the sites (139 sites) ranged from less than 0.04 mg/L as nitrogen at 64 sites to 0.59 mg/L as nitrogen at the Square Butte Creek below Center, N. Dak. (site 140) (appendix table 1–5).

The highest overall median nitrate plus nitrite concentrations (total and dissolved) tended to occur in the Red River of the North Basin (fig. 6). This pattern of high concentrations in the Red River of the North Basin particularly was evident during the spring season, and may reflect fertilizer application to row crops and other cropland in that area. This pattern was reversed during the winter season, with the lowest median concentrations occurring in the Red River of the North Basin. No median concentrations exceeded the North Dakota drinking-water standard. In North Dakota, nitrate plus nitrite concentrations cannot exceed 10 mg/L for any waters used as a municipal or domestic drinking-water supply (North Dakota Department of Health, 2010). Median nitrate plus nitrite concentrations for the period of records ranged from less than 0.10 mg/L as nitrogen at 98 out of 150 sites to 1.60 mg/L as nitrogen at Cart Creek at Mountain, N. Dak. (site 66) (appendix table 1–5).

Median dissolved and total phosphorus concentrations across North Dakota generally were greater for the Red, Souris, and James River Basins than river basins in the southwest part of the State (figs. 1, 7, and 8). Median dissolved phosphorus concentrations tended to be similar among the seasons (fig. 7), whereas median total phosphorus concentrations tended to be higher in the summer than other seasons (fig. 8), particularly in the Souris River, Devils Lake, and James River Basins. No water-quality standards have been defined by the USEPA or North Dakota for dissolved or total phosphorus concentrations. Median dissolved phosphorus concentrations for the period of record ranged from less than 0.01 mg/L as phosphorus at 11 out of 128 sites to 0.55 mg/L as phosphorus at Channel A near Penn, N. Dak. (site 30) (appendix table 1–5). Median total phosphorus concentrations for the period of record ranged from less than 0.01 mg/L as phosphorus at the Missouri River at Garrison Dam, N. Dak. (site 115) to 0.51 mg/L as phosphorus at the Elm River near Kelso, N. Dak. (site 51) (appendix table 1–5). The relatively low total

phosphorus at site 115 may be because the site is below a dam. Total phosphorus includes inorganic and organic phosphorus. Inorganic phosphorus can be adsorbed to sediment particles that may be retained in the upstream reservoir by settling and organic phosphorus also may be retained in the upstream reservoir by biological processes (Hem, 1985).

Median dissolved and total organic carbon concentrations tended to be lowest in samples collected at sites located in the eastern part of the State compared with other median concentrations at sites throughout the remainder of the State (figs. 9 and 10). No water-quality standards have been defined by the USEPA or North Dakota for dissolved or total organic carbon concentrations. Median dissolved organic carbon concentrations for the period of record ranged from 3.3 mg/L as carbon at the Missouri River at Garrison Dam, N. Dak. (site 115) to 30.0 mg/L as carbon at Buffalo Creek Tributary near Gascoyne, N. Dak. (site 174) (table 1–5). Median total organic carbon concentrations for the period of record ranged from 4.0 mg/L as carbon at the Missouri River near Schmidt, N. Dak. (site 159) to 24.0 mg/L as carbon at the East Fork Shell Creek near Parshall, N. Dak. (site 108) (appendix table 1–5).

Trace Metals

Trace-metal concentrations generally are much lower than dissolved major ion and nutrient concentrations in streams in North Dakota. Trace metals in streams exist in both dissolved and particulate form. Constituents selected for presentation in this section were chosen dependent on the amount of data available, and included only the total concentration (includes dissolved and particulate concentrations). Analyses for many trace metals were performed on water samples collected from sites across North Dakota from 1993 through 2008, but only information concerning the concentrations of total aluminum, total arsenic, total chromium, total iron, total lead, and total nickel are presented in this section. Period of record summary statistics for all of the constituents analyzed and seasonal medians for selected constituents in this report are presented in appendix 1 (tables 1–3 and 1–5).

Median total aluminum concentrations generally were higher in samples from sites in the southern and eastern parts of the State compared to concentrations in other parts of the State (fig. 11). Median concentrations exceeded the USEPA secondary drinking-water regulation for aluminum of 200 micrograms per liter ($\mu\text{g/L}$) (U.S. Environmental Protection Agency, 2009) at 45 out of 57 sites with available data. Seasonal variations indicated higher median total aluminum concentrations during spring and summer and lower concentrations during winter at many locations. Median total aluminum concentrations for the period of record ranged from less than 100 $\mu\text{g/L}$ at 7 out of 57 sites to 20,050 $\mu\text{g/L}$ at the Little Missouri River near Marmarth, N. Dak. (site 110) (appendix table 1–5).

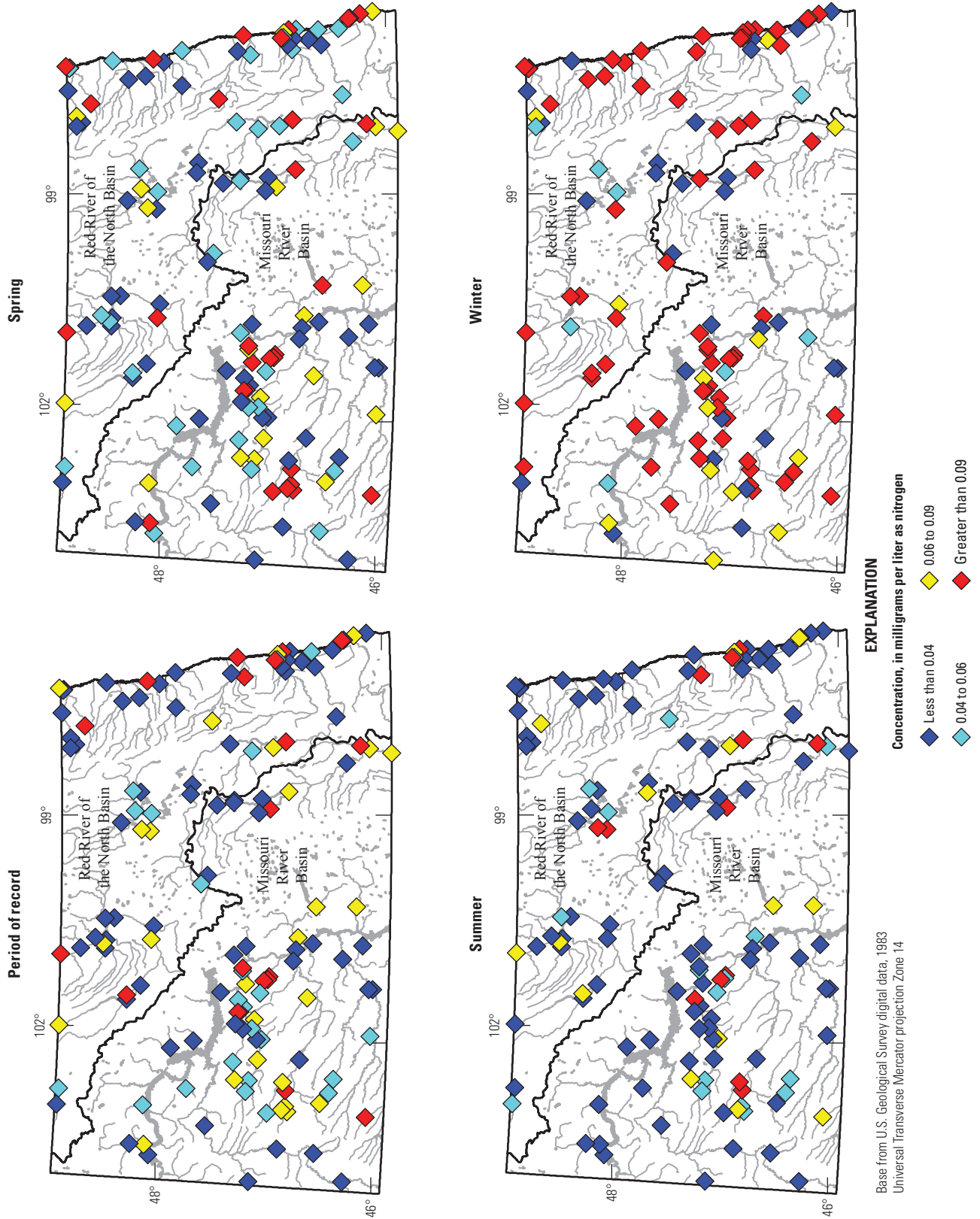


Figure 5. Spatial distribution of median ammonia concentrations (total and dissolved), in milligrams per liter as nitrogen, for selected stream sites in North Dakota for the period of record (1970 through 2008), spring (March through June), summer (July through October), and winter (November through February).

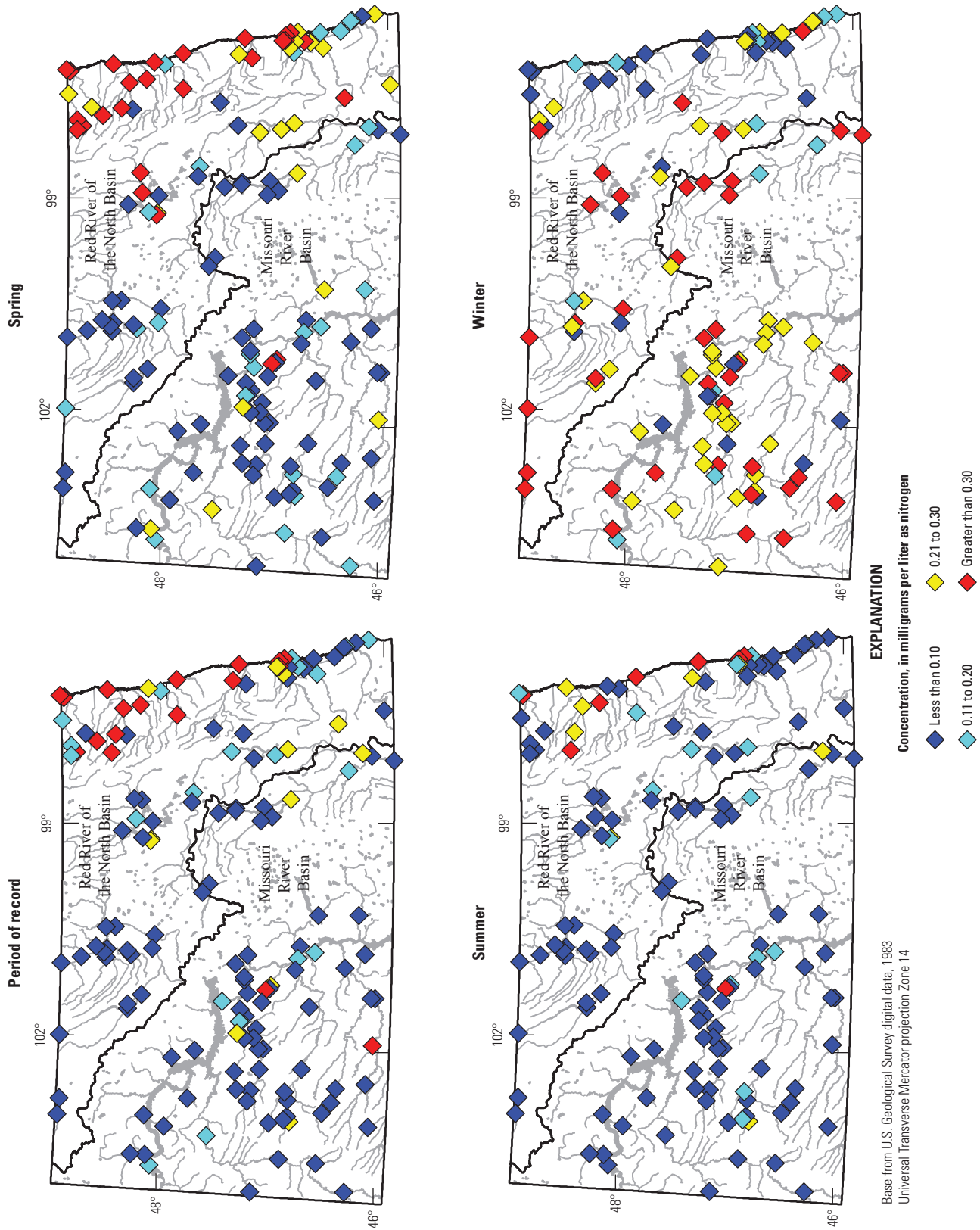
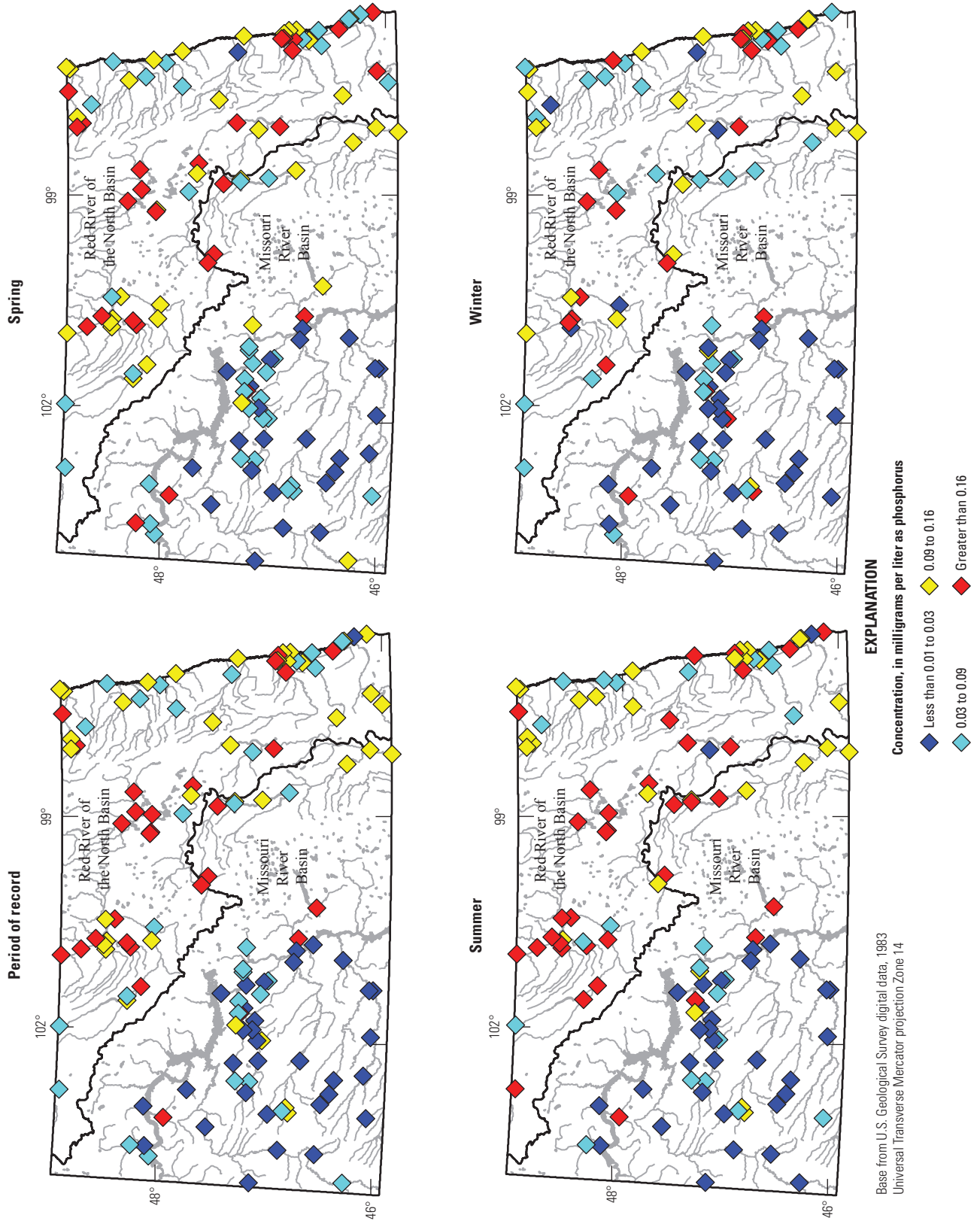


Figure 6. Spatial distribution of median nitrate plus nitrite concentrations (total and dissolved), in milligrams per liter as nitrogen, for selected stream sites in North Dakota for the period of record (1970 through 2008), spring (March through June), summer (July through October), and winter (November through February).



Base from U.S. Geological Survey digital data, 1983
Universal Transverse Mercator projection Zone 14

Figure 7. Spatial distribution of median dissolved phosphorus concentrations, in milligrams per liter as phosphorus, for selected stream sites in North Dakota for the period of record (1970 through 2008), spring (March through June), summer (July through October), and winter (November through February).

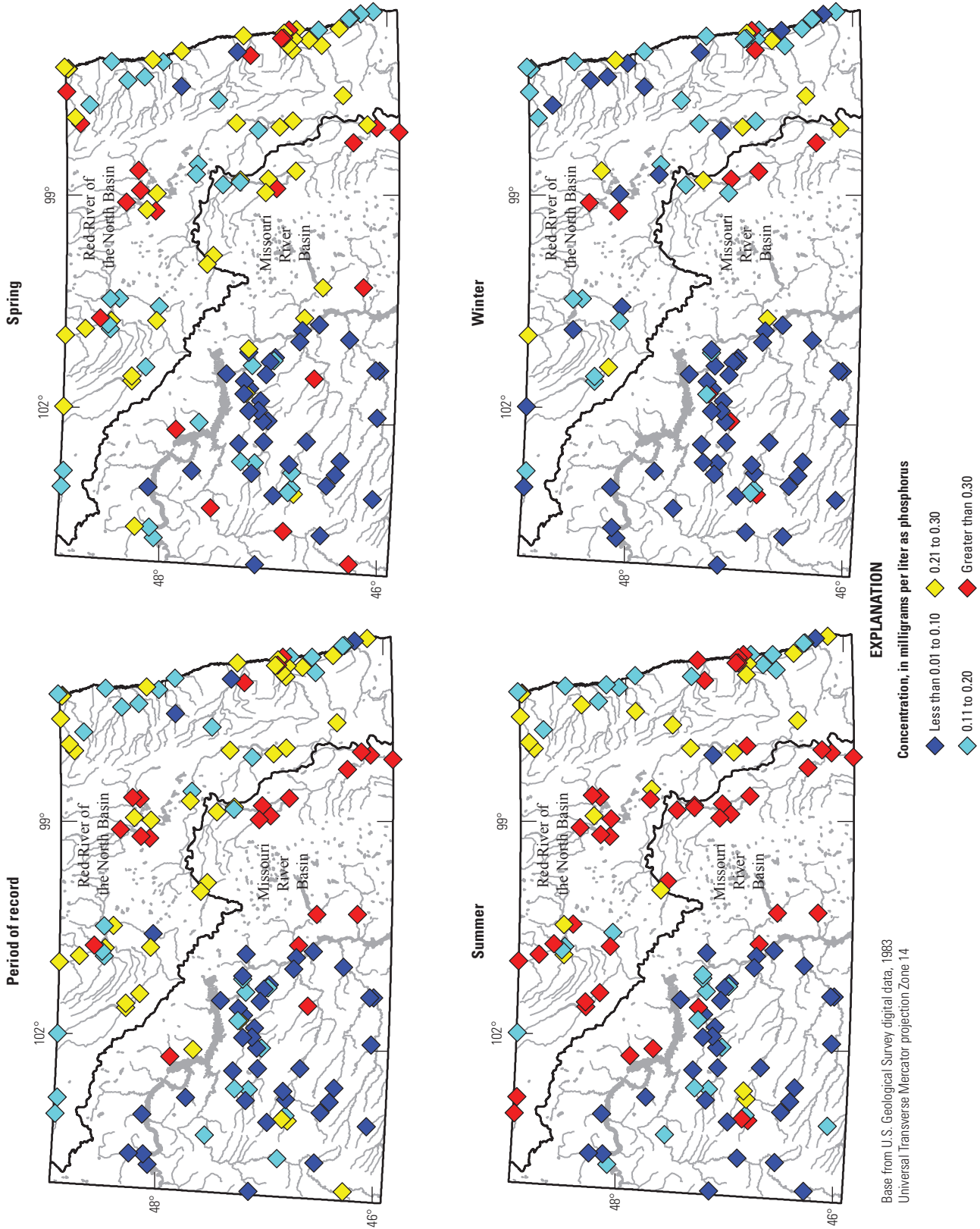


Figure 8. Spatial distribution of median total phosphorus concentrations, in milligrams per liter as phosphorus, for selected stream sites in North Dakota for the period of record (1970 through 2008), spring (March through June), summer (July through October), and winter (November through February).

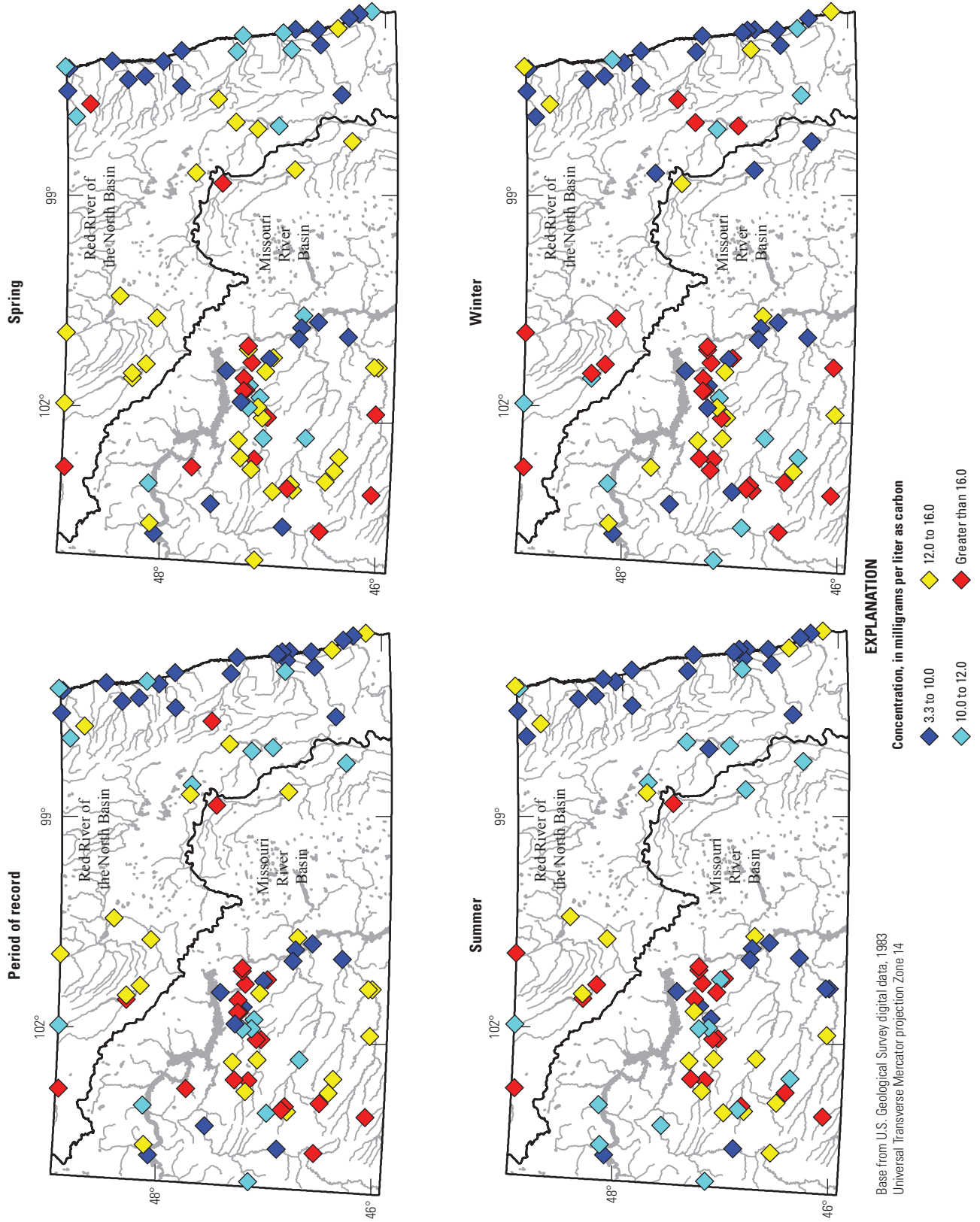


Figure 9. Spatial distribution of median dissolved organic carbon concentrations, in milligrams per liter as carbon, for selected stream sites in North Dakota for the period of record (1970 through 2008), spring (March through June), summer (July through October), and winter (November through February).

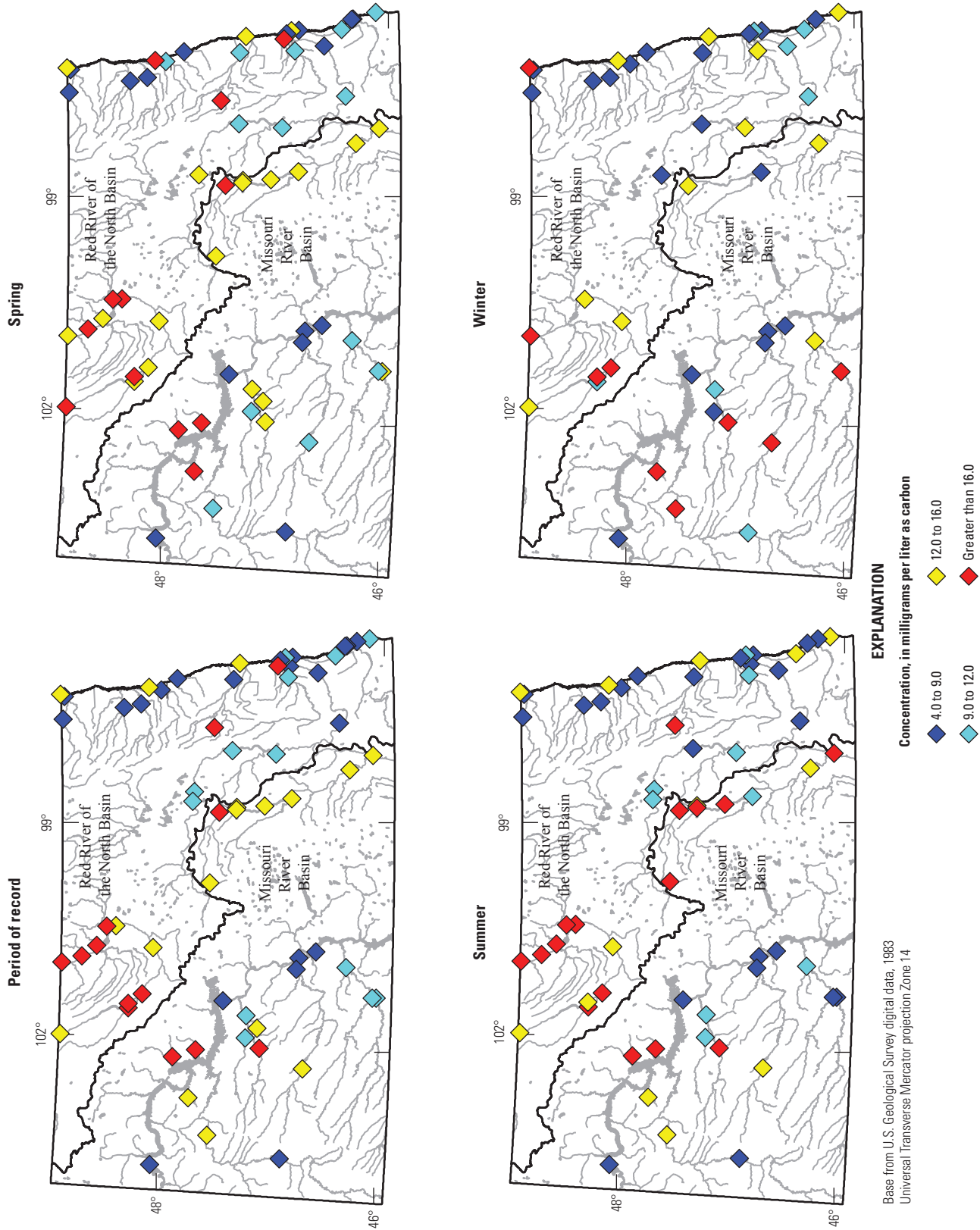


Figure 10. Spatial distribution of median total organic carbon concentrations, in milligrams per liter as carbon, for selected stream sites in North Dakota for the period of record (1970 through 2008), spring (March through June), summer (July through October), and winter (November through February).

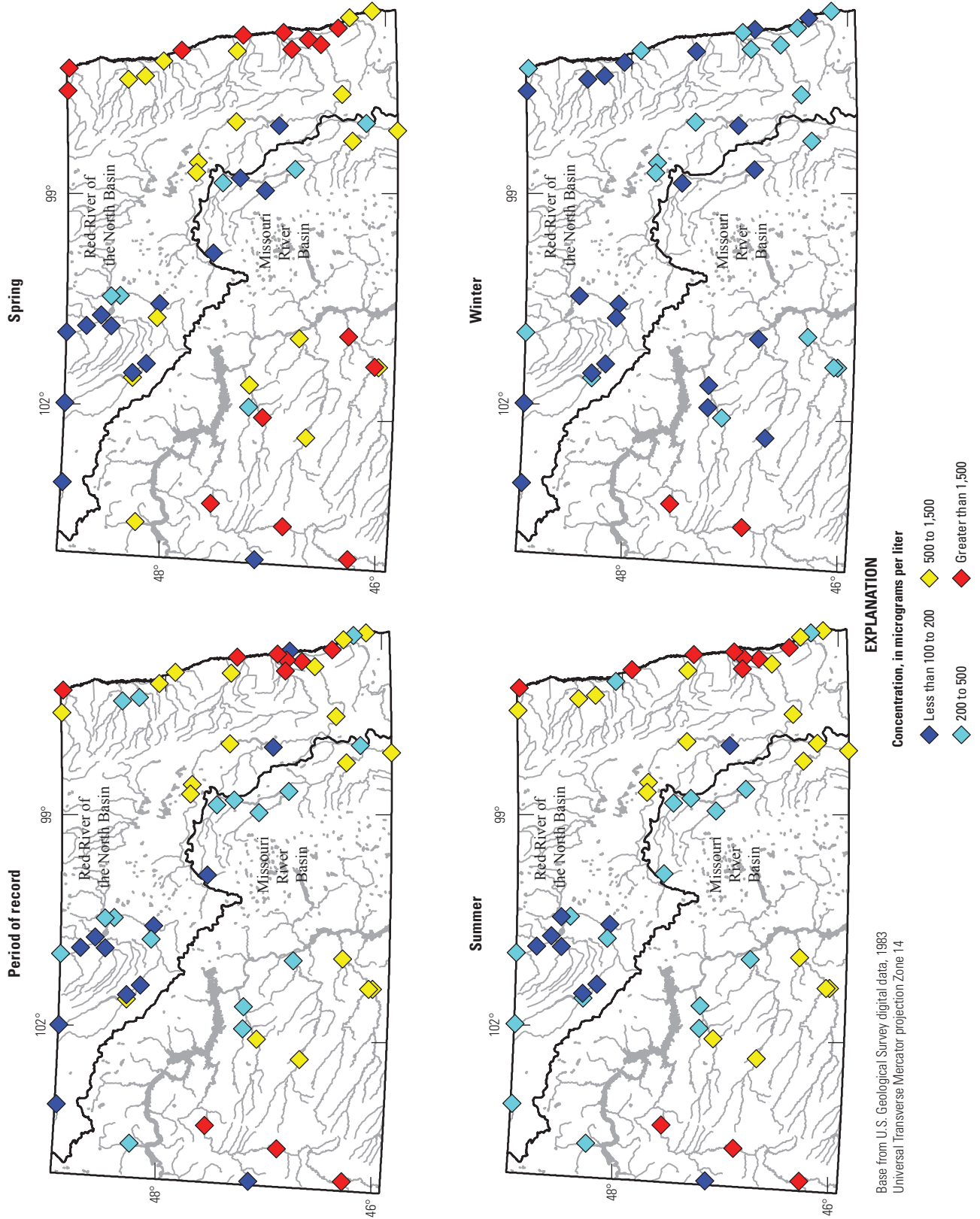


Figure 11. Spatial distribution of median total aluminum concentrations, in micrograms per liter, for selected stream sites in North Dakota for the period of record (1993 through 2008), spring (March through June), summer (July through October), and winter (November through February).

Median total arsenic concentrations in North Dakota indicate that the lowest values occurred mostly in the southwestern parts of the State, whereas the highest values occurred mostly in the eastern parts of the State (fig. 12). The median arsenic concentration exceeded the USEPA and North Dakota standards of 10.0 µg/L (U.S. Environmental Protection Agency, 2009 and North Dakota Department of Health, 2010) at only one site for the period of record (site 3; only one sample available). The median arsenic concentrations for the spring exceeded 10.0 µg/L at two sites, and the median concentrations for the summer exceeded 10.0 µg/L at three sites. Seasonal variations indicated higher median total arsenic concentrations in samples collected during summer and lower concentrations from samples collected during spring and winter at many locations. Median total arsenic concentrations for the period of record ranged from 1.3 µg/L at the Heart River near Mandan, N. Dak. (site 156) to 24.9 µg/L at the Red River of the North near Wahpeton, N. Dak. (site 3; only one sample available) (appendix table 1–5).

Median total chromium concentrations in water samples collected across North Dakota generally were greater in the far eastern and western areas of the State, and no median concentrations exceeded the USEPA and North Dakota standards for chromium of 100 µg/L (U.S. Environmental Protection Agency, 2009 and North Dakota Department of Health, 2010) (fig. 13). Seasonal variations indicated higher median total chromium concentrations in samples collected during spring and lower concentrations from samples collected during winter at many locations. Median total chromium concentrations for the period of record ranged from less than 1.2 µg/L at 34 out of 60 sites to 21.0 µg/L at the Little Missouri River at Marmarth, N. Dak. (site 110) (appendix table 1–5).

Median total iron concentrations in North Dakota were lowest in the Souris, Sheyenne, and James River Basins compared to sites in other parts of North Dakota (figs. 1 and 14). Median total iron concentrations exceeded the USEPA secondary drinking-water standard for iron of 300 µg/L (U.S. Environmental Protection Agency, 2009) at 66 out of 78 sites. Median total iron concentration for the period of record ranged from 11 µg/L at the Red River of the North at Emerson, Manitoba (site 79) to 20,150 µg/L at the Little Missouri River at Marmarth, N. Dak. (site 110) (appendix table 1–5).

The highest median total lead concentrations in water samples were scattered across North Dakota (fig. 15). Median total lead concentrations only exceeded the USEPA and North Dakota standards for lead concentration in drinking water of 15.0 µg/L (U.S. Environmental Protection Agency, 2009 and North Dakota Department of Health, 2010) at two sites from samples collected in the spring. Seasonal variations indicated higher median total lead concentrations during spring and lower concentrations during winter at many locations, particularly in the Red River of the North Basin. Median total lead concentrations for the period of record ranged from less than 1.0 µg/L (at 30 out of 60 sites) to 12.8 µg/L at the Little Missouri River at Marmarth, N. Dak. (site 110) (appendix table 1–5).

Median total nickel concentrations were higher at a few sites in the southwest and eastern parts of North Dakota compared to other sites (fig. 16). No median nickel concentrations exceeded the North Dakota regulation for nickel concentration in waters for human usage of 100.0 µg/L (North Dakota Department of Health, 2010). Seasonal variations indicated higher median total nickel concentrations in samples collected during spring and lower concentrations from samples collected during winter at many locations. Median total nickel concentrations for the period of record ranged from 2.0 µg/L at Boundary Creek near Landa, N. Dak. (site 97) to 26.0 µg/L at the Little Missouri River at Marmarth, N. Dak. (site 110) (appendix table 1–5).

Suspended Sediment and Suspended Solids

Suspended sediment in water is the particulate matter that consists of soil and rock particles eroded from the landscape. Sediment can be transported in the water column or can settle to the streambed. The movement of suspended sediment in streams is important in the fate and transport of chemicals in the environment because the particles can sorb nutrients, trace elements, and organic compounds. Large concentrations of suspended sediment often are associated with storm-runoff events that increase streamflow, erosion, and resuspension of bed material (Guy, 1970). Activities such as row-crop agriculture, animal grazing, timber harvesting, mining, road construction and maintenance, and urbanization can cause increased sediment concentrations in streams (Guy, 1970).

Suspended-sediment concentration (SSC) and total suspended solids (TSS) are commonly used to quantify concentrations of suspended solid-phase material in surface water. Often TSS is used as a surrogate for SSC, which includes the inorganic sand, silt, and clay matrix transported in streams, and SSC and TSS frequently have been used interchangeably; however, the analytical methods differ and the two may not be equivalent when solid-phase material, especially sand, becomes more concentrated (Gray and others, 2000). SSC analytical methods measure all the sediment and the mass of the entire water-sediment mixture of the original sample; TSS methods only use an aliquot of the original sample for subsequent analysis. SSC typically is used to analyze natural water, whereas TSS originally was designed for wastewater discharge analyses and later was extended operationally to include natural water (Gray and others, 2000). Gray and others (2000) show that TSS is fundamentally unreliable for the analysis of solid-phase material in natural-water samples with sand-size material, but concluded that the SSC method produces relatively reliable results regardless of the amount or percentage of sand-size material. Gray and others (2000) also concluded that SSC and TSS data collected from natural water are not comparable and should not be used interchangeably, and that the accuracy and comparability of suspended solid-phase concentrations of natural waters would be greatly enhanced if SSC data were used.

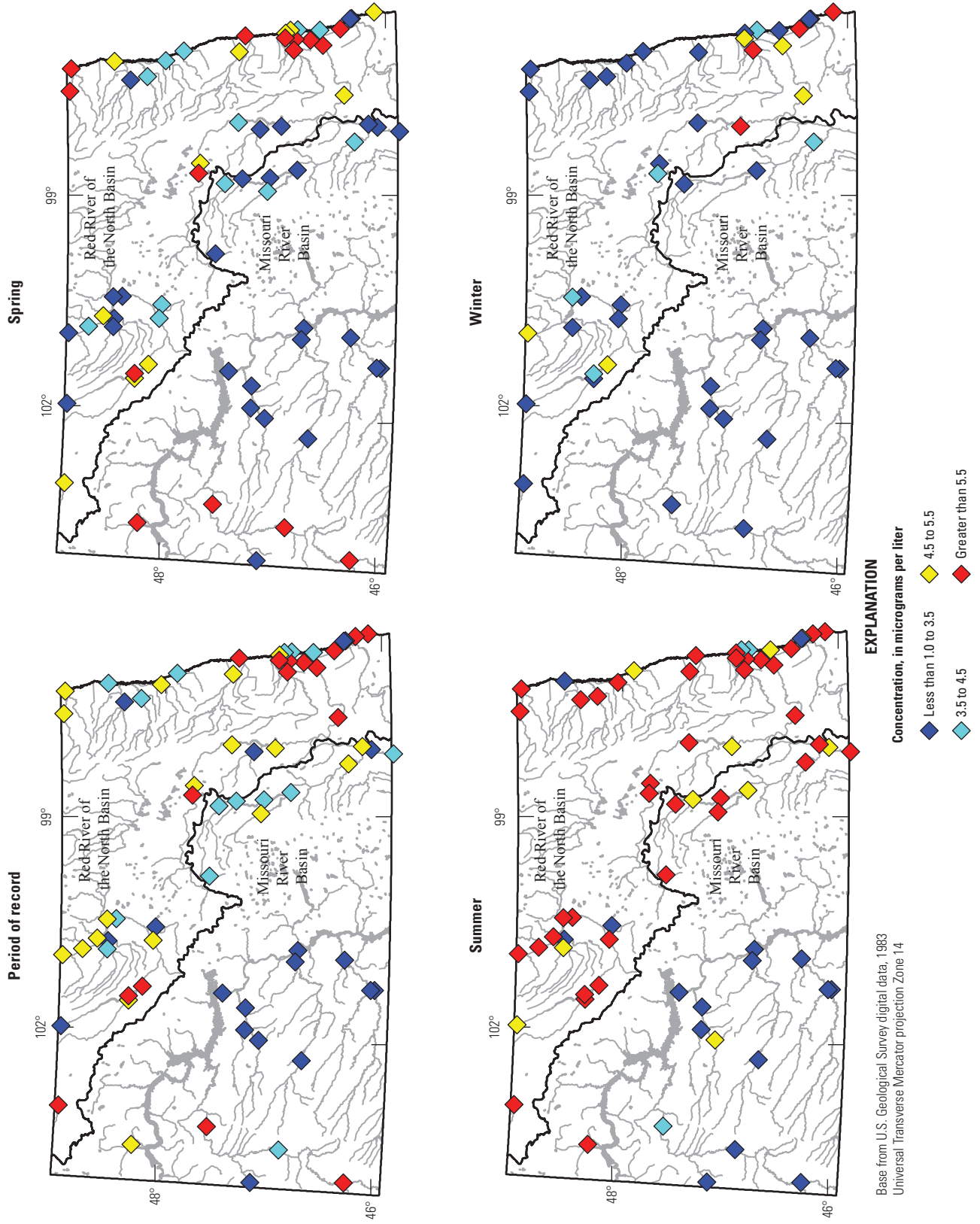


Figure 12. Spatial distribution of median total arsenic concentrations, in micrograms per liter, for selected stream sites in North Dakota for the period of record (1993 through 2008), spring (March through June), summer (July through October), and winter (November through February).

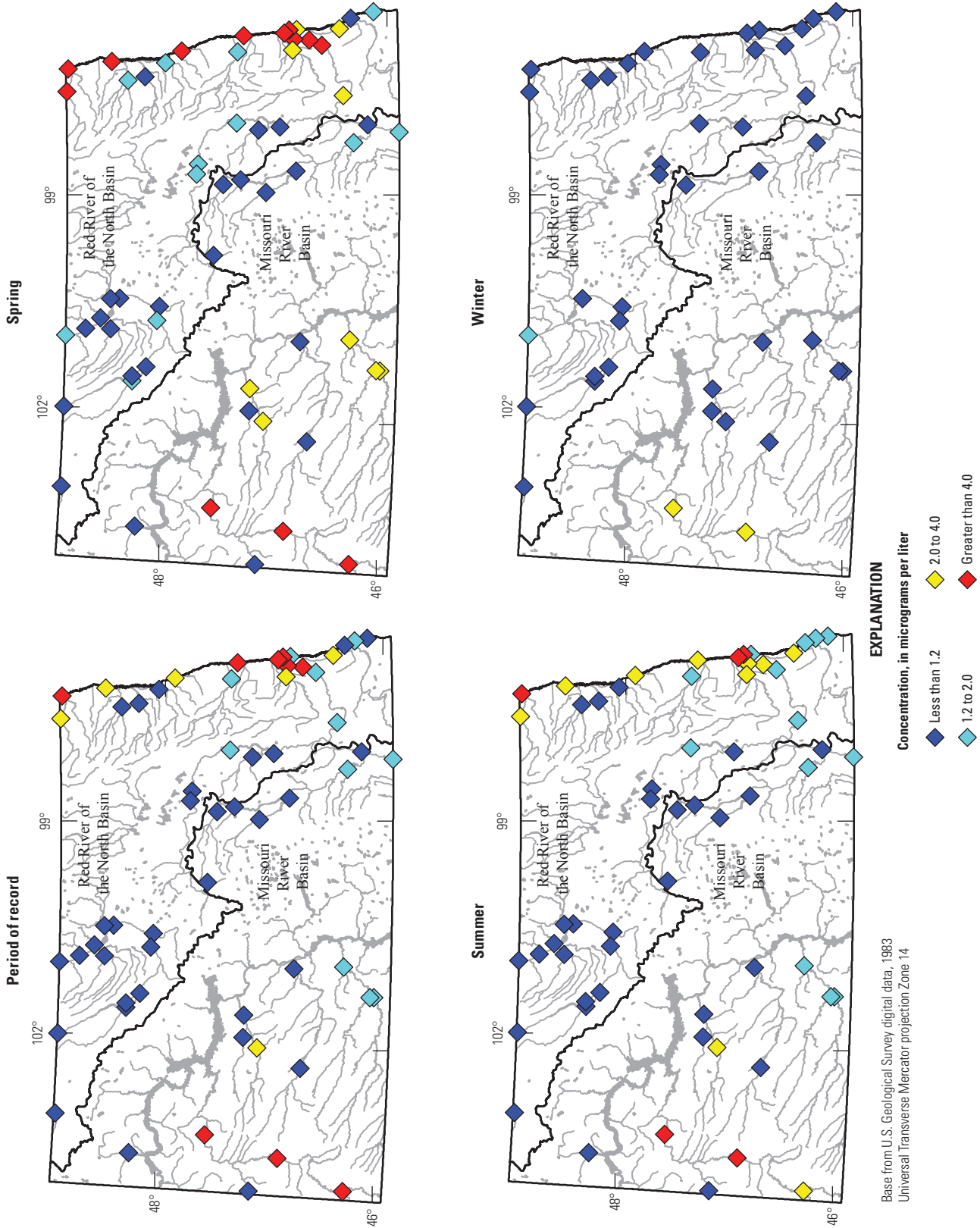


Figure 13. Spatial distribution of median total chromium concentrations, in micrograms per liter, for selected stream sites in North Dakota for the period of record (1993 through 2008), spring (March through June), summer (July through October), and winter (November through February).

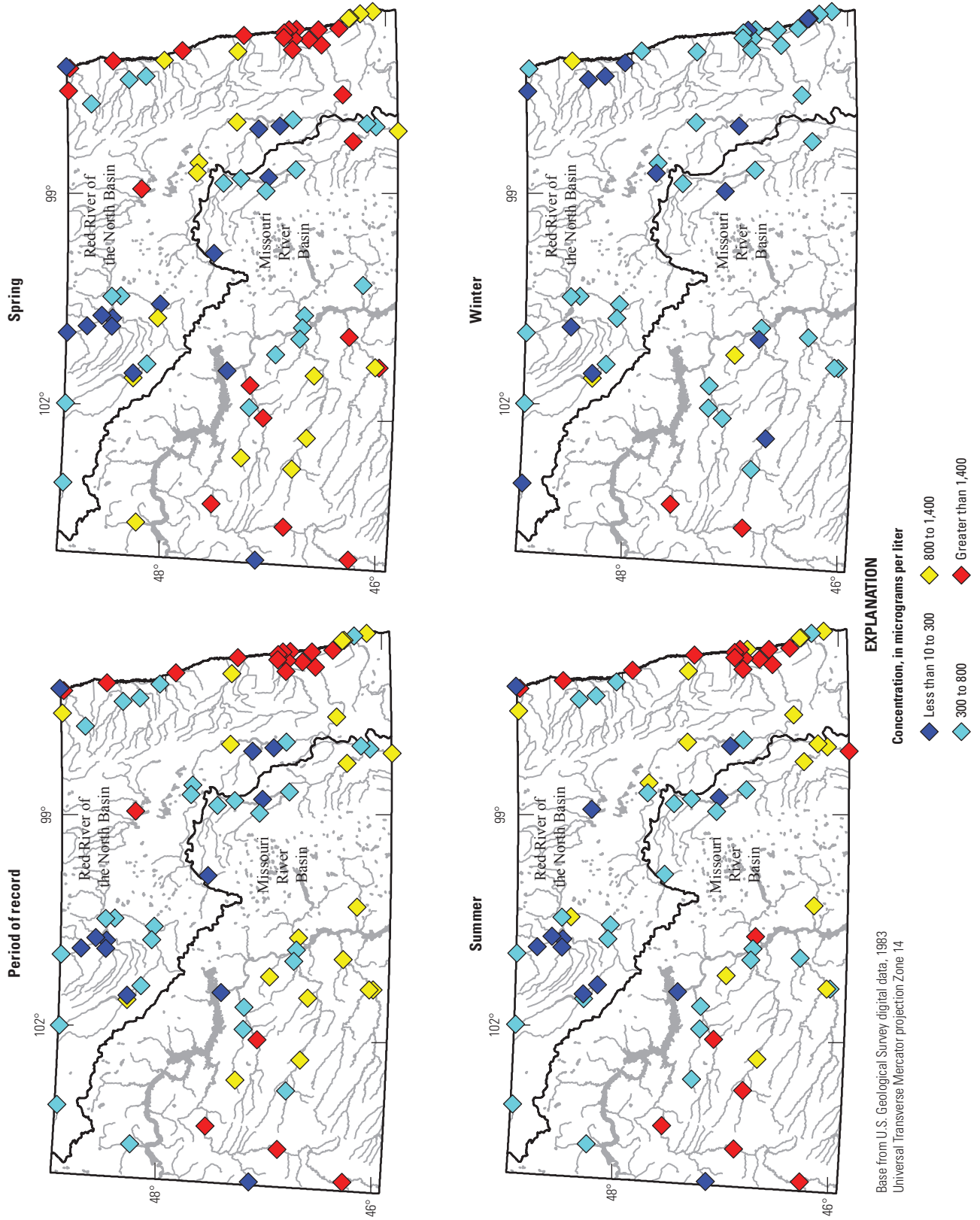


Figure 14. Spatial distribution of median total iron concentrations, in micrograms per liter, for selected stream sites in North Dakota for the period of record (1993 through 2008), spring (March through June), summer (July through October), and winter (November through February).

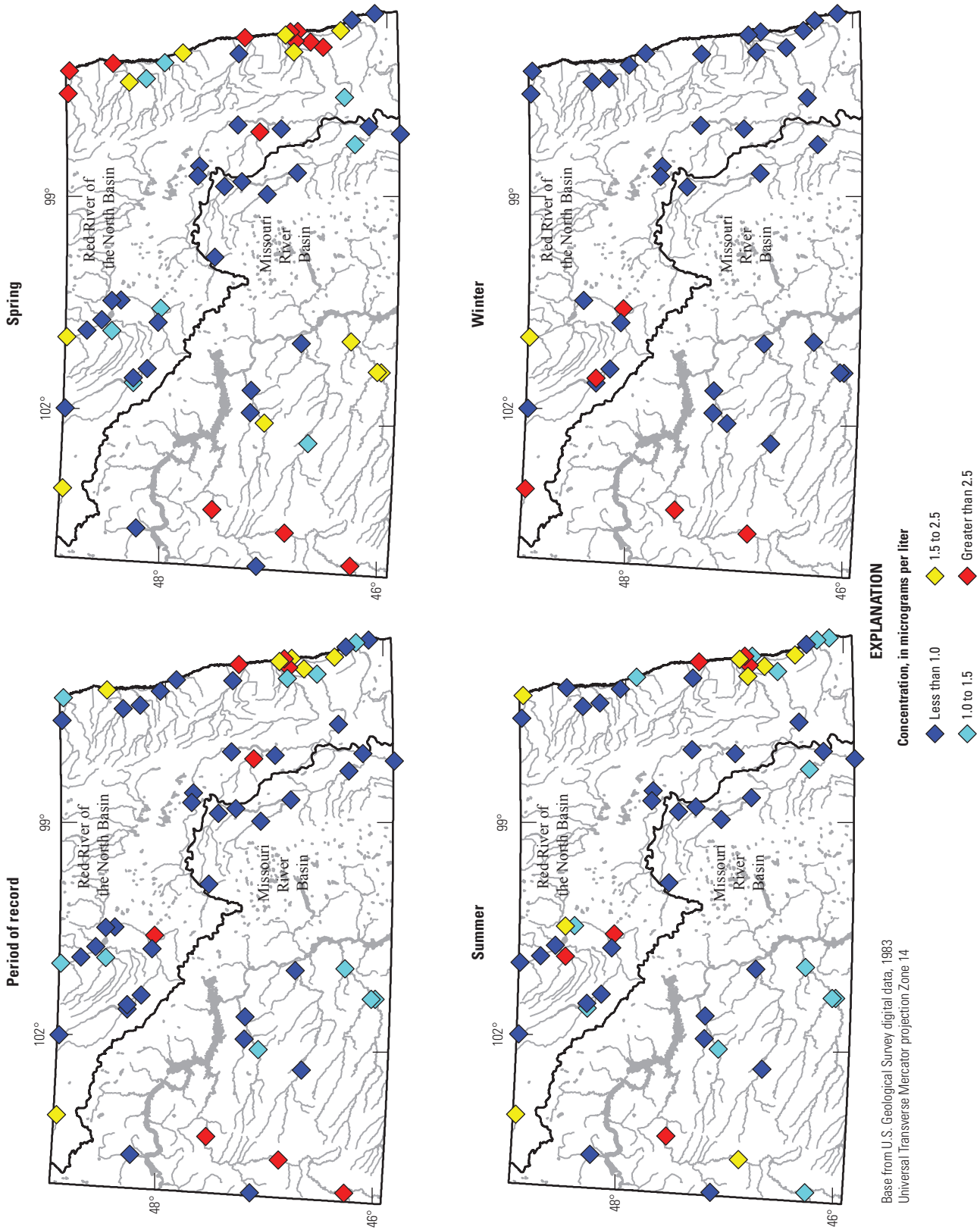
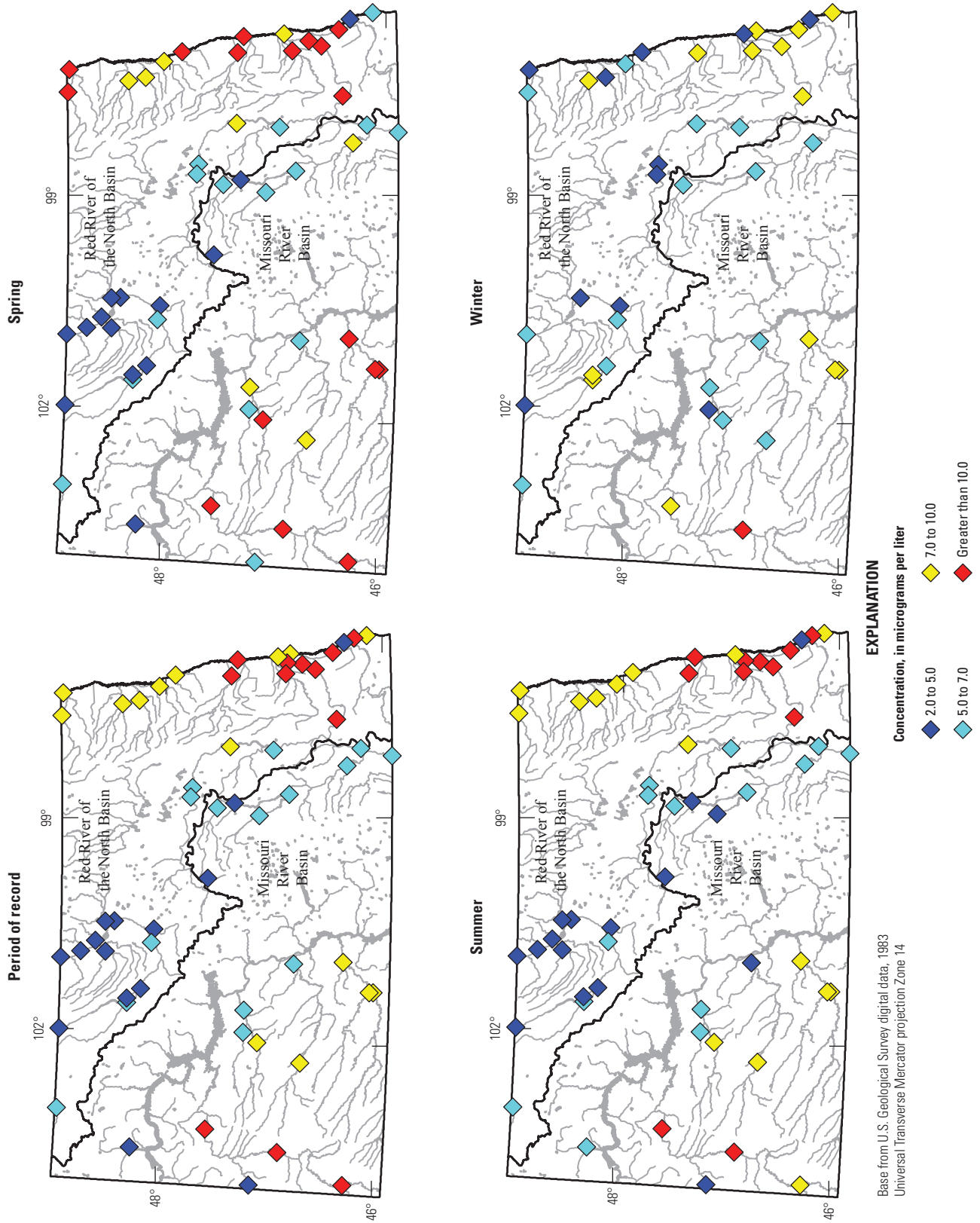


Figure 15. Spatial distribution of median total lead concentrations, in micrograms per liter, for selected stream sites in North Dakota for the period of record (1993 through 2008), spring (March through June), summer (July through October), and winter (November through February).



Base from U.S. Geological Survey digital data, 1983
Universal Transverse Mercator projection Zone 14

Figure 16. Spatial distribution of median total nickel concentrations, in micrograms per liter, for selected stream sites in North Dakota for the period of record (1993 through 2008), spring (March through June), summer (July through October), and winter (November through February).

Median SSC and TSS in water samples obtained across North Dakota were higher at sites located in southwestern and eastern areas of North Dakota compared to sites located in other areas of the State (figs. 17 and 18). No USEPA or North Dakota standards have been established for TSS or SSC. Median SSC for the period of record at a sampling site ranged from 2 mg/L at the Missouri River at Garrison Dam, N. Dak. (site 115) to 1,028 mg/L at the Little Missouri River near Watford City, N. Dak. (site 114). Median TSS for the period of record at a sampling site ranged from less than 10 mg/L at 15 out of 63 sites to 314 mg/L at the Little Missouri River near Watford City, N. Dak. (site 114) (appendix table 1–5). The relatively low SSC and TSS at site 115 are likely because the site is located below a dam, where sediment particles are retained in the upstream reservoir through settling. The higher values in the Little Missouri River may be because of the occurrence of highly erodible soils in the area and the lack of any control structures or reservoirs on the Little Missouri River that would retain sediment.

Yields of Selected Constituents

Normalized annual loads and yields were estimated for sulfate, TDS, nitrogen (nitrate plus nitrite and ammonia), phosphorus (total and dissolved), total organic carbon, and suspended sediment at 34 sites across North Dakota. Information on the load model calibration periods and results are given in table 3. To facilitate comparisons between sites, this section focuses on the estimated yields. Loads, which are highly dependent on streamflow, were computed primarily to obtain yields.

Sulfate and Total Dissolved Solids

Normalized annual sulfate yields ranged from 9,250 to 56,200 lbs/yr/mi² in the Missouri River Basin and from 4,680 to 72,500 lbs/yr/mi² in the Red River of the North Basin (fig. 19 and table 4). The highest yields (greater than 45,200 lbs/yr/mi²) were at five sites in the Missouri River Basin (site 112 on the Little Missouri River; sites 149 and 156 on the Heart River; site 169 on Cedar Creek; and site 170 on the Cannonball River) and two sites in the Red River of the North Basin (site 45 on the Maple River and site 55 on the Goose River) (figs. 1 and 19; table 4). The lowest yields (less than 12,200 lbs/yr/mi²) were at two sites in the Missouri River Basin (site 158 on Apple Creek and site 176 on the James River) and six sites in the Red River of the North Basin (sites 32 and 37 on the Sheyenne River; and sites 82, 85, 89, and 98 on the Souris River) (figs. 1 and 19; table 4).

Normalized annual TDS yields ranged from 30,400 to 119,000 lbs/yr/mi² in the Missouri River Basin and from 13,000 to 169,000 lbs/yr/mi² in the Red River of the North Basin (fig. 19 and table 4). The highest yields (greater than 107,000 lbs/yr/mi²) were at three sites in the Missouri River

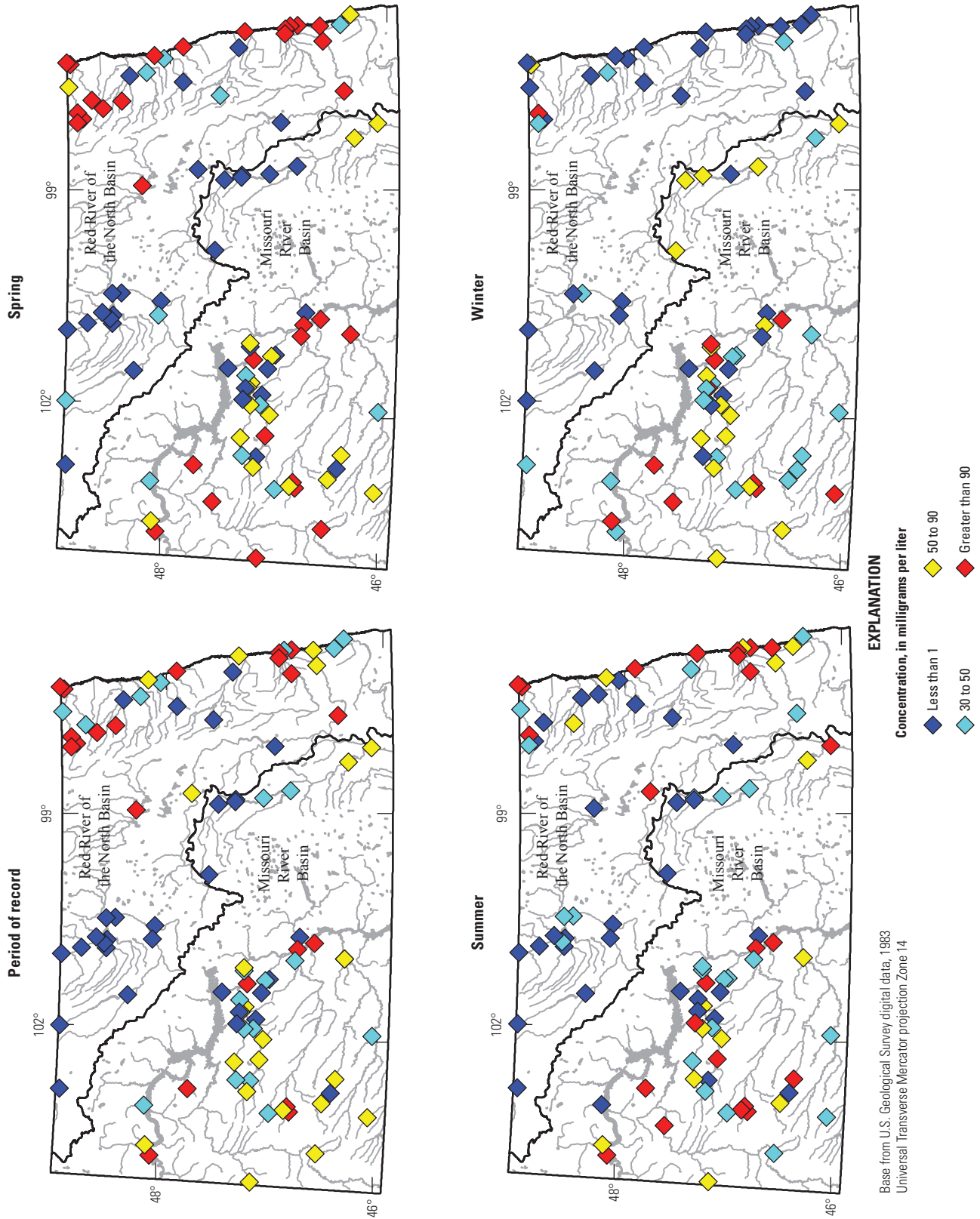
Basin (site 112 in the Little Missouri River and sites 149 and 156 on the Heart River) and at four sites in the Red River of the North Basin (site 45 on the Maple River; site 55 on the Goose River; and sites 11 and 79 on the Red River of the North) (figs. 1 and 19; table 4). The lowest yields (43,600 lbs/yr/mi² or less) were at two sites in the Missouri River Basin (site 158 on Apple Creek and site 176 on the James River) and seven sites in the Red River of the North Basin (sites 32 and 37 on the Sheyenne River; site 33 on Baldhill Creek; and sites 82, 85, 89, and 98 on the Souris River) (figs. 1 and 19; table 4).

Nutrients

Normalized annual nitrate plus nitrite yields ranged from 24 to 120 lbs/yr/mi² as nitrogen in the Missouri River Basin and from 2 to 1,260 lbs/yr/mi² as nitrogen in the Red River of the North Basin (fig. 20 and table 4). The highest yields (greater than 120 lbs/yr/mi²) were at eight sites in the Red River of the North Basin (site 21 on Edmore Coulee; site 45 on the Maple River; site 55 on the Goose River; site 67 on the Park River; site 75 on the Pembina River; site 76 on the Tongue River; and sites 56 and 79 on the Red River of the North) (figs. 1 and 20; table 4). The lowest yields (less than 33 lbs/yr/mi²) were at three sites in the Missouri River Basin (sites 115 and 142 on the Missouri River and site 158 on Apple Creek) and five sites in the Red River of the North Basin (site 32 on the Sheyenne River and sites 82, 85, 89, and 98 on the Souris River) (figs. 1 and 20; table 4).

Normalized annual ammonia yields ranged from 6 to 22 lbs/yr/mi² as nitrogen in the Missouri River Basin and from 4 to 62 lbs/yr/mi² as nitrogen in the Red River of the North Basin (fig. 20 and table 4). The highest yields (greater than 22 lbs/yr/mi²) were at six sites in the Red River of the North Basin (site 10 on the Wild Rice River; site 45 on the Maple River; site 55 on the Goose River; site 76 on the Tongue River; and sites 5 and 79 on the Red River of the North) (figs. 1 and 20; table 4). The lowest yields (less than 8 lbs/yr/mi²) were at one site in the Missouri River Basin (site 112 on the Little Missouri River) and five sites in the Red River of the North Basin (site 32 on the Sheyenne River and sites 82, 85, 89, and 98 on the Souris River) (figs. 1 and 20; table 4).

Normalized annual dissolved phosphorus yields ranged from less than 1 to 35 lbs/yr/mi² as phosphorus in the Missouri River Basin and from 5 to 47 lbs/yr/mi² as phosphorus in the Red River of the North Basin (fig. 20 and table 4). The highest yields (greater than 39 lbs/yr/mi²) were at four sites in the Red River of the North Basin (site 55 on the Goose River and sites 11, 56, and 79 on the Red River of the North) (figs. 1 and 20; table 4). The lowest yields (less than 8 lbs/yr/mi²) were at four sites in the Missouri River Basin (site 114 on the Little Missouri River; site 115 on the Missouri River; site 156 on the Heart River; and site 170 on the Cannonball River) and two sites in the Red River of the North Basin (sites 85 and 89 on the Souris River) (figs. 1 and 20; table 4).



Base from U.S. Geological Survey digital data, 1983
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Figure 17. Spatial distribution of suspended-sediment concentrations, in milligrams per liter, for selected stream sites in North Dakota for the period of record (1970 through 2008), spring (March through June), summer (July through October), and winter (November through February).

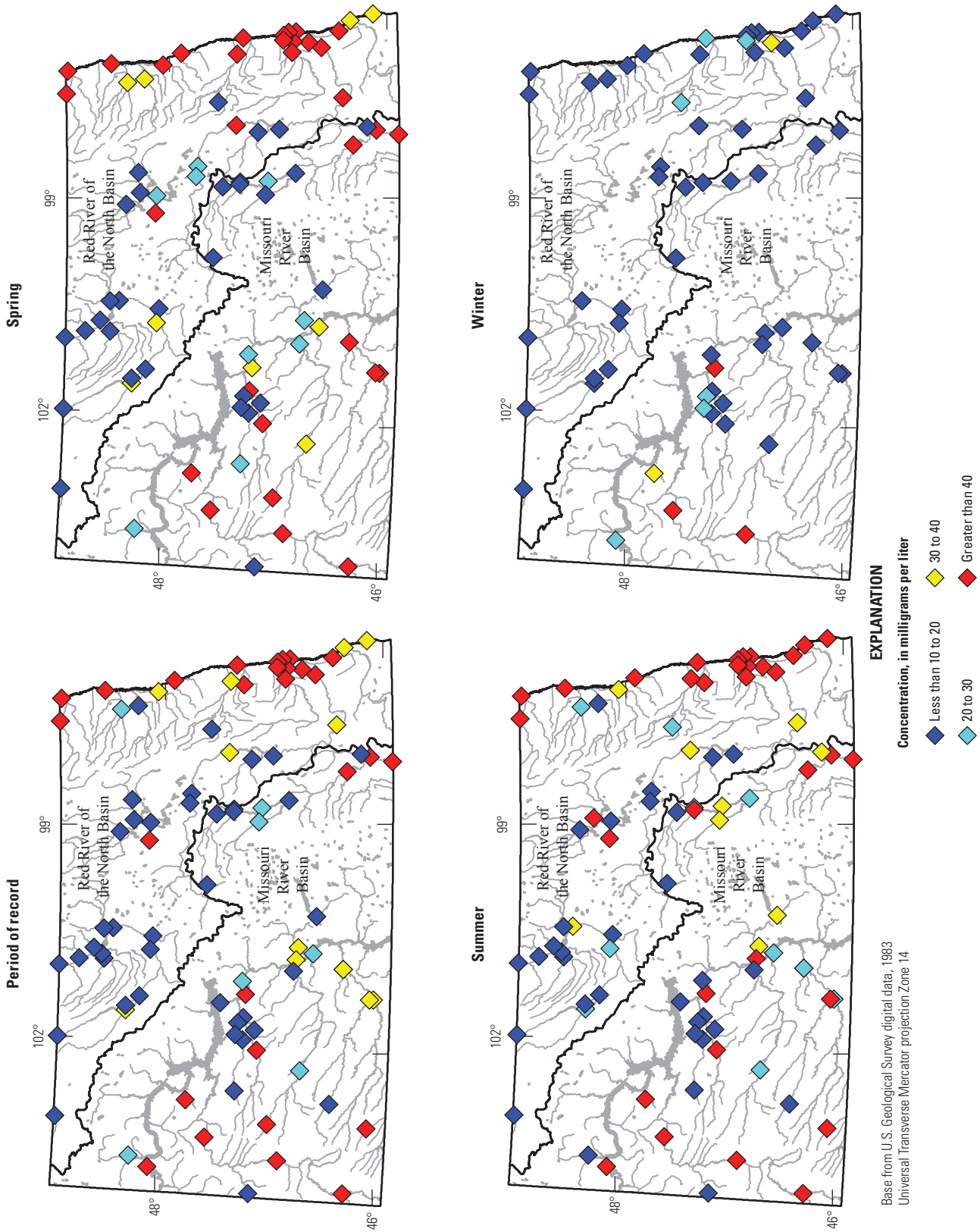


Figure 18. Spatial distribution of total suspended-solids concentrations, in milligrams per liter, for selected stream sites in North Dakota for the period of record (1970 through 2008), spring (March through June), summer (July through October), and winter (November through February).

Table 3. Regression model characteristics for S-LOADEST models for selected sites in North Dakota from 1970 through 2008.

[Q, natural log discharge; BpQ, natural log of discharge with a break point; T, time; SS, season; CEN, data had more than 80 percent censored values; ISD, insufficient data; --, not used]

Map identification number	Site name	Calibration data range, years	Median year for normalized load calculation	Selected model explanatory variables	Regression coefficient (β_1) for Q	Coefficient of determination
Sulfate						
5	Red River of the North below Wahpeton, N. Dak.	1970–1999	1984.5	BpQ	0.96	85.1
10	Wild Rice River near Abercrombie, N. Dak.	1970–2008	1989	Q+T	0.91	94.6
11	Red River of the North at Fargo, N. Dak.	1970–2008	1989	Q+T	1.17	93.8
20	Mauvais Coulee near Cando, N. Dak.	1973–2008	1990.5	Q+T+SS	0.86	97.6
21	Edmore Coulee near Edmore, N. Dak.	1973–2008	1990.5	Q+T+SS	0.86	93.7
32	Sheyenne River near Cooperstown, N. Dak.	1970–2008	1989	Q+T	0.92	97.0
33	Baldhill Creek near Dazey, N. Dak.	1972–2008	1990	Q+T	0.85	97.5
37	Sheyenne River near Kindred, N. Dak.	1973–2008	1990.5	Q+T	0.91	96.8
45	Maple River below Mapleton, N. Dak.	1995–2000	2001	Q+T+SS	0.81	96.0
55	Goose River at Hillsboro, N. Dak.	1970–2008	1989	Q+T	0.85	95.8
56	Red River of the North at Grand Forks, N. Dak.	1970–2008	1989	Q+T+SS	0.95	90.8
62	Forest River near Minto, N. Dak.	1971–2008	1989.5	Q+T	0.97	97.2
67	Park River at Grafton, N. Dak.	1970–2008	1989	Q+T+SS	0.90	98.6
75	Pembina River at Neche, N. Dak.	1972–2008	1990	Q+T+SS	0.90	98.0
76	Tongue River at Akra, N. Dak.	1972–2008	1990	Q	0.95	97.2
79	Red River of the North at Emerson, Manitoba	1977–2004	1990.5	Q+T+SS	0.91	89.2
82	Souris River near Sherwood, N. Dak.	1972–2008	1990.5	Q+T+SS	0.92	95.6
85	Souris River above Minot, N. Dak.	1970–2008	1989	Q+T+SS	0.91	97.7
89	Souris River near Bantry, N. Dak.	1970–2008	1989	Q+T+SS	0.90	96.1
98	Souris River near Westhope, N. Dak.	1970–2008	1989	Q+T+SS	0.91	95.3
112	Little Missouri River at Medora, N. Dak.	1972–2008	1990	Q+T	0.74	96.7
114	Little Missouri River near Watford City, N. Dak.	1972–2008	1989.5	Q+T+SS	0.80	90.9
115	Missouri River at Garrison Dam, N. Dak.	1971–2007	1989	Q+T	0.95	90.2
125	Spring Creek at Zap, N. Dak.	1970–2008	1989	Q	0.67	89.7
127	Knife River at Hazen, N. Dak.	1970–2008	1989	Q+T+SS	0.79	91.3
142	Missouri River at Bismarck, N. Dak.	1971–2008	1989.5	Q+T+SS	0.95	90.7
149	Heart River near Richardton, N. Dak.	1973–2008	1990.5	Q+T	0.81	92.7
156	Heart River near Mandan, N. Dak.	1971–2008	1989.5	Q+T+SS	0.84	96.2
158	Apple Creek near Menoken, N. Dak.	1972–2008	1990	Q+T+SS	0.85	96.0
169	Cedar Creek near Raleigh, N. Dak.	1973–2008	1990.5	Q+SS	0.94	95.2
170	Cannonball River at Breien, N. Dak.	1971–2008	1989.5	Q+T	0.87	92.4
176	James River near Grace City, N. Dak.	1972–2008	1990	Q+T	0.84	96.6
180	Pipestem Creek near Pingree, N. Dak.	1975–2008	1991	Q+T	0.88	96.6
182	James River at Jamestown, N. Dak.	1972–2007	1989.5	Q+T	0.82	97.9
Total dissolved solids						
5	Red River of the North below Wahpeton, N. Dak.	1970–1974	1984.5	Q+SS	0.99	97.4
10	Wild Rice River near Abercrombie, N. Dak.	1970–2007	1989	Q+T+SS	0.91	96.6
11	Red River of the North at Fargo, N. Dak.	1970–2003	1989	Q+T	1.01	97.8
20	Mauvais Coulee near Cando, N. Dak.	1973–2003	1990.5	Q+T+SS	0.92	98.9

Table 3. Regression model characteristics for S-LOADEST models for selected sites in North Dakota from 1970 through 2008.—Continued

[Q, natural log discharge; BpQ, natural log of discharge with a break point; T, time; SS, season; CEN, data had more than 80 percent censored values; ISD, insufficient data; --, not used]

Map identification number	Site name	Calibration data range, years	Median year for normalized load calculation	Selected model explanatory variables	Regression coefficient (β_1) for Q	Coefficient of determination
Total dissolved solids—Continued						
21	Edmore Coulee near Edmore, N. Dak.	1973–2003	1990.5	Q+T	0.89	96.6
32	Sheyenne River near Cooperstown, N. Dak.	1970–2007	1989	Q+T+SS	0.93	97.5
33	Baldhill Creek near Dazey, N. Dak.	1972–2008	1990	Q+T+SS	0.88	98.5
37	Sheyenne River near Kindred, N. Dak.	1973–2007	1990.5	Q+T	0.88	97.6
45	Maple River below Mapleton, N. Dak.	1995–2000	2001	BpQ+T+SS	0.90	98.0
55	Goose River at Hillsboro, N. Dak.	1970–2007	1989	Q+T	0.86	97.1
56	Red River of the North at Grand Forks, N. Dak.	1971–2006	1989	Q+T	0.94	96.7
62	Forest River near Minto, N. Dak.	1971–2006	1989.5	Q+T	0.92	97.1
67	Park River at Grafton, N. Dak.	1970–2006	1989	Q+T	0.89	98.9
75	Pembina River at Neche, N. Dak.	1973–2006	1990	Q+T+SS	0.89	98.8
76	Tongue River at Akra, N. Dak.	1972–2003	1990	BpQ	1.00	99.6
79	Red River of the North at Emerson, Manitoba	1977–2000	1990.5	Q+T	0.86	96.8
82	Souris River near Sherwood, N. Dak.	1973–2008	1990.5	Q+SS	0.88	97.2
85	Souris River above Minot, N. Dak.	1970–2008	1989	Q+T+SS	0.92	98.4
89	Souris River near Bantry, N. Dak.	1970–2002	1989	Q+T	0.87	97.1
98	Souris River near Westhope, N. Dak.	1970–2008	1989	Q+T+SS	0.91	96.8
112	Little Missouri River at Medora, N. Dak.	1973–2007	1990	Q+T	0.77	97.0
114	Little Missouri River near Watford City, N. Dak.	1972–2007	1989.5	Q+T+SS	0.78	96.8
115	Missouri River at Garrison Dam, N. Dak.	1971–2007	1989	Q+T	0.96	95.0
125	Spring Creek at Zap, N. Dak.	1970–2007	1989	Q	0.69	90.5
127	Knife River at Hazen, N. Dak.	1970–2007	1989	Q+T+SS	0.77	93.6
142	Missouri River at Bismarck, N. Dak.	1971–2003	1989.5	Q	1.03	81.0
149	Heart River near Richardton, N. Dak.	1973–2007	1990.5	Q	0.82	94.9
156	Heart River near Mandan, N. Dak.	1971–2007	1989.5	Q+T	0.83	97.6
158	Apple Creek near Menoken, N. Dak.	1972–2003	1990	Q+T+SS	0.83	97.3
169	Cedar Creek near Raleigh, N. Dak.	1973–2007	1990.5	Q	0.92	96.0
170	Cannonball River at Breien, N. Dak.	1971–2007	1989.5	Q+T	0.85	94.0
176	James River near Grace City, N. Dak.	1972–2007	1990	Q+T	0.83	97.8
180	Pipestem Creek near Pingree, N. Dak.	1974–2003	1991	Q+T+SS	0.92	98.6
182	James River at Jamestown, N. Dak.	1972–2007	1989.5	Q+T	0.91	98.8
Ammonia, dissolved and total as nitrogen						
5	Red River of the North below Wahpeton, N. Dak.	1970–1999	1984.5	Q+T+SS	1.01	62.4
10	Wild Rice River near Abercrombie, N. Dak.	1982–2007	1989	Q+T+SS	1.04	85.2
11	Red River of the North at Fargo, N. Dak.	1991–2008	1989	BpQ+SS	0.91	73.4
20	Mauvais Coulee near Cando, N. Dak.	1987–2004	1990.5	Q+SS	0.93	80.3
21	Edmore Coulee near Edmore, N. Dak.	1987–2003	1990.5	Q+SS	0.97	86.0
32	Sheyenne River near Cooperstown, N. Dak.	1979–2007	1989	Q+T+SS	0.72	68.4
33	Baldhill Creek near Dazey, N. Dak.	1979–1996	1990	Q+SS	0.96	89.4

Table 3. Regression model characteristics for S-LOADEST models for selected sites in North Dakota from 1970 through 2008.—Continued

[Q, natural log discharge; BpQ, natural log of discharge with a break point; T, time; SS, season; CEN, data had more than 80 percent censored values; ISD, insufficient data; --, not used]

Map identification number	Site name	Calibration data range, years	Median year for normalized load calculation	Selected model explanatory variables	Regression coefficient (β_1) for Q	Coefficient of determination
Ammonia, dissolved and total as nitrogen—Continued						
37	Sheyenne River near Kindred, N. Dak.	1977–2007	1990.5	Q+T+SS	1.57	76.0
45	Maple River below Mapleton, N. Dak.	1997–2007	2001	Q+SS	1.08	82.7
55	Goose River at Hillsboro, N. Dak.	1994–2008	1989	Q+SS	1.05	61.1
56	Red River of the North at Grand Forks, N. Dak.	1992–2008	1989	Q+SS	1.28	79.5
62	Forest River near Minto, N. Dak.	1994–2008	1989.5	Q+SS	0.67	44.6
67	Park River at Grafton, N. Dak.	1994–2007	1989	Q+SS	0.84	80.2
75	Pembina River at Neche, N. Dak.	1994–2008	1990	CEN	CEN	CEN
76	Tongue River at Akra, N. Dak.	1979–2004	1990	Q+SS	0.85	88.1
79	Red River of the North at Emerson, Manitoba	1978–2004	1990.5	Q+T+SS	1.22	79.2
82	Souris River near Sherwood, N. Dak.	1974–2008	1990.5	Q+SS	0.82	78.0
85	Souris River above Minot, N. Dak.	1981–2008	1989	Q+T+SS	0.92	81.0
89	Souris River near Bantry, N. Dak.	1981–2000	1989	Q+T+SS	0.85	78.2
98	Souris River near Westhope, N. Dak.	1970–2006	1989	Q+T+SS	0.77	60.3
112	Little Missouri River at Medora, N. Dak.	1979–2007	1990	Q	0.98	52.0
114	Little Missouri River near Watford City, N. Dak.	1977–2007	1989.5	Q+T+SS	0.96	79.0
115	Missouri River at Garrison Dam, N. Dak.	1974–2007	1989	CEN	CEN	CEN
125	Spring Creek at Zap, N. Dak.	1974–2007	1989	Q+T+SS	1.12	59.9
127	Knife River at Hazen, N. Dak.	1974–2007	1989	Q+T+SS	1.19	76.0
142	Missouri River at Bismarck, N. Dak.	1971–2001	1989.5	CEN	CEN	CEN
149	Heart River near Richardton, N. Dak.	1995–2007	1990.5	Q+SS	1.57	74.7
156	Heart River near Mandan, N. Dak.	1978–2007	1989.5	BpQ+SS	0.42	85.0
158	Apple Creek near Menoken, N. Dak.	1977–2007	1990	Q+SS	1.10	89.1
169	Cedar Creek near Raleigh, N. Dak.	1994–2007	1990.5	Q+SS	1.44	91.3
170	Cannonball River at Breien, N. Dak.	1978–2007	1989.5	Q+T+SS	1.19	82.9
176	James River near Grace City, N. Dak.	1987–2007	1990	Custom period January–March	0.93	73.3
180	Pipestem Creek near Pingree, N. Dak.	ISD	ISD	ISD	ISD	ISD
182	James River at Jamestown, N. Dak.	1987–2007	1989.5	Q+SS	0.93	82.7
Nitrate + nitrite dissolved and total as nitrogen						
5	Red River of the North below Wahpeton, N. Dak.	1971–1999	1984.5	Q+T+SS	1.24	52.6
10	Wild Rice River near Abercrombie, N. Dak.	1972–2007	1989	Q+SS	1.34	86.3
11	Red River of the North at Fargo, N. Dak.	1971–2008	1989	BpQ+SS	--	86.5
20	Mauvais Coulee near Cando, N. Dak.	1987–2004	1990.5	Q+SS	1.41	88.7
21	Edmore Coulee near Edmore, N. Dak.	1983–2004	1990.5	Q+SS	1.30	87.5
32	Sheyenne River near Cooperstown, N. Dak.	1971–2007	1989	Q+SS	1.26	76.6
33	Baldhill Creek near Dazey, N. Dak.	1979–1996	1990	Q+SS	1.45	95.6
37	Sheyenne River near Kindred, N. Dak.	1977–2007	1990.5	Q+SS	1.64	83.7

Table 3. Regression model characteristics for S-LOADEST models for selected sites in North Dakota from 1970 through 2008.—Continued

[Q, natural log discharge; BpQ, natural log of discharge with a break point; T, time; SS, season; CEN, data had more than 80 percent censored values; ISD, insufficient data; --, not used]

Map identification number	Site name	Calibration data range, years	Median year for normalized load calculation	Selected model explanatory variables	Regression coefficient (β_1) for Q	Coefficient of determination
Nitrate + nitrite dissolved and total as nitrogen—Continued						
45	Maple River below Mapleton, N. Dak.	1997–2007	2001	Q+SS	1.78	90.9
55	Goose River at Hillsboro, N. Dak.	1994–2008	1989	Q+SS	1.45	72.0
56	Red River of the North at Grand Forks, N. Dak.	1972–2008	1989	Q+T+SS	1.31	83.3
62	Forest River near Minto, N. Dak.	1994–2008	1989.5	Q+T+SS	1.25	72.2
67	Park River at Grafton, N. Dak.	1994–2008	1989	Q+SS	1.29	89.8
75	Pembina River at Neche, N. Dak.	1994–2008	1990	Q+SS	1.48	87.7
76	Tongue River at Akra, N. Dak.	1979–2004	1990	BpQ	--	81.8
79	Red River of the North at Emerson, Manitoba	1978–2004	1990.5	Q+SS	1.37	84.7
82	Souris River near Sherwood, N. Dak.	1974–2008	1990.5	Q+T+SS	1.17	90.9
85	Souris River above Minot, N. Dak.	1972–2008	1989	Q+SS	1.14	83.3
89	Souris River near Bantry, N. Dak.	1981–2000	1989	Q+SS	1.24	73.8
98	Souris River near Westhope, N. Dak.	1972–2008	1989	Q+T+SS	0.97	61.5
112	Little Missouri River at Medora, N. Dak.	1974–2007	1990	Q	1.52	78.3
114	Little Missouri River near Watford City, N. Dak.	1974–2007	1989.5	Q	1.41	74.1
115	Missouri River at Garrison Dam, N. Dak.	1972–2007	1989	Q+T	1.10	56.6
125	Spring Creek at Zap, N. Dak.	1974–2007	1989	Q+T+SS	1.26	72.4
127	Knife River at Hazen, N. Dak.	1974–2007	1989	Q+SS	1.42	79.5
142	Missouri River at Bismarck, N. Dak.	1971–2001	1989.5	Q+T+SS	1.53	66.2
149	Heart River near Richardton, N. Dak.	1995–2007	1990.5	Q+SS	1.51	72.0
156	Heart River near Mandan, N. Dak.	1978–2007	1989.5	Q+T+SS	1.32	88.8
158	Apple Creek near Menoken, N. Dak.	1977–2007	1990	Q+SS	1.48	92.2
169	Cedar Creek near Raleigh, N. Dak.	1994–2007	1990.5	BpQ+SS	--	83.1
170	Cannonball River at Breien, N. Dak.	1972–2007	1989.5	Q+SS	1.42	81.9
176	James River near Grace City, N. Dak.	1985–2007	1990	Q+SS	1.32	83.7
180	Pipestem Creek near Pingree, N. Dak.	ISD	ISD	ISD	ISD	ISD
182	James River at Jamestown, N. Dak.	1984–2007	1989.5	Q+T+SS	1.25	83.8
Phosphorus, dissolved as phosphorus						
5	Red River of the North below Wahpeton, N. Dak.	1970–1999	1984.5	BpQ	--	13.5
10	Wild Rice River near Abercrombie, N. Dak.	1971–2007	1989	Q+T	0.93	88.1
11	Red River of the North at Fargo, N. Dak.	1970–2008	1989	Q+SS	1.27	82.4
20	Mauvais Coulee near Cando, N. Dak.	ISD	ISD	ISD	ISD	ISD
21	Edmore Coulee near Edmore, N. Dak.	ISD	ISD	ISD	ISD	ISD
32	Sheyenne River near Cooperstown, N. Dak.	1970–2007	1989	Q+SS	0.95	89.4
33	Baldhill Creek near Dazey, N. Dak.	1979–1980	1990	Q+SS	1.21	94.6
37	Sheyenne River near Kindred, N. Dak.	1977–2007	1990.5	Q+SS	1.22	84.5
45	Maple River below Mapleton, N. Dak.	ISD	ISD	ISD	ISD	ISD
55	Goose River at Hillsboro, N. Dak.	1994–2008	1989	BpQ	--	81.3
56	Red River of the North at Grand Forks, N. Dak.	1971–2008	1989	Q+SS	1.20	82.1

Table 3. Regression model characteristics for S-LOADEST models for selected sites in North Dakota from 1970 through 2008.—Continued

[Q, natural log discharge; BpQ, natural log of discharge with a break point; T, time; SS, season; CEN, data had more than 80 percent censored values; ISD, insufficient data; --, not used]

Map identification number	Site name	Calibration data range, years	Median year for normalized load calculation	Selected model explanatory variables	Regression coefficient (β_1) for Q	Coefficient of determination
Phosphorus, dissolved as phosphorus—Continued						
62	Forest River near Minto, N. Dak.	2005–2008	1989.5	Q	1.51	85.5
67	Park River at Grafton, N. Dak.	2005–2008	1989	Q+SS	1.47	88.7
75	Pembina River at Neche, N. Dak.	2005–2008	1990	Q+T	1.26	92.8
76	Tongue River at Akra, N. Dak.	ISD	ISD	ISD	ISD	ISD
79	Red River of the North at Emerson, Manitoba	1978–2004	1990.5	BpQ	--	86.2
82	Souris River near Sherwood, N. Dak.	1974–2006	1990.5	Q+SS	0.80	92.1
85	Souris River above Minot, N. Dak.	1981–2007	1989	Q	0.88	97.3
89	Souris River near Bantry, N. Dak.	1981–2000	1989	Q+T+SS	0.92	88.2
98	Souris River near Westhope, N. Dak.	1970–1994	1989	Q+T+SS	0.93	82.9
112	Little Missouri River at Medora, N. Dak.	ISD	ISD	ISD	ISD	ISD
114	Little Missouri River near Watford City, N. Dak.	1977–2007	1989.5	Q	1.18	76.2
115	Missouri River at Garrison Dam, N. Dak.	1971–2007	1989	Q+T	1.14	37.6
125	Spring Creek at Zap, N. Dak.	1977–2007	1989	Q+SS	2.02	83.3
127	Knife River at Hazen, N. Dak.	1977–2007	1989	Q	1.46	64.9
142	Missouri River at Bismarck, N. Dak.	ISD	ISD	ISD	ISD	ISD
149	Heart River near Richardton, N. Dak.	ISD	ISD	ISD	ISD	ISD
156	Heart River near Mandan, N. Dak.	1978–2007	1989.5	Q	1.44	82.6
158	Apple Creek near Menoken, N. Dak.	1977–1981	1990	Q	0.81	80.3
169	Cedar Creek near Raleigh, N. Dak.	2006–2007	1990.5	ISD	ISD	ISD
170	Cannonball River at Breien, N. Dak.	1978–2007	1989.5	Q+SS	1.20	82.5
176	James River near Grace City, N. Dak.	1985–2007	1990	Q+SS	1.10	94.2
180	Pipestem Creek near Pingree, N. Dak.	ISD	ISD	ISD	ISD	ISD
182	James River at Jamestown, N. Dak.	1984–2007	1989.5	Q+T	1.21	91.2
Phosphorus, total as phosphorus						
5	Red River of the North below Wahpeton, N. Dak.	1970–1999	1984.5	Q	1.00	76.9
10	Wild Rice River near Abercrombie, N. Dak.	1994–2007	1989	Q+SS	1.10	96.5
11	Red River of the North at Fargo, N. Dak.	1994–2008	1989	Q+T+SS	1.44	92.9
20	Mauvais Coulee near Cando, N. Dak.	1989–2004	1990.5	Q+SS	1.02	96.5
21	Edmore Coulee near Edmore, N. Dak.	1989–2004	1990.5	Q	0.97	96.1
32	Sheyenne River near Cooperstown, N. Dak.	1979–2007	1989	Q+SS	1.05	90.8
33	Baldhill Creek near Dazey, N. Dak.	1979–1996	1990	Q+SS	1.15	97.1
37	Sheyenne River near Kindred, N. Dak.	1977–2007	1990.5	Q+SS	1.30	91.5
45	Maple River below Mapleton, N. Dak.	1997–2007	2001	Q+T+SS	1.09	83.4
55	Goose River at Hillsboro, N. Dak.	1994–2008	1989	Q	1.30	89.8
56	Red River of the North at Grand Forks, N. Dak.	1971–2008	1989	Q+T+SS	1.14	93.0
62	Forest River near Minto, N. Dak.	1994–2008	1989.5	Q	1.32	84.2
67	Park River at Grafton, N. Dak.	1994–2008	1989	Q+SS	1.17	93.6
75	Pembina River at Neche, N. Dak.	1994–2008	1990	Q+T	1.46	98.1

Table 3. Regression model characteristics for S-LOADEST models for selected sites in North Dakota from 1970 through 2008.—Continued

[Q, natural log discharge; BpQ, natural log of discharge with a break point; T, time; SS, season; CEN, data had more than 80 percent censored values; ISD, insufficient data; --, not used]

Map identification number	Site name	Calibration data range, years	Median year for normalized load calculation	Selected model explanatory variables	Regression coefficient (β_1) for Q	Coefficient of determination
Phosphorus, total as phosphorus—Continued						
76	Tongue River at Akra, N. Dak.	1979–2004	1990	Q	1.08	95.8
79	Red River of the North at Emerson, Manitoba	1978–2004	1990.5	BpQ+SS	--	89.4
82	Souris River near Sherwood, N. Dak.	1974–2008	1990.5	BpQ+T+SS	--	95.5
85	Souris River above Minot, N. Dak.	1981–2008	1989	Q+SS	0.91	95.2
89	Souris River near Bantry, N. Dak.	1981–2000	1989	Q+T+SS	0.82	90.4
98	Souris River near Westhope, N. Dak.	1970–2008	1989	Q+SS	0.94	89.2
112	Little Missouri River at Medora, N. Dak.	1979–2007	1990	Q+SS	1.55	89.3
114	Little Missouri River near Watford City, N. Dak.	1974–2007	1989.5	Q+SS	1.60	82.3
115	Missouri River at Garrison Dam, N. Dak.	1974–2007	1989	Q+T+SS	0.63	25.3
125	Spring Creek at Zap, N. Dak.	1974–2007	1989	Q+T+SS	1.47	82.9
127	Knife River at Hazen, N. Dak.	1974–2007	1989	Q+T+SS	1.42	82.2
142	Missouri River at Bismarck, N. Dak.	1971–2001	1989.5	Q+SS	1.44	29.1
149	Heart River near Richardton, N. Dak.	1995–2007	1990.5	Q+SS	1.33	86.5
156	Heart River near Mandan, N. Dak.	1978–2007	1989.5	Q+T+SS	1.42	88.6
158	Apple Creek near Menoken, N. Dak.	1977–2007	1990	BpQ + SS	--	94.9
169	Cedar Creek near Raleigh, N. Dak.	1994–2007	1990.5	Q	1.20	91.8
170	Cannonball River at Breien, N. Dak.	1975–2007	1989.5	BpQ+T+SS	--	89.4
176	James River near Grace City, N. Dak.	1987–2007	1990	Q+SS	1.02	97.0
180	Pipestem Creek near Pingree, N. Dak.	ISD	ISD	ISD	ISD	ISD
182	James River at Jamestown, N. Dak.	1986–2007	1989.5	Q+T+SS	1.00	83.1
Organic carbon, total as carbon						
5	Red River of the North below Wahpeton, N. Dak.	ISD	ISD	ISD	ISD	ISD
10	Wild Rice River near Abercrombie, N. Dak.	ISD	ISD	ISD	ISD	ISD
11	Red River of the North at Fargo, N. Dak.	2006–2008	1989	Q+T	1.05	98.5
20	Mauvais Coulee near Cando, N. Dak.	ISD	ISD	ISD	ISD	ISD
21	Edmore Coulee near Edmore, N. Dak.	ISD	ISD	ISD	ISD	ISD
32	Sheyenne River near Cooperstown, N. Dak.	ISD	ISD	ISD	ISD	ISD
33	Baldhill Creek near Dazey, N. Dak.	ISD	ISD	ISD	ISD	ISD
37	Sheyenne River near Kindred, N. Dak.	1979–2007	1990.5	Q+T	1.06	84.9
45	Maple River below Mapleton, N. Dak.	ISD	ISD	ISD	ISD	ISD
55	Goose River at Hillsboro, N. Dak.	2006–2008	1989	Q	1.07	99.4
56	Red River of the North at Grand Forks, N. Dak.	2006–2008	1989	Q	1.05	98.6
62	Forest River near Minto, N. Dak.	2006–2008	1989.5	Q+SS	1.23	99.3
67	Park River at Grafton, N. Dak.	2006–2008	1989	Q+SS	1.03	99.8
75	Pembina River at Neche, N. Dak.	2006–2008	1990	Q	1.14	99.6
76	Tongue River at Akra, N. Dak.	ISD	ISD	ISD	ISD	ISD
79	Red River of the North at Emerson, Manitoba	ISD	ISD	ISD	ISD	ISD
82	Souris River near Sherwood, N. Dak.	1974–2008	1990.5	Q+T+SS	1.00	98.5

Table 3. Regression model characteristics for S-LOADEST models for selected sites in North Dakota from 1970 through 2008.—Continued

[Q, natural log discharge; BpQ, natural log of discharge with a break point; T, time; SS, season; CEN, data had more than 80 percent censored values; ISD, insufficient data; --, not used]

Map identification number	Site name	Calibration data range, years	Median year for normalized load calculation	Selected model explanatory variables	Regression coefficient (β_1) for Q	Coefficient of determination
Organic carbon, total as carbon—Continued						
85	Souris River above Minot, N. Dak.	1981–2008	1989	Q+SS	0.96	98.9
89	Souris River near Bantry, N. Dak.	1982–1998	1989	Q+SS	0.98	98.8
98	Souris River near Westhope, N. Dak.	1970–2008	1989	Q+T	0.95	95.0
112	Little Missouri River at Medora, N. Dak.	ISD	ISD	ISD	ISD	ISD
114	Little Missouri River near Watford City, N. Dak.	1974–2007	1989.5	Q+T	0.99	84.2
115	Missouri River at Garrison Dam, N. Dak.	1974–1981	1989	Q+T+SS	0.92	44.9
125	Spring Creek at Zap, N. Dak.	ISD	ISD	ISD	ISD	ISD
127	Knife River at Hazen, N. Dak.	1974–2007	1989	Q+T	1.12	86.5
142	Missouri River at Bismarck, N. Dak.	1971–1978	1989.5	Q+T	1.28	55.9
149	Heart River near Richardton, N. Dak.	ISD	ISD	ISD	ISD	ISD
156	Heart River near Mandan, N. Dak.	1979–2007	1989.5	Q+T+SS	0.98	92.9
158	Apple Creek near Menoken, N. Dak.	ISD	ISD	ISD	ISD	ISD
169	Cedar Creek near Raleigh, N. Dak.	ISD	ISD	ISD	ISD	ISD
170	Cannonball River at Breien, N. Dak.	1975–2007	1989.5	Q+T	1.07	96.8
176	James River near Grace City, N. Dak.	1988–2007	1990	Q+SS	1.03	99.0
180	Pipestem Creek near Pingree, N. Dak.	ISD	ISD	ISD	ISD	ISD
182	James River at Jamestown, N. Dak.	1987–2007	1989.5	Q+SS	1.11	99.2
Suspended sediment						
5	Red River of the North below Wahpeton, N. Dak.	ISD	ISD	ISD	ISD	ISD
10	Wild Rice River near Abercrombie, N. Dak.	1976–1994	1989	Q	1.16	93.9
11	Red River of the North at Fargo, N. Dak.	1976–2008	1989	Q+T+SS	1.60	81.4
20	Mauvais Coulee near Cando, N. Dak.	ISD	ISD	ISD	ISD	ISD
21	Edmore Coulee near Edmore, N. Dak.	ISD	ISD	ISD	ISD	ISD
32	Sheyenne River near Cooperstown, N. Dak.	ISD	ISD	ISD	ISD	ISD
33	Baldhill Creek near Dazey, N. Dak.	ISD	ISD	ISD	ISD	ISD
37	Sheyenne River near Kindred, N. Dak.	1977–2001	1990.5	Q+T+SS	1.49	86.8
45	Maple River below Mapleton, N. Dak.	ISD	ISD	ISD	ISD	ISD
55	Goose River at Hillsboro, N. Dak.	ISD	ISD	ISD	ISD	ISD
56	Red River of the North at Grand Forks, N. Dak.	1994–2008	1989	Q+T	1.76	76.7
62	Forest River near Minto, N. Dak.	1974–2007	1989.5	Q+T	1.33	88.7
67	Park River at Grafton, N. Dak.	ISD	ISD	ISD	ISD	ISD
75	Pembina River at Neche, N. Dak.	ISD	ISD	ISD	ISD	ISD
76	Tongue River at Akra, N. Dak.	ISD	ISD	ISD	ISD	ISD
79	Red River of the North at Emerson, Manitoba	1978–2001	1990.5	Q+T+SS	1.23	90.8
82	Souris River near Sherwood, N. Dak.	1974–1981	1990.5	Q	1.26	95.9
85	Souris River above Minot, N. Dak.	ISD	ISD	ISD	ISD	ISD
89	Souris River near Bantry, N. Dak.	1985–2000	1989	Q+T	1.01	74.0
98	Souris River near Westhope, N. Dak.	1974–1994	1989	Q+T+SS	0.94	83.6

Table 3. Regression model characteristics for S-LOADEST models for selected sites in North Dakota from 1970 through 2008.—Continued

[Q, natural log discharge; BpQ, natural log of discharge with a break point; T, time; SS, season; CEN, data had more than 80 percent censored values; ISD, insufficient data; --, not used]

Map identification number	Site name	Calibration data range, years	Median year for normalized load calculation	Selected model explanatory variables	Regression coefficient (β_1) for Q	Coefficient of determination
112	Little Missouri River at Medora, N. Dak.	ISD	ISD	ISD	ISD	ISD
114	Little Missouri River near Watford City, N. Dak.	1971–1994	1989.5	Q+SS	1.67	86.2
115	Missouri River at Garrison Dam, N. Dak.	1975–2007	1989	Q+SS	1.24	60.5
125	Spring Creek at Zap, N. Dak.	1975–2008	1989	Q+T+SS	1.49	89.5
127	Knife River at Hazen, N. Dak.	1974–1993	1989	Q+SS	1.53	88.3
142	Missouri River at Bismarck, N. Dak.	1972–2001	1989.5	Q+T	2.01	46.5
149	Heart River near Richardton, N. Dak.	ISD	ISD	ISD	ISD	ISD
156	Heart River near Mandan, N. Dak.	1972–1993	1989.5	Q+March–June period	0.95	93.9
158	Apple Creek near Menoken, N. Dak.	1979–1981	1990	Q+SS	1.01	77.3
169	Cedar Creek near Raleigh, N. Dak.	ISD	ISD	ISD	ISD	ISD
170	Cannonball River at Breien, N. Dak.	1973–1992	1989.5	Q+T+SS	1.57	90.7
176	James River near Grace City, N. Dak.	1985–1995	1990	Q+SS	0.94	90.6
180	Pipestem Creek near Pingree, N. Dak.	ISD	ISD	ISD	ISD	ISD
182	James River at Jamestown, N. Dak.	1985–1995	1989.5	Q+SS	0.94	91.8

Normalized annual total phosphorus yields ranged from less than 1 to 167 lbs/yr/mi² as phosphorus in the Missouri River Basin and from 6 to 76 lbs/yr/mi² as phosphorus in the Red River of the North Basin (fig. 20 and table 4). The highest yields (greater than 46 lbs/yr/mi²) were at two sites in the Missouri River Basin (sites 112 and 114 on the Little Missouri River) and six sites in the Red River of the North Basin (site 20 on Mauvais Coulee; site 21 on Edmore Coulee; site 75 on the Pembina River; site 76 on the Tongue River; and sites 5 and 79 on the Red River of the North) (figs. 1 and 20; table 4). The lowest yields (less than 14 lbs/yr/mi²) were at three sites in the Missouri River Basin (sites 115 and 142 on the Missouri River and site 169 on Cedar Creek) and five sites in the Red River of the North Basin (site 32 on the Sheyenne River; site 45 on the Maple River; and sites 82, 85 and 89 on the Souris River) (figs. 1 and 20; table 4).

Normalized annual total organic carbon yields ranged from 426 to 2,670 lbs/yr/mi² as carbon in the Missouri River Basin and from 394 to 11,100 lbs/yr/mi² as carbon in the Red River of the North Basin (fig. 21 and table 4). The highest

yields (greater than 2,100 lbs/yr/mi²) were at two sites in the Missouri River Basin (site 115 on the Missouri River and site 127 on the Knife River) and three sites in the Red River of the North Basin (site 11 and 56 on the Red River of the North and site 55 on the Goose River) (figs. 1 and 21; table 4). The lowest yields (less than 800 lbs/yr/mi²) were at one site in the Missouri River Basin (site 142 on the Missouri River) and four sites in the Red River of the North Basin (site 37 on the Sheyenne River and sites 82, 85 and 89 on the Souris River) (figs. 1 and 21; table 4).

Suspended Sediment

Normalized annual suspended-sediment yields ranged from 519 to 622,000 lbs/yr/mi² in the Missouri River Basin and from 1,500 to 78,800 lbs/yr/mi² in the Red River of the North Basin (fig. 22 and table 4). The highest yields (greater than 31,700 lbs/yr/mi²) were at three sites in the Missouri River Basin (sites 114 on the Little Missouri River; site 156

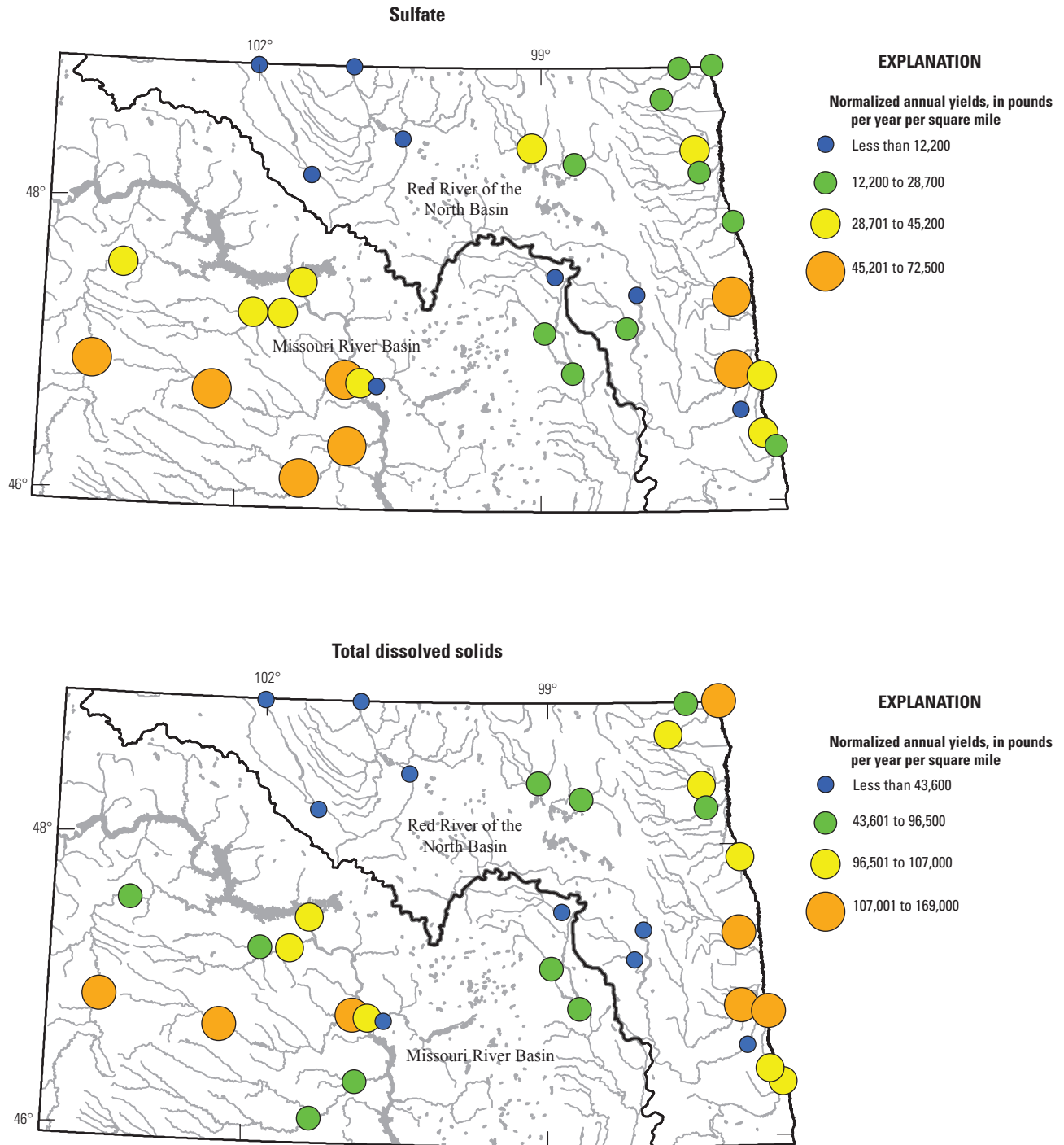


Figure 19. Spatial distribution of normalized annual sulfate and total dissolved solids yields for selected stream sites in North Dakota.

Table 4. Estimated normalized annual loads and yields for selected sites and water-quality constituents in North Dakota.

[ID, identification; tons/yr, tons (short) per year; lbs/yr/mi², pounds per year per square mile; N, nitrogen; --, not calculated; P, phosphorus; C, carbon; <, less than]

Site ID number (table 1)	Site name	Sulfate		Total dissolved solids		Nitrate + Nitrite dissolved and total as N		Ammonia, dissolved and total as N	
		Annual load, tons/yr	Annual yield, lbs/yr/mi ²	Annual load, tons/yr	Annual yield, lbs/yr/mi ²	Annual load, tons/yr	Annual yield, lbs/yr/mi ²	Annual load, tons/yr	Annual yield, lbs/yr/mi ²
5	Red River of the North below Wahpeton, N. Dak.	52,300	26,000	213,000	106,000	103	51	70	35
10	Wild Rice River near Abercrombie, N. Dak.	46,900	45,200	107,000	103,000	104	100	34	33
11	Red River of the North at Fargo, N. Dak.	112,000	32,900	369,000	108,000	389	114	73	21
20	Mauvais Coulee near Cando, N. Dak.	6,030	31,200	17,400	90,200	21	109	3	15
21	Edmore Coulee near Edmore, N. Dak.	3,760	19,700	11,400	59,400	29	154	2	12
32	Sheyenne River near Cooperstown, N. Dak.	26,300	8,110	92,500	28,600	59	18	13	4
33	Baldhill Creek near Dazey, N. Dak.	4,220	12,200	13,200	38,400	18	53	5	14
37	Sheyenne River near Kindred, N. Dak.	52,500	11,900	164,000	37,400	203	46	35	8
45	Maple River below Mapleton, N. Dak.	41,300	55,800	114,000	154,000	934	1,260	22	30
55	Goose River at Hillsboro, N. Dak.	43,500	72,500	102,000	169,000	271	450	15	24
56	Red River of the North at Grand Forks, N. Dak.	396,000	26,300	1,510,000	99,900	2,340	155	314	21
62	Forest River near Minto, N. Dak.	10,100	27,200	29,000	78,200	35	95	4	10
67	Park River at Grafton, N. Dak.	12,900	37,200	37,200	107,000	130	375	4	12
75	Pembina River at Neche, N. Dak.	48,900	28,700	140,000	82,200	320	188	--	--
76	Tongue River at Akra, N. Dak.	1,970	24,700	8,000	99,900	12	153	5	62
79	Red River of the North at Emerson, Manitoba	557,000	27,700	2,240,000	111,000	5,200	259	733	36
82	Souris River near Sherwood, N. Dak.	21,000	4,680	57,900	13,000	25	6	16	4
85	Souris River above Minot, N. Dak.	42,000	7,930	116,000	21,900	35	7	25	5
89	Souris River near Bantry, N. Dak.	48,900	7,930	146,600	23,800	46	7	24	4
98	Souris River near Westhope, N. Dak.	65,500	7,760	210,000	24,900	20	2	46	5
112	Little Missouri River at Medora, N. Dak.	174,000	56,200	368,000	119,000	370	120	18	6
114	Little Missouri River near Watford City, N. Dak.	188,000	45,200	349,000	83,900	409	98	33	8
115	Missouri River at Garrison Dam, N. Dak.	3,604,000	39,700	8,940,000	98,800	2,270	25	--	--
125	Spring Creek at Zap, N. Dak.	10,200	37,300	23,800	86,800	9	33	6	22
127	Knife River at Hazen, N. Dak.	48,600	43,400	112,000	99,900	64	58	22	20
142	Missouri River at Bismarck, N. Dak.	3,890,000	41,700	9,930,000	107,000	2,190	24	--	--
146	Heart River at Dickinson, N. Dak.	45,400	51,900	84,600	96,500	65	75	10	12
149	Heart River Richardson, N. Dak.	32,700	52,900	67,700	109,000	47	75	14	22
156	Heart River near Mandan, N. Dak.	78,800	47,600	181,800	110,000	101	61	32	19
158	Apple Creek near Menoken, N. Dak.	7,760	9,250	25,600	30,400	23	27	9	11
169	Cedar Creek near Raleigh, N. Dak.	45,400	51,900	84,600	96,500	65	75	10	12
170	Cannonball River at Breiten, N. Dak.	102,000	50,000	198,000	96,500	160	78	28	13
176	James River near Grace City, N. Dak.	6,420	12,100	23,100	43,600	22	41	10	18
180	Pipestem Creek near Pingree, N. Dak.	6,240	17,800	19,200	54,800	--	--	--	--
182	James River at Jamestown, N. Dak.	20,700	14,700	68,000	48,200	64	45	20	14

Table 4. Estimated normalized annual loads and yields for selected sites and water-quality constituents in North Dakota.—Continued

[ID, identification; tons/yr, tons (short) per year; lbs/yr/mi², pounds per year per square mile; N, nitrogen; --, not calculated; P, phosphorus; C, carbon; <, less than]

Site ID number (table 1)	Site name	Phosphorus, dissolved as P			Phosphorus, total as P			Organic carbon, total as C			Suspended-sediment		
		Annual load, tons/yr	Annual yield, lbs/yr/mi ²	Annual load, tons/yr	Annual yield, lbs/yr/mi ²	Annual load, tons/yr	Annual yield, lbs/yr/mi ²	Annual load, tons/yr	Annual yield, lbs/yr/mi ²	Annual load, tons/yr	Annual yield, lbs/yr/mi ²	Annual load, tons/yr	Annual yield, lbs/yr/mi ²
5	Red River of the North below Wahpeton, N. Dak.	79	39	115	57	--	--	--	--	--	--	--	
10	Wild Rice River near Abercrombie, N. Dak.	29	28	35	33	--	--	--	--	13,200	12,700	--	
11	Red River of the North at Fargo, N. Dak.	156	46	117	34	37,800	11,100	78,000	22,900	--	--	--	
20	Mauvais Coulee near Cando, N. Dak.	--	--	12	64	--	--	--	--	--	--	--	
21	Edmore Coulee near Edmore, N. Dak.	--	--	11	56	--	--	--	--	--	--	--	
32	Sheyenne River near Cooperstown, N. Dak.	28	9	40	12	--	--	--	--	--	--	--	
33	Baldhill Creek near Dazey, N. Dak.	6	16	8	23	--	--	--	--	--	--	--	
37	Sheyenne River near Kindred, N. Dak.	34	8	87	20	3,450	785	56,500	12,800	--	--	--	
45	Maple River below Mapleton, N. Dak.	--	--	7	10	--	--	--	--	--	--	--	
55	Goose River at Hillsboro, N. Dak.	28	47	28	46	1,420	2,360	--	--	--	--	--	
56	Red River of the North at Grand Forks, N. Dak.	614	41	590	39	35,200	2,330	430,000	28,500	--	--	--	
62	Forest River near Minto, N. Dak.	11	30	12	32	426	1,150	3,090	8,330	--	--	--	
67	Park River at Grafton, N. Dak.	13	39	15	42	561	1,610	--	--	--	--	--	
75	Pembina River at Neche, N. Dak.	--	--	126	74	2,520	1,480	--	--	--	--	--	
76	Tongue River at Akra, N. Dak.	--	--	5	57	--	--	--	--	--	--	--	
79	Red River of the North at Emerson, Manitoba	875	44	1,530	76	--	--	1,580,000	78,800	--	--	--	
82	Souris River near Sherwood, N. Dak.	8	17	26	6	1,760	394	7,090	1,580	--	--	--	
85	Souris River above Minot, N. Dak.	28	5	43	8	2,840	537	--	--	--	--	--	
89	Souris River near Bantry, N. Dak.	45	7	72	12	4,440	722	9,250	1,500	--	--	--	
98	Souris River near Westhope, N. Dak.	107	13	117	14	8,460	1,000	13,000	1,540	--	--	--	
112	Little Missouri River at Medora, N. Dak.	--	--	387	125	--	--	--	--	--	--	--	
114	Little Missouri River near Watford City, N. Dak.	14	3	695	167	7,630	1,840	2,580,000	622,000	--	--	--	
115	Missouri River at Garrison Dam, N. Dak.	121	<1	218	<1	192,000	2,120	47,100	519	--	--	--	
125	Spring Creek at Zap, N. Dak.	6	21	5	18	--	--	2,040	7,420	--	--	--	
127	Knife River at Hazen, N. Dak.	13	12	27	24	3,000	2,670	35,500	31,700	--	--	--	
142	Missouri River at Bismarck, N. Dak.	--	--	873	9	39,700	426	2,350,000	25,200	--	--	--	
146	Heart River at Dickinson, N. Dak.	--	--	9	10	--	--	--	--	--	--	--	
149	Heart River Richardton, N. Dak.	--	--	10	16	--	--	--	--	--	--	--	
156	Heart River near Mandan, N. Dak.	8	5	32	19	2,480	1,500	89,300	53,900	--	--	--	
158	Apple Creek near Menoken, N. Dak.	9	11	17	21	--	--	1,140	1,350	--	--	--	
169	Cedar Creek near Raleigh, N. Dak.	--	--	9	10	--	--	--	--	--	--	--	
170	Cannonball River at Breiten, N. Dak.	10	5	51	25	3,500	1,710	255,000	124,000	--	--	--	
176	James River near Grace City, N. Dak.	19	35	16	29	1,040	1,970	1,050	1,990	--	--	--	
180	Pipestem Creek near Pingree, N. Dak.	--	--	--	--	--	--	--	--	--	--	--	
182	James River at Jamestown, N. Dak.	29	21	49	35	2,250	1,590	6,010	4,260	--	--	--	

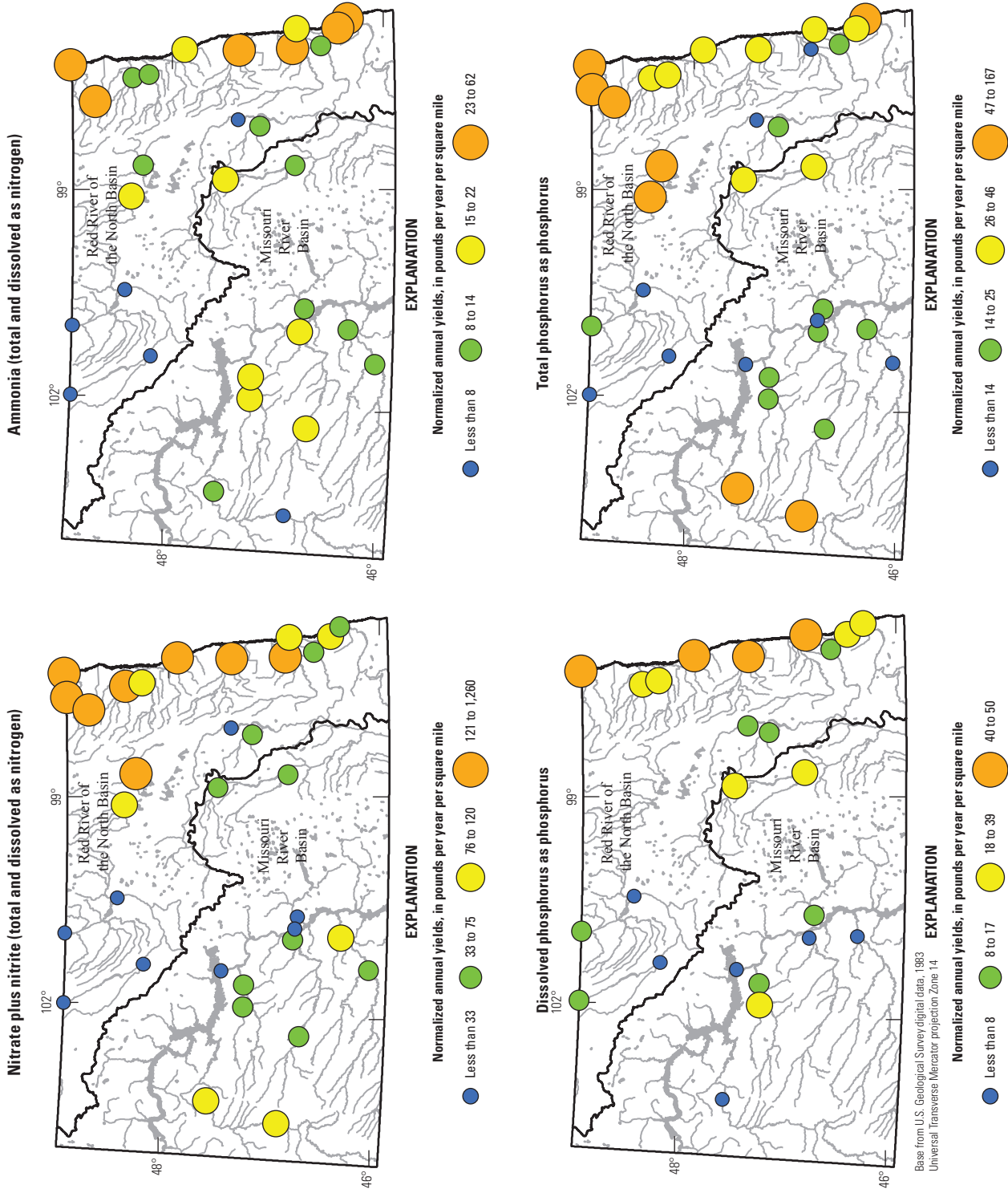


Figure 20. Spatial distribution of normalized annual nitrogen and phosphorus yields for selected stream sites in North Dakota.

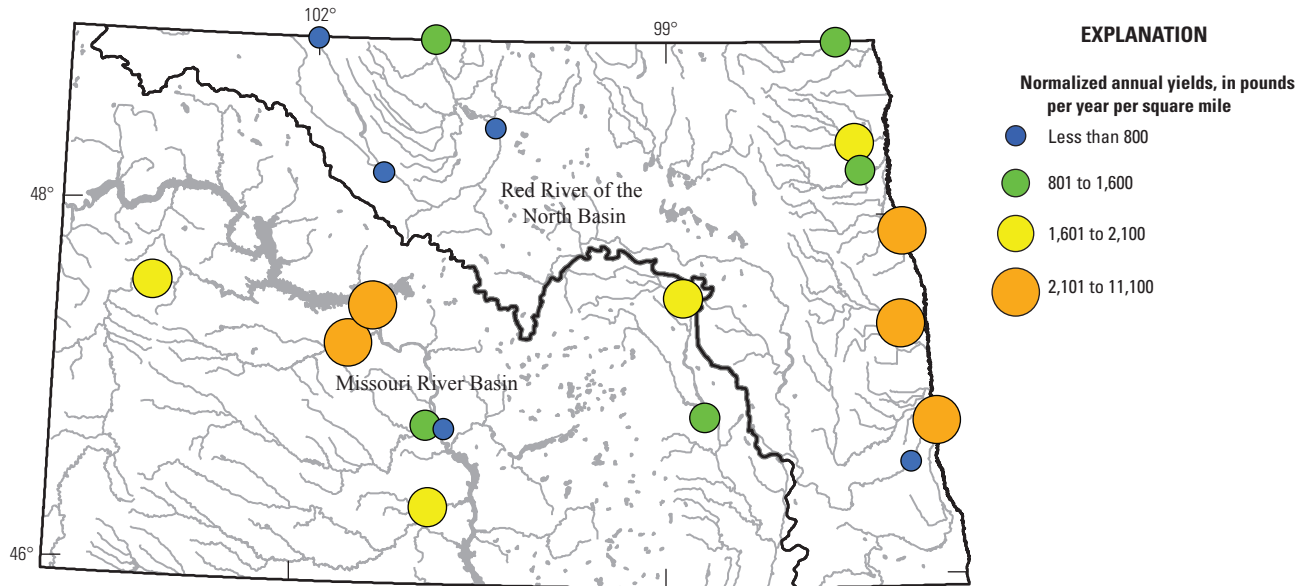


Figure 21. Spatial distribution of normalized annual total organic carbon yields for selected stream sites in North Dakota.

on the Heart River; and site 170 on the Cannonball River) and one site in the Red River of the North Basin (site 79 on the Red River of the North) (figs. 1 and 22; table 4). The lowest yields (1,580 lbs/yr/mi² or less) were at two sites in the Missouri River Basin (site 115 on the Missouri River and site 158 on Apple Creek) and three sites in the Red River of the North Basin (sites 82, 89 and 98 on the Souris River) (figs. 1 and 22; table 4).

Water-Quality Trend Analysis

The results of the water-quality trend analysis for the stations and constituents used for this study are summarized in this section. Long-term variability in the fitted annual median of the measured concentrations (FAMC) (eq. 3) indicates the inter-annual variability in concentration that can be attributed to both the flow-related variability (ANN) and the trend (TREND). The trend indicates long-term changes in standardized concentrations (eq. 4) that are unrelated to streamflow. The fitted trends along with statistical significance levels (P-values) are given in table 5. Unless otherwise noted, the fitted trends discussed in this section were highly significant, as indicated by a generalized likelihood ratio test (Vecchia, 2005) with a p-value less than 0.01. Thus, for any given station and constituent, the chance that the fitted trend could have occurred given the null hypothesis that the standardized concentrations were trend free was less than 1 percent (the data were trend free if their probability distribution remained the same for the entire trend-analysis period).

Sulfate and Total Dissolved Solids

The fitted annual median concentrations for sulfate at the 10 sites analyzed for trends from 1975 through 2008 indicated a pattern of generally higher median concentrations during the latter half of the period (1993–2008) compared to earlier years for most of the sites (fig. 23). This pattern was particularly evident for the sites in eastern North Dakota (sites 10, 32, 55, 56, and 82) and for two sites in western North Dakota (sites 125 and 127). The latter period corresponds with an extended period of wet conditions and high streamflows, especially in eastern North Dakota. Conversely, for two sites in western North Dakota (sites 114 and 170), median concentrations during 1993–2008 were somewhat lower compared to earlier years. The greatest ranges in annual median sulfate concentration were from 341 to 867 mg/L for the Little Missouri River near Watford City, N. Dak. (site 114) and from 382 to 767 mg/L for the Cannonball River at Breien, N. Dak. (site 170).

The fitted trends for standardized sulfate concentrations indicated significant increases in concentration at five sites and a significant decrease in concentration at one site from 1975 through 2008 (fig. 24 and table 5). Median standardized sulfate concentrations increased from about 55 to 106 mg/L for the Red River of the North at Grand Forks, N. Dak. (site 56); 262 to 308 mg/L for the Souris River near Sherwood, N. Dak. (site 82); 455 to 506 mg/L for Spring Creek at Zap, N. Dak. (site 125); 440 to 520 mg/L for the Knife River at Hazen, N. Dak. (site 127); and 380 to 435 mg/L for the Heart River near Mandan, N. Dak. (site 156). The fitted trend for the Little Missouri River near Watford City, N. Dak. (site 114) showed a decrease in median standardized concentration from about 492 to 417 mg/L. No significant increase or decrease in sulfate

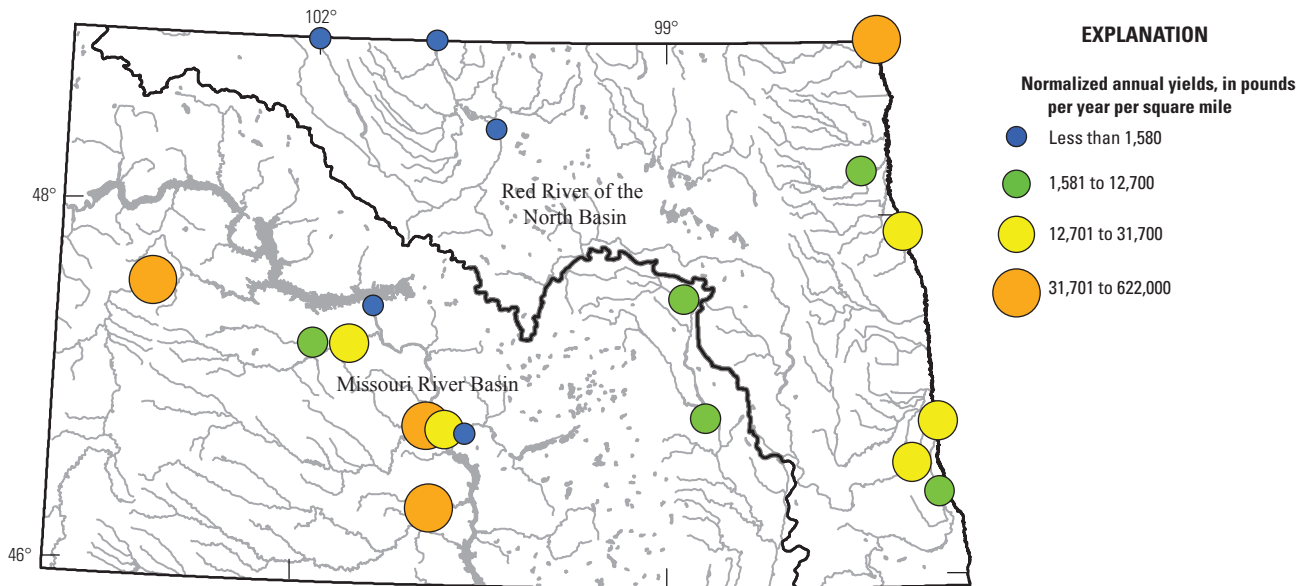


Figure 22. Spatial distribution of normalized annual suspended-sediment yields for selected stream sites in North Dakota.

concentrations was detected at the Wild Rice River near Abercrombie, N. Dak. (site 10), Sheyenne River near Cooperstown, N. Dak. (site 32), Goose River at Hillsboro, N. Dak. (site 55), or the Cannonball River at Breien, N. Dak. (site 170).

The fitted annual median TDS concentrations at the 10 sites analyzed for trends (fig. 25) were relatively variable compared to sulfate (fig. 23). The greatest ranges in annual median TDS concentration were from about 480 to 1,140 mg/L for the Wild Rice River near Abercrombie, N. Dak. (site 10), 630 to 1,170 mg/L for the Souris River near Sherwood, N. Dak. (site 82), and 720 to 1,950 mg/L for the Little Missouri River near Watford City, N. Dak. (site 114).

The fitted trends for standardized TDS concentrations indicated significant increases in concentration at five sites from 1975 through 2008 (fig. 26 and table 5). The greatest increase in median standardized TDS concentrations was detected for the Wild Rice River near Abercrombie, N. Dak. (site 10), where median concentrations increased from about 690 to 1,120 mg/L from 1975 through 2008. Median standardized TDS concentrations increased from about 880 mg/L to 1,000 mg/L for the Heart River near Mandan, N. Dak. (site 156); from about 1,090 to 1,210 mg/L for the Knife River at Hazen, N. Dak. (site 127); from about 1,000 to 1,110 mg/L for Spring Creek at Zap, N. Dak. (site 125); and from about 280 to 420 mg/L at the Red River of the North at Grand Forks, N. Dak. (site 56). No significant trend in TDS concentrations was detected at the Sheyenne River near Cooperstown, N. Dak. (site 32), Goose River at Hillsboro, N. Dak. (site 55), Souris River near Sherwood, N. Dak. (site 82), Little Missouri River near Watford City, N. Dak. (site 114), or Cannonball River at Breien, N. Dak. (site 170) (fig. 26).

Nitrate plus Nitrite and Total Phosphorus

The fitted annual median concentrations for nitrate plus nitrite (total and dissolved, as nitrogen) (fig. 27) were highly variable for sites in the Red River of the North Basin and the Little Missouri River near Watford City, N. Dak. (site 114). Concentrations varied from 0.12 to 0.50 mg/L for the Wild Rice River near Abercrombie, N. Dak. (site 10), from 0.11 to 0.41 mg/L for the Sheyenne River near Cooperstown, N. Dak. (site 32), from 0.23 to 0.66 mg/L for the Red River of the North near Grand Forks, N. Dak. (site 56), and from 0.19 to 0.59 mg/L for the Little Missouri River near Watford City, N. Dak. (site 114). Median concentrations for the other four sites did not vary more than 0.06 mg/L.

The fitted trends for standardized nitrate plus nitrite concentrations indicated no significant increases or decreases in concentration for 7 of the 8 sites analyzed for trends from 1975 through 2008 (fig. 28 and table 5); however, median standardized nitrate plus nitrite concentration for the Red River of the North near Grand Forks, N. Dak. (site 56) increased from about 0.26 to 0.45 mg/L as nitrogen during 1990 to 2008 (data were not available for that site before 1990).

The fitted annual median concentrations for total phosphorus were not highly variable (fig. 29). The greatest variability in annual median total phosphorus concentration was observed for the Souris River near Sherwood, N. Dak. (site 82), where median concentrations ranged from about 0.11 to 0.40 mg/L as phosphorus, and the Little Missouri River near Watford city, N. Dak. (site 114), where median concentrations ranged from about 0.05 to 0.26 mg/L as phosphorus.

The fitted trends for standardized total phosphorus concentrations indicated significant decreases in concentration at 4 out of the 10 sites and a significant increase at 1 out

Table 5. Fitted trends for selected standardized constituent concentrations at selected sites in North Dakota.

[ID, identification; mg/L, milligrams per liter; --, not calculated; <, less than; N, nitrogen; NA, insufficient data for analysis; P, phosphorus]

Site ID number (table 1)	Station Name	Estimated change in concentration from 1975 to 2008 (percent)	P-value for trend coefficient
Sulfate, mg/L			
10	Wild Rice River near Abercrombie, N. Dak.	No trend	--
32	Sheyenne River near Cooperstown, N. Dak.	No trend	--
55	Goose River at Hillsboro, N. Dak.	No trend	--
56	Red River of the North at Grand Forks, N. Dak.	95	0.0009
82	Souris River near Sherwood, N. Dak.	18	<0.0001
114	Little Missouri River near Watford City, N. Dak.	-15	0.0047
125	Spring Creek at Zap, N. Dak.	11	0.0016
127	Knife River at Hazen, N. Dak.	19	<0.0001
156	Heart River near Mandan, N. Dak.	14	0.0005
170	Cannonball River at Breien, N. Dak.	No trend	--
Total dissolved solids, mg/L			
10	Wild Rice River near Abercrombie, N. Dak.	63	<0.0001
32	Sheyenne River near Cooperstown, N. Dak.	No trend	--
55	Goose River at Hillsboro, N. Dak.	No trend	--
56	Red River of the North at Grand Forks, N. Dak.	48	<0.0001
82	Souris River near Sherwood, N. Dak.	No trend	--
114	Little Missouri River near Watford City, N. Dak.	No trend	--
125	Spring Creek at Zap, N. Dak.	11	0.0005
127	Knife River at Hazen, N. Dak.	11	<0.0001
156	Heart River near Mandan, N. Dak.	13	0.0001
170	Cannonball River at Breien, N. Dak.	No trend	--
Nitrate + Nitrite dissolved and total as N, in mg/L			
10	Wild Rice River near Abercrombie, N. Dak.	No trend	--
32	Sheyenne River near Cooperstown, N. Dak.	No trend	--
55	Goose River at Hillsboro, N. Dak.	NA	--
56	Red River of the North at Grand Forks, N. Dak.	¹ 70	<0.0001
82	Souris River near Sherwood, N. Dak.	No trend	--
114	Little Missouri River near Watford City, N. Dak.	No trend	--
125	Spring Creek at Zap, N. Dak.	NA	--
127	Knife River at Hazen, N. Dak.	No trend	--
156	Heart River near Mandan, N. Dak.	No trend	--
170	Cannonball River at Breien, N. Dak.	No trend	--
Phosphorus, total as P, in mg/L			
10	Wild Rice River near Abercrombie, N. Dak.	No trend ¹	--
32	Sheyenne River near Cooperstown, N. Dak.	No trend	--
55	Goose River at Hillsboro, N. Dak.	No trend ¹	--
56	Red River of the North at Grand Forks, N. Dak.	¹ 60	0.0001
82	Souris River near Sherwood, N. Dak.	No trend	--
114	Little Missouri River near Watford City, N. Dak.	No trend	--
125	Spring Creek at Zap, N. Dak.	-51	<0.0001
127	Knife River at Hazen, N. Dak.	-46	<0.0001
156	Heart River near Mandan, N. Dak.	-47	<0.0001
170	Cannonball River at Breien, N. Dak.	-51	<0.0001

¹Change was analyzed only from 1990 to 2008.

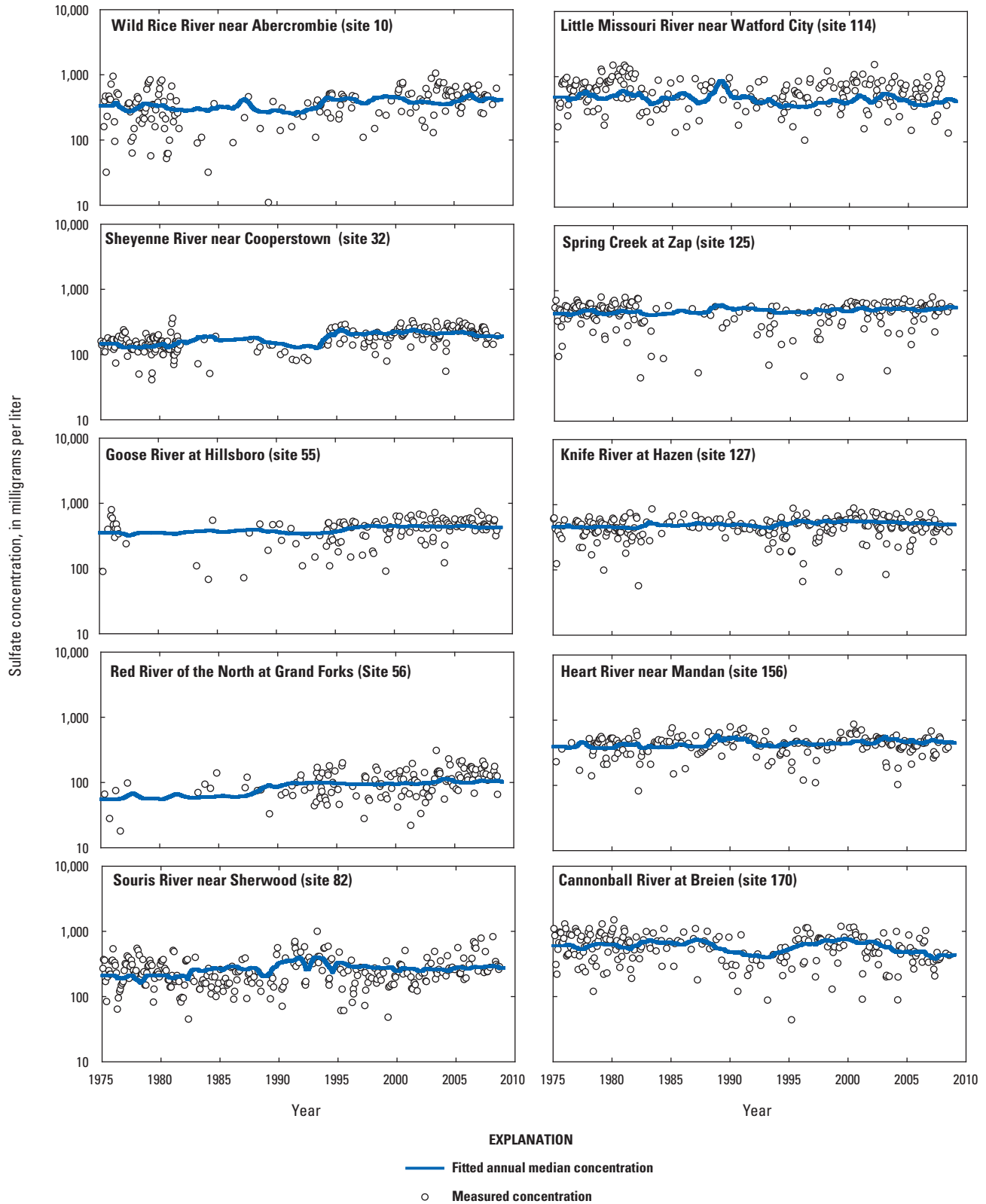


Figure 23. Measured sulfate concentrations and fitted annual median concentrations from 1975 through 2008 for selected sites in North Dakota.

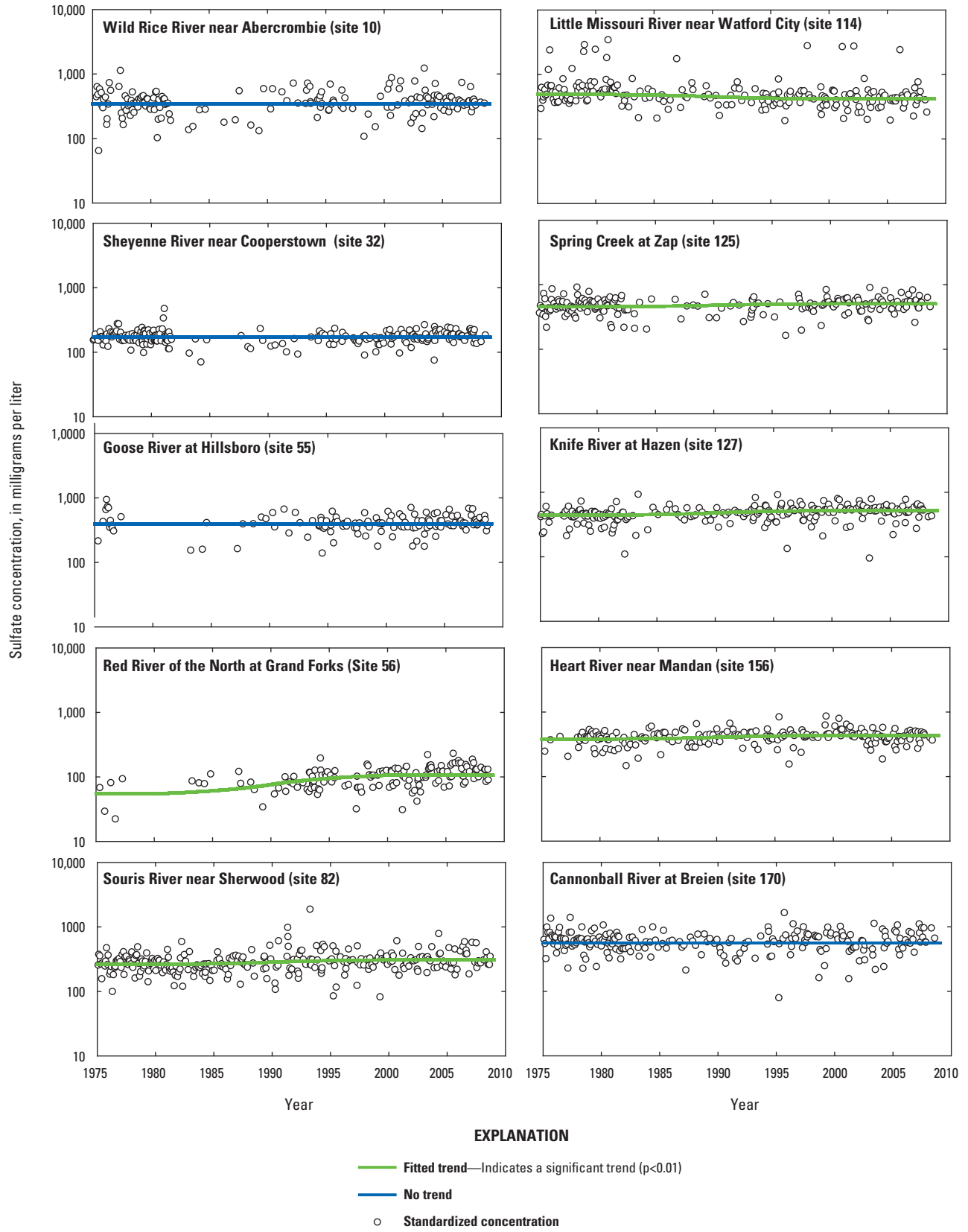


Figure 24. Standardized sulfate concentrations and fitted trends for 1975 through 2008 for selected sites in North Dakota.

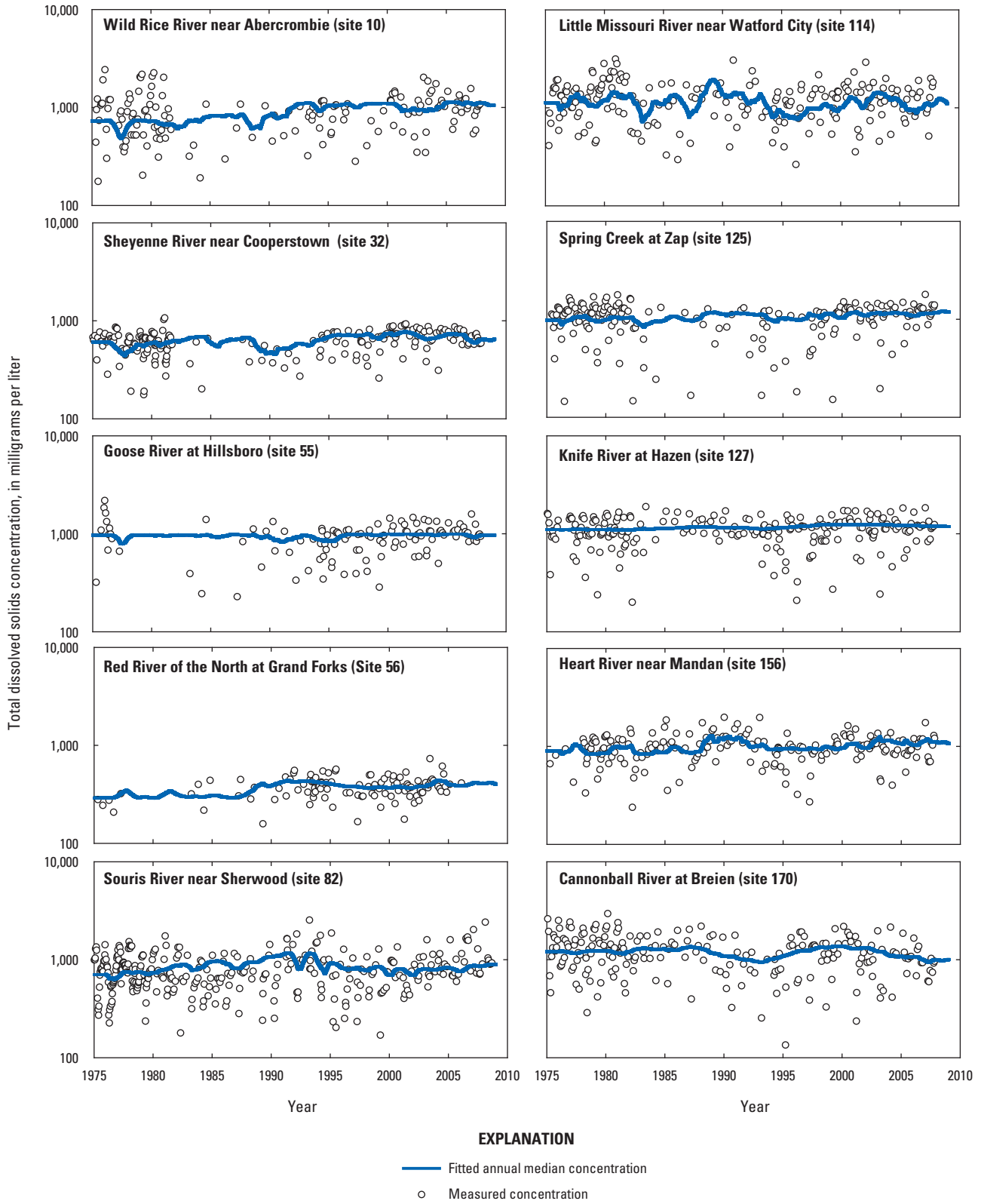


Figure 25. Measured total dissolved solids concentrations and fitted annual median concentrations for 1975 through 2008 for selected sites in North Dakota.

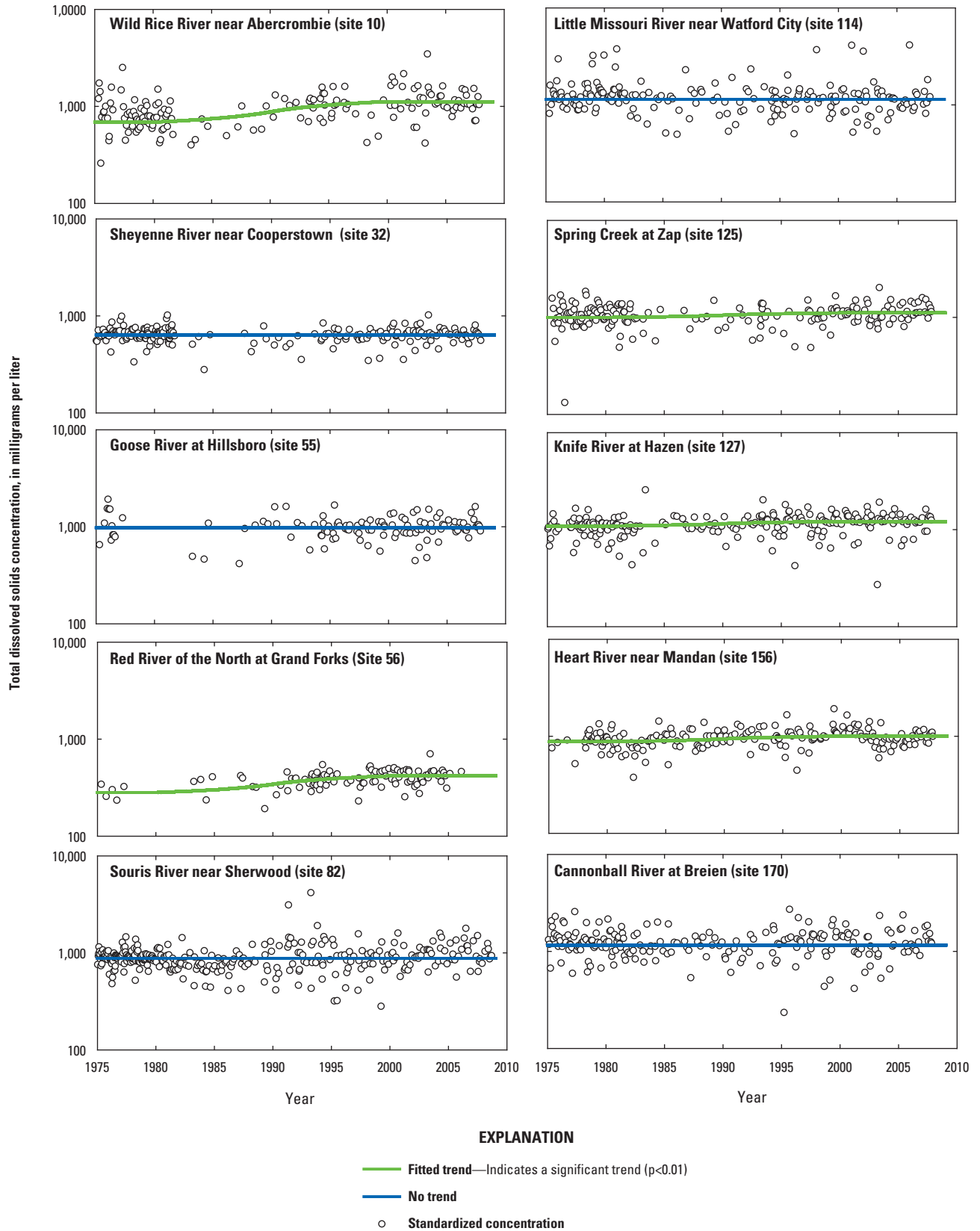


Figure 26. Standardized total dissolved solids concentrations and fitted trends for 1975 through 2008 for selected sites in North Dakota.

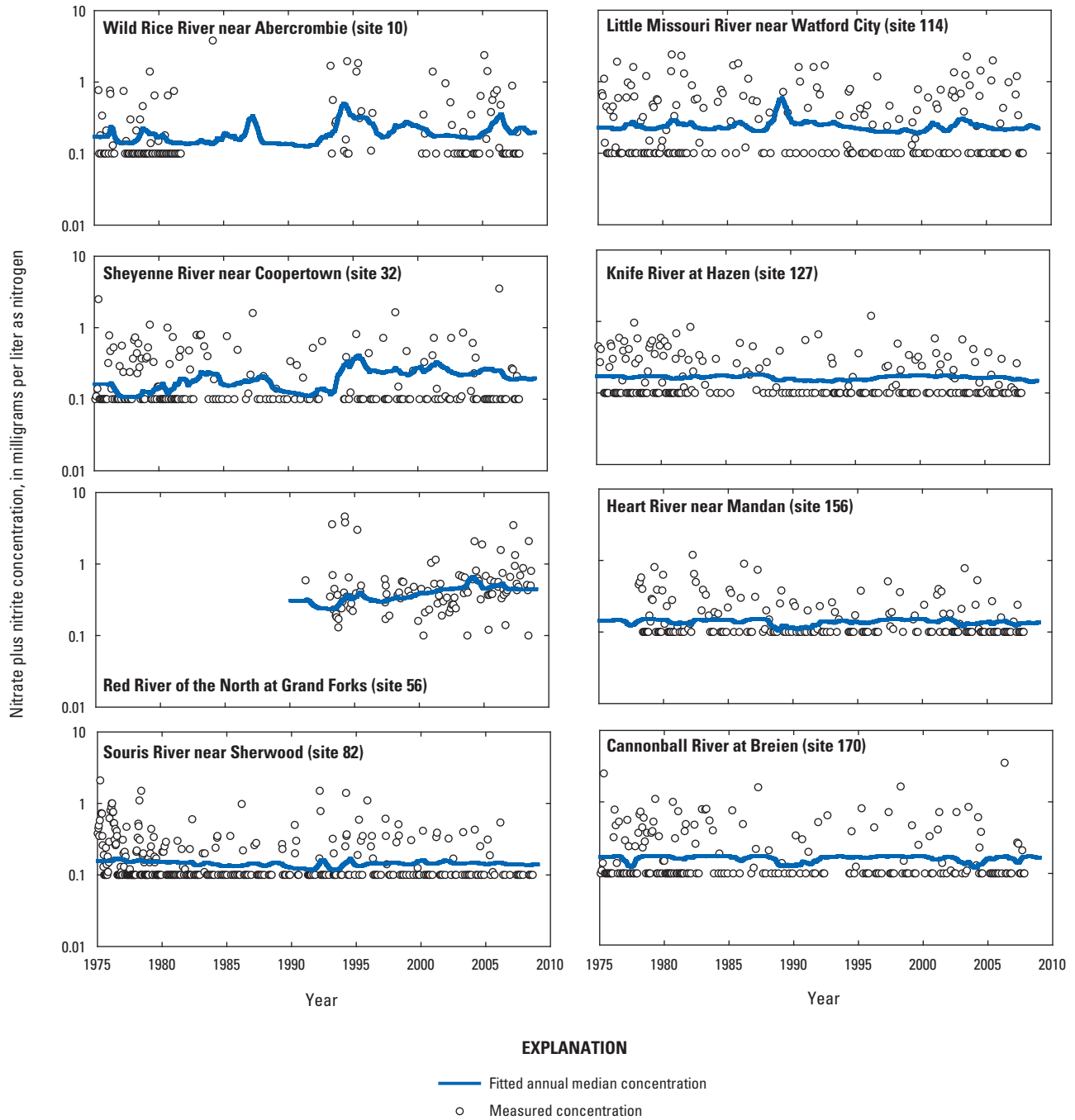
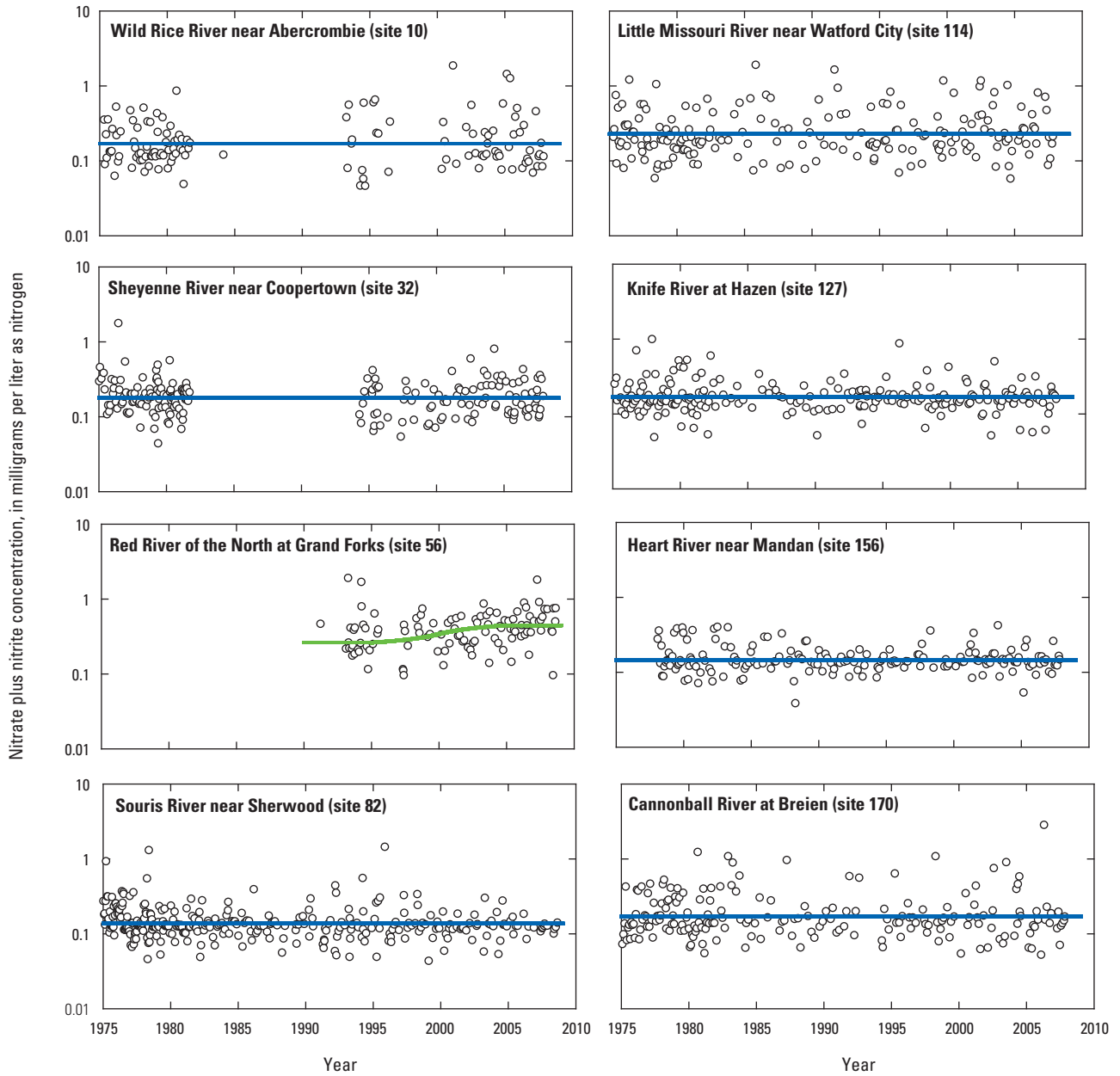


Figure 27. Measured nitrate plus nitrite concentrations and fitted annual median concentrations for 1975 through 2008 for selected sites in North Dakota.



EXPLANATION

- Fitted trend—Indicates a significant trend (p<0.01)
- No trend
- Standardized concentration

Figure 28. Standardized nitrate plus nitrite concentrations and fitted trends for 1975 through 2008 for selected sites in North Dakota.

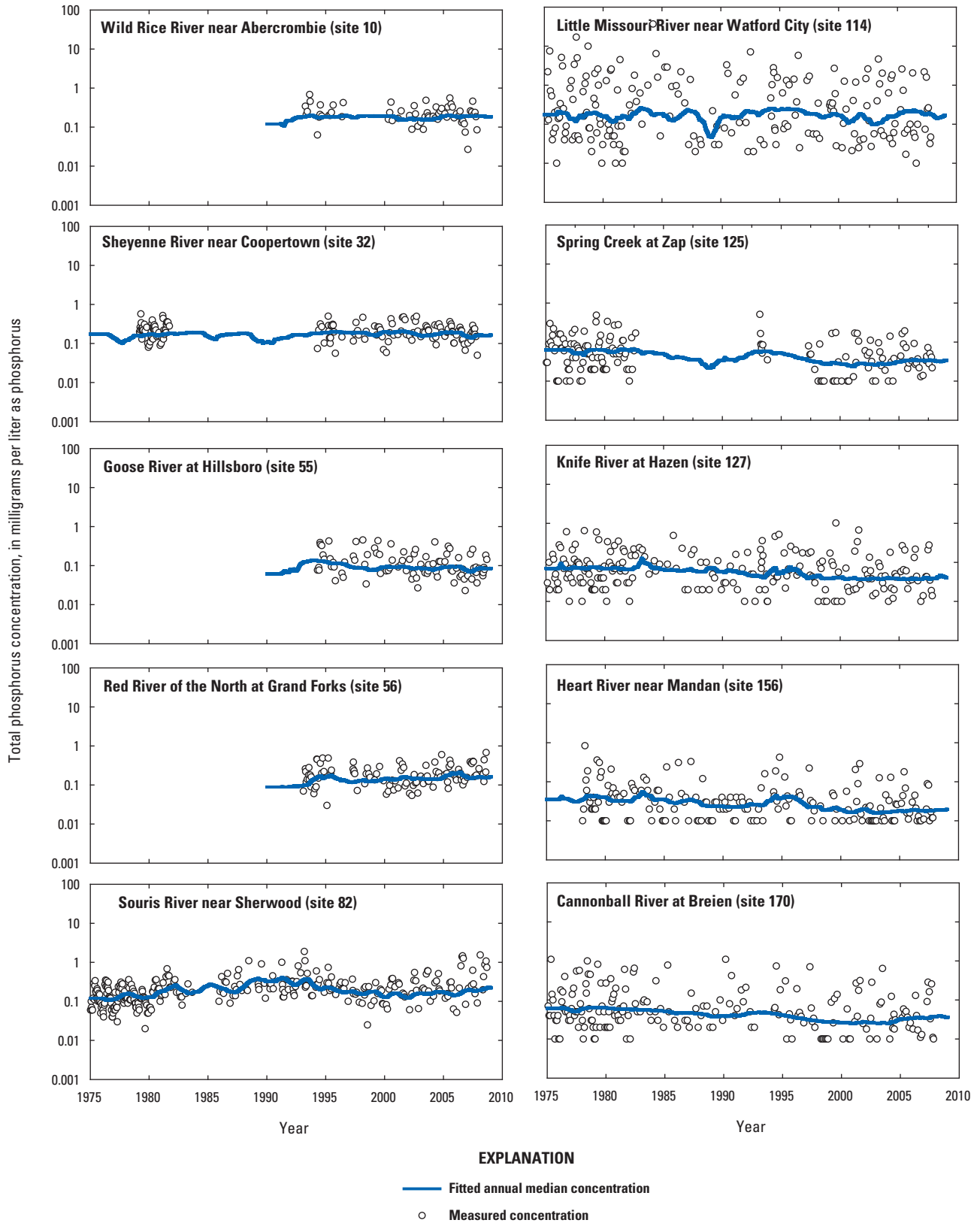


Figure 29. Measured total phosphorus concentrations and fitted annual median concentrations for 1975 through 2008 for selected sites in North Dakota.

of the 10 sites analyzed for trends (fig. 30 and table 5). All of the significant decreases were for sites in western North Dakota, including decreases in median standardized total phosphorus concentration from about 0.06 to 0.03 mg/L for the Cannonball River at Breien, N. Dak. (site 170); from about 0.04 to 0.02 mg/L for the Heart River near Mandan, N. Dak. (site 156); from about 0.07 to 0.04 mg/L for the Knife River at Hazen, N. Dak. (site 127); and from about 0.07 to 0.03 mg/L for Spring Creek at Zap, N. Dak. (site 125). Conversely, median standardized total phosphorus concentration for the Red River of the North at Grand Forks, N. Dak. (site 56) increased from about 0.10 to 0.16 mg/L from 1990 through 2008 (data were not available for that site before 1990). No significant trend in total phosphorus concentrations was detected for the remaining sites.

Sampling Designs to Monitor Water-Quality Trends and Loads

Many different sampling programs with various objectives and sampling designs throughout North Dakota have contributed data to this report. This section describes the results of spatial and statistical analyses of the data described in previous sections of the report to provide guidance to water-resource agencies for efficient and effective sampling designs for the detection of trends and estimation of constituent loads when developing new water-quality programs or refining current programs. The single most important consideration for interpreting water-quality data is having complete stream-flow records (Vecchia, 2005). This applies when interpreting spatial variability, temporal trends, or loads. Water-quality data from a location that does not have an active streamgage (or a nearby streamgage) is of limited use. The number and placement of streamflow gages is determined largely by considerations (cost, importance for flood warning or water supply, and so forth) unrelated to water quality. Therefore, rather than designing a sampling program that is optimal strictly with respect to water quality and thus might require relocation of streamgages, a much simpler and more practical approach of designing a water-quality sampling program that is optimal with respect to the existing placement of streamgage locations is the approach described here. Mean annual flows from 2000 (or the earliest available year of record if later than 2000) through 2011 are given in table 6 for streamgages that were active in 2011.

Spatial Distribution of Sampling Sites

One objective of a State-wide sampling program was to describe the spatial variability of water-quality conditions across the State in the most efficient manner. Given a fixed number of sampling sites that are colocated with streamgages, the locations of the sites should be selected to minimize

redundancy in the network to accomplish this objective. Each active site should provide as much incremental information as possible for characterizing water-quality conditions in a representative area of the State (corresponding to a particular drainage basin) that is not adequately characterized by any of the other sites in the network. To provide a quantitative evaluation of spatial network efficiency, it was assumed that the goal of the spatial network design is to characterize spatial variability in the long-term mean concentrations of each of the chemical constituents. The long-term mean is assumed to be constant through time (for example, no temporal trends) for this analysis. Temporal variability and trends will be considered in the next section of this report.

Because there generally are streamgages near the mouth (or, in the case of basins that overlap with other states or provinces, near the downstream border) of major drainage basins in the state, high priority was given to collecting water-quality samples at these locations to describe aggregate water-quality conditions across large areas of the State. Sampling sites colocated with streamgages that are nested within the larger basins can then be selected to minimize redundancy in the overall network. To evaluate the spatial redundancy in nested samples, two constituents – sulfate and total phosphorus – were selected. Sulfate generally is the major ion of greatest concern and phosphorus is the nutrient of greatest concern for evaluating water-quality conditions in the State (Mike Ell, North Dakota Department of Health, oral commun., 2011). As described previously in the Methods section, for each downstream/upstream pair of sites with at least 10 concurrent samples, the average absolute difference between the paired downstream and upstream concentrations, expressed as a percent of the average downstream concentration, was related to the average absolute difference in daily flow between the downstream and upstream pairs, expressed as a percent of the average downstream flow. The relation between the flow differences and concentration differences are shown in figure 31 for sulfate and figure 32 for total phosphorus. A nonlinear weighted regression procedure described in appendix 2 was used to fit the lines in these figures representing estimates of the 50th and 90th percentile of the concentration differences for given flow difference. Of the 186 sites considered for this analysis, which resulted in a total of 17,205 potential pairs of sites, only 178 pairs for sulfate and 73 pairs for phosphorus were upstream/downstream pairs with sufficient concurrent data to analyze. These site pairs are shown as the points in figure 31 (178 pairs) and fig. 32 (73 pairs). The sample sizes used to compute the mean percent differences varied widely among the station pairs, so the weighted regression procedure was used to adjust the pairs to represent a sample size of 40 and the sample-size adjusted data are shown in figures 31 and 32 (see appendix 2).

Several important observations regarding placement of sampling sites can be gleaned from figures 31 and 32. For pairs where the upstream site provided a large percentage of the downstream flows (50 percent or more), the concentration differences tend to be relatively small. For example, if the

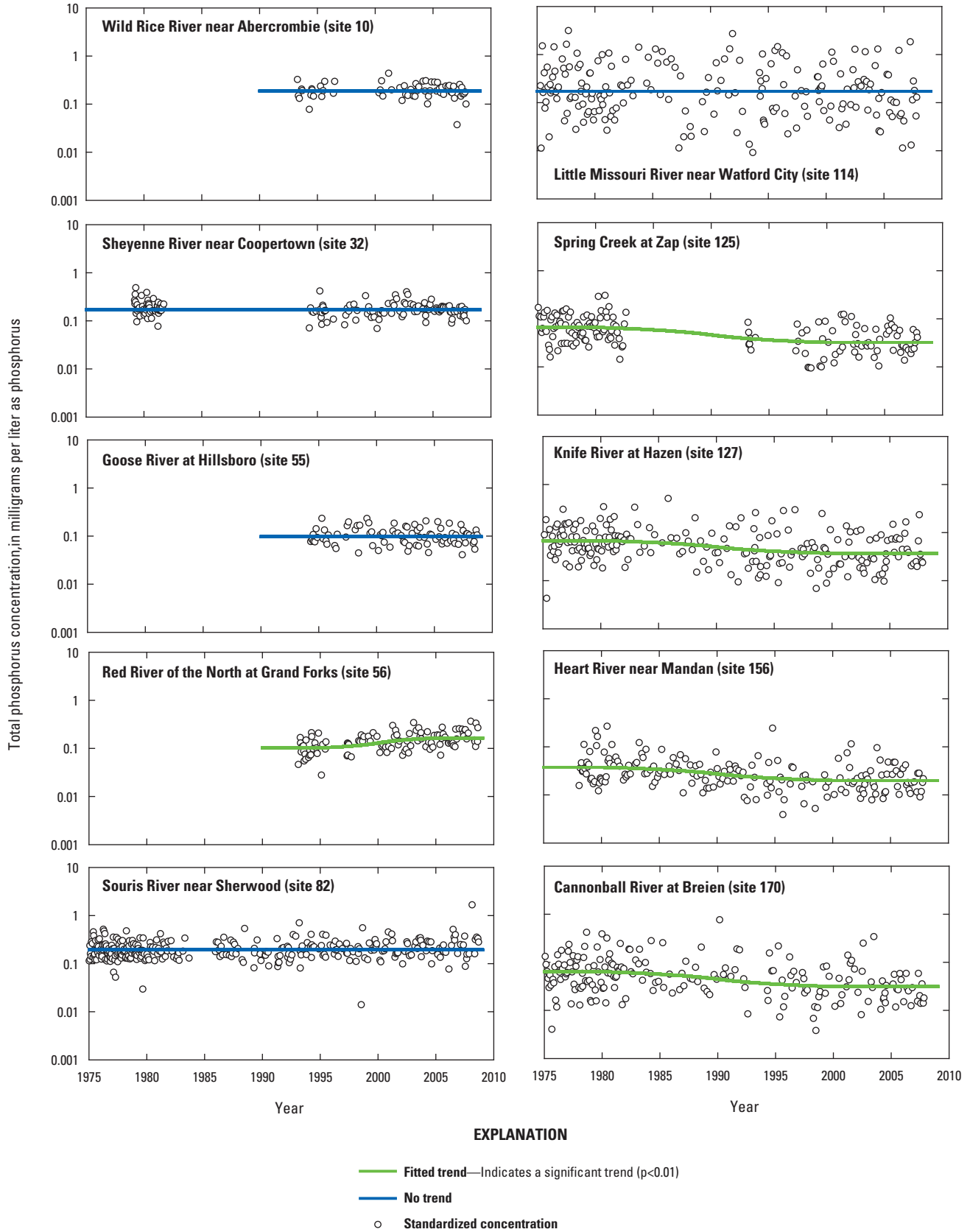


Figure 30. Standardized total phosphorus concentrations and fitted trends for 1975 through 2008 for selected sites in North Dakota.

Table 6. Current and potential state-wide water-quality sampling network for North Dakota.

[All streamflow data obtained from <http://nwis.waterdata.usgs.gov/nd/nwis/>; USGS, U.S. Geological Survey; ft³/s, cubic foot per second; --, not included in potential state-wide network; NA, not available; *, streamflow obtained from nearby upstream gage; **, no nearby gage; ***, streamflow obtained from Environment Canada (http://www.wateroffice.ec.gc.ca/graph/graph_e.html?stn=05OC001)]

Map identification number (fig. 33)	USGS site identification number	Site name	Drainage area, square miles	Mean annual streamflow, 2000–2011 (ft ³ /s)	Current sampling program	Design level
Red River of the North Basin						
1	05051300	Bois de Sioux River near Doran, Minn.	1,880	493	Ambient	1
2	05051500	Red River of the North at Wahpeton, N. Dak.	4,010	1,278	High-low	--
4	--	Red River of the North at Brushville, Minn.	4,020	NA	Ambient	*1
6	05051522	Red River of the North at Hickson, N. Dak.	4,300	1,437	High-low	2
7	05051600	Wild Rice River near Rutland, N. Dak.	546	113	High-low	2
9	05052500	Antelope Creek at Dwight, N. Dak.	294	159	High-low	3
10	05053000	Wild Rice River near Abercrombie, N. Dak.	2,080	428	Ambient/high-low	1
11	05054000	Red River of the North at Fargo, N. Dak.	6,800	1,981	Ambient	1
13	--	Red River of the North at Harwood, N. Dak.	6,980	NA	Ambient	*1
15	05054500	Sheyenne River above Harvey, N. Dak.	424	20	High-low	3
18a	05055300	Sheyenne River above Devils Lake Outlet near Flora, N. Dak.	1,661	84	Other	2
18	05056000	Sheyenne River near Warwick, N. Dak.	2,070	146	High-low	1
32	05057000	Sheyenne River near Cooperstown, N. Dak.	6,470	303	Ambient/high-low	1
33	05057200	Baldhill Creek near Dazey, N. Dak.	691	65	High-low	2
34	05058000	Sheyenne River below Baldhill Dam, N. Dak.	7,470	418	Ambient/high-low	1
36	05058700	Sheyenne River at Lisbon, N. Dak.	8,190	483	Ambient/high-low	1
37	05059000	Sheyenne River near Kindred, N. Dak.	8,800	573	Ambient/high-low	1
38	05059300	Sheyenne River above Diversion near Horace, N. Dak.	8,840	476	High-low	--
41	05059500	Sheyenne River at West Fargo, N. Dak.	8,870	505	High-low	--
42	05059600	Maple River near Hope, N. Dak.	20	12	High-low	--
43	05059700	Maple River near Enderlin, N. Dak.	843	139	High-low	2
44	05060000	Maple River near Mapleton, N. Dak.	1,450	280	High-low	--
45	05060100	Maple River below Mapleton, N. Dak.	1,480	276	Ambient/high-low	1
47	05060500	Rush River at Amenia, N. Dak.	116	29	High-low	3
52	05064500	Red River of the North at Halstad, Minn.	21,800	4,098	High-low	2
54	05065500	Goose River near Portland, N. Dak.	517	120	Other	2
55	05066500	Goose River at Hillsboro, N. Dak.	1,203	254	Ambient/high-low	1
56	05082500	Red River of the North at Grand Forks, N. Dak.	30,100	6,696	Ambient/high-low	1
57	05082625	Turtle River at State Park near Arvilla, N. Dak.	311	48	High-low	2
58	05083000	Turtle River at Manvel, N. Dak.	613	NA	Ambient	**1
61	05084000	Forest River near Fordville, N. Dak.	456	71	High-low	2
62	05085000	Forest River at Minto, N. Dak.	740	92	Ambient/high-low	1
67	05090000	Park River at Grafton, N. Dak.	695	125	Ambient/high-low	1
68	05092000	Red River of the North at Drayton, N. Dak.	34,800	7,854	High-low	2
73	05099400	Little South Pembina near Walhalla, N. Dak.	182	45	High-low	3
74	05099600	Pembina River at Walhalla, N. Dak.	3,350	444	High-low	--
75	05100000	Pembina River at Neche, N. Dak.	3,410	477	Ambient/high-low	1

Table 6. Current and potential state-wide water-quality sampling network for North Dakota.—Continued

[All streamflow data obtained from <http://nwis.waterdata.usgs.gov/nd/nwis/>; USGS, U.S. Geological Survey; ft³/s, cubic foot per second; --, not included in potential state-wide network; NA, not available; *, streamflow obtained from nearby upstream gage; **, no nearby gage; ***, streamflow obtained from Environment Canada (http://www.wateroffice.ec.gc.ca/graph/graph_e.html?stn=05OC001)]

Map identification number (fig. 33)	USGS site identification number	Site name	Drainage area, square miles	Mean annual streamflow, 2000–2011 (ft ³ /s)	Current sampling program	Design level
Red River of the North Basin—Continued						
76	05101000	Tongue River at Akra, N. Dak.	160	58	High-low	3
78	05102490	Red River of the North at Pembina, N. Dak.	40,200	8,120	Ambient	***1
79	05102500	Red River of the North at Emerson, Manitoba	40,200	8,120	Other	--
Devils Lake subbasin						
19	05056060	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	60	25	High-low	3
20	05056100	Mauvais Coulee near Cando, N. Dak.	387	87	High-low	3
21	05056200	Edmore Coulee near Edmore, N. Dak.	382	73	High-low	3
22	05056215	Edmore Coulee Tributary near Webster, N. Dak.	148	60	High-low	3
24	05056239	Starkweather Coulee near Webster, N. Dak.	310	64	High-low	3
26	05056340	Little Coulee near Leeds, N. Dak.	320	28	High-low	3
Souris Basin						
80	05113600	Long Creek near Noonan, N. Dak.	1,790	67	High-low	3
82	05114000	Souris River near Sherwood, N. Dak.	8,940	258	Other	1
83	05116000	Souris River near Foxholm, N. Dak.	9,470	260	High-low/other	--
84	05116500	Des Lacs River at Foxholm, N. Dak.	939	40	Ambient/high-low	2
85	05117500	Souris River above Minot, N. Dak.	10,600	333	Ambient/other	1
87	05120000	Souris River near Verendrye, N. Dak.	11,300	366	Ambient/other	1
88	05120500	Wintering River near Karlsruhe, N. Dak.	705	29	High-low	3
89	05122000	Souris River near Bantry, N. Dak.	12,300	426	High-low	--
90	05123400	Willow Creek near Willow City, N. Dak.	1,160	95	High-low	2
92	05123510	Deep River near Upham, N. Dak.	975	63	High-low	2
98	05124000	Souris River near Westhope, N. Dak.	16,900	655	Other	1
Missouri-Little Missouri Basin						
101	06331000	Little Muddy Creek below Cow Creek near Williston, N. Dak.	875	46	High-low	3
106	06332515	Bear Den Creek near Mandaree, N. Dak.	74	4	High-low	3
108	06332523	East Fork Shell Creek near Parshall, N. Dak.	360	7	High-low	3
109	06332770	Deepwater Creek at Mouth near Raub, N. Dak.	220	7	High-low	3
110	06335500	Little Missouri River at Marmath, N. Dak.	4,640	346	High-low	2
112	06336000	Little Missouri River at Medora, N. Dak.	6,190	473	Ambient/high-low	1
113	06336600	Beaver Creek near Trotters, N. Dak.	616	41	High-low	3
114	06337000	Little Missouri River near Watford City, N. Dak.	8,310	408	Ambient/high-low	1
Missouri-Oahe Basin						
116	06339100	Knife River at Manning, N. Dak.	205	15	High-low	3
120	06339500	Knife River near Golden Valley, N. Dak.	1,230	70	Ambient/high-low	1
125	06340000	Spring Creek at Zap, N. Dak.	549	35	Ambient/high-low	2
127	06340500	Knife River at Hazen, N. Dak.	2,240	160	Ambient/high-low	1
140	06342260	Square Butte Creek below Center, N. Dak.	146	14	High-low	3
141	06342450	Burnt Creek near Bismarck, N. Dak.	108	16	High-low	--

Table 6. Current and potential state-wide water-quality sampling network for North Dakota.—Continued

[All streamflow data obtained from <http://nwis.waterdata.usgs.gov/nd/nwis/>; USGS, U.S. Geological Survey; ft³/s, cubic foot per second; --, not included in potential state-wide network; NA, not available; *, streamflow obtained from nearby upstream gage; **, no nearby gage; ***, streamflow obtained from Environment Canada (http://www.wateroffice.ec.gc.ca/graph/graph_e.html?stn=05OC001)]

Map identification number (fig. 33)	USGS site identification number	Site name	Drainage area, square miles	Mean annual streamflow, 2000–2011 (ft ³ /s)	Current sampling program	Design level
Missouri-Oahe Basin—Continued						
142	06342500	Missouri River at Bismarck, N. Dak.	186,400	19,643	High-low	2
145	06343000	Heart River near South Heart, N. Dak.	311	17	Other	3
147	06344600	Green River near New Hradec, N. Dak.	152	13	High-low	3
149	06345500	Heart River near Richardton, N. Dak.	1,240	73	Ambient/high-low	1
150	06345780	Heart River above Lake Tschida near Glen Ullin, N. Dak.	1,530	89	High-low	--
151	06347000	Antelope Creek near Carson	221	27	High-low	3
152	06347500	Big Muddy Creek near Almont, N. Dak.	456	64	High-low	3
154	06348300	Heart River at Stark Bridge near Judson, N. Dak.	2,930	171	High-low	--
155	06348500	Sweetbriar Creek near Judson, N. Dak.	157	28	High-low	3
156	06349000	Heart River near Mandan, N. Dak.	3,310	218	Ambient/high-low	1
158	06349500	Apple Creek near Menoken, N. Dak.	1,680	59	High-low	2
162	06350000	Cannonball River at Regent, N. Dak.	580	35	High-low	2
164	06351200	Cannonball River near Raleigh, N. Dak.	1,640	121	Ambient/high-low	1
166	06352000	Cedar Creek near Haynes, N. Dak.	553	39	High-low	2
169	06353000	Cedar Creek near Raleigh, N. Dak.	1,750	93	Ambient/high-low	1
170	06354000	Cannonball River at Breien, N. Dak.	4,100	246	Ambient/high-low	1
172	06354580	Beaver Creek below Linton, N. Dak.	765	62	High-low	2
James Basin						
176	06468170	James River near Grace City, N. Dak.	1,060	88	Ambient/high-low	1
177	06468250	James River above Arrowwood Lake near Kensal, N. Dak.	1,200	98	Other	--
180	06469400	Pipestem Creek near Pingree, N. Dak.	700	52	High-low	2
182	06470000	James River at Jamestown, N. Dak.	2,820	279	Ambient/high-low	1
183	06470500	James River at Lamoure, N. Dak.	4,390	353	Ambient/high-low	1
184	06470800	Bear Creek near Oakes, N. Dak.	357	28	High-low	3
186	06470878	James River at State line, N. Dak.	5,480	419	High-low	--

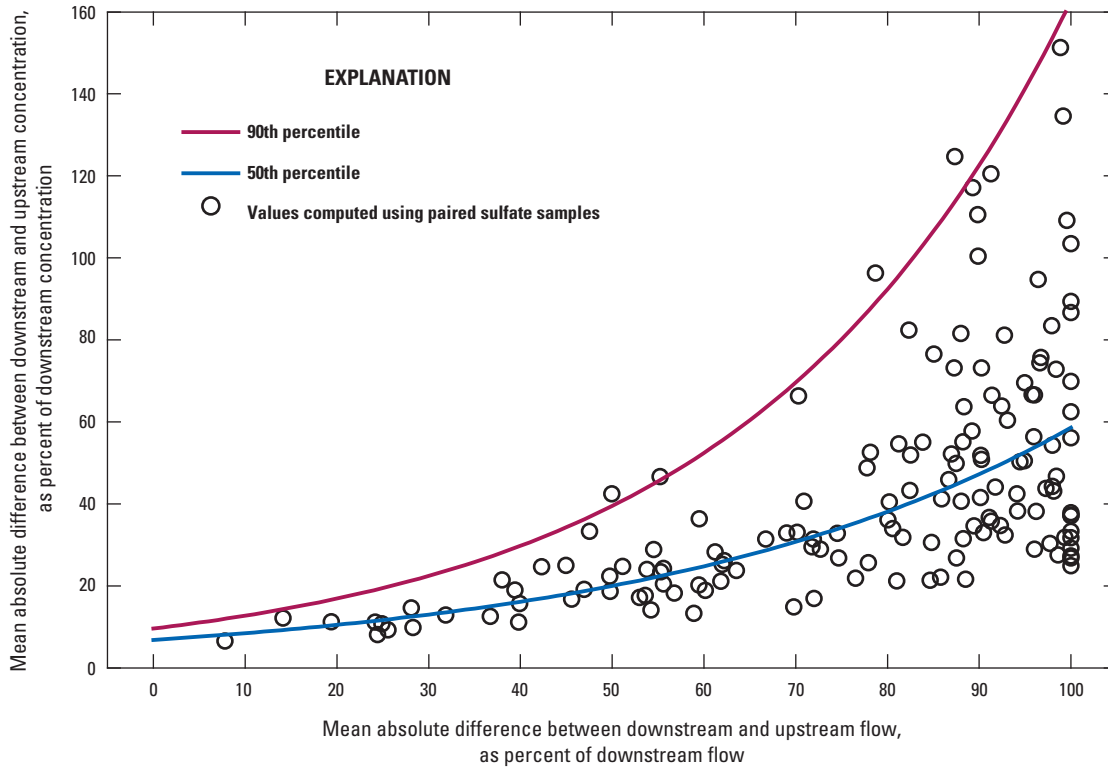


Figure 31. Relation between streamflow differences and sulfate concentration differences for selected sites in North Dakota.

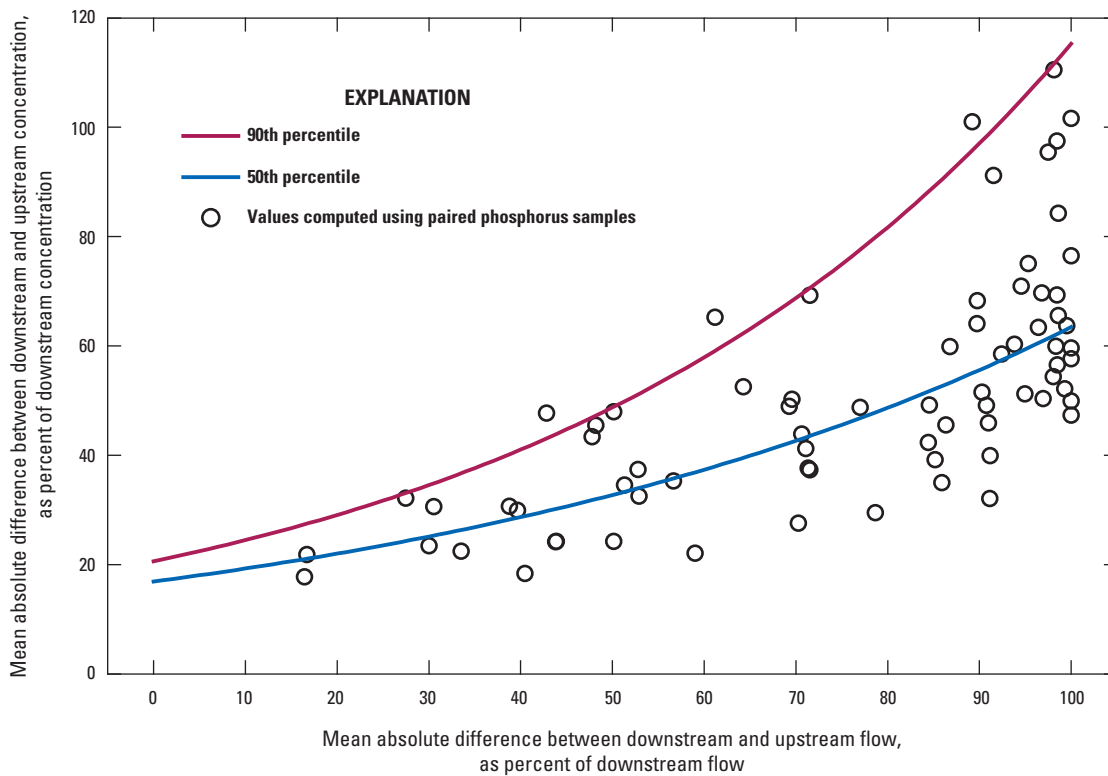


Figure 32. Relation between streamflow differences and total phosphorus concentration differences for selected sites in North Dakota.

upstream flow is 80 percent, on average, of the downstream flow (corresponding to a percent difference of 20 percent), 90 percent of the station pairs would have upstream concentration within about 15 percent, on average, of downstream concentration for sulfate (fig. 31) and within about 25 percent, on average, for phosphorus (fig. 32). If the upstream flow is 50 percent, on average, of the downstream flow (a percent difference of 50 percent), 90 percent of the station pairs would have upstream concentration within about 40 percent (for sulfate) and 50 percent (for phosphorus), on average, of the downstream concentration. Conversely, if the upstream site provides a small percentage of the downstream flow, the concentration differences can become quite large. For example, if upstream flow is only 10 percent, on average, of downstream flow (90 percent difference), more than one-half of the pairs have upstream concentrations more than 50 percent different (for sulfate) and 55 percent different (for phosphorus), on average, from downstream concentrations, and more than 10 percent of the pairs have upstream concentrations more than 140 percent different (for sulfate) and 100 percent different (for phosphorus), on average, from downstream concentrations. Thus, a reasonable spatial network would consist of including the most downstream sites in large basins first, followed by the next upstream site(s) that roughly bisect the downstream flows at the first sites (given the constraints of existing streamgauge locations), followed by the next upstream site(s) that roughly bisect flows for the second sites. Other special considerations, such as whether a site is located near a major city, water supply intake, or downstream of a major reservoir could be considered.

Considering the previous discussion, sampling sites to be included in the proposed State-wide network were prioritized into 3 design levels: level 1 (highest priority), level 2 (second priority), and level 3 (third priority) (table 6; fig. 33). Starting with the Red River of the North main stem sites, the downstream site on the North Dakota/Manitoba border (site 78, Red River of the North at Pembina, N. Dak.) was designated as a level-1 site and is currently (2010) a NDDH ambient network site. Site 52 (Red River of the North at Halstad, Minn.) has essentially one-half the flow of site 78 and would thus be an ideal location for the next level-1 site; however, site 56 (Red River of the North at Grand Forks, N. Dak.) currently (2010) is an established ambient network site. Therefore, site 56 was selected as a level-1 site and site 52 was included as a level-2 site. Site 68 (Red River of the North at Drayton, N. Dak.), which is midway between sites 56 and 78, also was selected as a level-2 site because of the importance of Red River of the North main stem water quality and the relatively large intervening drainage area (about 10,000 square miles) between sites 56 and 78. Proceeding upstream from site 52, site 11 (Red River of the North at Fargo), which provides about one-half the flow for site 52 and is currently (2010) an ambient network site, was included as a level-1 site. Site 13 (Red River of the North at Harwood, N. Dak.) has only a slightly higher drainage area than site 11 and the nearest active streamgauge is at site 11; however, this site is currently (2010)

an ambient network site and was important for NDDH for estimating point sources from the Fargo-Moorhead area (Mike Ell, North Dakota Department of Health, oral commun., 2011). Therefore, site 13 was designated as a level-1 site although it is largely redundant with site 11. Site 4 (Red River of the North at Brushville, Minn.) and site 1 (Bois de Sioux River near Doran, Minn.) both are current (2010) ambient network sites and were designated as level-1 sites. Site 6 (Red River of the North at Hickson, N. Dak.), midway between sites 11 and 4, was designated as a level-2 site. A currently (2010) active HILSP sampling site (site 2, table 6) could be discontinued because of redundancy with site 4 (fig. 1).

Among the Red River of the North tributaries (excluding the Sheyenne River, which is considered separately), sites 10 (Wild Rice River near Abercrombie, N. Dak.), 45 (Maple River below Mapleton, N. Dak.), 55 (Goose River at Hillsboro, N. Dak.), 58 (Turtle River at Manvel, N. Dak.), 62 (Forest River at Minto, N. Dak.), 67 (Park River at Grafton, N. Dak.), and 75 (Pembina River at Neche, N. Dak.) are all current (2010) ambient network sites and were all selected as level-1 sites (table 6, fig. 33). Although there is no active streamgauge near site 58, maintaining sampling at that site was important for estimating load contributions from the Turtle River (Mike Ell, North Dakota Department of Health, oral commun., 2011). Locating a streamgauge near site 58 would be beneficial for interpreting water-quality data from that site. Level-2 sites among the Red River of the North tributaries were upstream of level-1 sites, including sites 7 (Wild Rice River near Rutland, N. Dak.), 43 (Maple River near Enderlin, N. Dak.), 54 (Goose River near Portland, N. Dak.), 57 (Turtle River near Arvilla, N. Dak.), and 61 (Forest River near Fordville, N. Dak.). Several level-3 sites were selected on smaller tributaries, including sites 9 (Antelope Creek near Dwight, N. Dak.), 47 (Rush River at Armenia, N. Dak.), 73 (Little South Pembina River near Walhalla, N. Dak.), and 76 (Tongue River at Akra, N. Dak.). Three currently (2010) active HILSP sampling sites in the Maple and Pembina Basins (sites 42, 44, and 74; table 6) could be discontinued in the proposed network because of redundancy with other sites or (in the case of site 42) small drainage area (fig. 1 and table 1).

Next, sites were selected within the Sheyenne River Basin, the largest North Dakota tributary to the Red River of the North (table 6 and fig. 33). Three level-1 sites that adhered closely to the principle of bisecting flows were sites 37 (Sheyenne River near Kindred, N. Dak.), 32 (Sheyenne River near Cooperstown, N. Dak.), and 18 (Sheyenne River near Warwick, N. Dak.). These sites are currently (2010) ambient network sites. Two other ambient network sites, sites 36 (Sheyenne River at Lisbon, N. Dak.) and 34 (Sheyenne River below Baldhill Dam, N. Dak.), were designated as level-1 sites although there may be considerable redundancy of these sites with the downstream site (site 37). These sites are important for monitoring the effects of the Devils Lake outlets (<http://www.swc.state.nd.us/4dlink9/4dcgi/GetSubCategoryRecord/Devils%20Lake%20Flooding/Outlets>) on water-quality in the Sheyenne River. Three additional sites were included in the

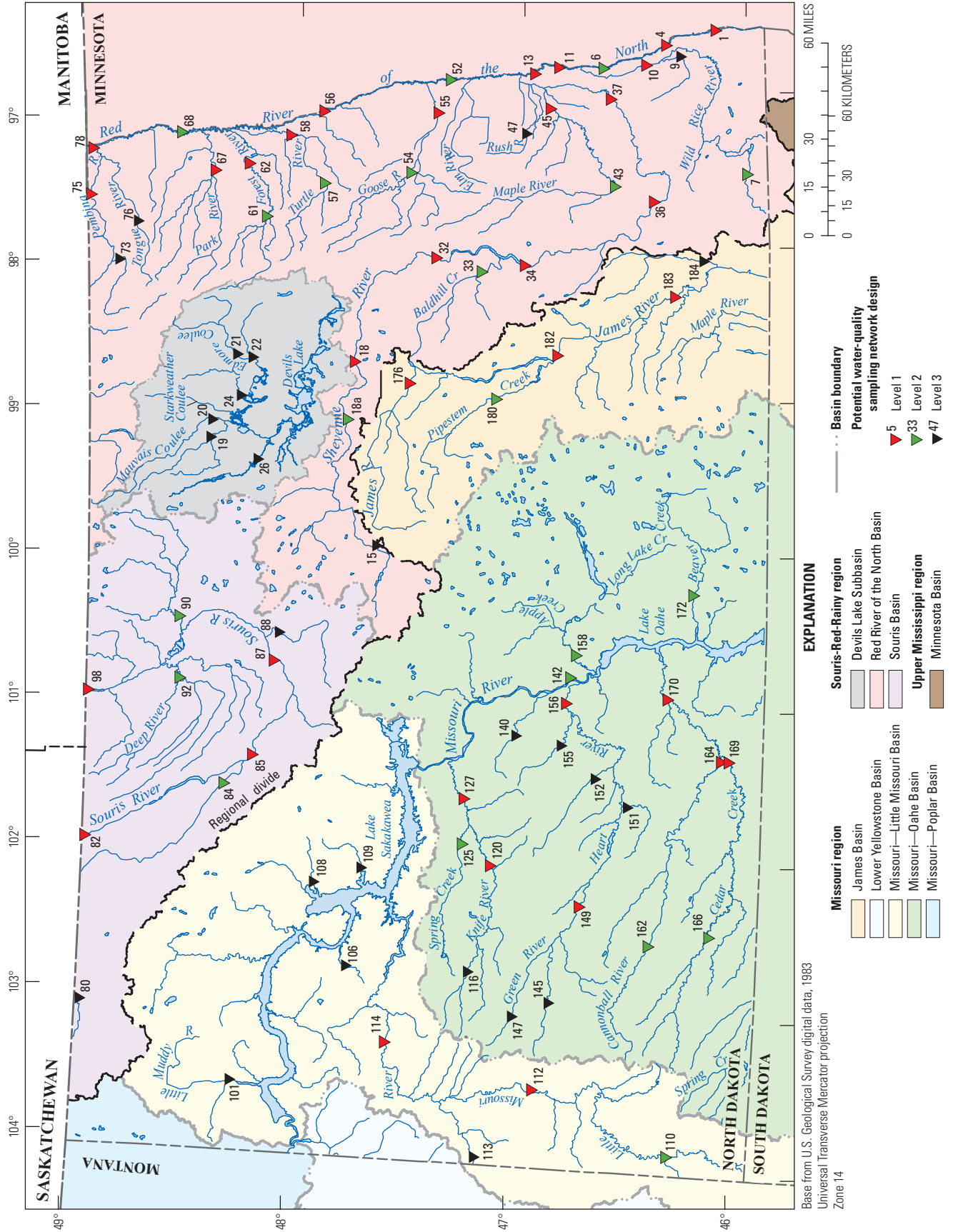


Figure 33. Potential spatial water-quality network design for North Dakota.

Sheyenne Basin: two level-2 sites (site 33, Baldhill Creek near Dazey, N. Dak. and site 18a, Sheyenne River above Devils Lake outlet near Flora, N. Dak.) and a level-3 site (site 15, Sheyenne River above Harvey, N. Dak.). Although water-quality data for the site near Flora, N. Dak. (site 18a) were not analyzed in this report, the site has been sampled recently as part of the Devils Lake outlet monitoring and would continue to be sampled in the proposed network. Two currently (2010) active HLSP sites in the Sheyenne Basin (sites 38 and 41, table 6) could be discontinued in the proposed network because of redundancy with site 37.

The Devils Lake Subbasin of the Sheyenne River has been experiencing extensive flooding since 1993 and there is concern of a potential spill from Devils Lake to the Sheyenne River, an event that has not happened for at least 800 years (Vecchia, 2008). The State has constructed outlets from the west end of Devils Lake in 2008 and from the east end of Devils Lake in 2012. Devils Lake water-quality issues are important for future outlet operation; therefore, six level-3 sites (sites 19, 20, 21, 22, 24, and 26) were designated on major tributaries to Devils Lake (fig. 33 and table 6).

Several sampling sites were designated in the Souris River Basin, which flows southeast from Saskatchewan into North Dakota before bending to the northwest and exiting North Dakota into Manitoba (table 6 and fig. 33). Site 98 (Souris River near Westhope, N. Dak.), which is the downstream site, and site 85 (Souris River above Minot, N. Dak.), which is about midway upstream from site 98, were selected as level-1 sites. Site 98 currently (2010) is sampled as part of the International Souris River Board mandate to monitor water-quality at the International border and site 85 is an ambient network site. Additional level-1 sites were site 87 (Souris River near Verendrye, N. Dak.) and 82 (Souris River near Sherwood, N. Dak.). Although site 87 was highly redundant with site 85, it is an ambient network site considered important for estimating point sources from the Minot area (Mike Ell, North Dakota Department of Health, oral commun., 2011). Site 87 also is an ambient network site and site 82 is sampled as part of the International Souris River Board mandate. Three level-2 sites (site 84, Des Lacs River at Foxholm, N. Dak.; site 92, Deep River near Upham, N. Dak.; and site 90, Willow Creek near Willow City, N. Dak.) and two level-3 sites (site 88, Wintering River near Karlsruhe, N. Dak. and site 80, Long Creek near Noonan, N. Dak.) also are included in the proposed Souris River sampling sites. Two current (2010) HLSP sampling sites (sites 83 and 89, table 6) could be discontinued because of redundancy with other sites.

The remaining sites in the proposed network are in the Missouri River Basin. Among the smaller tributaries, sites 172 (Beaver Creek below Linton, N. Dak.) and 158 (Apple Creek near Menoken, N. Dak.) were designated as level-2 sites and sites 140 (Square Butte Creek below Center, N. Dak.), 109 (Deepwater Creek near Raub, N. Dak.), 108 (East Fork Shell Creek near Parshall, N. Dak.), 106 (Bear Den Creek near Mandaree, N. Dak.), and site 101 (Little Muddy River below Cow Creek near Williston, N. Dak.) were designated as level-3 sites.

For the larger Missouri River tributaries, starting with the Cannonball River, sites 170 (Cannonball River at Breien, N. Dak.), 169 (Cedar Creek near Raleigh, N. Dak.), and 164 (Cannonball River near Raleigh, N. Dak.) were designated as level-1 sites. All of these sites are ambient network sites and adhere closely to the principle of bisecting flows. Upstream sites 166 (Cedar Creek near Haynes, N. Dak.) and 162 (Cannonball River at Regent, N. Dak.) were designated as level-2 sites. For the Heart River, ambient network sites 156 (Heart River near Mandan) and 149 (Heart River near Richardson, N. Dak.) were designated as level-1 sites, and sites 155 (Sweetbriar Creek near Judson, N. Dak.), 152 (Big Muddy Creek near Almont, N. Dak.), 151 (Antelope Creek near Carson, N. Dak.), 147 (Green River near New Hradec, N. Dak.), and 145 (Heart River near South Heart, N. Dak.) were designated as level-3 sites. Two HLSP sampling sites (sites 154 and 150, table 6) were not included in the proposed network because of redundancy with other sites. For the Knife River, sites 127 (Knife River at Hazen, N. Dak.) and 120 (Knife River near Golden Valley, N. Dak.), which are current (2010) ambient network sites, were designated as level-1 sites. Site 125 (Spring Creek at Zap, N. Dak.), a current (2010) ambient network site, was designated as a level-2 site and site 116 (Knife River at Manning, N. Dak.) was designated as a level-3 site. In addition to the previous sites, site 142 (Missouri River at Bismarck, N. Dak.) was designated as a level-2 site because it was the only site on the main stem Missouri River between Lake Sakakawea and Lake Oahe.

In the Little Missouri River Basin, site 114 (Little Missouri River near Watford City, N. Dak.) was designated as a level-1 site. Site 112 (Little Missouri River near Medora, N. Dak.), although similar in flow to site 114, is an ambient network site considered important for monitoring water quality for the undeveloped upper parts of the basin (Mike Ell, North Dakota Department of Health, oral commun., 2011) and thus was designated as a level-1 site. Remaining designated sites included a level-2 site (site 110, Little Missouri River near Marmarth, N. Dak.) and a level-3 site (site 113, Beaver Creek near Trotters, N. Dak.).

For the final Missouri River tributary, the James River, ambient network sites 183 (James River at Lamoure, N. Dak.), 182 (James River at Jamestown, N. Dak.), and 176 (James River near Grace City, N. Dak.) were designated at level-1 sites, site 180 (Pipestem Creek near Pingree, N. Dak.) a level-2 site, and site 184 (Bear Creek near Oakes, N. Dak.) a level-3 site. Two currently active (2010) sampling sites (sites 186 and 177, table 6) were not included in the potential network because of redundancy with other sites.

In all, the potential network consists of 81 sites, with 34 level-1 sites, 21 level-2 sites, and 26 level-3 sites (fig. 33). Given possible budget constraints of the sampling programs and considering the suggested temporal sampling frequencies described in the following section, this was considered to be the maximum potential number of sites for inclusion in the proposed network.

Sample Frequency for Detection of Seasonal Trends

Given the spatial distribution and priority designation (levels 1–3) of the sites in the potential network described in the previous section, the next consideration was to determine the appropriate temporal sampling frequency to use for monitoring changes in future water-quality conditions. The time-series model used to detect concentration trends for this report also was used to evaluate sampling designs to monitor future water-quality trends. The interpretation of trends in terms of cause and effect can be difficult and, although the data indicated that trends have occurred, establishing a cause for the trends may require more extensive data gathering and model development; however, to evaluate the various sampling designs for this report, no interpretation of cause and effect was needed because the designs depended only on the statistical properties of the high-frequency variability in concentration (eq. 2), and the statistical properties of the high-frequency variability were independent of the trends.

To evaluate temporal sampling designs, the number of samples collected (on average) each year needed to be considered along with the sampling dates and whether the number of samples or sampling dates should be variable or fixed (the same year after year). Assuming that trends can occur at any time, in any direction, and for any duration, a reasonable approach for trend monitoring is to collect a fixed number of samples each year (Vecchia, 2005). The sampling dates also should remain relatively fixed; however, sampling on the exact same days each year is neither feasible nor necessary.

Given that the number of samples and the sampling dates remain fixed, two related concepts (sensitivity and efficiency) were used to evaluate sampling designs. Sensitivity measures the ability of a design to detect a trend—the smaller the trend that can be detected, the more sensitive the design. An efficient design maximizes the sensitivity to detect a trend for a fixed cost, which for this report was measured in terms of the number of samples per year. The only way to increase the sensitivity of an efficient design is to increase the cost—that is, to collect samples more frequently. For example, among all possible two-sample designs, the most efficient design might be to sample once during April and once during August, and among all possible three-sample designs, the most efficient design might be to sample once in April, once in August, and once in December. The best three-sample design is more sensitive than the best two-sample design but also is more costly. Therefore, to determine whether three samples are preferable to two samples, judgment is needed as to whether the increased sensitivity is worth the increased cost.

For the design analysis in this report, the assumptions were made that a streamgauge would continue to be operated at each station (so that the future streamflow-related variability could be removed) and that concentration data would be collected no more than once each month. Concentration data potentially could be collected more often, but for trend analysis, sampling at most once in any given month generally

is sufficient. For estimating loads (see the next section), more frequent sampling may be useful. The assumption also was made that the concentration data would be collected near the fifth day of the month; however, the actual sampling date could vary from 1 week before to 1 week after the fifth day without appreciably changing the results of the design analysis (Vecchia, 2005).

The sensitivity of a sampling design depends on the duration of the trend. If concentrations are increasing at a rate of 5 percent per year, the chance of detecting the trend after only 1 year may be extremely small; however, if the trend persists for 5 years, the chance of detecting the trend increases dramatically. In contrast to the sensitivity of a design, the efficiency of a design is not dependent on the duration of the trend. If a particular four-sample (per year) design is most efficient for detecting a trend that persists for 5 years, that design generally will be most efficient for detecting a trend that persists for 2 years or 10 years. Therefore, a 5-year duration was used as a benchmark to determine which designs in the design analysis were most efficient.

Even if a trend persists for 5 years or longer, sampling designs cannot detect trends with absolute certainty or prove that no trends exist with absolute certainty. Therefore, the size of the trend that can be detected depends on the acceptable level of tolerance for incorrectly identifying a trend. For this report, the acceptable level of tolerance was controlled by specifying two probabilities—the probability that a true trend was detected and the probability that a trend was detected when no true trend existed. Because the selection of an efficient design is not highly dependent on the values specified for the two probabilities, for this report, the first probability (also called the power for detecting a trend) was set equal to 0.8 and the second probability (also called the type-I error probability) was set equal to 0.1. The designs then were compared in terms of their characteristic trends. The characteristic trend of a design, which was computed as described by Vecchia (2000), is interpreted as the increase or decrease in concentration during a 5-year period, in percent, that has an 80-percent chance of being detected using a type-I error probability of 0.1. Trends larger than the characteristic trend have more than an 80-percent chance of being detected, and trends smaller than the characteristic trend have less than an 80-percent chance of being detected. The characteristic trend is used in this report as a benchmark to compare the sensitivity of the various sampling designs.

Sampling designs were evaluated with regard to their sensitivity to detect seasonal trends that occurred during three 4-month seasons—March through June (the high-flow period, referred to as the spring season in this report), July through October (the late summer/early fall low-flow period, referred to as the summer season in this report), and November through February (the late fall/winter low-flow period, referred to as the winter season in this report). Trends that can occur in certain constituents only during certain times of the year may not be detected in sampling programs designed on an annual basis. For example, many constituents can reach a stream from

nonpoint sources when most of the snowmelt and rainfall runoff in North Dakota occurs, generally from March to June. Certain constituents may have substantial groundwater sources, therefore monitoring during low-flow conditions may be important for detecting trends. Many constituents may have a complex combination of point sources, groundwater sources, and nonpoint sources and may require monitoring during all flow conditions.

The design results for sulfate, TDS, nitrate plus nitrite, and total phosphorus at the sites examined in the Water Quality Trend Analysis section (table 5) were used to develop an efficient overall design. The most efficient design for one constituent may be an inefficient design for another constituent. Similarly, the most efficient design for one site may be an inefficient design for another site. Therefore, designs needed to be evaluated with regard to their overall ability to detect trends in various constituents and for various sites. The goal of the following discussion was to suggest designs that maintain reasonable efficiency and consistency for different sites and constituents. Implementing the single most efficient design for every individual constituent and site is neither logistically nor economically feasible.

The characteristic seasonal trends for sulfate and TDS for 10 selected sites are shown in figures 34 and 35. The designs shown in this figure are a small subset of the many potential designs considered. Designs not included in the figures generally were less efficient than the designs shown. Designs 1 through 7 have samples selected during the spring season, designs 8 through 15 have samples selected in the summer season, and designs 16 through 22 have samples selected in the winter season. The simplest design considered was a single sample in each of the three periods. Based on discussions with NDDH and NDSWC personnel, a characteristic trend of 20 percent or less for sulfate and TDS was selected as a benchmark for having good sensitivity for detecting trends in those constituents.

For the spring season, the one-sample designs (designs 1 and 2) for most of the sites have characteristic trends greater than 20 percent and do not meet the sensitivity criteria (figs. 34 and 35); however, the two-sample designs (3 and 4) have characteristic trends less than 20 percent at most sites for both sulfate and TDS. Although samples collected in March and May (design 3) yield a slightly smaller characteristic trend at most sites, there is not much difference than if samples were collected in April and June (design 4). The only exception is the Wild Rice River near Abercrombie, N. Dak. (site 10), for which sampling in March and May provides substantially better sensitivity than sampling in April and June. Adding either one or two additional samples to the two-sample designs in the spring (designs 5–7) provides negligible increases in sensitivity of detecting trends for sulfate and TDS. Therefore, design 3 or 4 are efficient designs for detecting trends in the spring season.

For the summer season many of the sites had characteristic trends less than 20 percent with the one-sample designs for sulfate and TDS (designs 8 and 9; figs. 34 and 35); however,

by increasing to two samples in the summer, the sensitivity of detecting a trend improved considerably. In particular, a two-sample design with samples collected in August and October (design 11) is a particularly sensitive design for the detection of trends in sulfate and TDS in the summer season. For that design, characteristic trends were less than 20 percent for all of the sites and less than 10 percent for most of the sites. As was observed in the spring, additional samples in the summer (designs 12 through 15) provided a negligible increase in the sensitivity of detecting trends for sulfate and TDS over the best two-sample design.

During the winter season, a one-sample design would provide sufficient sensitivity to detect trends in sulfate and TDS (figs. 34 and 35); however, the month when the sample is collected seems to be important in meeting the 20 percent characteristic trend criterion. Overall, a sample collected in November (design 16) meets the criterion at all sites for TDS and at 9 out of 10 sites for sulfate. The characteristic trends increase substantially at many of the sites if the sample is collected in December (design 17), January (design 18), and February (design 19) particularly at the Little Missouri River near Watford City, N. Dak. (site 114); however, conditions in November generally consist of open-water and low-flow conditions that are similar to flows in late summer. Therefore, the November sample may not add much additional information if collected along with an October sample. If concentrations during winter conditions are of particular concern, a single sample in December (design 17) or January (design 18) may be preferable to the November sample.

Overall, the most efficient design for the detection of seasonal trends for sulfate and TDS appears to be one that includes five samples collected per year, including two in spring (either March and May or April and June), two in summer and early fall (August and October), and one in winter (December or January). For many of the sites, when two samples are collected in the spring and in the summer months, the sensitivity to detect seasonal trends is not strongly affected by which months are sampled; however, for the winter months, where a one-sample design was used, the month selected for sampling is important for sensitivity in detecting the seasonal trend in sulfate and TDS.

A greater variation in the characteristic seasonal trends was evident for nitrate plus nitrite and total phosphorus (figs. 36 and 37) compared to characteristic trends in sulfate and TDS (figs. 34 and 35). Because of the greater variation and the expense required to achieve the same level of sensitivity as major ions (20 percent), based on discussions with NDDH and NDSWC personnel, designs with characteristic trends less than 40 percent were considered to have acceptable sensitivity for detecting trends in nitrate plus nitrite and total phosphorus. The same 4-month periods that were considered for sulfate and TDS were used for the analysis of nitrate plus nitrite and total phosphorus designs.

For the spring season, the one-sample designs (designs 1 and 2) had poor sensitivity for detecting trends in nitrate plus nitrite and total phosphorus for most sites (figs. 36 and 37).

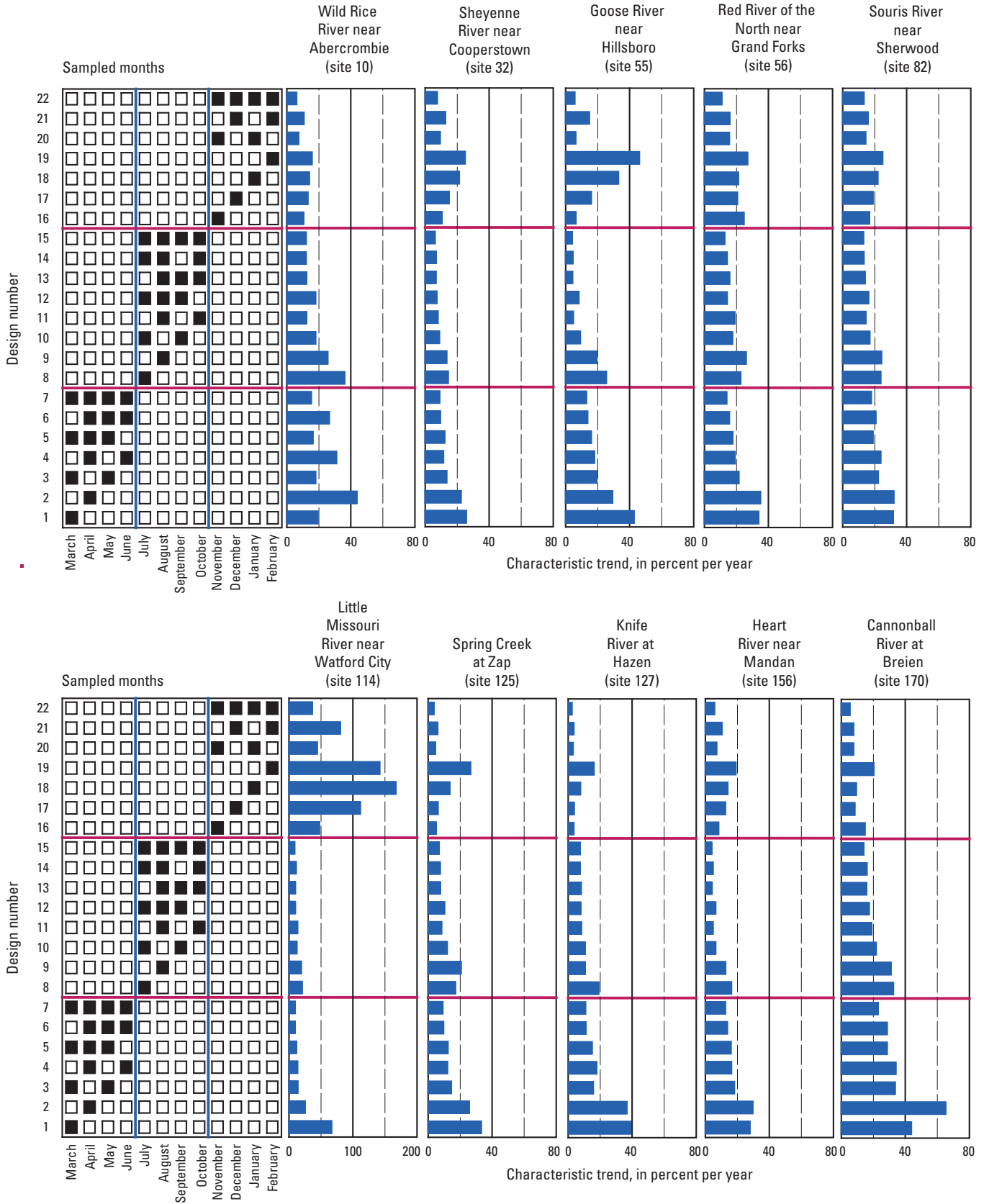


Figure 34. Characteristic seasonal trends for selected sampling designs for sulfate at selected sites in North Dakota.

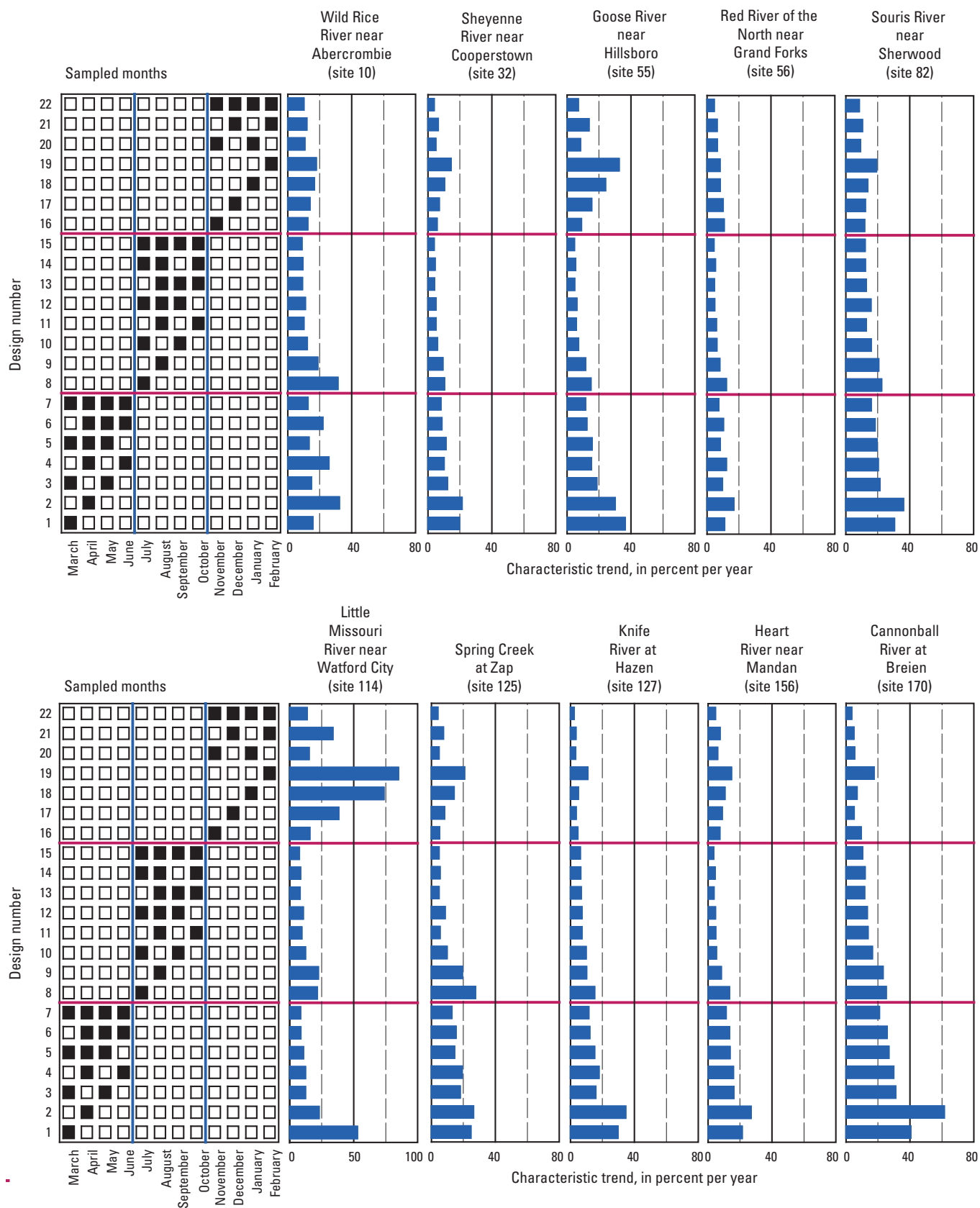


Figure 35. Characteristic seasonal trends for selected sampling designs for total dissolved solids at selected sites in North Dakota.

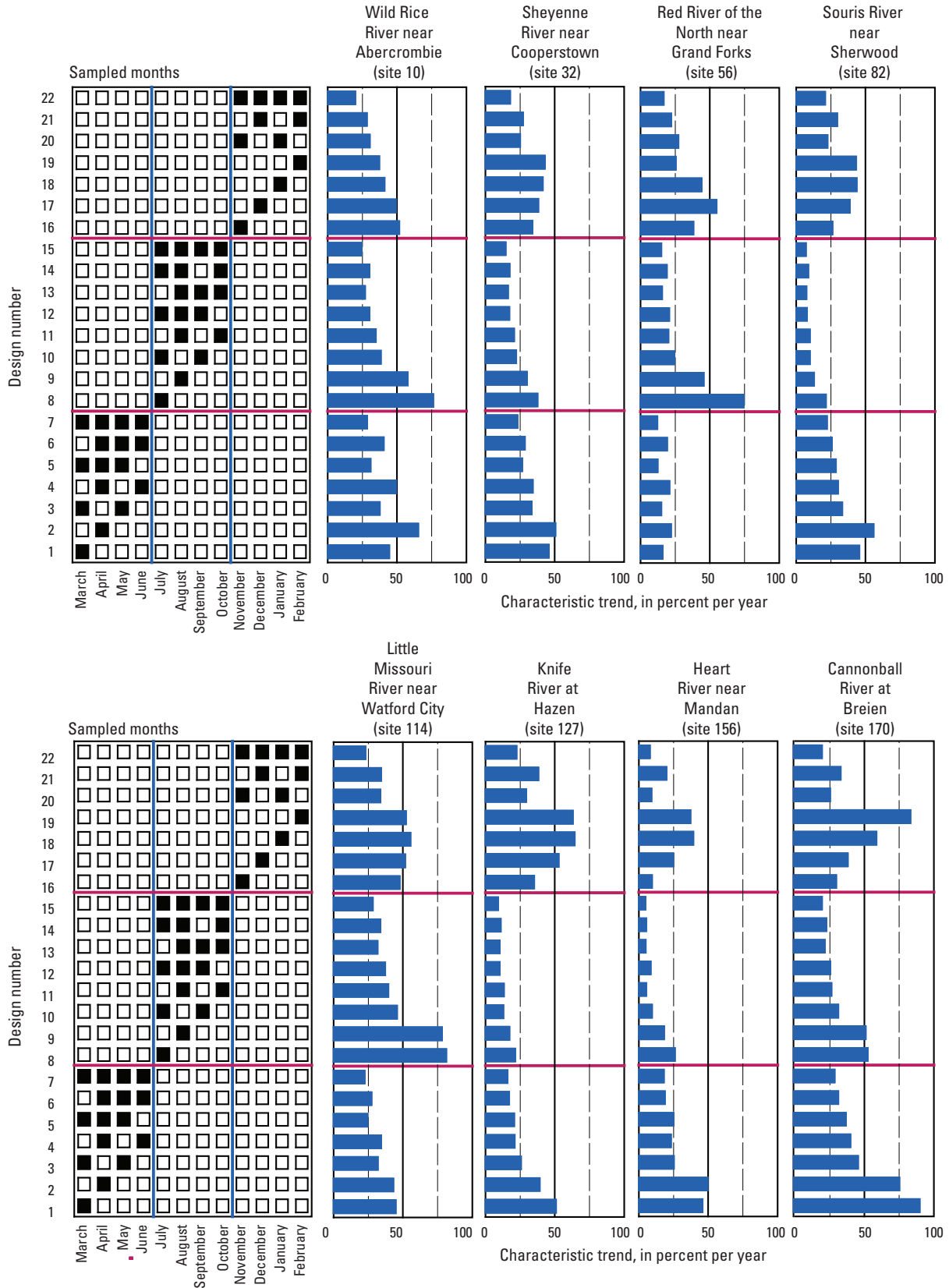


Figure 36. Characteristic seasonal trends for selected sampling designs for nitrate plus nitrite at selected sites in North Dakota.

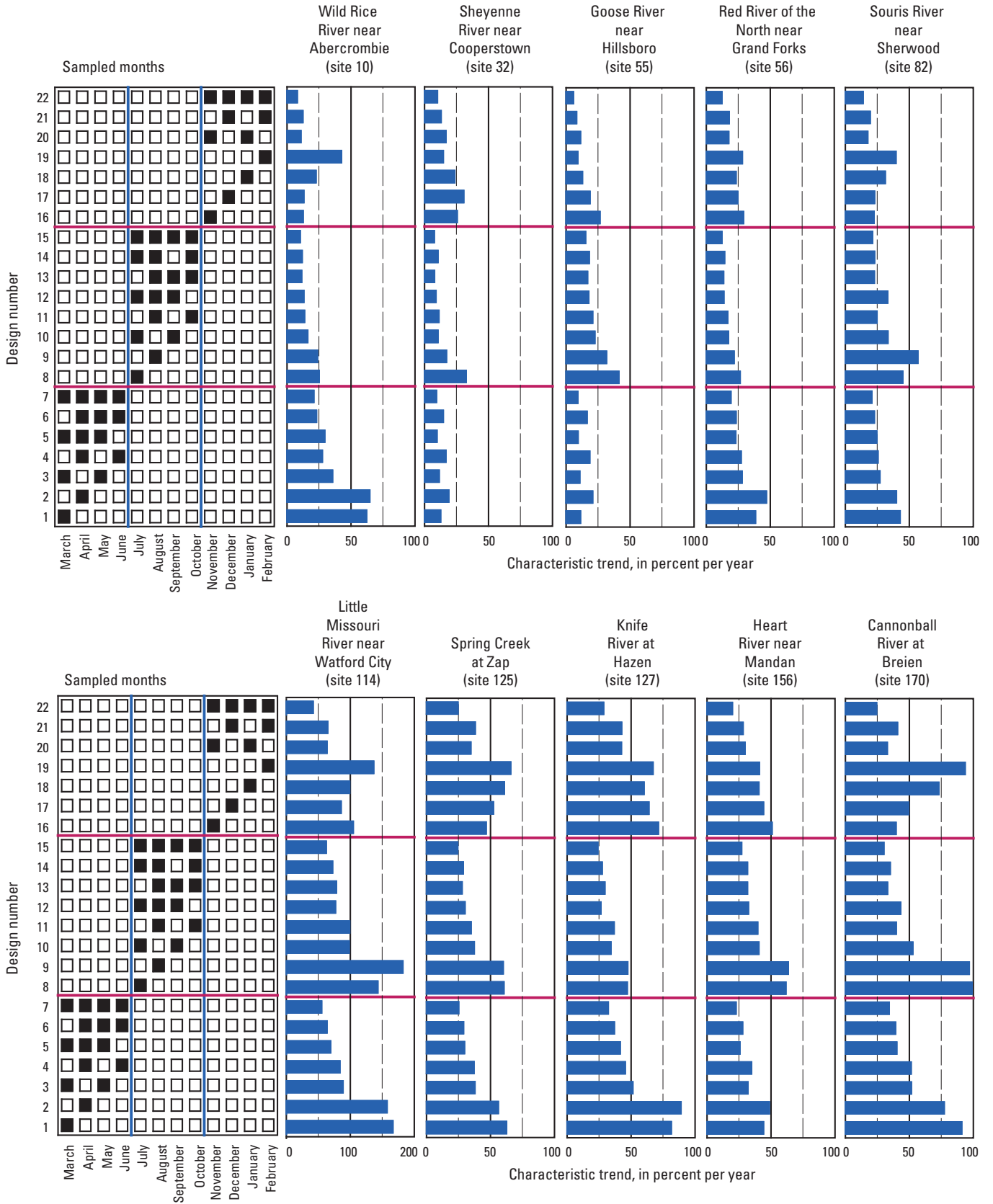


Figure 37. Characteristic seasonal trends for selected sampling designs for total phosphorus at selected sites in North Dakota.

If an additional sample was added (designs 3 and 4), most of the sites had characteristic seasonal trends less than 40 percent for nitrate plus nitrite (fig. 36), but for total phosphorus many sites did not meet this criterion (fig. 37). Using a three-sample design (designs 5 and 6) would provide sensitivity to detect small trends that meet the criterion of a characteristic trend less than 40 percent for all sites except the Little Missouri River near Watford City, N. Dak. (site 114). The most efficient design for sampling nitrate plus nitrite and total phosphorus appears to be one where samples are collected in April, May and June (design 6), however, sample design 5, where samples are collected in March, April and May, also meets the criterion of a characteristic seasonal trend less than 40 percent for most of the tested sites.

For the summer season, similar to the spring season, the one-sample designs (designs 8 and 9) for most sites had characteristic seasonal trends greater than 40 percent and did not meet the criterion for detecting trends in nitrate plus nitrite and phosphorus (figs. 36 and 37). By adding an additional sample in the summer (designs 10 and 11), the characteristic seasonal trend is less than 40 percent at most sites. The two-sample design, where samples are collected in August and October (design 11), meets the criterion for all sites for nitrate plus nitrite and for 9 out of 10 sites for total phosphorus. A three-sample design with samples in July, August, and October (design 14) provides substantial improvement in sensitivity to detect trends compared to design 11, especially for total phosphorus. Therefore, an efficient design for sampling nitrate plus nitrite and phosphorus in the summer season appears to be the three-sample design with samples in July, August, and October (design 14).

For the winter season, the one-sample designs (designs 16–19) provide poor sensitivity to detect trends in nitrate plus nitrite or total phosphorus for most sites (figs. 36 and 37). Although all of the sites had characteristic seasonal trends greater than 40 percent for all of the one-sample designs for total phosphorus, 6 out of 8 sites had characteristic seasonal trends less than 40 percent if the sample was collected in November for nitrate plus nitrite; however, as indicated previously, flow conditions in November are similar to October and thus a sample in November may not be necessary if a sample is collected in October. To reflect true winter conditions, if the November sample is excluded, design 21, with samples collected in December and February, has good sensitivity for detecting trends in nitrate plus nitrite for all of the sites and good sensitivity for detecting trends in phosphorus for 9 out of 10 sites.

Overall, the most efficient design for the detection of seasonal trends for nitrate plus nitrite and total phosphorus appears to be one that includes eight samples collected per year in the months of April, May, June, July, August, October, December, and February. Although reducing winter sampling to a single sample in December or January would result in considerable loss of sensitivity for detecting trends in that season, collecting two samples in winter may not be feasible

because of safety concerns. Therefore, the best feasible design consists of seven samples per year (April, May, June, July, August, October, and December or January).

When merging the results for nitrate plus nitrite and phosphorus with the previous results for sulfate and TDS, an efficient overall design for detecting seasonal trends consists of seven samples per year, with samples in early April, May, June, July, August, October, and January. This design consists of a combination of designs 6, 14, and 18. Maintaining a seven-sample design at all 81 sites in the spatial network (fig. 33) would result in 567 samples per year for both major ions (such as sulfate) and nutrients (such as nitrate plus nitrite and total phosphorus), compared to about 460 samples per year (for major ions) and 300 samples per year (for nutrients) currently (2010) being collected as part of the NDDH ambient network, HLSP, and other sampling programs in the Souris, James, and Red River of the North Basins. Therefore, to control sampling costs and allow extra samples for load estimation (see the following section), the sampling design for the level-3 sites were reduced from 7 to 4 samples per year. The design for the level-3 sites therefore consists of four samples per year, with samples in April, June, August, and October. This design should maintain reasonable power for detecting trends in the spring and summer seasons, and would provide considerable improvement compared to the two-sample HLSP design. Many of the level-3 sites have seasonally operated (March–October) streamgages because of negligible flows in winter, so excluding winter sampling was considered prudent for these sites. For level-2 sites, the sampling design was reduced from 7 to 6 samples per year, with samples in April, May, June, August, October, and January. Maintaining the seven-sample design for the 34 level-1 sites, the six-sample design for the 21 level-2 sites, and the four-sample design for the 26 level-3 sites would result in 468 major ion and nutrient samples per year for monitoring trends statewide.

The current (2010) sampling design for the NDDH ambient network includes eight samples collected in April, May (two samples), June, July, August, October, and January. Excluding the extra sample in May, the design would be equivalent to a combination of designs 6, 14, and 18 (figs. 34–37), which is the recommended seven-sample trend design for level-1 sites. Thus, the ambient network design has good sensitivity for detecting trends in all seasons except possibly winter (for certain sites). Although reducing sampling at these sites from 8 to 7 or perhaps even fewer samples per year would maintain nearly equivalent power for detecting trends, as indicated in the next section, maintaining at least 8 samples per year is necessary for load estimation. The NDSWC HLSP sampling design consists essentially of a combination of designs 2 and 9. That combination has moderate sensitivity for detecting trends in sulfate and TDS for spring and summer but poor sensitivity for detecting trends in nitrate plus nitrite and phosphorus in all seasons. Therefore, increasing from 2 to 4 or 6 samples per year would provide much better sensitivity for detecting trends in nutrient concentrations.

Sample Frequency for Estimation of Constituent Loads

One goal of the NDDH ambient network is to provide accurate estimates of loads over 5-year to 10-year periods. Unlike sample designs for detecting trends that are targeting changes in flow-adjusted concentration through time, sample designs for the estimation of constituent loads should focus on the main contributing factor that can affect the annual load—changes in concentration with streamflow. Loads are estimated by performing a regression analysis of concentration (or load) with streamflow and sometimes time and season, as discussed previously in the Load and Yield Estimation section. In general, the greatest streamflow will yield the greatest load, therefore it is important to design a sampling strategy that would target high-flow conditions such as snowmelt runoff and rainfall runoff events. Although it is important to define the constituent concentration at the full range of streamflow at a site, if the high streamflow conditions are not adequately included in the sampling, the estimated annual loads may be lower than what is actually occurring at the site.

Gilroy and others (1990) analyzed the relative efficiency of minimum variance unbiased estimates (MVUE) of loads for the simple regression model

$$\ln(L) = \beta_0 + \beta_1 \ln(Q) + E \quad (5)$$

where the terms in equation 5 are defined in the more detailed load model shown in equation 1. Although this model does not include the trend and seasonality terms in equation 3, uncertainty in load estimates generally is dominated by the flow term and thus the efficiency principles derived using equation 5 should be applicable to the more complicated model (eq. 1). Using elegant statistical theory, Gilroy and others (1990) developed a close approximation to the root-mean-squared error of the estimated total load for an N-day period,

$$RMSE = 100 (EV\{\langle L_N \rangle - L_N\}^2)^{1/2} / L_N \quad (6)$$

where

- $RMSE$ is the root-mean-squared error of the load estimate as a percentage of the true load;
- EV denotes expected value;
- L_N is the sum of the true daily loads in pounds per day for an N-day period; and
- $\langle L_N \rangle$ is the MVUE of L_N based on a calibration data set with M observations (for example, the estimate obtained using S-LOADEST);

Assuming N is large (for example, for a 5-year period, N would be 1,826 days), the size of the calibration data set (the number of concentration samples) used to fit the model (eq. 5) is small in relation to N, daily discharges are log-normally distributed, and the errors in equation 5 are independent and identically distributed normal random variables, Gilroy and others (1990) show that RMSE depends on two quantities,

$$D^* = (AVE_C\{\ln Q\} - AVE_N\{\ln Q\}) / SD_N\{\ln Q\} \quad (7)$$

and

$$R^* = SD_C\{\ln Q\} / SD_N\{\ln Q\} \quad (8)$$

where

- D^* is the difference between the average of the log-transformed daily flows for the calibration dataset ($AVE_C\{\ln Q\}$) and the average of the log-transformed daily flows for the full dataset ($AVE_N\{\ln Q\}$), divided by the standard deviation of log-transformed daily flows for the full dataset ($SD_N\{\ln Q\}$); and
- R^* is the ratio of the standard deviations of the log-transformed daily flows for the calibration dataset ($SD_C\{\ln Q\}$) and the full dataset.

Gilroy and others (1990) show that an efficient design (one with small $RMSE$ for a fixed number of samples) should have R^* greater than 1 and D^* close to β_1 . Designs with R^* less than 1 and/or $abs(D^* - \beta_1)$ greater than 1 generally are highly inefficient. Because each site/constituent combination can have a different slope (β_1), the most efficient design for load estimation, like the most efficient design for trend detection described in the previous section, depends on the site/constituent combination. For example, for the extreme case of a constant point source ($\beta_1=0$) the loads do not depend on flow and the best design would have $AVE_C\{\ln Q\} = AVE_N\{\ln Q\}$, so flows for the calibration data should have a similar distribution to flows for the full dataset. If concentration is constant with respect to flow (the slope of the $\ln(C)$ to $\ln Q$ relation is zero), then $\beta_1=1$ and the best design would have $AVE_C\{\ln Q\} = AVE_N\{\ln Q\} + SD_N\{\ln Q\}$ and thus the calibration dataset should be weighted toward higher flows. The higher the slope, the more weight should be given to higher flows in the calibration dataset. Using the slopes from table 3 as a guide, the median slope was 0.89 (range of 0.67 to 1.17) for dissolved sulfate and TDS; 0.96 (range of 0.42 to 1.57) for ammonia; 1.33 (0.97 to 1.78) for nitrite plus nitrate; 1.18 (0.63 to 2.02) for total and dissolved phosphorus; 1.05 (0.92 to 1.28) for total organic carbon; and 1.26 (0.94 to 2.01) for suspended sediment. Overall, $D^*=1$ (covering a range of β_1 from 0 to 2, with especially good efficiency for β_1 between 0.5 and 1.5) appears to be a good target to maintain high efficiency for all of the sites and constituents. A value of $D^*=0.5$ (covering a range from -0.5 to 1.5 with especially good efficiency for a range of 0 to 1) would be relatively efficient for many cases but may be inefficient for nutrients and suspended sediment for some sites.

As an experiment to evaluate various designs for load estimation for 5-year time periods, daily flow data for 5 sites were used to compute D^* and R^* for moving 5-year windows centered on 1973 (1971–75) through 2005 (2003–07). In this analysis, flows from April 1 to October 31 of each year were

used to avoid ice-cover conditions. The values of D^* for the five sites and various designs are shown in figure 38 and the values of R^* are shown in figure 39. Although the sites are scattered throughout North Dakota and represent a range of basin sizes (table 6), the overall results and conclusions were similar. For the level-3 design (samples in April, June, August, and October; fig. 38A), D^* was less than 0.2 for most site/time period combinations and less than 0.0 for many combinations, so that design is highly inefficient for load estimation. For the recommended seven-sample trend design for level-1 sites (samples in April, May, June, July, August, and October, excluding January; fig. 38B), D^* increased by about 0.2 compared to the level-3 design for most site/time period combinations, a big improvement over level-3 but still well below the target of $D^*=1$. The current (2010) ambient network design consists of the level-1 trend design plus an extra sample in May (fig. 38C). Although this design provides some increases in D^* compared to the design in figure 38B, the extra sample in May provides only small improvement in efficiency. Adding an extra sample in April rather than May (fig. 38D) results in much better overall efficiency, with D^* between 0.2 and 0.4 for most site/time period combinations. Thus, moving the sample in mid- to late-May that is in the current (2010) ambient network design to mid-April would be a more efficient design for load estimation. Adding a third or fourth sample in April (figs. 38E and 38F) provides still more improvement in efficiency. The design shown in figure 38F, with four samples in April (weekly beginning April 5) and one sample each in May, June, July, August, and October, for a total of nine samples during April–October, has D^* greater than 0.5 for many of the site/time period combinations. Reaching the optimal target of $D^*=1$ is not feasible without a much higher sampling frequency.

The other consideration (R^* greater than 1) can be evaluated using figure 39. It is apparent that the design with two samples in April (fig. 39D) has R^* greater than 1 much more frequently than the design with two samples in May (fig. 39C), providing additional evidence to place the extra sample in April instead of May. Designs with 3 or 4 samples in April (figs. 39E and 39F) also have R^* greater than 1 for most site/time period combinations.

Given the previous results, augmenting the level-1 design for trends by adding an extra sample in April would provide a good alternative for improving load estimates. Adding as many as two more samples in April (weekly) would provide still more improvement for load estimation but at considerably more cost. It may be prudent to select a few of the ambient network sites as test sites where more frequent April samples would be collected for a few years to see if the improvement in load estimates justify the added cost of the extra samples.

Overview of Potential Network

The potential State-wide sampling network for efficiently accomplishing the objectives of the sampling programs is summarized in table 7 and figure 33. Although only major ions and nutrients were used to determine the spatial distribution of sites and temporal sampling frequencies for this network, analysis of samples for trace-metal constituents for all sites and bacteria and sediment for the level-1 sites were included in the potential network because they are part of the current (2010) sampling networks and should be continued for monitoring water-quality conditions. The historical data for trace metals, bacteria, and sediment were not sufficient to do a rigorous analysis of network efficiency similar to what was done for major ions and nutrients. Therefore, the same design was assumed for trace metals for all sites. It was also assumed that bacteria and sediment would be sampled along with the other constituents at the level-1 sites.

For the 34 level-1 sites, samples would be collected for major ions, trace metals, nutrients, bacteria, and sediment eight times per year, with samples in January, April (two samples), May, June, July, August, and October (table 7). Thus, there would be a total of 272 samples collected per year for each of the constituents. These level-1 sites would essentially be a continuation of the 2010 NDDH ambient network (34 sites) and the Souris River International Joint Board monitoring program at the Souris River near Sherwood, N. Dak. (site 82) and Westhope, N. Dak. (site 98). In 2010, there were a total of 324 samples collected at these sites. The smaller number of samples in the potential design compared to the 2010 sampling program result from elimination of replication between NDDH and USGS sampling programs at two sites in the Souris Basin (sites 85 and 87, fig. 33). NDDH currently collects samples eight times per year and USGS collects samples seven times per year at each of these two sites for the same constituents and thus eliminating the extra USGS sampling would result in 14 fewer samples.

For the 21 level-2 sites, samples would be collected for major ions, trace metals, and nutrients six times per year (January, April, May, June, August, and October) and for the 26 level-3 sites samples would be collected for these constituents four times per year (April, June, August, and October) (table 7). Thus, there would be a total of 230 major ion, trace metal, and nutrient samples collected each year at 47 level-2 and level-3 sites. These 47 sites would replace the existing HLSP sites, for which, in 2010, there were 166 samples collected at 83 sites for major ions and trace metals. Although there are 36 fewer sites in the proposed network, in 2010, 21 of these 36 sites were sampled as both HLSP and NDDH ambient network sites (fig. 1). Thus, most of the 2010 HLSP sites would continue to be sampled as part of the potential network and only 15 of the 2010 HLSP sites would not be included in the potential network. These 15 sites (sites 2, 25, 30, 38, 40, 41, 42, 44, 74, 83, 89, 141, 150, 154, and 186; fig. 1) generally are either in close proximity to sites in the potential network or on very small drainages. Although

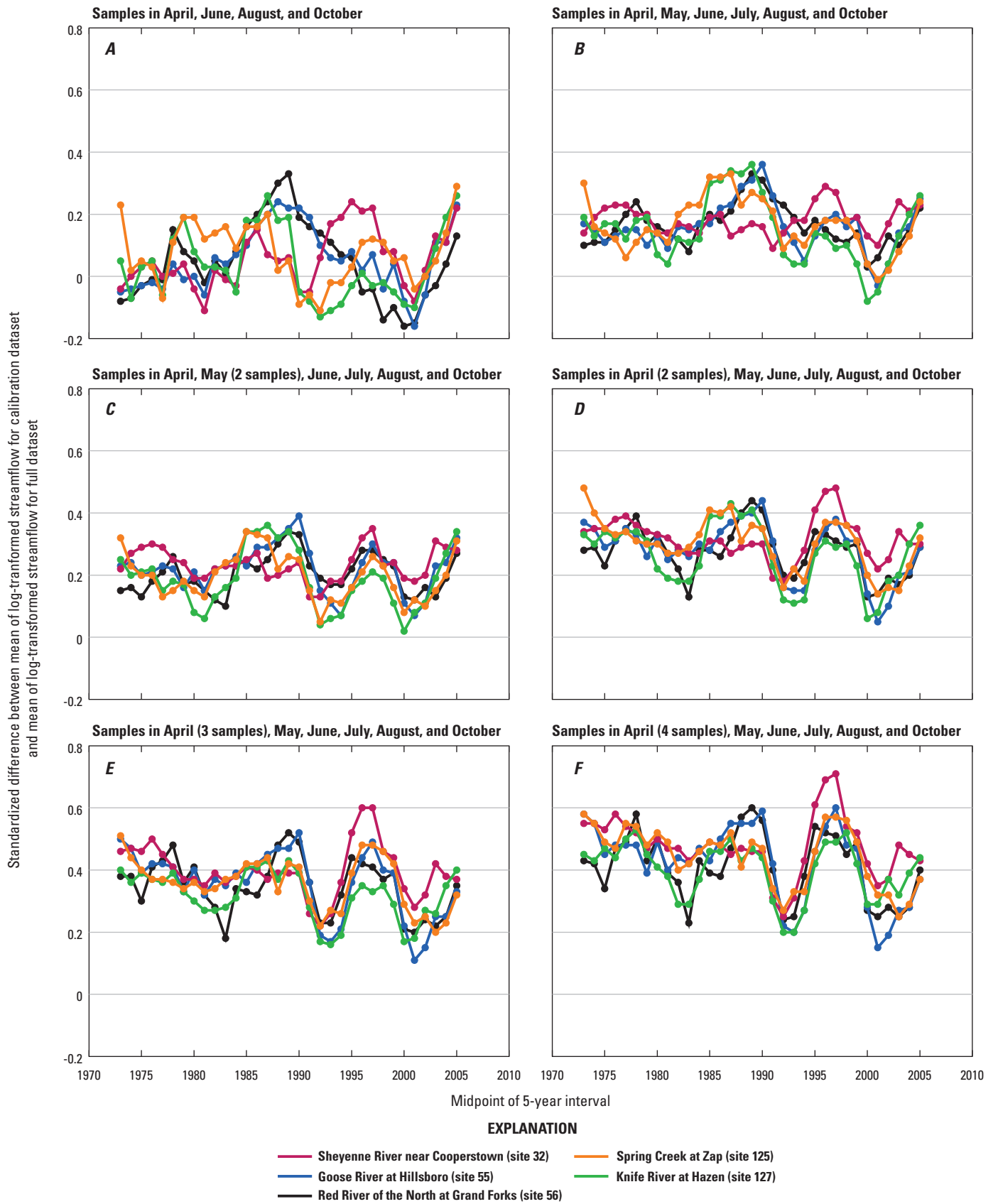


Figure 38. Efficiency of sample designs for load estimation in terms of standardized difference between the average of log-transformed flows for the calibration dataset and log-transformed flows for the full dataset for 5-year moving windows.

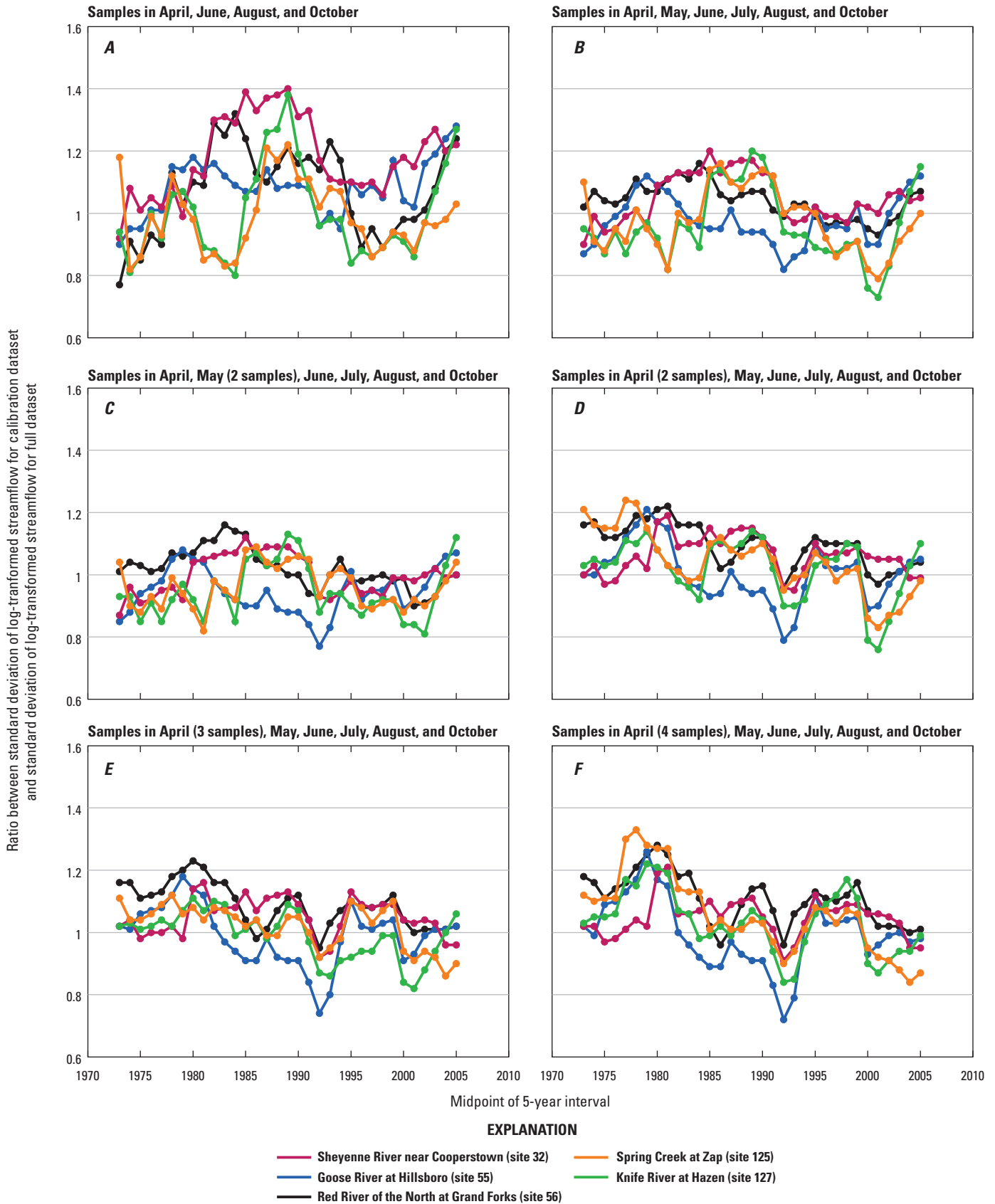


Figure 39. Efficiency of sample designs for load estimation in terms of ratio between the standard deviation of log-transformed flows for the calibration dataset and the standard deviation of log-transformed flows for the full dataset for 5-year moving windows.

Table 7. Summary of potential state-wide water-quality sampling network for North Dakota.

Design level	Number of sites	Sampling frequency	Total number of samples per year	Sampling time	Constituent groups	Sampling objectives
1	34	8	272	January, April (2 samples), May, June, July, August, October	Majors, trace metals, nutrients, bacteria, sediment	Trends and loads
2	21	6	126	January, April, May, June, August, October	Majors, trace metals, nutrients	Fill gaps in trends network
3	26	4	104	April, June, August, October	Majors, trace metals, nutrients	Fill gaps in spatial coverage

maintaining the level-2 and level-3 network at the suggested sampling frequencies would require additional resources compared to the current HLSP costs, there would be substantial benefits in terms of higher sensitivity to evaluate changes in water quality. Reducing costs from the potential level-2 and level-3 network could be achieved by lowering sampling frequencies (and losing power to detect trends) or eliminating sampling sites (and losing spatial coverage in some areas). Although nutrients are not sampled as part of the 2010 HLSP, including nutrient samples would provide substantial benefits for monitoring water-quality with negligible increase in sampling costs; however, laboratory costs would be higher as a result of adding nutrient analyses.

Summary

Although data collected for the North Dakota State Water Commission High-Low Sampling Program, the North Dakota Department of Health Ambient Water-Quality Network, and other projects and programs provide valuable information on the quality of water in streams of North Dakota, the objectives vary among the programs, some of the programs overlap spatially and temporally, and the various sampling designs may not be the most efficient or relevant to the objectives of the individual programs as they have changed through time. In response to the need to examine the large amount of historic water-quality data comprehensively across North Dakota and evaluate the efficiency of the State-wide sampling program, a study was conducted by the U.S. Geological Survey in cooperation with the North Dakota State Water Commission and the North Dakota Department of Health to describe the water-quality data collected by the various programs and determine an efficient State-wide sampling design for monitoring future water-quality conditions.

Median concentrations of water-quality constituents at sampling locations in North Dakota were determined for the period of record and for the spring (March through June), summer (July through October), and winter (November through February) seasons at each sampling location. In general, median sulfate concentrations tended to be higher in the southwest part of the State compared to the northeast part of the State in the Red River of the North Basin. Seasonal

variations indicated lower median concentrations in samples collected during spring and higher concentrations from samples collected during winter at many locations. Median chloride concentrations tended to be lower in the southwest and higher in the northeast parts of the State, nearly the opposite of the pattern seen in median sulfate concentrations. Substantial differences in median chloride concentrations were not evident among samples collected during different seasons. In general, median total dissolved solid concentrations tended to be lower for sites in the Red River of the North, Souris, and James River Basins compared to sites in southwest North Dakota. Like sulfate, median total dissolved solid concentrations at many locations tended to be lower in samples collected during spring compared to samples collected during the summer and winter.

In general, overall median ammonia concentrations (total and dissolved) were spatially variable across the State. Seasonally, median ammonia concentrations generally were highest during winter and lowest in summer. The highest overall median nitrate plus nitrite concentrations (total and dissolved) tended to occur in the Red River of the North Basin. This pattern of high concentrations in the Red River of the North Basin was particularly evident during the spring season, and may reflect fertilizer application to row crops and other cropland in that area. This pattern was reversed during the winter season, with the lowest median concentration occurring in the Red River of the North Basin. Median dissolved and total phosphorus concentrations across North Dakota generally were greater for the Red, Souris, and James River Basins than river basins in the southwest part of the State. Median dissolved phosphorus concentrations tended to be similar among the seasons, whereas median total phosphorus concentrations tended to be higher in the summer than other seasons, particularly in the Souris, Devils Lake, and James River Basins. Median dissolved and total organic carbon concentrations tended to be the lowest in samples collected at sites located in the eastern part of the State compared with other median concentrations at sites throughout the remainder of the State.

Median total aluminum concentrations generally were higher in samples from sites in the southern and eastern parts of the State compared to concentrations in other parts of the State. Seasonal variations indicated higher median total aluminum concentrations during spring and summer and lower

concentrations during winter at many locations. Median total arsenic concentrations in North Dakota indicate that the lowest values occurred mostly in the southwestern parts of the State, whereas the highest values occurred mostly in the eastern parts of the State. Seasonal variations indicated higher median total arsenic concentrations in samples collected during summer and lower concentrations from samples collected during winter at many locations. Median total chromium concentrations in water samples collected across North Dakota generally were higher in the far eastern and western areas of the State, and seasonal variations indicated higher median total chromium concentrations in samples collected during spring and lower concentrations from samples collected during winter at many locations. Median total iron concentrations in North Dakota were lowest in the Souris, Sheyenne, and James River Basins compared to sites in other parts of North Dakota. The highest median total lead concentrations in water samples were scattered across North Dakota. Seasonal variations indicated higher median total lead concentrations during spring and lower concentrations during winter at many locations, particularly in the Red River of the North Basin. Median total nickel concentrations were higher at a few sites in the southwest and eastern parts of North Dakota compared to other sites. Seasonal variations indicated higher median total nickel concentrations in samples collected during spring and lower concentrations from samples collected during winter at many locations. Median suspended-sediment concentrations and total suspended solids in water samples obtained across North Dakota were higher at sites located in parts of southwestern and eastern North Dakota compared to sites located in other areas of the State.

Normalized annual loads and yields were estimated for sulfate, total dissolved solids, nitrogen, phosphorus, total organic carbon, and suspended sediment at 34 sites across North Dakota. Normalized annual sulfate yields ranged from 9,250 to 56,200 pounds per year per square mile in the Missouri River Basin and from 4,680 to 72,500 pounds per year per square mile in the Red River of the North Basin. Total dissolved solids yields ranged from 30,400 to 119,000 pounds per year per square mile in the Missouri River Basin and from 13,000 to 169,000 pounds per year per square mile in the Red River of the North Basin. Nitrate plus nitrite yields ranged from 24 to 120 pounds per year per square mile as nitrogen in the Missouri River Basin and from 2 to 1,260 pounds per year per square mile as nitrogen in the Red River of the North Basin. Ammonia yields ranged from 6 to 22 pounds per year per square mile as nitrogen in the Missouri River Basin and from 4 to 62 pounds per year per square mile as nitrogen in the Red River of the North Basin. Normalized annual dissolved phosphorus yields ranged from less than 1 to 35 pounds per year per square mile as phosphorus in the Missouri River Basin and from 5 to 47 pounds per year per square mile as phosphorus in the Red River of the North Basin. Normalized annual total phosphorus yields ranged from less than 1 to 167 pounds per year per square mile as phosphorus in the Missouri River Basin and from 6 to 76 pounds per year

per square mile as phosphorus in the Red River of the North Basin. Normalized annual total organic carbon yields ranged from 426 to 2,670 pounds per year per square mile as carbon in the Missouri River Basin and from 394 to 11,100 pounds per year per square mile as carbon in the Red River of the North Basin. Suspended-sediment yields ranged from 519 to 622,000 pounds per year per square mile in the Missouri River Basin and from 1,500 to 78,800 pounds per year per square mile in the Red River of the North Basin.

Ten sites were selected for trend analysis for sulfate, total dissolved solids, nitrate plus nitrite, and total phosphorus. The fitted trends for standardized sulfate concentrations indicated significant increases in concentration at five sites and a significant decrease in concentration at one site from 1975 through 2008. Median standardized sulfate concentrations increased from about 55 to 106 milligrams per liter for the Red River of the North at Grand Forks, North Dakota; 262 to 308 milligrams per liter for the Souris River near Sherwood, North Dakota; 455 to 506 milligrams per liter for Spring Creek at Zap, North Dakota; 440 to 520 milligrams per liter for the Knife River at Hazen, North Dakota; and 380 to 435 milligrams per liter for the Heart River near Mandan, North Dakota. The fitted trend for the Little Missouri River near Watford City, North Dakota showed a decrease in median standardized concentration from about 492 to 417 milligrams per liter. The fitted trends for standardized total dissolved solid concentrations indicated significant increases in concentration at five sites from 1975 through 2008, including the Heart River near Mandan, North Dakota, Knife River at Hazen, North Dakota, Spring Creek at Zap, North Dakota, and the Red River of the North at Grand Forks, North Dakota. The greatest increase in median standardized total dissolved solid concentrations was detected for the Wild Rice River near Abercrombie, North Dakota, where median concentrations increased from about 690 to 1,120 milligrams per liter from 1975 through 2008.

The fitted trends for standardized nitrate plus nitrite concentrations indicated no significant increases or decreases in concentration for 7 of the 8 sites analyzed for trends; however, median standardized nitrate plus nitrite concentration for the Red River of the North near Grand Forks, North Dakota increased from about 0.26 to 0.45 milligrams per liter as nitrogen during 1990 to 2008. The fitted trends for standardized total phosphorus concentrations indicated significant decreases in concentration at 4 sites and a significant increase at 1 out of the 10 sites analyzed for trends. All of the significant decreases were for sites in western North Dakota, including decreases in median standardized total phosphorus concentration for the Cannonball River at Breien, North Dakota, Heart River near Mandan, North Dakota, Knife River at Hazen, North Dakota, and Spring Creek at Zap, North Dakota. Conversely, median standardized total phosphorus concentration for the Red River of the North at Grand Forks, North Dakota increased from about 0.10 to 0.16 milligrams per liter from 1990 through 2008.

One objective of a proposed State-wide sampling program was to describe the spatial variability of water-quality conditions across the State in the most efficient manner. To evaluate the spatial redundancy in nested (upstream/downstream) samples, two constituents – sulfate and phosphorus – were selected. Weighted least-squares regression analysis was used to relate the average absolute difference between paired downstream and upstream concentrations, expressed as a percent of the average downstream concentration, to the average absolute difference in daily flow between the downstream and upstream pairs, expressed as a percent of the average downstream flow. The analysis showed that a reasonable spatial network would consist of including the most downstream sites in large basins first, followed by the next upstream site(s) that roughly bisect the downstream flows at the first sites, followed by the next upstream site(s) that roughly bisect flows for the second sites. Sampling sites to be included in a potential State-wide network were prioritized into 3 design levels: level 1 (highest priority), level 2 (second priority), and level 3 (third priority). In all, the potential network consists of 81 sites, with 34 level-1 sites, 21 level-2 sites, and 26 level-3 sites.

Given the spatial distribution and priority designation (levels 1–3) of sites in the potential spatial network, the next consideration was to determine the appropriate temporal sampling frequency to use for monitoring future water-quality conditions. The time-series model used to detect concentration trends for this report also was used to evaluate sampling designs to monitor future water-quality trends. Sampling designs were evaluated with regard to their sensitivity to detect seasonal trends that occurred during three 4-month seasons—March through June, July through October, and November through February. The most efficient design for one constituent may be an inefficient design for another constituent. Therefore, the design results for sulfate, total dissolved solids, nitrate plus nitrite, and total phosphorus were analyzed at the sites examined for trends to develop an efficient overall design. Unlike sample designs for detecting trends that are targeting flow-adjusted concentration through time, sample designs for the estimation of constituent loads should focus on the main contributing factor that can affect the annual load, changes in concentration with streamflow.

For the 34 level-1 sites, samples would be collected for major ions, trace metals, nutrients, bacteria, and sediment eight times per year, with samples in January, April (2 samples), May, June, July, August, and October. The current (2010) ambient network design consists of the level-1 trend design with an additional sample in May instead of April. Moving the sample in mid- to late-May that is in the current (2010) ambient network design to mid-April would be a more efficient design for load estimation. For the 21 level-2 sites, samples would be collected for major ions, trace metals, and nutrients six times per year (January, April, May, June, August, and October) and for the 26 level-3 sites, samples would be collected for these constituents four times per year (April,

June, August, and October). Although maintaining the level-2 and level-3 network at the suggested sampling frequencies would require additional resources compared to the current High-Low Flow Sampling Program costs, there would be substantial benefits in terms of higher sensitivity to evaluate changes in water quality.

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Appendix 1. Summary statistics for constituents and field measurements at selected sites in North Dakota

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Boron, in $\mu\text{g/L}$						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	217	<50	497
2	Red River of the North at Wahpeton, N. Dak.	35	1973–2008	60	<50	280
3	Red River of the North near Wahpeton, N. Dak.	1	2006	394	394	394
4	Red River of the North at Brushville, Minn.	53	2000–2007	90	<50	238
5	Red River of the North below Wahpeton, N. Dak.	9	1970–1972	70	60	110
6	Red River of the North at Hickson, N. Dak.	91	1975–2008	80	<50	530
7	Wild Rice River near Rutland, N. Dak.	31	1971–2008	173	<50	460
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	162	<50	3,300
9	Antelope Creek at Dwight, N. Dak.	8	2005–2008	76	<50	218
10	Wild Rice River near Abercrombie, N. Dak.	182	1970–2008	290	<50	840
11	Red River of the North at Fargo, N. Dak.	102	1970–2008	80	<50	270
12	Red River of North below Fargo, N. Dak.	87	1970–1986	80	<50	370
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	117	<50	278
14	Red River of the North near Harwood, N. Dak.	12	2005–2007	93	86	151
15	Sheyenne River above Harvey, N. Dak.	180	1972–2008	722	<50	1,200
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	80	<50	1,100
17	Sheyenne River at Warwick, N. Dak.	45	1997–2006	254	82	438
18	Sheyenne River near Warwick, N. Dak.	99	1970–2008	150	<50	418
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	20	1987–2008	<50	<50	150
20	Mauvais Coulee near Cando, N. Dak.	64	1972–2008	60	<50	390
21	Edmore Coulee near Edmore, N. Dak.	63	1972–2008	50	<50	980
22	Edmore Coulee Tributary near Webster, N. Dak.	18	1987–2008	55	<50	175
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	80	80	80
24	Starkweather Coulee near Webster, N. Dak.	56	1983–2008	50	<50	189
25	Big Coulee below Churchs Ferry, N. Dak.	7	2005–2008	111	<50	223
26	Little Coulee near Leeds, N. Dak.	5	2005–2008	96	52	138
27	Little Coulee near Brinsmade, N. Dak.	24	1976–1994	140	<50	360
28	Big Coulee near Churchs Ferry, N. Dak.	113	1970–1994	100	<50	830
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	43	1970–1986	400	100	1,500
30	Channel A near Penn, N. Dak.	54	1984–2008	80	<50	480
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	6	2005–2007	530	377	619
32	Sheyenne River near Cooperstown, N. Dak.	279	1970–2008	190	<50	890
33	Baldhill Creek near Dazey, N. Dak.	73	1972–2008	149	<50	830
34	Sheyenne River below Baldhill Dam, N. Dak.	135	1972–2008	170	<50	310
35	Sheyenne River at Valley City, N. Dak.	14	1972–2005	145	<50	240
36	Sheyenne River at Lisbon, N. Dak.	260	1970–2008	210	<50	400
37	Sheyenne River near Kindred, N. Dak.	115	1972–2008	214	70	2,600
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	21	1993–2008	185	90	245
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	115	70	140

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Boron, in $\mu\text{g/L}$ —Continued						
40	Sheyenne River Diversion at West Fargo, N. Dak.	5	1994–2007	131	91	168
41	Sheyenne River at West Fargo, N. Dak.	39	1970–2008	130	<50	5,400
42	Maple River near Hope, N. Dak.	25	1972–2008	90	<50	240
43	Maple River near Enderlin, N. Dak.	44	1972–2008	165	<50	520
44	Maple River near Mapleton, N. Dak.	16	1972–2008	204	<50	1,000
45	Maple River below Mapleton, N. Dak.	56	1997–2008	232	<50	405
46	Sheyenne River at Harwood, N. Dak.	1	2005	115	115	115
47	Rush River at Amenia, N. Dak.	32	1972–2008	162	<50	790
48	Rush River near Prosper, N. Dak.	4	1983–1987	60	<50	250
49	Lower Branch Rush River near Prosper, N. Dak.	4	1983–1987	<50	<50	60
50	Sheyenne River near Harwood, N. Dak.	9	1970–1972	212	104	300
51	Elm River near Kelso, N. Dak.	3	1983–1987	<50	<50	150
52	Red River of the North at Halstad, Minn.	29	1972–2008	106	<50	290
53	Beaver Creek near Finley, N. Dak.	8	1970–1973	120	<50	243
54	Goose River near Portland, N. Dak.	30	1970–1988	120	<50	2,700
55	Goose River at Hillsboro, N. Dak.	130	1970–2008	200	<50	1,100
56	Red River of the North at Grand Forks, N. Dak.	145	1970–2008	84	<50	168
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	9	1991–2008	81	<50	336
58	Turtle River at Manvel, N. Dak.	104	1971–2008	491	<50	14,000
59	Red River of the North at Oslo, Minn.	9	1987–2005	<50	<50	140
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	115	<50	240
61	Forest River near Fordville, N. Dak.	45	1972–2008	<50	<50	280
62	Forest River near Minto, N. Dak.	124	1971–2008	92	<50	852
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	90	<50	560
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	80	<50	240
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	80	<50	120
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	100	<50	300
67	Park River at Grafton, N. Dak.	119	1970–2008	190	<50	830
68	Red River of the North at Drayton, N. Dak.	38	1972–2008	85	<50	1,100
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	70	<50	320
70	Hidden Island Coulee near Hansboro, N. Dak.	21	1972–1994	<50	<50	280
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	<50	<50	280
72	Pembina River near Vang, N. Dak.	62	1970–1979	130	<50	680
73	Little South Pembina River near Walhalla, N. Dak.	75	1970–2008	120	<50	220
74	Pembina River at Walhalla, N. Dak.	189	1970–2008	130	<50	290
75	Pembina River at Neche, N. Dak.	102	1972–2008	140	<50	380
76	Tongue River at Akra, N. Dak.	51	1972–2008	80	<50	350
78	Red River of the North at Pembina, N. Dak., site 2	97	1970–2008	110	<50	396
79	Red River of the North at Emerson, Manitoba	2	1982–1991	145	130	160
80	Long Creek near Noonan, N. Dak.	52	1972–2008	82	<50	650

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Boron, in $\mu\text{g/L}$ —Continued						
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	175	<50	310
82	Souris River near Sherwood, N. Dak.	302	1972–2008	232	<50	5,100
83	Souris River near Foxholm, N. Dak.	142	1972–2008	270	<50	1,300
84	Des Lacs River at Foxholm, N. Dak.	149	1972–2008	148	<50	808
85	Souris River above Minot, N. Dak.	191	1970–2008	209	<50	1,100
86	Bonnes Creek near Velva, N. Dak.	8	1987–2005	182	60	2,670
87	Souris River near Verendrye, N. Dak.	311	1970–2008	253	<50	980
88	Wintering River near Karlsruhe, N. Dak.	116	1972–2008	150	<50	1,100
89	Souris River near Bantry, N. Dak.	120	1970–2008	209	<50	780
90	Willow Creek near Willow City, N. Dak.	52	1972–2008	130	<50	380
91	Stone Creek near Kramer, N. Dak.	13	1986–1993	150	<50	10,000
92	Deep River near Upham, N. Dak.	31	1972–2007	50	<50	210
93	Egg Creek near Granville, N. Dak.	14	1972–1981	125	<50	270
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	120	<50	320
95	Cut Bank Creek at Upham, N. Dak.	17	1975–1989	120	<50	470
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	100	<50	220
97	Boundary Creek near Landa, N. Dak.	22	1972–1994	120	<50	390
98	Souris River near Westhope, N. Dak.	94	1970–2008	200	58	510
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	160	<50	760
100	Missouri River near Williston, N. Dak.	73	1974–1982	130	60	350
101	Little Muddy River below Cow Creek near Williston, N. Dak.	58	1972–2008	280	<50	860
102	Stony Creek near Williston, N. Dak.	31	1977–1981	280	<50	400
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	350	<50	970
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	280	<50	370
105	White Earth River at White Earth, N. Dak.	27	1970–1977	320	<50	960
106	Bear Den Creek near Mandaree, N. Dak.	23	1970–2008	230	70	354
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	380	<50	940
108	East Fork Shell Creek near Parshall, N. Dak.	46	1991–2008	593	<50	1,071
109	Deepwater Creek near Mandaree, N. Dak.	43	1991–2008	477	<50	964
110	Little Missouri River at Marmarth, N. Dak.	65	1971–2008	260	<50	950
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	1,400	250	2,800
112	Little Missouri River at Medora, N. Dak.	86	1972–2008	431	<50	3,050
113	Beaver Creek near Trotters, N. Dak.	79	1977–2008	648	90	1,100
114	Little Missouri River near Watford City, N. Dak.	113	1971–2008	359	<50	3,310
115	Missouri River at Garrison Dam, N. Dak.	160	1971–2007	118	<50	330
116	Knife River at Manning, N. Dak.	98	1972–2008	395	<50	1,500
117	Stray Creek near Manning, N. Dak.	17	1975–1981	460	130	1,200
118	Knife River at Marshall, N. Dak.	69	1972–1981	330	<50	1,100
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	210	<50	1,300

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Boron, in µg/L—Continued						
120	Knife River near Golden Valley, N. Dak.	111	1971–2008	325	<50	1,500
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	330	<50	700
122	Brush Creek near Beulah, N. Dak.	81	1974–1988	340	<50	470
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	47	1977–1981	550	80	1,300
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	670	100	920
125	Spring Creek at Zap, N. Dak.	189	1970–2008	450	<50	1,600
126	West Branch Otter Creek near Beulah, N. Dak.	14	1972–1994	120	<50	1,200
127	Knife River at Hazen, N. Dak.	170	1970–2008	322	<50	1,300
128	Antelope Creek above Hazen, N. Dak.	28	1977–1982	235	<50	430
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	10	1977–1982	65	<50	190
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	165	<50	460
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	315	60	430
132	Alderin Creek near Fort Clark, N. Dak.	35	1977–1982	240	<50	500
133	Coal Lake Coulee near Hensler, N. Dak.	16	1978–1982	130	<50	590
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	635	<50	1,100
135	Turtle Creek above Washburn, N. Dak.	100	1987–2003	499	70	1,400
136	Painted Woods Creek near Wilton, N. Dak.	201	1970–2003	378	<50	1,000
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	180	<50	310
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	55	1977–1982	310	<50	800
139	Hagel Creek near Center, N. Dak.	38	1977–1982	385	<50	770
140	Square Butte Creek below Center, N. Dak.	60	1972–2008	577	<50	2,900
141	Burnt Creek near Bismarck, N. Dak.	29	1972–2008	132	<50	2,800
142	Missouri River at Bismarck, N. Dak.	69	1974–2008	120	<50	540
143	South Branch Heart River near South Heart, N. Dak.	20	1979–1983	195	<50	420
144	North Creek near South Heart, N. Dak.	16	1978–1981	530	110	1,600
145	Heart River near South Heart, N. Dak.	67	1975–2005	600	80	1,300
146	Heart River at Dickinson, N. Dak.	17	1986–1994	400	140	580
147	Green River near New Hradec, N. Dak.	97	1972–2008	340	<50	1,700
148	Green River near Gladstone, N. Dak.	29	1970–1975	330	<50	620
149	Heart River near Richardton, N. Dak.	123	1972–2008	378	<50	1,700
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	20	1989–2008	320	70	801
151	Antelope Creek near Carson, N. Dak.	15	1972–2008	170	<50	650
152	Big Muddy Creek near Almont, N. Dak.	16	1991–2008	353	120	859
153	Heart River near Lark, N. Dak.	43	1971–1994	210	<50	1,700
154	Heart River at Stark Bridge near Judson, N. Dak.	21	1988–2008	323	<50	548
155	Sweetbriar Creek near Judson, N. Dak.	27	1972–2008	302	<50	1,200
156	Heart River near Mandan, N. Dak.	112	1971–2008	367	<50	1,700
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	10	1990–1994	305	70	670
158	Apple Creek near Menoken, N. Dak.	106	1972–2008	825	<50	1,700
159	Missouri River near Schmidt, N. Dak.	48	1976–1981	120	90	150

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Boron, in $\mu\text{g/L}$ —Continued						
160	Cannonball River at New England, N. Dak.	37	1978–2005	570	80	930
161	Coal Bank Creek near Havelock, N. Dak.	63	1974–1983	1,100	120	3,100
162	Cannonball River at Regent, N. Dak.	99	1970–2008	510	<50	1,300
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	560	<50	1,600
164	Cannonball River near Raleigh, N. Dak.	65	1997–2008	513	126	1,680
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	24	1972–1994	785	<50	2,200
166	Cedar Creek near Haynes, N. Dak.	56	1971–2008	545	60	3,000
167	Timber Creek near Bentley, N. Dak.	46	1977–1981	650	160	1,300
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	545	<50	1,700
169	Cedar Creek near Raleigh, N. Dak.	87	1972–2008	471	<50	1,900
170	Cannonball River at Breien, N. Dak.	123	1970–2008	513	<50	1,440
171	Beaver Creek near Linton, N. Dak.	35	1972–1989	200	<50	660
172	Beaver Creek below Linton, N. Dak.	18	1990–2008	250	80	470
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	718	<50	2,000
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	63	1974–1987	2,700	140	6,600
175	James River near Manfred, N. Dak.	48	1972–1998	220	<50	586
176	James River near Grace City, N. Dak.	137	1972–2008	160	<50	2,300
177	James River above Arrowwood Lake near Kensal, N. Dak.	173	1985–2008	150	<50	302
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	10	1986–1989	75	<50	110
179	James River near Pingree, N. Dak.	142	1978–2008	130	<50	307
180	Pipestem Creek near Pingree, N. Dak.	42	1974–2008	120	<50	870
181	Pipestem Creek near Buchanan, N. Dak.	4	1971–1974	135	<50	600
182	James River at Jamestown, N. Dak.	184	1972–2008	182	<50	630
183	James River at Lamoure, N. Dak.	261	1970–2008	220	<50	1,000
184	Bear Creek near Oakes, N. Dak.	34	1977–2008	155	<50	1,000
185	James River at Oakes, N. Dak.	107	1970–2008	210	<50	1,500
186	James River at N. Dak./S. Dak. State line	91	1974–2008	200	<50	1,100
Sodium, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	50	10	177
2	Red River of the North at Wahpeton, N. Dak.	74	1973–2008	15	5	50
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	23	16	268
4	Red River of the North at Brushville, Minn.	61	1993–2007	20	9	54
5	Red River of the North below Wahpeton, N. Dak.	34	1970–1999	14	8	42
6	Red River of the North at Hickson, N. Dak.	134	1975–2008	15	7	92
7	Wild Rice River near Rutland, N. Dak.	47	1971–2008	86	6	433
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	66	50	980
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	43	25	80
10	Wild Rice River near Abercrombie, N. Dak.	257	1970–2008	100	8	420
11	Red River of the North at Fargo, N. Dak.	186	1970–2008	18	7	43
12	Red River of North below Fargo, N. Dak.	146	1970–1986	19	7	110

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sodium, in mg/L —Continued						
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	31	10	64
14	Red River of the North near Harwood, N. Dak.	54	1993–2006	27	16	44
15	Sheyenne River above Harvey, N. Dak.	199	1972–2008	250	20	480
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	25	3	82
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	127	56	202
18	Sheyenne River near Warwick, N. Dak.	227	1970–2008	81	14	190
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	33	7	181
20	Mauvais Coulee near Cando, N. Dak.	104	1972–2008	42	10	130
21	Edmore Coulee near Edmore, N. Dak.	103	1972–2008	54	5	233
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	46	8	290
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	60	55	64
24	Starkweather Coulee near Webster, N. Dak.	94	1983–2008	20	4	97
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	61	24	217
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	83	24	167
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	56	9	200
28	Big Coulee near Churchs Ferry, N. Dak.	135	1970–1997	45	13	220
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	415	49	1,800
30	Channel A near Penn, N. Dak.	85	1984–2008	58	23	360
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	624	270	1,100
32	Sheyenne River near Cooperstown, N. Dak.	353	1970–2008	91	16	190
33	Baldhill Creek near Dazey, N. Dak.	94	1972–2008	58	6	150
34	Sheyenne River below Baldhill Dam, N. Dak.	165	1972–2008	79	20	176
35	Sheyenne River at Valley City, N. Dak.	29	1972–2005	64	24	132
36	Sheyenne River at Lisbon, N. Dak.	349	1970–2008	84	26	560
37	Sheyenne River near Kindred, N. Dak.	313	1972–2008	68	10	148
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	36	1993–2008	78	31	110
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	49	20	69
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	62	27	125
41	Sheyenne River at West Fargo, N. Dak.	62	1970–2008	65	23	104
42	Maple River near Hope, N. Dak.	39	1972–2008	74	9	293
43	Maple River near Enderlin, N. Dak.	63	1972–2008	88	12	180
44	Maple River near Mapleton, N. Dak.	25	1972–2008	87	19	150
45	Maple River below Mapleton, N. Dak.	74	1995–2008	92	13	499
46	Sheyenne River at Harwood, N. Dak.	37	1993–2005	67	23	111
47	Rush River at Amenia, N. Dak.	51	1972–2008	48	7	130
48	Rush River near Prosper, N. Dak.	4	1983–1987	13	9	110
49	Lower Branch Rush River near Prosper, N. Dak.	5	1983–1993	11	6	60
50	Sheyenne River near Harwood, N. Dak.	15	1970–1996	80	30	138
51	Elm River near Kelso, N. Dak.	6	1983–1993	55	13	82

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sodium, in mg/L—Continued						
52	Red River of the North at Halstad, Minn.	178	1972–2008	31	8	78
53	Beaver Creek near Finley, N. Dak.	117	1970–2003	82	7	290
54	Goose River near Portland, N. Dak.	30	1970–1988	65	8	124
55	Goose River at Hillsboro, N. Dak.	166	1970–2008	79	9	330
56	Red River of the North at Grand Forks, N. Dak.	242	1970–2008	19	4	64
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	47	11	130
58	Turtle River at Manvel, N. Dak.	105	1971–2008	290	56	2,100
59	Red River of the North at Oslo, Minn.	75	1973–2005	20	9	100
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	43	25	340
61	Forest River near Fordville, N. Dak.	64	1972–2008	40	15	148
62	Forest River near Minto, N. Dak.	154	1971–2008	46	7	738
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	39	19	64
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	52	18	83
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	23	13	32
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	44	14	55
67	Park River at Grafton, N. Dak.	144	1970–2008	95	12	370
68	Red River of the North at Drayton, N. Dak.	74	1972–2008	34	9	130
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	8	<3	25
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	27	12	82
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	24	16	75
72	Pembina River near Vang, N. Dak.	62	1970–1979	48	16	80
73	Little South Pembina River near Walhalla, N. Dak.	83	1970–2008	58	13	90
74	Pembina River at Walhalla, N. Dak.	270	1970–2008	48	18	110
75	Pembina River at Neche, N. Dak.	133	1972–2008	48	18	72
76	Tongue River at Akra, N. Dak.	72	1972–2008	26	13	39
77	Red River of the North at Pembina, N. Dak., site 1	10	1993–1993	33	14	48
78	Red River of the North at Pembina, N. Dak., site 2	152	1970–2008	31	8	130
79	Red River of the North at Emerson, Manitoba	148	1977–2004	34	8	190
80	Long Creek near Noonan, N. Dak.	70	1972–2008	125	14	418
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	300	90	850
82	Souris River near Sherwood, N. Dak.	302	1972–2008	120	14	507
83	Souris River near Foxholm, N. Dak.	202	1972–2008	91	26	360
84	Des Lacs River at Foxholm, N. Dak.	188	1972–2008	200	12	488
85	Souris River above Minot, N. Dak.	207	1970–2008	127	21	905
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	120	17	460
87	Souris River near Verendrye, N. Dak.	373	1970–2008	134	18	554
88	Wintering River near Karlsruhe, N. Dak.	134	1972–2008	69	25	328
89	Souris River near Bantry, N. Dak.	152	1970–2008	111	29	320
90	Willow Creek near Willow City, N. Dak.	90	1972–2008	91	<3	310
91	Stone Creek near Kramer, N. Dak.	30	1986–2000	81	12	500

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sodium, in mg/L —Continued						
92	Deep River near Upham, N. Dak.	68	1972–2007	47	7	95
93	Egg Creek near Granville, N. Dak.	14	1972–1981	56	16	190
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	110	34	190
95	Cut Bank Creek at Upham, N. Dak.	33	1975–2000	90	17	190
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	78	8	190
97	Boundary Creek near Landa, N. Dak.	39	1972–2000	102	13	400
98	Souris River near Westhope, N. Dak.	214	1970–2008	110	23	420
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	520	40	800
100	Missouri River near Williston, N. Dak.	95	1974–1992	65	31	100
101	Little Muddy River below Cow Creek near Williston, N. Dak.	77	1972–2008	314	14	498
102	Stony Creek near Williston, N. Dak.	32	1977–1981	405	20	590
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	550	86	920
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	330	16	390
105	White Earth River at White Earth, N. Dak.	27	1970–1977	360	34	600
106	Bear Den Creek near Mandaree, N. Dak.	228	1970–2008	560	25	1,000
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	500	44	650
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	626	16	830
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	295	9	733
110	Little Missouri River at Marmarth, N. Dak.	86	1971–2008	230	35	680
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	700	100	1,000
112	Little Missouri River at Medora, N. Dak.	112	1972–2008	290	44	1,170
113	Beaver Creek near Trotters, N. Dak.	95	1977–2008	360	19	570
114	Little Missouri River near Watford City, N. Dak.	243	1971–2008	288	54	800
115	Missouri River at Garrison Dam, N. Dak.	288	1971–2007	58	26	82
116	Knife River at Manning, N. Dak.	118	1972–2008	310	13	700
117	Stray Creek near Manning, N. Dak.	17	1975–1981	370	99	1,100
118	Knife River at Marshall, N. Dak.	69	1972–1981	390	24	840
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	180	<3	710
120	Knife River near Golden Valley, N. Dak.	130	1971–2008	340	15	1,100
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	320	21	650
122	Brush Creek near Beulah, N. Dak.	107	1974–1990	280	18	380
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	53	1977–1993	320	35	630
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	285	30	340
125	Spring Creek at Zap, N. Dak.	240	1970–2008	235	19	421
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	150	36	340
127	Knife River at Hazen, N. Dak.	269	1970–2008	250	25	466
128	Antelope Creek above Hazen, N. Dak.	44	1977–1985	245	9	740
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	21	1977–1985	32	<3	120
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	115	10	410
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	345	27	610

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sodium, in mg/L—Continued						
132	Alderin Creek near Fort Clark, N. Dak.	41	1977–1983	270	30	650
133	Coal Lake Coulee near Hensler, N. Dak.	39	1978–1988	160	12	320
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	520	24	1,000
135	Turtle Creek above Washburn, N. Dak.	100	1987–2003	229	36	1,100
136	Painted Woods Creek near Wilton, N. Dak.	202	1970–2003	190	<3	580
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	98	6	130
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	55	1977–1982	160	11	210
139	Hagel Creek near Center, N. Dak.	38	1977–1982	205	16	400
140	Square Butte Creek below Center, N. Dak.	81	1972–2008	190	59	291
141	Burnt Creek near Bismarck, N. Dak.	48	1972–2008	106	5	220
142	Missouri River at Bismarck, N. Dak.	120	1974–2008	58	38	80
143	South Branch Heart River near South Heart, N. Dak.	19	1979–1983	140	35	380
144	North Creek near South Heart, N. Dak.	16	1978–1981	310	41	1,100
145	Heart River near South Heart, N. Dak.	76	1975–2005	415	32	910
146	Heart River at Dickinson, N. Dak.	22	1986–1994	295	111	538
147	Green River near New Hradec, N. Dak.	116	1972–2008	150	15	520
148	Green River near Gladstone, N. Dak.	33	1970–1993	218	24	482
149	Heart River near Richardton, N. Dak.	154	1972–2008	221	39	548
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	206	40	405
151	Antelope Creek near Carson, N. Dak.	26	1972–2008	76	34	220
152	Big Muddy Creek near Almont, N. Dak.	39	1991–2008	340	49	590
153	Heart River near Lark, N. Dak.	45	1971–1995	140	30	230
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	180	22	278
155	Sweetbriar Creek near Judson, N. Dak.	33	1972–2008	232	25	403
156	Heart River near Mandan, N. Dak.	232	1971–2008	206	19	453
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	33	1988–2004	140	15	230
158	Apple Creek near Menoken, N. Dak.	129	1972–2008	240	9	460
159	Missouri River near Schmidt, N. Dak.	68	1974–1981	63	53	74
160	Cannonball River at New England, N. Dak.	36	1978–1981	420	45	810
161	Coal Bank Creek near Havelock, N. Dak.	84	1974–1983	270	35	660
162	Cannonball River at Regent, N. Dak.	119	1970–2008	270	36	490
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	290	55	480
164	Cannonball River near Raleigh, N. Dak.	89	1993–2008	240	10	1,060
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	365	44	920
166	Cedar Creek near Haynes, N. Dak.	76	1971–2008	280	25	530
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	390	70	670
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	335	33	540
169	Cedar Creek near Raleigh, N. Dak.	120	1972–2008	240	24	783
170	Cannonball River at Breien, N. Dak.	260	1970–2008	243	3	630
171	Beaver Creek near Linton, N. Dak.	39	1972–1993	77	10	140

Table 1-1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sodium, in mg/L—Continued						
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	110	12	180
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	221	14	450
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	920	130	2,000
175	James River near Manfred, N. Dak.	48	1972–1998	93	8	170
176	James River near Grace City, N. Dak.	155	1972–2008	93	7	570
177	James River above Arrowwood Lake near Kensal, N. Dak.	172	1985–2008	85	13	235
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	38	20	57
179	James River near Pingree, N. Dak.	143	1978–2008	68	17	207
180	Pipestem Creek near Pingree, N. Dak.	71	1974–2008	78	11	184
181	Pipestem Creek near Buchanan, N. Dak.	9	1971–1993	39	4	95
182	James River at Jamestown, N. Dak.	201	1972–2008	76	15	147
183	James River at Lamoure, N. Dak.	280	1970–2008	82	8	310
184	Bear Creek near Oakes, N. Dak.	54	1977–2008	101	13	173
185	James River at Oakes, N. Dak.	114	1970–2008	83	13	550
186	James River at N. Dak./S. Dak. State line	97	1974–2008	71	12	450
Magnesium, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	84.6	11.6	308.0
2	Red River of the North at Wahpeton, N. Dak.	74	1973–2008	32.4	10.0	82.1
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	42.4	32.6	44.5
4	Red River of the North at Brushville, Minn.	61	1993–2007	35.3	16.1	55.0
5	Red River of the North below Wahpeton, N. Dak.	58	1970–1999	30.6	23.0	79.8
6	Red River of the North at Hickson, N. Dak.	134	1975–2008	33.0	9.5	110.0
7	Wild Rice River near Rutland, N. Dak.	47	1971–2008	81.0	9.0	275.0
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	50.0	30.0	80.0
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	42.6	21.0	86.1
10	Wild Rice River near Abercrombie, N. Dak.	247	1970–2008	61.0	4.5	150.0
11	Red River of the North at Fargo, N. Dak.	170	1970–2008	33.0	8.0	55.8
12	Red River of North below Fargo, N. Dak.	168	1970–1986	33.0	11.0	70.0
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	41.6	18.6	66.8
14	Red River of the North near Harwood, N. Dak.	54	1993–2006	40.4	29.1	55.6
15	Sheyenne River above Harvey, N. Dak.	199	1972–2008	22.0	3.2	92.6
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	24.0	8.5	39.0
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	46.3	25.8	65.9
18	Sheyenne River near Warwick, N. Dak.	211	1970–2008	32.0	8.0	58.2
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	29.1	11.0	113.0
20	Mauvais Coulee near Cando, N. Dak.	104	1972–2008	45.2	12.0	101.0
21	Edmore Coulee near Edmore, N. Dak.	103	1972–2008	28.0	4.5	97.0
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	27.5	8.0	140.0
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	30.5	30.0	31.0
24	Starkweather Coulee near Webster, N. Dak.	94	1983–2008	24.8	4.5	71.7

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Magnesium, in mg/L —Continued						
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	44.6	23.0	83.9
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	42.7	15.0	116.0
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	36.0	8.3	110.0
28	Big Coulee near Churchs Ferry, N. Dak.	136	1970–1997	32.0	9.8	130.0
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	105.0	26.0	340.0
30	Channel A near Penn, N. Dak.	85	1984–2008	32.0	16.0	110.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	142.0	64.0	250.0
32	Sheyenne River near Cooperstown, N. Dak.	337	1970–2008	35.0	7.6	65.3
33	Baldhill Creek near Dazey, N. Dak.	94	1972–2008	39.0	7.3	68.0
34	Sheyenne River below Baldhill Dam, N. Dak.	165	1972–2008	38.4	10.0	79.0
35	Sheyenne River at Valley City, N. Dak.	29	1972–2005	31.0	16.0	56.9
36	Sheyenne River at Lisbon, N. Dak.	333	1970–2008	33.0	11.0	75.0
37	Sheyenne River near Kindred, N. Dak.	313	1972–2008	31.0	11.0	70.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	36	1993–2008	40.3	18.0	54.0
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	22.5	12.0	29.0
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	32.0	17.0	50.7
41	Sheyenne River at West Fargo, N. Dak.	62	1970–2008	31.0	13.0	72.3
42	Maple River near Hope, N. Dak.	39	1972–2008	43.0	11.0	150.0
43	Maple River near Enderlin, N. Dak.	63	1972–2008	60.0	9.5	100.0
44	Maple River near Mapleton, N. Dak.	25	1972–2008	56.6	18.0	79.5
45	Maple River below Mapleton, N. Dak.	74	1995–2008	64.2	13.0	120.0
46	Sheyenne River at Harwood, N. Dak.	37	1993–2005	38.6	25.6	63.0
47	Rush River at Amenia, N. Dak.	51	1972–2008	48.6	8.5	90.4
48	Rush River near Prosper, N. Dak.	4	1983–1987	16.0	9.5	79.0
49	Lower Branch Rush River near Prosper, N. Dak.	5	1983–1993	9.0	6.5	51.4
50	Sheyenne River near Harwood, N. Dak.	39	1970–1996	33.0	17.0	47.0
51	Elm River near Kelso, N. Dak.	6	1983–1993	45.4	11.0	58.7
52	Red River of the North at Halstad, Minn.	178	1972–2008	34.0	13.0	58.0
53	Beaver Creek near Finley, N. Dak.	117	1970–2003	45.0	7.5	130.0
54	Goose River near Portland, N. Dak.	30	1970–1988	65.0	12.0	130.0
55	Goose River at Hillsboro, N. Dak.	166	1970–2008	65.2	14.0	105.0
56	Red River of the North at Grand Forks, N. Dak.	226	1970–2008	28.0	10.7	110.0
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	36.0	6.7	60.0
58	Turtle River at Manvel, N. Dak.	105	1971–2008	66.2	18.0	200.0
59	Red River of the North at Oslo, Minn.	75	1973–2005	25.0	11.0	44.0
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	25.0	15.0	140.0
61	Forest River near Fordville, N. Dak.	64	1972–2008	30.0	16.0	63.3
62	Forest River near Minto, N. Dak.	154	1971–2008	39.0	7.4	140.0
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	26.0	9.0	40.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Magnesium, in mg/L —Continued						
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	18.0	5.6	24.0
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	15.0	5.0	34.0
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	22.0	3.1	37.0
67	Park River at Grafton, N. Dak.	144	1970–2008	41.0	8.1	116.0
68	Red River of the North at Drayton, N. Dak.	74	1972–2008	29.5	12.0	56.0
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	32.5	14.0	74.0
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	34.0	13.0	78.0
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	19.0	14.0	47.0
72	Pembina River near Vang, N. Dak.	62	1970–1979	26.5	6.8	59.0
73	Little South Pembina River near Walhalla, N. Dak.	82	1970–2008	21.2	3.8	29.3
74	Pembina River at Walhalla, N. Dak.	254	1970–2008	32.0	1.0	82.0
75	Pembina River at Neche, N. Dak.	133	1972–2008	34.0	8.4	53.0
76	Tongue River at Akra, N. Dak.	72	1972–2008	19.5	8.4	30.0
77	Red River of the North at Pembina, N. Dak., site 1	10	1993–1993	32.8	21.4	38.1
78	Red River of the North at Pembina, N. Dak., site 2	152	1970–2008	31.2	12.5	96.0
79	Red River of the North at Emerson, Manitoba	148	1977–2004	30.0	16.0	54.0
80	Long Creek near Noonan, N. Dak.	70	1972–2008	51.7	6.0	110.0
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	29.0	9.4	65.0
82	Souris River near Sherwood, N. Dak.	302	1972–2008	39.0	6.4	105.7
83	Souris River near Foxholm, N. Dak.	202	1972–2008	34.0	11.0	78.0
84	Des Lacs River at Foxholm, N. Dak.	188	1972–2008	52.4	5.5	160.0
85	Souris River above Minot, N. Dak.	207	1970–2008	42.6	11.0	187.0
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	36.0	7.5	90.0
87	Souris River near Verendrye, N. Dak.	372	1970–2008	42.0	10.0	105.0
88	Wintering River near Karlsruhe, N. Dak.	134	1972–2008	29.0	8.0	57.0
89	Souris River near Bantry, N. Dak.	152	1970–2008	38.0	12.0	64.0
90	Willow Creek near Willow City, N. Dak.	90	1972–2008	54.0	10.0	110.0
91	Stone Creek near Kramer, N. Dak.	30	1986–2000	42.3	8.1	180.0
92	Deep River near Upham, N. Dak.	68	1972–2007	51.1	10.0	95.0
93	Egg Creek near Granville, N. Dak.	14	1972–1981	31.5	12.0	91.0
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	63.0	22.0	94.0
95	Cut Bank Creek at Upham, N. Dak.	33	1975–2000	56.0	18.0	180.0
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	57.0	12.0	120.0
97	Boundary Creek near Landa, N. Dak.	39	1972–2000	33.0	8.3	140.0
98	Souris River near Westhope, N. Dak.	215	1970–2008	40.0	13.0	180.0
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	27.0	6.0	37.0
100	Missouri River near Williston, N. Dak.	95	1974–1992	23.0	10.0	31.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	76	1972–2008	64.0	1.0	91.0
102	Stony Creek near Williston, N. Dak.	32	1977–1981	39.0	5.6	63.0
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	21.0	5.1	41.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Magnesium, in mg/L —Continued						
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	66.0	6.9	92.0
105	White Earth River at White Earth, N. Dak.	27	1970–1977	38.0	17.0	74.0
106	Bear Den Creek near Mandaree, N. Dak.	228	1970–2008	25.0	4.6	230.0
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	46.0	9.2	61.0
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	64.5	5.6	127.4
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	63.0	5.5	100.0
110	Little Missouri River at Marmarth, N. Dak.	86	1971–2008	23.9	4.6	70.0
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	120.0	21.0	250.0
112	Little Missouri River at Medora, N. Dak.	112	1972–2008	33.1	6.0	338.0
113	Beaver Creek near Trotters, N. Dak.	95	1977–2008	88.0	11.0	140.0
114	Little Missouri River near Watford City, N. Dak.	243	1971–2008	30.0	3.2	128.0
115	Missouri River at Garrison Dam, N. Dak.	288	1971–2007	20.8	9.8	28.0
116	Knife River at Manning, N. Dak.	118	1972–2008	25.0	2.5	54.0
117	Stray Creek near Manning, N. Dak.	17	1975–1981	53.0	16.0	180.0
118	Knife River at Marshall, N. Dak.	69	1972–1981	35.0	7.3	100.0
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	21.0	6.0	63.0
120	Knife River near Golden Valley, N. Dak.	130	1971–2008	34.0	4.5	79.2
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	37.0	7.0	81.0
122	Brush Creek near Beulah, N. Dak.	107	1974–1990	57.0	8.4	97.0
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	53	1977–1993	43.0	5.4	110.0
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	60.0	5.9	86.0
125	Spring Creek at Zap, N. Dak.	240	1970–2008	49.0	5.9	80.0
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	40.0	10.0	66.0
127	Knife River at Hazen, N. Dak.	269	1970–2008	42.0	6.3	88.4
128	Antelope Creek above Hazen, N. Dak.	44	1977–1985	46.5	4.8	92.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	21	1977–1985	27.0	2.9	65.0
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	27.0	5.5	81.0
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	61.0	7.9	100.0
132	Alderin Creek near Fort Clark, N. Dak.	41	1977–1983	34.0	5.8	73.0
133	Coal Lake Coulee near Hensler, N. Dak.	39	1978–1988	41.0	2.5	130.0
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	24.0	5.6	55.0
135	Turtle Creek above Washburn, N. Dak.	100	1987–2003	60.0	12.0	130.1
136	Painted Woods Creek near Wilton, N. Dak.	202	1970–2003	68.0	2.5	260.0
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	54.0	4.6	84.0
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	55	1977–1982	34.0	5.2	48.0
139	Hagel Creek near Center, N. Dak.	38	1977–1982	26.0	3.9	52.0
140	Square Butte Creek below Center, N. Dak.	81	1972–2008	35.0	14.0	68.0
141	Burnt Creek near Bismarck, N. Dak.	48	1972–2008	51.0	4.0	76.0
142	Missouri River at Bismarck, N. Dak.	127	1974–2008	21.0	13.0	26.0
143	South Branch Heart River near South Heart, N. Dak.	19	1979–1983	8.9	<1.0	56.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Magnesium, in mg/L—Continued						
144	North Creek near South Heart, N. Dak.	16	1978–1981	28.5	8.6	100.0
145	Heart River near South Heart, N. Dak.	76	1975–2005	28.5	3.3	120.0
146	Heart River at Dickinson, N. Dak.	22	1986–1994	37.0	13.0	70.5
147	Green River near New Hradec, N. Dak.	116	1972–2008	27.0	3.5	91.0
148	Green River near Gladstone, N. Dak.	33	1970–1993	43.4	7.4	93.0
149	Heart River near Richardton, N. Dak.	154	1972–2008	46.9	11.5	91.0
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	34.5	11.0	100.0
151	Antelope Creek near Carson, N. Dak.	26	1972–2008	43.6	18.0	110.0
152	Big Muddy Creek near Almont, N. Dak.	39	1991–2008	30.9	8.5	70.0
153	Heart River near Lark, N. Dak.	45	1971–1995	35.0	9.5	56.0
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	37.2	6.5	60.0
155	Sweetbriar Creek near Judson, N. Dak.	33	1972–2008	30.0	6.0	60.4
156	Heart River near Mandan, N. Dak.	232	1971–2008	41.0	<1.0	87.0
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	33	1988–2004	27.9	5.5	53.0
158	Apple Creek near Menoken, N. Dak.	129	1972–2008	31.0	4.3	69.5
159	Missouri River near Schmidt, N. Dak.	68	1974–1981	22.0	18.0	30.0
160	Cannonball River at New England, N. Dak.	36	1978–1981	67.0	12.0	180.0
161	Coal Bank Creek near Havelock, N. Dak.	84	1974–1983	77.0	13.0	250.0
162	Cannonball River at Regent, N. Dak.	119	1970–2008	55.0	15.0	120.0
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	77.0	19.0	160.0
164	Cannonball River near Raleigh, N. Dak.	89	1993–2008	56.6	12.2	192.0
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	130.0	15.0	320.0
166	Cedar Creek near Haynes, N. Dak.	76	1971–2008	70.5	11.0	200.0
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	100.0	32.0	180.0
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	115.0	13.0	180.0
169	Cedar Creek near Raleigh, N. Dak.	120	1972–2008	50.9	8.3	172.0
170	Cannonball River at Breien, N. Dak.	260	1970–2008	51.3	<1.0	150.0
171	Beaver Creek near Linton, N. Dak.	39	1972–1993	29.0	4.0	57.0
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	34.0	4.5	56.6
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	8.6	<1.0	12.0
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	160.0	37.0	460.0
175	James River near Manfred, N. Dak.	48	1972–1998	33.0	6.3	56.0
176	James River near Grace City, N. Dak.	155	1972–2008	39.4	6.6	156.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	172	1985–2008	44.2	9.7	139.4
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	28.0	15.0	34.0
179	James River near Pingree, N. Dak.	143	1978–2008	35.4	12.0	73.0
180	Pipestem Creek near Pingree, N. Dak.	71	1974–2008	42.0	11.0	106.0
181	Pipestem Creek near Buchanan, N. Dak.	9	1971–1993	25.6	4.5	43.0
182	James River at Jamestown, N. Dak.	201	1972–2008	35.2	13.0	71.6
183	James River at Lamoure, N. Dak.	280	1970–2008	35.0	6.1	76.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Magnesium, in mg/L —Continued						
184	Bear Creek near Oakes, N. Dak.	54	1977–2008	59.6	6.0	110.0
185	James River at Oakes, N. Dak.	135	1970–2008	37.0	8.2	190.0
186	James River at N. Dak./S. Dak. State line	97	1974–2008	33.0	9.1	190.0
Potassium, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	10.3	4.9	25.0
2	Red River of the North at Wahpeton, N. Dak.	74	1973–2008	5.7	2.5	15.0
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	7.0	5.2	8.7
4	Red River of the North at Brushville, Minn.	61	1993–2007	5.9	4.0	20.0
5	Red River of the North below Wahpeton, N. Dak.	23	1970–1999	4.9	3.6	14.2
6	Red River of the North at Hickson, N. Dak.	134	1975–2008	5.5	1.3	24.0
7	Wild Rice River near Rutland, N. Dak.	47	1971–2008	19.4	8.5	34.4
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	15.0	9.7	25.0
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	10.1	7.6	12.4
10	Wild Rice River near Abercrombie, N. Dak.	249	1970–2008	14.7	1.9	47.0
11	Red River of the North at Fargo, N. Dak.	140	1970–2008	6.0	3.2	23.2
12	Red River of North below Fargo, N. Dak.	136	1970–1986	6.1	3.7	20.0
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	9.6	5.0	17.5
14	Red River of the North near Harwood, N. Dak.	54	1993–2006	7.8	4.8	17.2
15	Sheyenne River above Harvey, N. Dak.	198	1972–2008	8.3	4.2	20.0
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	4.5	3.6	29.0
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	10.4	5.8	12.8
18	Sheyenne River near Warwick, N. Dak.	221	1970–2008	8.3	1.8	19.0
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	13.0	7.7	31.0
20	Mauvais Coulee near Cando, N. Dak.	104	1972–2008	13.0	4.9	23.0
21	Edmore Coulee near Edmore, N. Dak.	103	1972–2008	14.0	5.0	32.0
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	13.0	8.0	28.0
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	19.5	19.0	20.0
24	Starkweather Coulee near Webster, N. Dak.	94	1983–2008	14.0	3.0	28.0
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	16.0	9.7	34.5
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	20.5	10.0	26.0
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	19.0	9.1	40.0
28	Big Coulee near Churchs Ferry, N. Dak.	135	1970–1997	18.0	5.3	65.0
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	58.5	16.0	230.0
30	Channel A near Penn, N. Dak.	85	1984–2008	17.0	7.0	30.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	74.8	37.0	125.6
32	Sheyenne River near Cooperstown, N. Dak.	347	1970–2008	8.8	6.0	17.0
33	Baldhill Creek near Dazey, N. Dak.	94	1972–2008	9.5	4.8	17.0
34	Sheyenne River below Baldhill Dam, N. Dak.	165	1972–2008	10.7	1.8	16.0
35	Sheyenne River at Valley City, N. Dak.	29	1972–2005	9.8	6.5	15.0
36	Sheyenne River at Lisbon, N. Dak.	344	1970–2008	11.0	4.9	22.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Potassium, in mg/L—Continued						
37	Sheyenne River near Kindred, N. Dak.	312	1972–2008	9.4	3.8	15.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	36	1993–2008	9.9	7.5	12.0
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	9.7	6.5	15.0
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	9.7	7.4	12.3
41	Sheyenne River at West Fargo, N. Dak.	62	1970–2008	9.1	5.7	14.0
42	Maple River near Hope, N. Dak.	39	1972–2008	9.0	3.5	22.0
43	Maple River near Enderlin, N. Dak.	63	1972–2008	12.0	8.3	24.0
44	Maple River near Mapleton, N. Dak.	25	1972–2008	11.6	9.0	17.0
45	Maple River below Mapleton, N. Dak.	74	1995–2008	12.0	6.6	25.0
46	Sheyenne River at Harwood, N. Dak.	37	1993–2005	10.5	8.1	13.3
47	Rush River at Amenia, N. Dak.	51	1972–2008	11.1	4.9	19.0
48	Rush River near Prosper, N. Dak.	4	1983–1987	12.0	7.9	17.0
49	Lower Branch Rush River near Prosper, N. Dak.	5	1983–1993	7.6	6.2	11.8
50	Sheyenne River near Harwood, N. Dak.	3	1970–1996	8.9	7.3	11.0
51	Elm River near Kelso, N. Dak.	6	1983–1993	13.4	9.5	16.0
52	Red River of the North at Halstad, Minn.	178	1972–2008	7.2	3.9	18.0
53	Beaver Creek near Finley, N. Dak.	116	1970–2003	11.0	1.5	19.0
54	Goose River near Portland, N. Dak.	30	1970–1988	11.5	4.9	19.0
55	Goose River at Hillsboro, N. Dak.	166	1970–2008	9.6	2.6	20.0
56	Red River of the North at Grand Forks, N. Dak.	196	1970–2008	5.9	2.6	12.0
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	5.9	4.2	11.0
58	Turtle River at Manvel, N. Dak.	105	1971–2008	14.8	7.5	83.0
59	Red River of the North at Oslo, Minn.	75	1973–2005	5.5	2.9	85.0
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	7.3	1.9	16.0
61	Forest River near Fordville, N. Dak.	64	1972–2008	6.1	3.2	13.0
62	Forest River near Minto, N. Dak.	154	1971–2008	7.3	3.6	62.0
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	7.8	4.0	12.0
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	5.6	1.6	18.0
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	6.1	4.1	9.6
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	5.1	1.6	11.0
67	Park River at Grafton, N. Dak.	144	1970–2008	9.1	3.8	16.0
68	Red River of the North at Drayton, N. Dak.	74	1972–2008	7.3	3.1	12.0
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	6.7	4.2	14.0
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	11.0	5.2	20.0
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	8.3	3.7	12.0
72	Pembina River near Vang, N. Dak.	62	1970–1979	8.6	3.2	12.0
73	Little South Pembina River near Walhalla, N. Dak.	82	1970–2008	7.6	2.5	12.0
74	Pembina River at Walhalla, N. Dak.	226	1970–2008	9.0	<1.0	21.0
75	Pembina River at Neche, N. Dak.	133	1972–2008	10.4	3.2	13.9

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Potassium, in mg/L —Continued						
76	Tongue River at Akra, N. Dak.	72	1972–2008	6.1	3.8	11.0
77	Red River of the North at Pembina, N. Dak., site 1	10	1993–1993	8.0	4.3	11.2
78	Red River of the North at Pembina, N. Dak., site 2	144	1970–2008	7.4	4.3	11.4
79	Red River of the North at Emerson, Manitoba	148	1977–2004	6.7	3.8	17.0
80	Long Creek near Noonan, N. Dak.	70	1972–2008	12.2	5.4	23.0
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	11.0	7.0	17.0
82	Souris River near Sherwood, N. Dak.	200	1972–2008	11.0	6.5	21.7
83	Souris River near Foxholm, N. Dak.	172	1972–2008	13.0	<1.0	26.0
84	Des Lacs River at Foxholm, N. Dak.	188	1972–2008	12.0	4.1	29.6
85	Souris River above Minot, N. Dak.	169	1970–2008	14.0	6.2	29.2
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	12.0	7.6	19.0
87	Souris River near Verendrye, N. Dak.	288	1970–2008	12.9	6.0	25.0
88	Wintering River near Karlsruhe, N. Dak.	134	1972–2008	6.0	1.1	20.0
89	Souris River near Bantry, N. Dak.	108	1970–2008	11.0	2.0	15.7
90	Willow Creek near Willow City, N. Dak.	84	1972–2008	12.6	<1.0	77.0
91	Stone Creek near Kramer, N. Dak.	25	1986–2000	18.0	9.2	24.0
92	Deep River near Upham, N. Dak.	68	1972–2007	16.1	8.2	27.0
93	Egg Creek near Granville, N. Dak.	14	1972–1981	11.5	7.7	19.0
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	16.0	8.0	37.0
95	Cut Bank Creek at Upham, N. Dak.	33	1975–2000	16.5	10.0	44.0
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	15.0	9.6	27.0
97	Boundary Creek near Landa, N. Dak.	33	1972–2000	12.0	6.8	27.0
98	Souris River near Westhope, N. Dak.	201	1970–2008	14.0	4.1	61.0
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	8.1	5.2	10.0
100	Missouri River near Williston, N. Dak.	95	1974–1992	4.3	2.7	17.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	77	1972–2008	9.9	5.9	16.0
102	Stony Creek near Williston, N. Dak.	32	1977–1981	10.0	5.8	17.0
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	8.0	6.0	9.4
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	9.7	6.8	12.0
105	White Earth River at White Earth, N. Dak.	27	1970–1977	8.1	4.5	15.0
106	Bear Den Creek near Mandaree, N. Dak.	228	1970–2008	7.6	<1.0	14.0
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	8.0	6.4	11.0
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	11.0	2.6	19.0
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	10.6	7.1	19.7
110	Little Missouri River at Marmarth, N. Dak.	86	1971–2008	7.6	3.8	16.0
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	14.0	6.4	22.0
112	Little Missouri River at Medora, N. Dak.	112	1972–2008	10.1	1.8	67.7
113	Beaver Creek near Trotters, N. Dak.	94	1977–2008	11.0	6.0	17.0
114	Little Missouri River near Watford City, N. Dak.	243	1971–2008	10.0	4.4	49.9
115	Missouri River at Garrison Dam, N. Dak.	288	1971–2007	4.0	3.1	8.2

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Potassium, in mg/L—Continued						
116	Knife River at Manning, N. Dak.	118	1972–2008	8.5	4.6	16.0
117	Stray Creek near Manning, N. Dak.	17	1975–1981	12.0	6.6	21.0
118	Knife River at Marshall, N. Dak.	69	1972–1981	8.7	6.3	15.0
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	11.0	6.2	610.0
120	Knife River near Golden Valley, N. Dak.	130	1971–2008	10.7	6.3	18.0
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	9.7	4.7	15.0
122	Brush Creek near Beulah, N. Dak.	98	1974–1988	9.0	6.7	14.0
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	53	1977–1993	8.2	1.2	11.0
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	8.5	5.9	17.0
125	Spring Creek at Zap, N. Dak.	240	1970–2008	8.8	4.9	15.0
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	9.2	5.5	13.0
127	Knife River at Hazen, N. Dak.	270	1970–2008	9.0	1.0	15.0
128	Antelope Creek above Hazen, N. Dak.	28	1977–1982	12.0	6.6	23.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	10	1977–1982	7.1	5.2	13.0
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	8.5	6.9	14.0
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	10.5	1.2	23.0
132	Alderin Creek near Fort Clark, N. Dak.	35	1977–1982	10.0	5.3	15.0
133	Coal Lake Coulee near Hensler, N. Dak.	17	1978–1982	8.0	4.9	22.0
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	9.6	6.1	30.0
135	Turtle Creek above Washburn, N. Dak.	100	1987–2003	16.0	1.7	37.0
136	Painted Woods Creek near Wilton, N. Dak.	202	1970–2003	14.0	1.0	81.0
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	8.0	4.4	17.0
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	56	1977–1982	6.4	4.6	18.0
139	Hagel Creek near Center, N. Dak.	38	1977–1982	9.0	4.4	18.0
140	Square Butte Creek below Center, N. Dak.	81	1972–2008	8.3	4.0	21.0
141	Burnt Creek near Bismarck, N. Dak.	48	1972–2008	9.0	5.1	21.0
142	Missouri River at Bismarck, N. Dak.	127	1974–2008	4.1	2.7	6.9
143	South Branch Heart River near South Heart, N. Dak.	20	1979–1983	6.4	2.2	12.0
144	North Creek near South Heart, N. Dak.	16	1978–1981	9.7	4.9	17.0
145	Heart River near South Heart, N. Dak.	76	1975–2005	8.2	3.7	24.0
146	Heart River at Dickinson, N. Dak.	22	1986–1994	8.8	3.5	16.0
147	Green River near New Hradec, N. Dak.	116	1972–2008	6.3	3.7	85.0
148	Green River near Gladstone, N. Dak.	33	1970–1993	6.7	4.9	9.5
149	Heart River near Richardton, N. Dak.	154	1972–2008	9.8	4.3	19.0
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	12.0	4.6	16.0
151	Antelope Creek near Carson, N. Dak.	26	1972–2008	8.3	4.5	12.0
152	Big Muddy Creek near Almont, N. Dak.	39	1991–2008	9.9	3.9	15.0
153	Heart River near Lark, N. Dak.	45	1971–1995	8.1	4.4	14.0
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	11.0	4.1	13.0
155	Sweetbriar Creek near Judson, N. Dak.	33	1972–2008	7.1	2.7	13.8

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Potassium, in mg/L—Continued						
156	Heart River near Mandan, N. Dak.	232	1971–2008	9.1	2.5	14.1
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	33	1988–2004	12.1	6.7	43.0
158	Apple Creek near Menoken, N. Dak.	128	1972–2008	8.6	4.7	43.0
159	Missouri River near Schmidt, N. Dak.	68	1974–1981	4.2	3.7	5.5
160	Cannonball River at New England, N. Dak.	36	1978–1981	10.0	<1.0	15.0
161	Coal Bank Creek near Havelock, N. Dak.	84	1974–1983	9.1	4.4	15.0
162	Cannonball River at Regent, N. Dak.	119	1970–2008	8.3	3.5	17.0
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	7.8	5.2	14.0
164	Cannonball River near Raleigh, N. Dak.	89	1993–2008	11.7	5.5	28.2
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	11.0	6.4	30.0
166	Cedar Creek near Haynes, N. Dak.	76	1971–2008	11.0	5.0	17.0
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	12.0	1.2	20.0
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	10.0	8.5	14.0
169	Cedar Creek near Raleigh, N. Dak.	120	1972–2008	11.1	4.7	18.5
170	Cannonball River at Breien, N. Dak.	260	1970–2008	10.0	<1.0	23.2
171	Beaver Creek near Linton, N. Dak.	39	1972–1993	12.0	5.9	16.0
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	15.1	7.2	18.9
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	6.4	<1.0	8.7
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	14.0	<1.0	33.0
175	James River near Manfred, N. Dak.	48	1972–1998	11.0	2.0	19.0
176	James River near Grace City, N. Dak.	155	1972–2008	14.0	5.6	25.3
177	James River above Arrowwood Lake near Kensal, N. Dak.	172	1985–2008	13.4	3.6	26.0
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	11.0	6.5	16.0
179	James River near Pingree, N. Dak.	143	1978–2008	14.0	2.7	35.0
180	Pipestem Creek near Pingree, N. Dak.	71	1974–2008	12.3	5.9	22.0
181	Pipestem Creek near Buchanan, N. Dak.	9	1971–1993	10.0	9.3	12.6
182	James River at Jamestown, N. Dak.	201	1972–2008	12.9	<1.0	107.0
183	James River at Lamoure, N. Dak.	284	1970–2008	13.0	1.9	45.9
184	Bear Creek near Oakes, N. Dak.	54	1977–2008	14.7	8.2	23.0
185	James River at Oakes, N. Dak.	101	1970–2008	14.0	5.9	46.0
186	James River at N. Dak./S. Dak. State line	97	1974–2008	13.9	5.6	40.0
Calcium, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	118.0	28.4	352.0
2	Red River of the North at Wahpeton, N. Dak.	74	1973–2008	50.0	27.0	123.0
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	58.7	45.7	62.1
4	Red River of the North at Brushville, Minn.	61	1993–2007	51.5	38.2	84.1
5	Red River of the North below Wahpeton, N. Dak.	58	1970–1999	43.0	36.0	124.0
6	Red River of the North at Hickson, N. Dak.	134	1975–2008	50.0	21.0	140.0
7	Wild Rice River near Rutland, N. Dak.	47	1971–2008	99.0	23.0	168.0
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	84.0	55.0	160.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Calcium, in mg/L—Continued						
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	73.1	42.0	118.0
10	Wild Rice River near Abercrombie, N. Dak.	247	1970–2008	110.0	13.0	290.0
11	Red River of the North at Fargo, N. Dak.	170	1970–2008	47.8	21.0	84.9
12	Red River of North below Fargo, N. Dak.	168	1970–1986	48.0	30.0	98.0
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	62.4	39.4	96.2
14	Red River of the North near Harwood, N. Dak.	54	1993–2006	64.9	42.7	80.5
15	Sheyenne River above Harvey, N. Dak.	199	1972–2008	34.0	13.0	140.0
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	75.0	18.0	81.0
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	66.5	40.3	109.0
18	Sheyenne River near Warwick, N. Dak.	211	1970–2008	53.0	17.0	100.0
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	62.5	24.0	170.0
20	Mauvais Coulee near Cando, N. Dak.	104	1972–2008	77.0	26.0	170.0
21	Edmore Coulee near Edmore, N. Dak.	103	1972–2008	59.0	18.0	160.0
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	56.5	27.0	170.0
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	49.5	46.0	53.0
24	Starkweather Coulee near Webster, N. Dak.	94	1983–2008	56.5	13.0	106.0
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	71.0	46.0	130.0
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	55.5	30.0	149.0
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	66.0	20.0	310.0
28	Big Coulee near Churchs Ferry, N. Dak.	136	1970–1997	59.0	22.0	190.0
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	72.0	50.0	150.0
30	Channel A near Penn, N. Dak.	85	1984–2008	58.0	30.0	170.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	66.7	35.0	130.0
32	Sheyenne River near Cooperstown, N. Dak.	337	1970–2008	68.6	19.0	120.0
33	Baldhill Creek near Dazey, N. Dak.	94	1972–2008	66.0	20.0	160.0
34	Sheyenne River below Baldhill Dam, N. Dak.	165	1972–2008	61.6	22.0	117.0
35	Sheyenne River at Valley City, N. Dak.	29	1972–2005	51.0	30.0	79.0
36	Sheyenne River at Lisbon, N. Dak.	333	1970–2008	65.0	30.0	130.0
37	Sheyenne River near Kindred, N. Dak.	313	1972–2008	78.0	28.0	117.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	36	1993–2008	76.4	40.0	110.0
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	49.5	31.0	76.0
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	66.0	39.0	81.6
41	Sheyenne River at West Fargo, N. Dak.	62	1970–2008	77.0	33.0	110.0
42	Maple River near Hope, N. Dak.	39	1972–2008	85.2	26.0	230.0
43	Maple River near Enderlin, N. Dak.	63	1972–2008	130.0	26.0	200.0
44	Maple River near Mapleton, N. Dak.	25	1972–2008	110.0	40.0	140.0
45	Maple River below Mapleton, N. Dak.	74	1995–2008	118.0	34.0	309.0
46	Sheyenne River at Harwood, N. Dak.	37	1993–2005	82.5	61.0	126.0
47	Rush River at Amenias, N. Dak.	51	1972–2008	110.0	27.0	180.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Calcium, in mg/L —Continued						
48	Rush River near Prosper, N. Dak.	4	1983–1987	45.0	27.0	170.0
49	Lower Branch Rush River near Prosper, N. Dak.	5	1983–1993	25.0	22.0	124.0
50	Sheyenne River near Harwood, N. Dak.	39	1970–1996	78.0	41.0	130.0
51	Elm River near Kelso, N. Dak.	6	1983–1993	92.1	28.0	118.0
52	Red River of the North at Halstad, Minn.	178	1972–2008	61.4	28.0	96.0
53	Beaver Creek near Finley, N. Dak.	116	1970–2003	95.0	21.0	240.0
54	Goose River near Portland, N. Dak.	30	1970–1988	120.0	36.0	360.0
55	Goose River at Hillsboro, N. Dak.	166	1970–2008	130.0	35.0	242.0
56	Red River of the North at Grand Forks, N. Dak.	227	1970–2008	58.0	29.8	150.0
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	97.1	25.0	130.0
58	Turtle River at Manvel, N. Dak.	105	1971–2008	145.0	55.0	410.0
59	Red River of the North at Oslo, Minn.	75	1973–2005	55.0	28.0	86.0
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	59.0	36.0	200.0
61	Forest River near Fordville, N. Dak.	64	1972–2008	76.3	36.0	114.0
62	Forest River near Minto, N. Dak.	154	1971–2008	84.8	33.0	180.0
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	71.0	24.0	96.0
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	50.0	16.0	62.0
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	40.5	16.0	78.0
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	79.0	13.0	130.0
67	Park River at Grafton, N. Dak.	144	1970–2008	93.0	32.0	224.0
68	Red River of the North at Drayton, N. Dak.	74	1972–2008	61.0	30.0	98.0
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	53.0	37.0	110.0
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	64.0	32.0	150.0
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	51.0	37.0	110.0
72	Pembina River near Vang, N. Dak.	62	1970–1979	63.5	26.0	160.0
73	Little South Pembina River near Walhalla, N. Dak.	82	1970–2008	72.5	18.0	110.0
74	Pembina River at Walhalla, N. Dak.	254	1970–2008	73.5	26.0	150.0
75	Pembina River at Neche, N. Dak.	133	1972–2008	81.1	27.4	151.0
76	Tongue River at Akra, N. Dak.	72	1972–2008	63.4	32.3	98.0
77	Red River of the North at Pembina, N. Dak., site 1	10	1993–1993	67.4	53.5	78.6
78	Red River of the North at Pembina, N. Dak., site 2	152	1970–2008	66.0	31.8	140.0
79	Red River of the North at Emerson, Manitoba	148	1977–2004	63.0	36.0	110.0
80	Long Creek near Noonan, N. Dak.	70	1972–2008	67.5	11.0	140.0
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	41.5	16.0	85.0
82	Souris River near Sherwood, N. Dak.	302	1972–2008	60.4	14.2	164.3
83	Souris River near Foxholm, N. Dak.	202	1972–2008	51.0	25.0	110.0
84	Des Lacs River at Foxholm, N. Dak.	188	1972–2008	74.5	13.0	180.0
85	Souris River above Minot, N. Dak.	207	1970–2008	57.0	22.0	217.0
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	70.0	18.0	140.0
87	Souris River near Verendrye, N. Dak.	373	1970–2008	69.0	22.0	151.7

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Calcium, in mg/L—Continued						
88	Wintering River near Karlsruhe, N. Dak.	134	1972–2008	52.5	12.7	100.0
89	Souris River near Bantry, N. Dak.	152	1970–2008	60.6	25.6	110.0
90	Willow Creek near Willow City, N. Dak.	90	1972–2008	56.4	21.0	110.0
91	Stone Creek near Kramer, N. Dak.	30	1986–2000	59.0	17.0	170.0
92	Deep River near Upham, N. Dak.	68	1972–2007	59.1	19.0	93.0
93	Egg Creek near Granville, N. Dak.	14	1972–1981	41.5	18.0	86.0
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	43.0	20.0	66.0
95	Cut Bank Creek at Upham, N. Dak.	33	1975–2000	53.9	24.7	160.0
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	58.0	23.0	120.0
97	Boundary Creek near Landa, N. Dak.	39	1972–2000	58.0	21.0	130.0
98	Souris River near Westhope, N. Dak.	214	1970–2008	52.4	27.0	330.0
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	32.5	15.0	59.0
100	Missouri River near Williston, N. Dak.	95	1974–1992	56.0	33.0	73.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	77	1972–2008	55.0	15.0	110.0
102	Stony Creek near Williston, N. Dak.	32	1977–1981	45.0	12.0	63.0
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	35.0	17.0	110.0
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	64.0	17.0	90.0
105	White Earth River at White Earth, N. Dak.	27	1970–1977	49.0	22.0	120.0
106	Bear Den Creek near Mandaree, N. Dak.	228	1970–2008	34.0	5.5	70.0
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	42.0	18.0	63.0
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	47.0	13.0	120.0
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	44.0	11.4	100.0
110	Little Missouri River at Marmarth, N. Dak.	86	1971–2008	38.0	9.8	79.3
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	100.0	28.0	180.0
112	Little Missouri River at Medora, N. Dak.	112	1972–2008	54.1	7.2	489.0
113	Beaver Creek near Trotters, N. Dak.	95	1977–2008	83.6	20.0	160.0
114	Little Missouri River near Watford City, N. Dak.	243	1971–2008	65.0	6.0	160.0
115	Missouri River at Garrison Dam, N. Dak.	288	1971–2007	51.9	26.0	65.0
116	Knife River at Manning, N. Dak.	118	1972–2008	42.0	7.0	87.0
117	Stray Creek near Manning, N. Dak.	17	1975–1981	50.0	19.0	110.0
118	Knife River at Marshall, N. Dak.	69	1972–1981	52.0	18.0	140.0
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	36.0	10.0	82.0
120	Knife River near Golden Valley, N. Dak.	130	1971–2008	44.1	11.0	91.0
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	51.0	15.0	120.0
122	Brush Creek near Beulah, N. Dak.	107	1974–1990	78.0	17.0	110.0
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	53	1977–1993	65.0	11.0	170.0
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	76.5	10.0	110.0
125	Spring Creek at Zap, N. Dak.	240	1970–2008	66.5	13.0	120.0
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	53.0	16.0	90.0
127	Knife River at Hazen, N. Dak.	269	1970–2008	64.7	15.0	130.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Calcium, in mg/L—Continued						
128	Antelope Creek above Hazen, N. Dak.	44	1977–1985	70.0	12.0	120.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	21	1977–1985	58.0	7.9	130.0
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	37.0	12.0	84.0
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	60.5	15.0	110.0
132	Alderin Creek near Fort Clark, N. Dak.	41	1977–1983	45.0	12.0	110.0
133	Coal Lake Coulee near Hensler, N. Dak.	39	1978–1988	56.0	7.8	110.0
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	30.5	15.0	82.0
135	Turtle Creek above Washburn, N. Dak.	100	1987–2003	31.7	13.0	71.4
136	Painted Woods Creek near Wilton, N. Dak.	202	1970–2003	60.0	11.0	280.0
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	78.0	9.3	110.0
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	55	1977–1982	60.0	13.0	83.0
139	Hagel Creek near Center, N. Dak.	38	1977–1982	32.5	9.5	110.0
140	Square Butte Creek below Center, N. Dak.	81	1972–2008	70.0	29.0	101.0
141	Burnt Creek near Bismarck, N. Dak.	48	1972–2008	54.5	9.0	82.0
142	Missouri River at Bismarck, N. Dak.	126	1974–2008	53.0	30.0	61.0
143	South Branch Heart River near South Heart, N. Dak.	18	1979–1983	20.0	1.9	94.0
144	North Creek near South Heart, N. Dak.	16	1978–1981	41.5	12.0	120.0
145	Heart River near South Heart, N. Dak.	76	1975–2005	48.5	9.4	120.0
146	Heart River at Dickinson, N. Dak.	22	1986–1994	58.0	23.0	106.0
147	Green River near New Hradec, N. Dak.	116	1972–2008	40.0	7.0	83.0
148	Green River near Gladstone, N. Dak.	33	1970–1993	81.0	15.0	110.0
149	Heart River near Richardton, N. Dak.	154	1972–2008	67.2	21.1	160.0
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	49.0	21.0	120.0
151	Antelope Creek near Carson, N. Dak.	26	1972–2008	49.8	22.7	96.0
152	Big Muddy Creek near Almont, N. Dak.	39	1991–2008	35.4	17.0	79.0
153	Heart River near Lark, N. Dak.	45	1971–1995	55.0	18.0	90.0
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	52.0	15.0	77.0
155	Sweetbriar Creek near Judson, N. Dak.	33	1972–2008	32.0	13.0	73.0
156	Heart River near Mandan, N. Dak.	232	1971–2008	57.0	18.0	150.0
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	33	1988–2004	41.0	0.5	59.0
158	Apple Creek near Menoken, N. Dak.	129	1972–2008	46.0	11.0	100.0
159	Missouri River near Schmidt, N. Dak.	68	1974–1981	54.5	43.0	61.0
160	Cannonball River at New England, N. Dak.	36	1978–1981	91.0	17.0	170.0
161	Coal Bank Creek near Havelock, N. Dak.	84	1974–1983	115.0	23.0	240.0
162	Cannonball River at Regent, N. Dak.	119	1970–2008	79.0	27.8	200.0
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	84.0	32.0	160.0
164	Cannonball River near Raleigh, N. Dak.	89	1993–2008	59.2	26.3	167.0
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	185.0	23.0	750.0
166	Cedar Creek near Haynes, N. Dak.	76	1971–2008	67.5	19.0	190.0
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	120.0	39.0	190.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Calcium, in mg/L—Continued						
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	110.0	33.0	180.0
169	Cedar Creek near Raleigh, N. Dak.	120	1972–2008	59.4	18.0	149.0
170	Cannonball River at Breien, N. Dak.	260	1970–2008	64.2	0.3	160.0
171	Beaver Creek near Linton, N. Dak.	39	1972–1993	57.0	9.5	100.0
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	63.6	11.0	93.0
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	28.2	2.4	36.6
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	130.0	30.0	250.0
175	James River near Manfred, N. Dak.	48	1972–1998	54.5	14.0	84.0
176	James River near Grace City, N. Dak.	155	1972–2008	51.0	13.0	172.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	172	1985–2008	57.8	16.0	185.4
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	43.0	28.0	58.0
179	James River near Pingree, N. Dak.	143	1978–2008	47.8	18.0	110.7
180	Pipestem Creek near Pingree, N. Dak.	71	1974–2008	61.0	21.0	129.0
181	Pipestem Creek near Buchanan, N. Dak.	9	1972–1993	50.2	9.6	68.5
182	James River at Jamestown, N. Dak.	201	1972–2008	69.0	24.0	142.0
183	James River at Lamoure, N. Dak.	280	1970–2008	67.0	17.0	190.0
184	Bear Creek near Oakes, N. Dak.	54	1977–2008	77.9	15.0	190.0
185	James River at Oakes, N. Dak.	135	1970–2008	65.0	21.0	350.0
186	James River at N. Dak./S. Dak. State line	97	1974–2008	58.8	23.0	380.0
Manganese, total, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	0.19	<0.04	0.85
2	Red River of the North at Wahpeton, N. Dak.	17	1993–1996	0.10	<0.04	0.55
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	0.11	0.07	0.12
4	Red River of the North at Brushville, Minn.	61	1993–2007	0.08	<0.04	0.21
10	Wild Rice River near Abercrombie, N. Dak.	58	1993–2007	0.28	0.10	0.92
11	Red River of the North at Fargo, N. Dak.	16	1994–1996	0.11	0.05	0.56
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	0.15	<0.04	0.50
14	Red River of the North near Harwood, N. Dak.	26	1993–1996	0.15	<0.04	0.34
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	0.20	<0.04	0.90
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	0.21	0.07	0.41
32	Sheyenne River near Cooperstown, N. Dak.	80	1994–2007	0.36	0.16	0.96
33	Baldhill Creek near Dazey, N. Dak.	3	1993–1996	0.18	0.09	0.88
34	Sheyenne River below Baldhill Dam, N. Dak.	73	1994–2007	0.29	0.05	0.71
35	Sheyenne River at Valley City, N. Dak.	4	1993	0.47	0.30	0.80
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	0.47	0.09	2.86
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	0.50	0.12	3.19
41	Sheyenne River at West Fargo, N. Dak.	13	1994–2006	0.76	0.16	1.41
45	Maple River below Mapleton, N. Dak.	47	1997–2007	0.33	0.08	1.12
46	Sheyenne River at Harwood, N. Dak.	10	1993	0.41	0.22	1.34
49	Lower Branch Rush River near Prosper, N. Dak.	1	1993	0.08	0.08	0.08

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Manganese, total, in mg/L —Continued						
51	Elm River near Kelso, N. Dak.	3	1993	0.41	0.35	0.52
55	Goose River at Hillsboro, N. Dak.	76	1994–2007	0.34	0.13	1.04
56	Red River of the North at Grand Forks, N. Dak.	46	1997–2006	0.12	<0.04	0.69
58	Turtle River at Manvel, N. Dak.	38	1993–2006	0.28	0.09	1.13
62	Forest River near Minto, N. Dak.	47	1994–2006	0.27	0.07	1.34
67	Park River at Grafton, N. Dak.	40	1994–2006	0.37	0.10	2.17
68	Red River of the North at Drayton, N. Dak.	15	1994–1996	0.18	<0.04	0.58
75	Pembina River at Neche, N. Dak.	55	1994–2006	0.30	0.06	5.85
76	Tongue River at Akra, N. Dak.	1	1993	0.33	0.33	0.33
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	0.17	<0.04	0.44
78	Red River of the North at Pembina, N. Dak., site 2	52	1997–2006	0.18	<0.04	1.16
80	Long Creek near Noonan, N. Dak.	10	1997–1997	0.21	0.08	0.40
83	Souris River near Foxholm, N. Dak.	11	1997–1998	0.17	0.06	3.74
84	Des Lacs River at Foxholm, N. Dak.	97	1993–2007	0.26	<0.04	1.99
85	Souris River above Minot, N. Dak.	75	1994–2007	0.17	<0.04	4.68
87	Souris River near Verendrye, N. Dak.	76	1997–2007	0.22	0.05	0.63
88	Wintering River near Karlsruhe, N. Dak.	11	1997–1998	<0.04	<0.04	0.16
89	Souris River near Bantry, N. Dak.	10	1997–1998	0.20	<0.04	0.61
90	Willow Creek near Willow City, N. Dak.	6	1997	0.09	<0.04	0.14
92	Deep River near Upham, N. Dak.	7	1997	<0.04	<0.04	0.15
98	Souris River near Westhope, N. Dak.	7	1997–1998	<0.04	<0.04	0.79
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	0.08	<0.04	0.11
110	Little Missouri River at Marmarth, N. Dak.	8	1999	0.32	0.05	1.11
112	Little Missouri River at Medora, N. Dak.	88	1993–2007	0.21	<0.04	18.10
113	Beaver Creek near Trotters, N. Dak.	9	1999	<0.04	<0.04	0.08
114	Little Missouri River near Watford City, N. Dak.	81	1994–2007	0.30	<0.04	18.70
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	0.15	0.07	0.50
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	6	1993	0.07	<0.04	0.09
125	Spring Creek at Zap, N. Dak.	77	1993–2007	0.10	<0.04	0.49
127	Knife River at Hazen, N. Dak.	94	1993–2007	0.14	0.07	1.16
140	Square Butte Creek below Center, N. Dak.	4	1993	0.31	0.11	0.37
142	Missouri River at Bismarck, N. Dak.	1	1994	<0.04	<0.04	<0.04
146	Heart River at Dickinson, N. Dak.	5	1993	0.26	0.09	0.40
148	Green River near Gladstone, N. Dak.	4	1993	0.22	0.09	0.33
149	Heart River near Richardton, N. Dak.	76	1994–2007	0.19	0.05	0.46
152	Big Muddy Creek near Almont, N. Dak.	3	1993	0.25	0.15	0.32
156	Heart River near Mandan, N. Dak.	81	1994–2007	0.06	<0.04	0.58
158	Apple Creek near Menoken, N. Dak.	4	1993	0.17	0.05	0.24
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	0.11	<0.04	1.03

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Manganese, total, in mg/L—Continued						
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	0.16	<0.04	1.76
170	Cannonball River at Breien, N. Dak.	74	1994–2007	0.11	<0.04	1.63
171	Beaver Creek near Linton, N. Dak.	4	1993	0.24	0.15	0.45
175	James River near Manfred, N. Dak.	6	1998	<0.04	<0.04	0.05
176	James River near Grace City, N. Dak.	60	1997–2007	0.22	<0.04	1.80
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	0.21	<0.04	1.05
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	0.20	<0.04	0.75
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	0.15	0.06	0.19
182	James River at Jamestown, N. Dak.	75	1997–2007	0.67	0.27	2.06
183	James River at Lamoure, N. Dak.	73	1996–2007	0.66	0.19	1.95
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	0.51	0.08	0.62
185	James River at Oakes, N. Dak.	3	1993	0.09	0.09	0.24
186	James River at N. Dak./S. Dak. State line	9	1998–1999	0.44	0.24	1.49
Manganese, dissolved, in mg/L						
2	Red River of the North at Wahpeton, N. Dak.	57	1973–2008	<0.04	<0.04	0.11
5	Red River of the North below Wahpeton, N. Dak.	9	1970–1972	<0.04	<0.04	0.06
6	Red River of the North at Hickson, N. Dak.	51	1975–2008	<0.04	<0.04	0.09
7	Wild Rice River near Rutland, N. Dak.	46	1971–2008	0.14	<0.04	1.70
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	0.21	<0.04	0.48
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	0.21	<0.04	0.49
10	Wild Rice River near Abercrombie, N. Dak.	77	1970–2008	0.11	<0.04	1.66
11	Red River of the North at Fargo, N. Dak.	89	1970–2008	<0.04	<0.04	0.15
12	Red River of North below Fargo, N. Dak.	46	1970–1986	<0.04	<0.04	0.19
13	Red River of the North at Harwood, N. Dak.	1	2005	<0.04	<0.04	<0.04
14	Red River of the North near Harwood, N. Dak.	7	2005–2006	<0.04	<0.04	<0.04
15	Sheyenne River above Harvey, N. Dak.	89	1972–2008	0.07	<0.04	0.38
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	0.13	<0.04	0.20
18	Sheyenne River near Warwick, N. Dak.	80	1970–2008	0.07	<0.04	0.66
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	<0.04	<0.04	0.92
20	Mauvais Coulee near Cando, N. Dak.	104	1972–2008	0.08	<0.04	2.10
21	Edmore Coulee near Edmore, N. Dak.	102	1972–2008	<0.04	<0.04	1.40
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	0.05	<0.04	2.00
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	<0.04	<0.04	<0.04
24	Starkweather Coulee near Webster, N. Dak.	92	1983–2008	<0.04	<0.04	0.63
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	0.13	<0.04	0.94
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	0.12	<0.04	0.73
27	Little Coulee near Brinsmade, N. Dak.	21	1976–1998	0.12	<0.04	2.60
28	Big Coulee near Churchs Ferry, N. Dak.	88	1970–1997	0.07	<0.04	1.20
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	39	1970–1985	<0.04	<0.04	3.40
30	Channel A near Penn, N. Dak.	85	1984–2008	0.09	<0.04	3.30

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Manganese, dissolved, in mg/L —Continued						
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	<0.04	<0.04	0.32
32	Sheyenne River near Cooperstown, N. Dak.	150	1970–2008	0.19	<0.04	5.00
33	Baldhill Creek near Dazey, N. Dak.	91	1972–2008	0.16	<0.04	2.20
34	Sheyenne River below Baldhill Dam, N. Dak.	95	1972–2008	0.19	<0.04	2.10
35	Sheyenne River at Valley City, N. Dak.	25	1972–2005	0.23	<0.04	0.77
36	Sheyenne River at Lisbon, N. Dak.	92	1970–2008	0.16	<0.04	0.88
37	Sheyenne River near Kindred, N. Dak.	214	1972–2008	0.07	<0.04	0.50
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	36	1993–2008	<0.04	<0.04	0.21
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	0.16	<0.04	0.28
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	0.06	<0.04	0.19
41	Sheyenne River at West Fargo, N. Dak.	41	1972–2008	<0.04	<0.04	0.26
42	Maple River near Hope, N. Dak.	39	1972–2008	0.09	<0.04	3.66
43	Maple River near Enderlin, N. Dak.	63	1972–2008	0.38	<0.04	1.57
44	Maple River near Mapleton, N. Dak.	25	1972–2008	0.06	<0.04	1.10
45	Maple River below Mapleton, N. Dak.	28	1995–2008	0.07	<0.04	0.69
46	Sheyenne River at Harwood, N. Dak.	6	2000–2005	0.07	<0.04	0.12
47	Rush River at Amenia, N. Dak.	51	1972–2008	0.20	<0.04	1.10
48	Rush River near Prosper, N. Dak.	4	1983–1987	0.10	<0.04	0.22
49	Lower Branch Rush River near Prosper, N. Dak.	4	1983–1987	<0.04	<0.04	0.04
50	Sheyenne River near Harwood, N. Dak.	10	1970–1996	0.05	<0.04	0.55
51	Elm River near Kelso, N. Dak.	3	1983–1987	0.15	0.09	0.28
52	Red River of the North at Halstad, Minn.	125	1972–2008	<0.04	<0.04	0.20
53	Beaver Creek near Finley, N. Dak.	72	1970–2003	0.16	<0.04	0.72
54	Goose River near Portland, N. Dak.	23	1970–1988	0.07	<0.04	1.50
55	Goose River at Hillsboro, N. Dak.	86	1970–2008	0.16	<0.04	1.20
56	Red River of the North at Grand Forks, N. Dak.	124	1970–2008	<0.04	<0.04	0.25
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	0.13	<0.04	0.48
58	Turtle River at Manvel, N. Dak.	66	1971–2008	0.28	<0.04	1.50
59	Red River of the North at Oslo, Minn.	40	1973–2005	<0.04	<0.04	0.08
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	0.10	<0.04	0.46
61	Forest River near Fordville, N. Dak.	64	1972–2008	0.18	<0.04	0.73
62	Forest River near Minto, N. Dak.	106	1971–2008	0.14	<0.04	15.00
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	0.56	<0.04	3.10
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	0.34	<0.04	1.00
65	Middle Branch Park River near Edinburg, N. Dak.	13	1978–1980	0.05	<0.04	0.18
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	0.09	<0.04	0.61
67	Park River at Grafton, N. Dak.	96	1970–2008	0.13	<0.04	0.85
68	Red River of the North at Drayton, N. Dak.	59	1972–2008	<0.04	<0.04	0.09
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	0.05	<0.04	0.10

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Manganese, dissolved, in mg/L —Continued						
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	0.08	<0.04	0.51
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	<0.04	<0.04	0.58
72	Pembina River near Vang, N. Dak.	60	1970–1979	0.06	<0.04	2.10
73	Little South Pembina River near Walhalla, N. Dak.	81	1970–2008	0.05	<0.04	2.40
74	Pembina River at Walhalla, N. Dak.	149	1970–2008	0.07	<0.04	0.86
75	Pembina River at Neche, N. Dak.	78	1972–2008	<0.04	<0.04	0.78
76	Tongue River at Akra, N. Dak.	69	1972–2008	0.41	<0.04	11.00
78	Red River of the North at Pembina, N. Dak., site 2	95	1970–2008	<0.04	<0.04	0.56
79	Red River of the North at Emerson, Manitoba	95	1978–2004	<0.04	<0.04	0.09
80	Long Creek near Noonan, N. Dak.	69	1972–2008	0.05	<0.04	0.88
81	West Branch Short Creek near Columbus, N. Dak.	10	1978–1981	<0.04	<0.04	0.07
82	Souris River near Sherwood, N. Dak.	73	1972–1991	0.08	<0.04	4.00
83	Souris River near Foxholm, N. Dak.	145	1972–2008	0.12	<0.04	4.08
84	Des Lacs River at Foxholm, N. Dak.	76	1972–2008	0.09	<0.04	0.94
85	Souris River above Minot, N. Dak.	65	1970–1998	0.05	<0.04	6.50
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	0.09	<0.04	0.17
87	Souris River near Verendrye, N. Dak.	54	1970–1998	0.14	<0.04	1.00
88	Wintering River near Karlsruhe, N. Dak.	92	1972–2008	0.08	<0.04	1.30
89	Souris River near Bantry, N. Dak.	79	1970–2008	<0.04	<0.04	2.20
90	Willow Creek near Willow City, N. Dak.	57	1972–2008	<0.04	<0.04	1.60
91	Stone Creek near Kramer, N. Dak.	4	1986–1989	<0.04	<0.04	0.06
92	Deep River near Upham, N. Dak.	46	1972–2007	<0.04	<0.04	0.54
93	Egg Creek near Granville, N. Dak.	14	1972–1981	<0.04	<0.04	0.06
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	<0.04	<0.04	0.41
95	Cut Bank Creek at Upham, N. Dak.	15	1975–1989	<0.04	<0.04	2.20
96	Deep River below Cut Bank Creek near Upham, N. Dak.	14	1975–1989	<0.04	<0.04	0.18
97	Boundary Creek near Landa, N. Dak.	13	1972–1994	<0.04	<0.04	0.30
98	Souris River near Westhope, N. Dak.	107	1970–2001	0.05	<0.04	2.90
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	<0.04	<0.04	0.09
100	Missouri River near Williston, N. Dak.	17	1975–1992	<0.04	<0.04	0.04
101	Little Muddy River below Cow Creek near Williston, N. Dak.	77	1972–2008	<0.04	<0.04	0.30
102	Stony Creek near Williston, N. Dak.	16	1977–1981	<0.04	<0.04	0.14
103	Tobacco Garden Creek near Watford City, N. Dak.	14	1976–1977	0.05	<0.04	0.46
104	Beaver Creek near Ray, N. Dak.	28	1977–1982	<0.04	<0.04	0.11
105	White Earth River at White Earth, N. Dak.	18	1973–1977	0.08	<0.04	0.24
106	Bear Den Creek near Mandaree, N. Dak.	115	1970–2008	<0.04	<0.04	1.80
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	0.06	<0.04	0.22
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	0.05	<0.04	0.33
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	0.05	<0.04	0.27
110	Little Missouri River at Marmarth, N. Dak.	85	1971–2008	<0.04	<0.04	0.38

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Manganese, dissolved, in mg/L —Continued						
111	Deep Creek near Amidon, N. Dak.	26	1977–1983	0.08	<0.04	0.26
112	Little Missouri River at Medora, N. Dak.	33	1972–2008	<0.04	<0.04	0.06
113	Beaver Creek near Trotters, N. Dak.	69	1977–2008	<0.04	<0.04	0.14
114	Little Missouri River near Watford City, N. Dak.	121	1971–2008	<0.04	<0.04	0.40
115	Missouri River at Garrison Dam, N. Dak.	103	1971–1998	<0.04	<0.04	0.07
116	Knife River at Manning, N. Dak.	92	1972–2008	0.05	<0.04	0.36
117	Stray Creek near Manning, N. Dak.	9	1979–1981	<0.04	<0.04	0.40
118	Knife River at Marshall, N. Dak.	43	1972–1981	<0.04	<0.04	0.32
119	Elm Creek near Golden Valley, N. Dak.	29	1973–1995	0.08	<0.04	1.60
120	Knife River near Golden Valley, N. Dak.	76	1971–2008	<0.04	<0.04	0.14
121	Coyote Creek near Zap, N. Dak.	30	1977–1983	0.05	<0.04	0.19
122	Brush Creek near Beulah, N. Dak.	61	1974–1988	0.09	<0.04	0.40
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	20	1977–1981	0.15	<0.04	0.66
124	Spring Creek near Halliday, N. Dak.	22	1977–1981	0.05	<0.04	0.18
125	Spring Creek at Zap, N. Dak.	90	1972–2008	0.06	<0.04	0.17
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	0.12	<0.04	0.35
127	Knife River at Hazen, N. Dak.	127	1970–2008	<0.04	<0.04	0.36
128	Antelope Creek above Hazen, N. Dak.	15	1977–1982	<0.04	<0.04	0.13
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	10	1977–1982	0.05	<0.04	0.12
130	West Branch Antelope Creek near Hazen, N. Dak.	10	1978–1983	0.05	<0.04	0.12
131	Coal Creek near Stanton, N. Dak.	13	1977–1981	<0.04	<0.04	0.09
132	Alderin Creek near Fort Clark, N. Dak.	21	1978–1982	<0.04	<0.04	0.62
133	Coal Lake Coulee near Hensler, N. Dak.	12	1978–1982	0.04	<0.04	0.14
134	Buffalo Creek near Washburn, N. Dak.	23	1979–1983	0.05	<0.04	0.14
136	Painted Woods Creek near Wilton, N. Dak.	63	1970–1977	0.05	<0.04	1.20
137	Square Butte Creek near Hannover, N. Dak.	14	1977–1981	<0.04	<0.04	0.10
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	28	1977–1982	0.11	<0.04	0.28
139	Hagel Creek near Center, N. Dak.	24	1977–1982	<0.04	<0.04	0.24
140	Square Butte Creek below Center, N. Dak.	79	1972–2008	0.08	<0.04	1.00
141	Burnt Creek near Bismarck, N. Dak.	48	1972–2008	<0.04	<0.04	0.25
142	Missouri River at Bismarck, N. Dak.	41	1974–2008	<0.04	<0.04	0.04
143	South Branch Heart River near South Heart, N. Dak.	15	1979–1983	<0.04	<0.04	0.23
144	North Creek near South Heart, N. Dak.	8	1979–1981	0.05	<0.04	0.25
145	Heart River near South Heart, N. Dak.	48	1977–2005	0.06	<0.04	0.85
146	Heart River at Dickinson, N. Dak.	17	1986–1994	0.09	<0.04	0.31
147	Green River near New Hradec, N. Dak.	90	1972–2008	<0.04	<0.04	0.41
148	Green River near Gladstone, N. Dak.	29	1970–1975	<0.04	<0.04	0.16
149	Heart River near Richardton, N. Dak.	83	1972–2008	<0.04	<0.04	1.10
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	<0.04	<0.04	0.16
151	Antelope Creek near Carson, N. Dak.	26	1972–2008	<0.04	<0.04	0.12

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Manganese, dissolved, in mg/L —Continued						
152	Big Muddy Creek near Almont, N. Dak.	36	1991–2008	<0.04	<0.04	0.22
153	Heart River near Lark, N. Dak.	45	1971–1995	<0.04	<0.04	0.18
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	<0.04	<0.04	0.05
155	Sweetbriar Creek near Judson, N. Dak.	33	1972–2008	<0.04	<0.04	0.89
156	Heart River near Mandan, N. Dak.	114	1971–2008	<0.04	<0.04	0.65
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	29	1990–2004	0.12	<0.04	0.28
158	Apple Creek near Menoken, N. Dak.	125	1972–2008	0.10	<0.04	1.90
159	Missouri River near Schmidt, N. Dak.	8	1975–1979	<0.04	<0.04	0.04
160	Cannonball River at New England, N. Dak.	19	1979–2005	0.20	<0.04	0.53
161	Coal Bank Creek near Havelock, N. Dak.	44	1974–1983	0.12	<0.04	1.90
162	Cannonball River at Regent, N. Dak.	93	1970–2008	0.06	<0.04	1.10
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	0.05	<0.04	0.26
164	Cannonball River near Raleigh, N. Dak.	21	2001–2008	<0.04	<0.04	0.07
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	0.22	<0.04	0.80
166	Cedar Creek near Haynes, N. Dak.	73	1972–2008	0.06	<0.04	0.44
167	Timber Creek near Bentley, N. Dak.	23	1977–1981	0.06	<0.04	0.25
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	0.06	<0.04	0.24
169	Cedar Creek near Raleigh, N. Dak.	60	1972–2008	<0.04	<0.04	0.16
170	Cannonball River at Breien, N. Dak.	139	1970–2008	<0.04	<0.04	0.41
171	Beaver Creek near Linton, N. Dak.	34	1972–1989	0.15	<0.04	1.70
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	11.0	<0.04	0.47
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	0.06	<0.04	0.63
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	50	1974–1987	0.12	<0.04	2.10
175	James River near Manfred, N. Dak.	48	1972–1998	<0.04	<0.04	0.30
176	James River near Grace City, N. Dak.	109	1972–2008	0.06	<0.04	1.90
177	James River above Arrowwood Lake near Kensal, N. Dak.	172	1985–2008	0.05	<0.04	4.80
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	<0.04	<0.04	0.44
179	James River near Pingree, N. Dak.	130	1978–2008	0.11	<0.04	5.50
180	Pipestem Creek near Pingree, N. Dak.	61	1974–2008	0.10	<0.04	0.98
181	Pipestem Creek near Buchanan, N. Dak.	4	1972–1974	0.17	0.05	0.24
182	James River at Jamestown, N. Dak.	140	1972–2008	0.58	<0.04	2.40
183	James River at Lamoure, N. Dak.	149	1970–2008	0.27	<0.04	4.80
184	Bear Creek near Oakes, N. Dak.	53	1977–2008	0.23	<0.04	0.88
185	James River at Oakes, N. Dak.	105	1970–2008	0.14	<0.04	2.60
186	James River at N. Dak./S. Dak. State line	31	1975–2008	0.22	<0.04	1.55
Chloride, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	16.5	<4.0	65.0
2	Red River of the North at Wahpeton, N. Dak.	74	1973–2008	12.0	<4.0	37.6
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	14.05	9.3	16.7

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Chloride, in mg/L —Continued						
4	Red River of the North at Brushville, Minn.	61	1993–2007	15.3	<4.0	47.7
5	Red River of the North below Wahpeton, N. Dak.	58	1970–1999	7.1	<4.0	23.5
6	Red River of the North at Hickson, N. Dak.	134	1975–2008	11.0	<4.0	44.0
7	Wild Rice River near Rutland, N. Dak.	47	1971–2008	32.0	<4.0	156.0
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	30.0	17.0	408.0
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	24.3	13.2	40.0
10	Wild Rice River near Abercrombie, N. Dak.	218	1970–2008	38.9	<4.0	180.0
11	Red River of the North at Fargo, N. Dak.	139	1970–2008	13.0	<4.0	45.5
12	Red River of North below Fargo, N. Dak.	167	1970–1986	11.0	4.4	96.0
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	21.3	5.6	63.6
14	Red River of the North near Harwood, N. Dak.	59	1993–2007	18.7	4.8	35.4
15	Sheyenne River above Harvey, N. Dak.	199	1972–2008	17.0	<4.0	54.0
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	8.5	<4.0	36.0
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	17.0	8.4	51.3
18	Sheyenne River near Warwick, N. Dak.	181	1970–2008	14.0	<4.0	28.0
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	17.2	<4.0	123.0
20	Mauvais Coulee near Cando, N. Dak.	104	1972–2008	19.0	<4.0	60.0
21	Edmore Coulee near Edmore, N. Dak.	103	1972–2008	20.4	<4.0	100.0
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	20.1	4.3	150.0
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	20.0	19.0	21.0
24	Starkweather Coulee near Webster, N. Dak.	94	1983–2008	14.0	<4.0	49.8
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	24.5	9.3	98.8
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	24.5	11.0	46.9
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	23.0	<4.0	150.0
28	Big Coulee near Churchs Ferry, N. Dak.	136	1970–1997	18.5	6.2	92.0
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	195.0	21.0	900.0
30	Channel A near Penn, N. Dak.	87	1984–2008	19.0	7.4	96.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	278.5	96.4	480.0
32	Sheyenne River near Cooperstown, N. Dak.	321	1970–2008	16.0	<4.0	39.0
33	Baldhill Creek near Dazey, N. Dak.	104	1972–2008	15.0	<4.0	51.0
34	Sheyenne River below Baldhill Dam, N. Dak.	181	1972–2008	15.3	4.7	31.0
35	Sheyenne River at Valley City, N. Dak.	29	1972–2005	18.0	5.1	52.0
36	Sheyenne River at Lisbon, N. Dak.	300	1970–2008	27.0	7.2	110.0
37	Sheyenne River near Kindred, N. Dak.	313	1972–2008	26.0	5.7	74.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	43	1993–2008	24.0	<4.0	40.0
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	19.5	7.4	28.0
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	15.7	<4.0	26.0
41	Sheyenne River at West Fargo, N. Dak.	62	1970–2008	26.6	7.8	57.3
42	Maple River near Hope, N. Dak.	39	1972–2008	26.0	5.3	90.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Chloride, in mg/L —Continued						
43	Maple River near Enderlin, N. Dak.	63	1972–2008	53.0	<4.0	140.0
44	Maple River near Mapleton, N. Dak.	25	1972–2008	45.6	15.0	99.0
45	Maple River below Mapleton, N. Dak.	74	1995–2008	55.4	7.4	180.0
46	Sheyenne River at Harwood, N. Dak.	36	1993–2005	31.4	11.0	94.5
47	Rush River at Amenia, N. Dak.	51	1972–2008	17.0	<4.0	64.0
48	Rush River near Prosper, N. Dak.	4	1983–1987	10.4	<4.0	39.0
49	Lower Branch Rush River near Prosper, N. Dak.	5	1983–1993	4.8	<4.0	29.7
50	Sheyenne River near Harwood, N. Dak.	39	1970–1996	39.0	9.3	120.0
51	Elm River near Kelso, N. Dak.	6	1983–1993	36.7	11.0	76.7
52	Red River of the North at Halstad, Minn.	183	1972–2008	17.0	4.7	52.0
53	Beaver Creek near Finley, N. Dak.	116	1970–2003	19.0	<4.0	68.0
54	Goose River near Portland, N. Dak.	30	1970–1988	25.0	4.6	134.0
55	Goose River at Hillsboro, N. Dak.	166	1970–2008	36.5	6.9	310.0
56	Red River of the North at Grand Forks, N. Dak.	198	1970–2008	12.0	<4.0	32.4
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	23.0	6.8	160.0
58	Turtle River at Manvel, N. Dak.	106	1971–2008	446.5	71.0	3,600.0
59	Red River of the North at Oslo, Minn.	75	1973–2005	15.0	5.1	130.0
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	15.0	4.9	100.0
61	Forest River near Fordville, N. Dak.	64	1972–2008	13.0	4.8	35.2
62	Forest River near Minto, N. Dak.	155	1971–2008	25.0	4.4	1,270.0
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	14.0	<4.0	20.0
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	11.0	5.7	31.0
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	8.0	4.6	14.0
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	16.0	5.1	27.0
67	Park River at Grafton, N. Dak.	145	1970–2008	74.3	6.2	410.0
68	Red River of the North at Drayton, N. Dak.	74	1972–2008	33.5	5.8	160.0
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	5.9	<4.0	27.0
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	11.0	<4.0	24.0
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	9.2	<4.0	31.0
72	Pembina River near Vang, N. Dak.	63	1970–1979	11.0	<4.0	24.0
73	Little South Pembina River near Walhalla, N. Dak.	83	1970–2008	15.0	<4.0	27.0
74	Pembina River at Walhalla, N. Dak.	225	1970–2008	13.0	<4.0	57.0
75	Pembina River at Neche, N. Dak.	133	1972–2008	15.0	<4.0	31.0
76	Tongue River at Akra, N. Dak.	72	1972–2008	10.0	<4.0	40.0
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	27.8	15.6	66.2
78	Red River of the North at Pembina, N. Dak., site 2	160	1970–2008	26.0	5.0	142.0
79	Red River of the North at Emerson, Manitoba	149	1977–2004	34.0	9.8	240.0
80	Long Creek near Noonan, N. Dak.	70	1972–2008	18.0	<4.0	48.5
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	14.5	4.4	37.0
82	Souris River near Sherwood, N. Dak.	304	1972–2008	47.5	<4.0	220.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Chloride, in mg/L —Continued						
83	Souris River near Foxholm, N. Dak.	202	1972–2008	22.0	5.3	160.0
84	Des Lacs River at Foxholm, N. Dak.	188	1972–2008	26.1	<4.0	53.0
85	Souris River above Minot, N. Dak.	207	1970–2008	29.8	<4.0	161.0
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	7.6	<4.0	19.0
87	Souris River near Verendrye, N. Dak.	371	1970–2008	32.5	<4.0	247.0
88	Wintering River near Karlsruhe, N. Dak.	134	1972–2008	11.2	4.9	38.0
89	Souris River near Bantry, N. Dak.	152	1970–2008	26.7	5.8	110.0
90	Willow Creek near Willow City, N. Dak.	90	1972–2008	22.2	<4.0	220.0
91	Stone Creek near Kramer, N. Dak.	30	1986–2000	12.4	<4.0	56.0
92	Deep River near Upham, N. Dak.	68	1972–2007	45.5	<4.0	180.0
93	Egg Creek near Granville, N. Dak.	14	1972–1981	20.0	5.4	73.0
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	31.0	10.0	66.0
95	Cut Bank Creek at Upham, N. Dak.	33	1975–2000	26.4	8.4	58.0
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	39.0	8.5	130.0
97	Boundary Creek near Landa, N. Dak.	39	1972–2000	14.0	<4.0	59.0
98	Souris River near Westhope, N. Dak.	214	1970–2008	28.0	6.0	140.0
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	5.4	<4.0	7.5
100	Missouri River near Williston, N. Dak.	99	1970–1992	10.0	5.3	22.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	77	1972–2008	8.0	<4.0	89.0
102	Stony Creek near Williston, N. Dak.	32	1977–1981	7.9	<4.0	50.0
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	5.1	<4.0	8.9
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	12.0	<4.0	23.0
105	White Earth River at White Earth, N. Dak.	27	1970–1977	34.0	14.0	150.0
106	Bear Den Creek near Mandaree, N. Dak.	229	1970–2008	4.4	<4.0	180.0
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	8.5	<4.0	17.0
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	19.0	<4.0	52.0
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	10.9	<4.0	33.0
110	Little Missouri River at Marmarth, N. Dak.	86	1971–2008	9.0	<4.0	30.0
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	9.8	<4.0	28.0
112	Little Missouri River at Medora, N. Dak.	112	1972–2008	9.6	<4.0	36.7
113	Beaver Creek near Trotters, N. Dak.	94	1977–2008	9.2	<4.0	22.0
114	Little Missouri River near Watford City, N. Dak.	243	1971–2008	9.4	<4.0	219.0
115	Missouri River at Garrison Dam, N. Dak.	264	1971–2007	9.5	<4.0	19.0
116	Knife River at Manning, N. Dak.	118	1972–2008	6.6	<4.0	32.0
117	Stray Creek near Manning, N. Dak.	17	1975–1981	7.0	<4.0	14.0
118	Knife River at Marshall, N. Dak.	69	1972–1981	5.3	<4.0	49.0
119	Elm Creek near Golden Valley, N. Dak.	36	1973–1994	4.5	<4.0	31.0
120	Knife River near Golden Valley, N. Dak.	130	1971–2008	6.4	<4.0	26.0
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	6.9	<4.0	17.0
122	Brush Creek near Beulah, N. Dak.	105	1974–1990	6.7	<4.0	14.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Chloride, in mg/L—Continued						
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	53	1977–1993	6.8	<4.0	42.0
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	6.5	<4.0	26.0
125	Spring Creek at Zap, N. Dak.	239	1970–2008	7.3	<4.0	31.4
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	<4.0	<4.0	30.0
127	Knife River at Hazen, N. Dak.	270	1970–2008	7.2	<4.0	48.0
128	Antelope Creek above Hazen, N. Dak.	28	1977–1982	11.0	<4.0	24.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	10	1977–1982	<4.0	<4.0	5.6
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	<4.0	<4.0	18.0
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	8.1	<4.0	18.0
132	Alderin Creek near Fort Clark, N. Dak.	35	1977–1982	5.1	<4.0	19.0
133	Coal Lake Coulee near Hensler, N. Dak.	17	1978–1987	<4.0	<4.0	14.0
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	6.5	<4.0	150.0
135	Turtle Creek above Washburn, N. Dak.	102	1987–2003	12.2	<4.0	80.0
136	Painted Woods Creek near Wilton, N. Dak.	201	1970–2003	17.0	<4.0	82.0
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	5.9	<4.0	9.7
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	56	1977–1982	7.0	<4.0	12.0
139	Hagel Creek near Center, N. Dak.	38	1977–1982	4.3	<4.0	10.0
140	Square Butte Creek below Center, N. Dak.	81	1972–2008	10.0	<4.0	27.3
141	Burnt Creek near Bismarck, N. Dak.	48	1972–2008	7.3	<4.0	15.0
142	Missouri River at Bismarck, N. Dak.	128	1974–2008	9.6	<4.0	15.0
143	South Branch Heart River near South Heart, N. Dak.	31	1979–1996	4.8	<4.0	47.0
144	North Creek near South Heart, N. Dak.	24	1978–1996	5.2	<4.0	15.2
145	Heart River near South Heart, N. Dak.	76	1975–2005	18.0	<4.0	100.0
146	Heart River at Dickinson, N. Dak.	22	1986–1994	48.0	7.0	110.0
147	Green River near New Hradec, N. Dak.	116	1972–2008	5.9	<4.0	20.0
148	Green River near Gladstone, N. Dak.	33	1970–1993	6.3	<4.0	25.0
149	Heart River near Richardton, N. Dak.	154	1972–2008	17.0	<4.0	66.2
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	13.5	<4.0	48.0
151	Antelope Creek near Carson, N. Dak.	26	1972–2008	5.9	<4.0	14.0
152	Big Muddy Creek near Almont, N. Dak.	39	1991–2008	7.0	<4.0	16.4
153	Heart River near Lark, N. Dak.	45	1971–1995	5.9	<4.0	15.0
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	10.0	<4.0	19.6
155	Sweetbriar Creek near Judson, N. Dak.	33	1972–2008	5.1	<4.0	13.1
156	Heart River near Mandan, N. Dak.	232	1971–2008	12.0	<4.0	303.0
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	33	1988–2004	6.2	<4.0	18.0
158	Apple Creek near Menoken, N. Dak.	129	1972–2008	30.0	<4.0	77.0
159	Missouri River near Schmidt, N. Dak.	68	1974–1981	9.4	7.4	18.0
160	Cannonball River at New England, N. Dak.	36	1978–1981	8.1	<4.0	42.0
161	Coal Bank Creek near Havelock, N. Dak.	84	1974–1983	10.0	<4.0	89.0
162	Cannonball River at Regent, N. Dak.	119	1970–2008	9.7	<4.0	55.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Chloride, in mg/L —Continued						
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	11.0	<4.0	17.0
164	Cannonball River near Raleigh, N. Dak.	89	1993–2008	9.9	<4.0	41.8
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	18.5	4.4	180.0
166	Cedar Creek near Haynes, N. Dak.	76	1971–2008	11.0	<4.0	22.0
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	14.0	<4.0	510.0
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	11.5	<4.0	18.0
169	Cedar Creek near Raleigh, N. Dak.	120	1972–2008	9.3	<4.0	34.8
170	Cannonball River at Breien, N. Dak.	260	1970–2008	11.0	<4.0	62.0
171	Beaver Creek near Linton, N. Dak.	39	1972–1993	7.8	<4.0	19.0
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	11.0	<4.0	55.0
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	13.7	<4.0	62.0
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	14.0	<4.0	89.0
175	James River near Manfred, N. Dak.	48	1972–1998	9.8	<4.0	20.0
176	James River near Grace City, N. Dak.	155	1972–2008	18.0	<4.0	250.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	172	1985–2008	18.0	<4.0	59.3
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	11.0	4.9	17.0
179	James River near Pingree, N. Dak.	142	1978–2008	14.5	<4.0	54.0
180	Pipestem Creek near Pingree, N. Dak.	71	1974–2008	12.0	<4.0	27.9
181	Pipestem Creek near Buchanan, N. Dak.	9	1972–1993	7.3	<4.0	28.0
182	James River at Jamestown, N. Dak.	201	1972–2008	21.6	6.0	84.5
183	James River at Lamoure, N. Dak.	284	1970–2008	28.3	<4.0	180.0
184	Bear Creek near Oakes, N. Dak.	54	1977–2008	50.2	6.8	110.0
185	James River at Oakes, N. Dak.	136	1970–2008	38.7	7.3	430.0
186	James River at N. Dak./S. Dak. State line	97	1974–2008	30.0	5.5	250.0
Sulfate, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	462	41	1,660
2	Red River of the North at Wahpeton, N. Dak.	74	1973–2008	86	15	520
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	176	49	433
4	Red River of the North at Brushville, Minn.	61	1993–2007	87	21	273
5	Red River of the North below Wahpeton, N. Dak.	64	1970–1999	38	12	422
6	Red River of the North at Hickson, N. Dak.	134	1975–2008	67	5	340
7	Wild Rice River near Rutland, N. Dak.	47	1971–2008	490	52	1,870
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	320	230	1,310
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	235	140	419
10	Wild Rice River near Abercrombie, N. Dak.	224	1970–2008	394	11	1,200
11	Red River of the North at Fargo, N. Dak.	144	1970–2008	86	23	311
12	Red River of North below Fargo, N. Dak.	174	1970–1986	69	19	330
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	146	38	288
14	Red River of the North near Harwood, N. Dak.	59	1993–2007	152	40	298

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sulfate, in mg/L—Continued						
15	Sheyenne River above Harvey, N. Dak.	199	1972–2008	210	37	610
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	20	10	220
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	217	139	353
18	Sheyenne River near Warwick, N. Dak.	186	1970–2008	110	35	307
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	179	33	820
20	Mauvais Coulee near Cando, N. Dak.	104	1972–2008	230	35	680
21	Edmore Coulee near Edmore, N. Dak.	103	1972–2008	170	17	793
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	190	25	1,100
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	155	150	160
24	Starkweather Coulee near Webster, N. Dak.	94	1983–2008	115	17	472
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	227	110	556
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	270	91	896
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	160	44	1,100
28	Big Coulee near Churchs Ferry, N. Dak.	136	1970–1997	150	54	600
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	910	150	3,800
30	Channel A near Penn, N. Dak.	87	1984–2008	172	51	1,200
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	1,385	527	2,500
32	Sheyenne River near Cooperstown, N. Dak.	316	1970–2008	160	37	360
33	Baldhill Creek near Dazey, N. Dak.	94	1972–2008	170	29	309
34	Sheyenne River below Baldhill Dam, N. Dak.	172	1972–2008	208	48	382
35	Sheyenne River at Valley City, N. Dak.	29	1972–2005	140	74	300
36	Sheyenne River at Lisbon, N. Dak.	304	1970–2008	200	64	437
37	Sheyenne River near Kindred, N. Dak.	313	1972–2008	170	50	389
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	43	1993–2008	227	98	300
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	115	58	150
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	180	100	284
41	Sheyenne River at West Fargo, N. Dak.	62	1970–2008	170	69	403
42	Maple River near Hope, N. Dak.	39	1972–2008	322	66	1,100
43	Maple River near Enderlin, N. Dak.	63	1972–2008	450	42	650
44	Maple River near Mapleton, N. Dak.	25	1972–2008	370	100	589
45	Maple River below Mapleton, N. Dak.	74	1995–2008	419	73	1,130
46	Sheyenne River at Harwood, N. Dak.	36	1993–2005	222	94	417
47	Rush River at Amenia, N. Dak.	51	1972–2008	280	37	670
48	Rush River near Prosper, N. Dak.	4	1983–1987	75	41	550
49	Lower Branch Rush River near Prosper, N. Dak.	5	1983–1993	27	10	376
50	Sheyenne River near Harwood, N. Dak.	44	1970–1996	180	100	260
51	Elm River near Kelso, N. Dak.	6	1983–1993	208	45	326
52	Red River of the North at Halstad, Minn.	183	1972–2008	110	37	270
53	Beaver Creek near Finley, N. Dak.	114	1970–2003	320	6	980

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sulfate, in mg/L —Continued						
54	Goose River near Portland, N. Dak.	30	1970–1988	405	84	810
55	Goose River at Hillsboro, N. Dak.	166	1970–2008	445	68	800
56	Red River of the North at Grand Forks, N. Dak.	202	1970–2008	87	18	310
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	205	48	490
58	Turtle River at Manvel, N. Dak.	106	1971–2008	425	100	1,600
59	Red River of the North at Oslo, Minn.	75	1973–2005	74	20	180
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	185	78	1,400
61	Forest River near Fordville, N. Dak.	64	1972–2008	174	84	569
62	Forest River near Minto, N. Dak.	155	1971–2008	216	36	543
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	180	47	260
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	63	<4	120
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	87	31	150
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	180	27	280
67	Park River at Grafton, N. Dak.	145	1970–2008	260	53	849
68	Red River of the North at Drayton, N. Dak.	74	1972–2008	103	37	220
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	120	38	480
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	200	51	430
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	100	74	290
72	Pembina River near Vang, N. Dak.	63	1970–1979	180	56	410
73	Little South Pembina River near Walhalla, N. Dak.	83	1970–2008	180	36	287
74	Pembina River at Walhalla, N. Dak.	230	1970–2008	180	49	310
75	Pembina River at Neche, N. Dak.	133	1972–2008	195	60	293
76	Tongue River at Akra, N. Dak.	72	1972–2008	88	6	141
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	120	63	158
78	Red River of the North at Pembina, N. Dak., site 2	164	1970–2008	110	<4	448
79	Red River of the North at Emerson, Manitoba	149	1977–2004	94	6	230
80	Long Creek near Noonan, N. Dak.	70	1972–2008	376	39	1,110
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	495	160	1,300
82	Souris River near Sherwood, N. Dak.	304	1972–2008	230	45	1,000
83	Souris River near Foxholm, N. Dak.	202	1972–2008	180	69	560
84	Des Lacs River at Foxholm, N. Dak.	188	1972–2008	456	33	1,100
85	Souris River above Minot, N. Dak.	207	1970–2008	267	70	1,850
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	390	51	1,200
87	Souris River near Verendrye, N. Dak.	371	1970–2008	284	69	1,040
88	Wintering River near Karlsruhe, N. Dak.	134	1972–2008	94	5	570
89	Souris River near Bantry, N. Dak.	152	1970–2008	215	69	550
90	Willow Creek near Willow City, N. Dak.	90	1972–2008	235	30	750
91	Stone Creek near Kramer, N. Dak.	30	1986–2000	227	30	1,700
92	Deep River near Upham, N. Dak.	68	1972–2007	141	32	421
93	Egg Creek near Granville, N. Dak.	14	1972–1981	160	52	430

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sulfate, in mg/L—Continued						
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	250	97	470
95	Cut Bank Creek at Upham, N. Dak.	33	1975–2000	236	50	1,300
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	200	43	480
97	Boundary Creek near Landa, N. Dak.	39	1972–2000	286	32	1,200
98	Souris River near Westhope, N. Dak.	214	1970–2008	200	59	860
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	710	77	980
100	Missouri River near Williston, N. Dak.	100	1970–1982	200	88	290
101	Little Muddy River below Cow Creek near Williston, N. Dak.	77	1972–2008	570	39	909
102	Stony Creek near Williston, N. Dak.	32	1977–1981	530	46	800
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	640	100	1,200
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	610	8	730
105	White Earth River at White Earth, N. Dak.	27	1970–1977	421	75	580
106	Bear Den Creek near Mandaree, N. Dak.	229	1970–2008	690	45	1,200
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	680	84	910
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	1,000	36	1,545
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	570	19	1,250
110	Little Missouri River at Marmarth, N. Dak.	86	1971–2008	484	73	1,200
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	1,700	280	2,900
112	Little Missouri River at Medora, N. Dak.	112	1972–2008	615	119	2,000
113	Beaver Creek near Trotters, N. Dak.	94	1977–2008	994	68	1,400
114	Little Missouri River near Watford City, N. Dak.	243	1971–2008	610	<4	1,530
115	Missouri River at Garrison Dam, N. Dak.	264	1971–2007	170	120	250
116	Knife River at Manning, N. Dak.	118	1972–2008	440	20	2,400
117	Stray Creek near Manning, N. Dak.	17	1975–1981	760	240	2,500
118	Knife River at Marshall, N. Dak.	69	1972–1981	570	50	1,200
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	340	9	940
120	Knife River near Golden Valley, N. Dak.	130	1971–2008	564	38	1,420
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	510	50	1,000
122	Brush Creek near Beulah, N. Dak.	107	1974–1990	490	35	790
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	53	1977–1993	580	57	1,500
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	605	53	770
125	Spring Creek at Zap, N. Dak.	238	1970–2008	492	46	803
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	410	110	760
127	Knife River at Hazen, N. Dak.	270	1970–2008	459	57	890
128	Antelope Creek above Hazen, N. Dak.	44	1977–1985	465	<4	1,100
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	21	1977–1985	170	6	520
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	190	27	900
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	600	56	1,000
132	Alderin Creek near Fort Clark, N. Dak.	41	1977–1983	440	46	920
133	Coal Lake Coulee near Hensler, N. Dak.	38	1978–1988	315	6	780

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sulfate, in mg/L —Continued						
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	485	27	1,000
135	Turtle Creek above Washburn, N. Dak.	102	1987–2003	324	60	2,000
136	Painted Woods Creek near Wilton, N. Dak.	201	1970–2003	550	22	2,200
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	330	25	520
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	56	1977–1982	240	16	410
139	Hagel Creek near Center, N. Dak.	38	1977–1982	240	10	500
140	Square Butte Creek below Center, N. Dak.	81	1972–2008	340	86	700
141	Burnt Creek near Bismarck, N. Dak.	48	1972–2008	262	10	580
142	Missouri River at Bismarck, N. Dak.	129	1970–2008	170	100	260
143	South Branch Heart River near South Heart, N. Dak.	20	1979–1983	225	8	910
144	North Creek near South Heart, N. Dak.	16	1978–1981	560	95	1,700
145	Heart River near South Heart, N. Dak.	76	1975–2005	720	59	2,100
146	Heart River at Dickinson, N. Dak.	22	1986–1994	565	221	931
147	Green River near New Hradec, N. Dak.	116	1972–2008	230	8	1,100
148	Green River near Gladstone, N. Dak.	33	1970–1993	490	60	862
149	Heart River near Richardton, N. Dak.	154	1972–2008	550	105	1,070
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	415	98	1,100
151	Antelope Creek near Carson, N. Dak.	26	1972–2008	200	90	810
152	Big Muddy Creek near Almont, N. Dak.	39	1991–2008	473	120	960
153	Heart River near Lark, N. Dak.	45	1971–1995	340	75	530
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	388	41	610
155	Sweetbriar Creek near Judson, N. Dak.	33	1972–2008	320	39	670
156	Heart River near Mandan, N. Dak.	232	1971–2008	440	55	866
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	33	1988–2004	141	33	320
158	Apple Creek near Menoken, N. Dak.	129	1972–2008	230	11	630
159	Missouri River near Schmidt, N. Dak.	68	1974–1981	180	140	260
160	Cannonball River at New England, N. Dak.	36	1978–1981	935	120	2,200
161	Coal Bank Creek near Havelock, N. Dak.	84	1974–1983	790	120	2,600
162	Cannonball River at Regent, N. Dak.	119	1970–2008	640	130	1,400
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	820	200	1,650
164	Cannonball River near Raleigh, N. Dak.	89	1993–2008	640	106	2,210
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	1,500	170	3,400
166	Cedar Creek near Haynes, N. Dak.	76	1971–2008	707	66	1,900
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	1,100	270	2,100
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	1,115	120	1,800
169	Cedar Creek near Raleigh, N. Dak.	120	1972–2008	570	90	1,800
170	Cannonball River at Breien, N. Dak.	260	1970–2008	568	7	1,500
171	Beaver Creek near Linton, N. Dak.	39	1972–1993	140	20	300
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	224	30	360

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sulfate, in mg/L—Continued						
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	211	11	370
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	2,400	410	5,800
175	James River near Manfred, N. Dak.	48	1972–1998	150	16	340
176	James River near Grace City, N. Dak.	155	1972–2008	190	25	968
177	James River above Arrowwood Lake near Kensal, N. Dak.	172	1985–2008	185	31	604
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	100	27	130
179	James River near Pingree, N. Dak.	142	1978–2008	153	38	530
180	Pipestem Creek near Pingree, N. Dak.	71	1974–2008	220	32	632
181	Pipestem Creek near Buchanan, N. Dak.	9	1972–1993	110	18	200
182	James River at Jamestown, N. Dak.	201	1972–2008	190	42	377
183	James River at Lamoure, N. Dak.	284	1970–2008	170	22	510
184	Bear Creek near Oakes, N. Dak.	54	1977–2008	339	30	900
185	James River at Oakes, N. Dak.	142	1970–2008	170	37	1,000
186	James River at N. Dak./S. Dak. State line	97	1974–2008	176	36	1,000
Total dissolved solids, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	894	151	3,050
2	Red River of the North at Wahpeton, N. Dak.	61	1973–2003	324	177	959
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	442	321	1,090
4	Red River of the North at Brushville, Minn.	61	1993–2007	352	199	577
5	Red River of the North below Wahpeton, N. Dak.	44	1970–1974	299	232	448
6	Red River of the North at Hickson, N. Dak.	98	1975–2003	331	168	1,180
7	Wild Rice River near Rutland, N. Dak.	36	1971–2003	969	170	2,200
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	795	567	3,340
9	Antelope Creek at Dwight, N. Dak.	2	2001–2003	434	368	500
10	Wild Rice River near Abercrombie, N. Dak.	243	1970–2007	925	83	2,840
11	Red River of the North at Fargo, N. Dak.	141	1970–2003	324	140	644
12	Red River of North below Fargo, N. Dak.	174	1970–1986	355	183	769
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	446	222	719
14	Red River of the North near Harwood, N. Dak.	26	1993–1996	428	313	624
15	Sheyenne River above Harvey, N. Dak.	186	1972–2003	922	152	1,590
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	380	125	644
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	727	399	1,040
18	Sheyenne River near Warwick, N. Dak.	209	1970–2007	506	166	952
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	28	1987–2003	424	168	1,490
20	Mauvais Coulee near Cando, N. Dak.	84	1972–2003	545	214	1,350
21	Edmore Coulee near Edmore, N. Dak.	82	1972–2003	486	135	1,620
22	Edmore Coulee Tributary near Webster, N. Dak.	28	1987–2003	413	187	2,150
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	492	491	493
24	Starkweather Coulee near Webster, N. Dak.	73	1983–2003	373	93	834

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total dissolved solids, in mg/L—Continued						
25	Big Coulee below Churchs Ferry, N. Dak.	13	1998–2003	545	351	1,110
26	Little Coulee near Leeds, N. Dak.	9	1998–2003	578	269	821
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	572	168	2,240
28	Big Coulee near Churchs Ferry, N. Dak.	136	1970–1997	498	196	1,910
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	2,060	457	7,610
30	Channel A near Penn, N. Dak.	75	1984–2003	516	271	2,300
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	3	2002–2003	3,970	1,330	4,980
32	Sheyenne River near Cooperstown, N. Dak.	331	1970–2007	622	169	1,070
33	Baldhill Creek near Dazey, N. Dak.	83	1972–2003	555	131	991
34	Sheyenne River below Baldhill Dam, N. Dak.	144	1972–2007	579	196	1,090
35	Sheyenne River at Valley City, N. Dak.	27	1972–2003	473	278	886
36	Sheyenne River at Lisbon, N. Dak.	333	1970–2007	605	220	1,060
37	Sheyenne River near Kindred, N. Dak.	301	1972–2007	562	200	991
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	18	1993–2003	633	277	832
39	Sheyenne River near Horace, N. Dak.	45	1976–1992	539	231	772
40	Sheyenne River Diversion at West Fargo, N. Dak.	8	1994–2001	499	273	743
41	Sheyenne River at West Fargo, N. Dak.	56	1970–2006	565	260	903
42	Maple River near Hope, N. Dak.	30	1972–2003	654	209	2,210
43	Maple River near Enderlin, N. Dak.	52	1972–2003	1,070	182	1,570
44	Maple River near Mapleton, N. Dak.	14	1972–2003	859	326	1,260
45	Maple River below Mapleton, N. Dak.	62	1995–2007	940	223	2,800
46	Sheyenne River at Harwood, N. Dak.	14	1993–2003	569	382	956
47	Rush River at Amenias, N. Dak.	40	1972–2003	766	137	1,430
48	Rush River near Prosper, N. Dak.	4	1983–1987	294	159	1,270
49	Lower Branch Rush River near Prosper, N. Dak.	5	1983–1993	172	119	865
50	Sheyenne River near Harwood, N. Dak.	45	1970–1996	632	327	965
51	Elm River near Kelso, N. Dak.	6	1983–1993	684	212	855
52	Red River of the North at Halstad, Minn.	158	1972–2003	429	176	695
53	Beaver Creek near Finley, N. Dak.	113	1970–2003	787	138	2,110
54	Goose River near Portland, N. Dak.	30	1970–1988	939	221	1,790
55	Goose River at Hillsboro, N. Dak.	146	1970–2007	983	228	2,190
56	Red River of the North at Grand Forks, N. Dak.	206	1970–2006	344	158	731
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	88	1991–2003	614	165	1,150
58	Turtle River at Manvel, N. Dak.	74	1971–2006	1,460	465	4,560
59	Red River of the North at Oslo, Minn.	71	1973–2002	334	183	679
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	430	312	2,460
61	Forest River near Fordville, N. Dak.	53	1972–2003	465	294	988
62	Forest River near Minto, N. Dak.	121	1971–2006	570	173	2,890
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	486	203	647

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total dissolved solids, in mg/L —Continued						
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	381	160	493
65	Middle Branch Park River near Edinburg, N. Dak.	12	1979–1980	296	139	424
66	Cart Creek at Mountain, N. Dak.	16	1972–1984	459	166	734
67	Park River at Grafton, N. Dak.	111	1970–2006	781	219	2,260
68	Red River of the North at Drayton, N. Dak.	61	1972–2003	411	179	932
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	326	199	843
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	476	241	1,090
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	345	237	788
72	Pembina River near Vang, N. Dak.	63	1970–1979	485	183	1,000
73	Little South Pembina River near Walhalla, N. Dak.	71	1970–2003	511	132	700
74	Pembina River at Walhalla, N. Dak.	257	1970–2003	554	175	1,200
75	Pembina River at Neche, N. Dak.	100	1972–2006	551	215	797
76	Tongue River at Akra, N. Dak.	60	1972–2003	361	195	515
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	436	286	480
78	Red River of the North at Pembina, N. Dak., site 2	123	1970–2006	414	203	1,060
79	Red River of the North at Emerson, Manitoba	145	1977–2000	438	245	1,100
80	Long Creek near Noonan, N. Dak.	58	1972–2003	875	117	2,020
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	1,095	378	2,860
82	Souris River near Sherwood, N. Dak.	371	1972–2008	746	170	2,540
83	Souris River near Foxholm, N. Dak.	132	1972–2003	626	138	1,620
84	Des Lacs River at Foxholm, N. Dak.	176	1972–2007	1,090	106	2,520
85	Souris River above Minot, N. Dak.	207	1970–2008	745	196	4,110
86	Bonnes Creek near Velva, N. Dak.	16	1987–2003	703	196	2,180
87	Souris River near Verendrye, N. Dak.	370	1970–2008	808	199	2,400
88	Wintering River near Karlsruhe, N. Dak.	123	1972–2003	454	223	1,370
89	Souris River near Bantry, N. Dak.	121	1970–2002	684	224	1,320
90	Willow Creek near Willow City, N. Dak.	61	1972–2003	658	10	1,760
91	Stone Creek near Kramer, N. Dak.	14	1986–1993	434	175	2,550
92	Deep River near Upham, N. Dak.	40	1972–2003	503	133	925
93	Egg Creek near Granville, N. Dak.	14	1972–1981	448	179	1,240
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	780	298	1,230
95	Cut Bank Creek at Upham, N. Dak.	17	1975–1989	636	245	2,260
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	691	184	1,510
97	Boundary Creek near Landa, N. Dak.	23	1972–1994	588	204	1,420
98	Souris River near Westhope, N. Dak.	279	1970–2008	680	230	2,830
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	1,690	232	2,550
100	Missouri River near Williston, N. Dak.	89	1970–1982	476	269	645
101	Little Muddy River below Cow Creek near Williston, N. Dak.	66	1972–2003	1,410	141	1,830
102	Stony Creek near Williston, N. Dak.	32	1977–1981	1,430	144	1,970
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	1,800	347	2,860

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total dissolved solids, in mg/L —Continued						
104	Beaver Creek near Ray, N. Dak.	50	1977–1982	1,420	147	1,690
105	White Earth River at White Earth, N. Dak.	27	1970–1977	1,350	261	1,890
106	Bear Den Creek near Mandaree, N. Dak.	212	1970–2003	1,815	171	3,110
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	1,760	256	2,130
108	East Fork Shell Creek near Parshall, N. Dak.	45	1991–2003	2,230	160	3,036
109	Deepwater Creek near Mandaree, N. Dak.	40	1991–2003	1,326	130	2,080
110	Little Missouri River at Marmarth, N. Dak.	74	1971–2003	1,040	184	2,230
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	3,100	548	4,450
112	Little Missouri River at Medora, N. Dak.	100	1972–2007	1,205	259	4,110
113	Beaver Creek near Trotters, N. Dak.	83	1977–2003	1,800	222	2,760
114	Little Missouri River near Watford City, N. Dak.	230	1971–2007	1,235	264	3,150
115	Missouri River at Garrison Dam, N. Dak.	277	1971–2007	424	350	641
116	Knife River at Manning, N. Dak.	107	1972–2003	1,160	81	2,400
117	Stray Creek near Manning, N. Dak.	17	1975–1981	1,610	460	4,360
118	Knife River at Marshall, N. Dak.	69	1972–1981	1,400	192	2,560
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	762	215	2,450
120	Knife River near Golden Valley, N. Dak.	119	1971–2007	1,310	148	3,410
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	1,220	159	2,420
122	Brush Creek near Beulah, N. Dak.	107	1974–1990	1,270	174	2,540
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	53	1977–1993	1,300	164	2,430
124	Spring Creek near Halliday, N. Dak.	46	1977–1981	1,325	157	1,620
125	Spring Creek at Zap, N. Dak.	221	1970–2007	1,120	145	1,790
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	833	234	1,560
127	Knife River at Hazen, N. Dak.	256	1970–2007	1,110	200	1,890
128	Antelope Creek above Hazen, N. Dak.	44	1977–1985	1,125	112	2,350
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	12	1977–1985	598	112	1,020
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	614	113	1,930
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	1,445	166	2,510
132	Alderin Creek near Fort Clark, N. Dak.	40	1977–1983	1,075	162	2,370
133	Coal Lake Coulee near Hensler, N. Dak.	39	1978–1988	925	98	1,760
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	1,655	164	3,120
135	Turtle Creek above Washburn, N. Dak.	55	1987–2003	1,310	436	3,800
136	Painted Woods Creek near Wilton, N. Dak.	153	1970–2003	1,140	110	3,750
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	772	81	1,120
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	55	1977–1982	775	112	1,030
139	Hagel Creek near Center, N. Dak.	38	1977–1982	762	112	1,490
140	Square Butte Creek below Center, N. Dak.	70	1972–2003	839	342	1,290
141	Burnt Creek near Bismarck, N. Dak.	39	1972–2002	709	55	1,250
142	Missouri River at Bismarck, N. Dak.	174	1970–2003	436	274	4,050
143	South Branch Heart River near South Heart, N. Dak.	19	1979–1983	462	220	1,720

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total dissolved solids, in mg/L—Continued						
144	North Creek near South Heart, N. Dak.	16	1978–1981	1,175	235	3,460
145	Heart River near South Heart, N. Dak.	72	1975–2002	1,655	203	3,550
146	Heart River at Dickinson, N. Dak.	22	1986–1994	1,245	514	2,140
147	Green River near New Hradec, N. Dak.	105	1972–2003	685	103	2,140
148	Green River near Gladstone, N. Dak.	33	1970–1993	1,080	177	1,950
149	Heart River near Richardton, N. Dak.	144	1972–2007	1,130	242	2,290
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	29	1989–2003	1,010	257	1,850
151	Antelope Creek near Carson, N. Dak.	17	1972–2003	615	303	1,550
152	Big Muddy Creek near Almont, N. Dak.	28	1991–2003	1,130	276	2,010
153	Heart River near Lark, N. Dak.	45	1971–1995	750	193	1,090
154	Heart River at Stark Bridge near Judson, N. Dak.	30	1988–2003	886	176	1,280
155	Sweetbriar Creek near Judson, N. Dak.	23	1972–2003	809	184	1,380
156	Heart River near Mandan, N. Dak.	219	1971–2007	961	182	1,980
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	29	1988–2002	595	150	1,040
158	Apple Creek near Menoken, N. Dak.	117	1972–2003	970	93	1,730
159	Missouri River near Schmidt, N. Dak.	141	1974–1981	441	347	525
160	Cannonball River at New England, N. Dak.	35	1978–1981	1,790	281	4,070
161	Coal Bank Creek near Havelock, N. Dak.	83	1974–1983	1,550	309	4,290
162	Cannonball River at Regent, N. Dak.	108	1970–2003	1,320	290	2,450
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	1,530	366	2,800
164	Cannonball River near Raleigh, N. Dak.	80	1993–2007	1,235	367	4,340
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	2,575	368	5,200
166	Cedar Creek near Haynes, N. Dak.	65	1971–2003	1,520	232	3,230
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	1,990	531	3,480
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	1,900	302	2,970
169	Cedar Creek near Raleigh, N. Dak.	111	1972–2007	1,150	241	3,030
170	Cannonball River at Breien, N. Dak.	246	1970–2007	1,175	20	2,960
171	Beaver Creek near Linton, N. Dak.	39	1972–1993	538	72	834
172	Beaver Creek below Linton, N. Dak.	26	1990–2002	639	129	1,000
173	Porcupine Creek near Fort Yates, N. Dak.	40	1992–1999	777	82	1,390
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	4,270	772	9,280
175	James River near Manfred, N. Dak.	48	1972–1998	593	134	933
176	James River near Grace City, N. Dak.	145	1972–2007	646	134	6,540
177	James River above Arrowwood Lake near Kensal, N. Dak.	171	1985–2008	656	164	1,818
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	362	218	529
179	James River near Pingree, N. Dak.	143	1978–2008	552	191	1,147
180	Pipestem Creek near Pingree, N. Dak.	60	1974–2003	580	174	1,110
181	Pipestem Creek near Buchanan, N. Dak.	9	1972–1993	376	81	619
182	James River at Jamestown, N. Dak.	188	1972–2007	591	197	1,060
183	James River at Lamoure, N. Dak.	272	1970–2007	609	141	1,790

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total dissolved solids, in mg/L —Continued						
184	Bear Creek near Oakes, N. Dak.	43	1977–2003	857	141	1,680
185	James River at Oakes, N. Dak.	125	1970–2008	672	155	3,330
186	James River at N. Dak./S. Dak. State line	85	1974–2003	541	177	2,960
Fluoride, in mg/L						
2	Red River of the North at Wahpeton, N. Dak.	55	1973–2008	<1.0	<1.0	<1.0
5	Red River of the North below Wahpeton, N. Dak.	14	1970–1974	<1.0	<1.0	<1.0
6	Red River of the North at Hickson, N. Dak.	111	1975–2008	<1.0	<1.0	<1.0
7	Wild Rice River near Rutland, N. Dak.	47	1971–2008	<1.0	<1.0	<1.0
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	<1.0	<1.0	6.7
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	<1.0	<1.0	<1.0
10	Wild Rice River near Abercrombie, N. Dak.	161	1970–2008	<1.0	<1.0	1.5
11	Red River of the North at Fargo, N. Dak.	119	1970–2008	<1.0	<1.0	<1.0
12	Red River of North below Fargo, N. Dak.	145	1970–1986	<1.0	<1.0	<1.0
14	Red River of the North near Harwood, N. Dak.	13	2005–2007	<1.0	<1.0	<1.0
15	Sheyenne River above Harvey, N. Dak.	197	1972–2008	<1.0	<1.0	<1.0
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	<1.0	<1.0	<1.0
18	Sheyenne River near Warwick, N. Dak.	108	1970–2008	<1.0	<1.0	<1.0
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	<1.0	<1.0	<1.0
20	Mauvais Coulee near Cando, N. Dak.	103	1972–2008	<1.0	<1.0	<1.0
21	Edmore Coulee near Edmore, N. Dak.	103	1972–2008	<1.0	<1.0	<1.0
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	<1.0	<1.0	<1.0
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	<1.0	<1.0	<1.0
24	Starkweather Coulee near Webster, N. Dak.	92	1983–2008	<1.0	<1.0	<1.0
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	<1.0	<1.0	<1.0
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	<1.0	<1.0	<1.0
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	<1.0	<1.0	<1.0
28	Big Coulee near Churchs Ferry, N. Dak.	135	1970–1997	<1.0	<1.0	1.2
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	<1.0	<1.0	<1.0
30	Channel A near Penn, N. Dak.	84	1984–2008	<1.0	<1.0	<1.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	11	2002–2007	<1.0	<1.0	<1.0
32	Sheyenne River near Cooperstown, N. Dak.	230	1970–2008	<1.0	<1.0	<1.0
33	Baldhill Creek near Dazey, N. Dak.	91	1972–2008	<1.0	<1.0	<1.0
34	Sheyenne River below Baldhill Dam, N. Dak.	95	1972–2008	<1.0	<1.0	<1.0
35	Sheyenne River at Valley City, N. Dak.	25	1972–2005	<1.0	<1.0	<1.0
36	Sheyenne River at Lisbon, N. Dak.	231	1970–2008	<1.0	<1.0	<1.0
37	Sheyenne River near Kindred, N. Dak.	239	1972–2008	<1.0	<1.0	<1.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	41	1993–2008	<1.0	<1.0	<1.0
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	<1.0	<1.0	<1.0
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	<1.0	<1.0	<1.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Fluoride, in mg/L —Continued						
41	Sheyenne River at West Fargo, N. Dak.	49	1970–2008	<1.0	<1.0	<1.0
42	Maple River near Hope, N. Dak.	39	1972–2008	<1.0	<1.0	<1.0
43	Maple River near Enderlin, N. Dak.	63	1972–2008	<1.0	<1.0	<1.0
44	Maple River near Mapleton, N. Dak.	25	1972–2008	<1.0	<1.0	<1.0
45	Maple River below Mapleton, N. Dak.	28	1995–2008	<1.0	<1.0	<1.0
46	Sheyenne River at Harwood, N. Dak.	6	2000–2005	<1.0	<1.0	<1.0
47	Rush River at Amenia, N. Dak.	51	1972–2008	<1.0	<1.0	<1.0
48	Rush River near Prosper, N. Dak.	4	1983–1987	<1.0	<1.0	<1.0
49	Lower Branch Rush River near Prosper, N. Dak.	4	1983–1987	<1.0	<1.0	<1.0
50	Sheyenne River near Harwood, N. Dak.	15	1970–1996	<1.0	<1.0	<1.0
51	Elm River near Kelso, N. Dak.	3	1983–1987	<1.0	<1.0	<1.0
52	Red River of the North at Halstad, Minn.	179	1972–2008	<1.0	<1.0	<1.0
53	Beaver Creek near Finley, N. Dak.	114	1970–2003	<1.0	<1.0	<1.0
54	Goose River near Portland, N. Dak.	30	1970–1988	<1.0	<1.0	<1.0
55	Goose River at Hillsboro, N. Dak.	91	1970–2008	<1.0	<1.0	1.5
56	Red River of the North at Grand Forks, N. Dak.	151	1970–2008	<1.0	<1.0	<1.0
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	<1.0	<1.0	<1.0
58	Turtle River at Manvel, N. Dak.	59	1971–2008	<1.0	<1.0	1.5
59	Red River of the North at Oslo, Minn.	72	1973–2005	<1.0	<1.0	<1.0
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	<1.0	<1.0	<1.0
61	Forest River near Fordville, N. Dak.	64	1972–2008	<1.0	<1.0	<1.0
62	Forest River near Minto, N. Dak.	108	1971–2008	<1.0	<1.0	<1.0
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	<1.0	<1.0	<1.0
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	<1.0	<1.0	<1.0
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	<1.0	<1.0	<1.0
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	<1.0	<1.0	<1.0
67	Park River at Grafton, N. Dak.	104	1970–2008	<1.0	<1.0	2.0
68	Red River of the North at Drayton, N. Dak.	57	1972–2008	<1.0	<1.0	<1.0
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	<1.0	<1.0	<1.0
70	Hidden Island Coulee near Hansboro, N. Dak.	22	1972–1995	<1.0	<1.0	<1.0
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	<1.0	<1.0	<1.0
72	Pembina River near Vang, N. Dak.	63	1970–1979	<1.0	<1.0	<1.0
73	Little South Pembina River near Walhalla, N. Dak.	82	1970–2008	<1.0	<1.0	<1.0
74	Pembina River at Walhalla, N. Dak.	225	1970–2008	<1.0	<1.0	<1.0
75	Pembina River at Neche, N. Dak.	78	1972–2008	<1.0	<1.0	<1.0
76	Tongue River at Akra, N. Dak.	71	1972–2008	<1.0	<1.0	<1.0
78	Red River of the North at Pembina, N. Dak., site 2	108	1970–2008	<1.0	<1.0	<1.0
79	Red River of the North at Emerson, Manitoba	144	1978–2000	<1.0	<1.0	<1.0
80	Long Creek near Noonan, N. Dak.	60	1972–2008	<1.0	<1.0	<1.0
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	<1.0	<1.0	<1.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Fluoride, in mg/L —Continued						
82	Souris River near Sherwood, N. Dak.	297	1972–2008	<1.0	<1.0	1.8
83	Souris River near Foxholm, N. Dak.	192	1972–2008	<1.0	<1.0	1.2
84	Des Lacs River at Foxholm, N. Dak.	92	1972–2008	<1.0	<1.0	<1.0
85	Souris River above Minot, N. Dak.	137	1970–2008	<1.0	<1.0	<1.0
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	<1.0	<1.0	<1.0
87	Souris River near Verendrye, N. Dak.	287	1970–2008	<1.0	<1.0	1.2
88	Wintering River near Karlsruhe, N. Dak.	123	1972–2008	<1.0	<1.0	<1.0
89	Souris River near Bantry, N. Dak.	124	1970–2008	<1.0	<1.0	<1.0
90	Willow Creek near Willow City, N. Dak.	65	1972–2008	<1.0	<1.0	<1.0
91	Stone Creek near Kramer, N. Dak.	14	1986–1993	<1.0	<1.0	<1.0
92	Deep River near Upham, N. Dak.	42	1972–2007	<1.0	<1.0	<1.0
93	Egg Creek near Granville, N. Dak.	14	1972–1981	<1.0	<1.0	<1.0
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	<1.0	<1.0	<1.0
95	Cut Bank Creek at Upham, N. Dak.	17	1975–1989	<1.0	<1.0	<1.0
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	<1.0	<1.0	<1.0
97	Boundary Creek near Landa, N. Dak.	23	1972–1994	<1.0	<1.0	<1.0
98	Souris River near Westhope, N. Dak.	193	1970–2008	<1.0	<1.0	<1.0
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	<1.0	<1.0	<1.0
100	Missouri River near Williston, N. Dak.	88	1974–1992	<1.0	<1.0	<1.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	68	1972–2008	<1.0	<1.0	<1.0
102	Stony Creek near Williston, N. Dak.	32	1977–1981	<1.0	<1.0	<1.0
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	<1.0	<1.0	<1.0
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	<1.0	<1.0	<1.0
105	White Earth River at White Earth, N. Dak.	27	1970–1977	<1.0	<1.0	<1.0
106	Bear Den Creek near Mandaree, N. Dak.	228	1970–2008	<1.0	<1.0	2.5
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	<1.0	<1.0	<1.0
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	<1.0	<1.0	<1.0
109	Deepwater Creek near Mandaree, N. Dak.	56	1991–2008	<1.0	<1.0	<1.0
110	Little Missouri River at Marmarth, N. Dak.	78	1971–2008	<1.0	<1.0	1.2
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	<1.0	<1.0	<1.0
112	Little Missouri River at Medora, N. Dak.	24	1972–2008	<1.0	<1.0	<1.0
113	Beaver Creek near Trotters, N. Dak.	86	1977–2008	<1.0	<1.0	<1.0
114	Little Missouri River near Watford City, N. Dak.	162	1971–2008	<1.0	<1.0	<1.0
115	Missouri River at Garrison Dam, N. Dak.	256	1971–2007	<1.0	<1.0	4.8
116	Knife River at Manning, N. Dak.	118	1972–2008	<1.0	<1.0	1.4
117	Stray Creek near Manning, N. Dak.	17	1975–1981	<1.0	<1.0	<1.0
118	Knife River at Marshall, N. Dak.	69	1972–1981	<1.0	<1.0	1.3
119	Elm Creek near Golden Valley, N. Dak.	36	1973–1994	<1.0	<1.0	<1.0
120	Knife River near Golden Valley, N. Dak.	70	1971–2008	<1.0	<1.0	<1.0
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	<1.0	<1.0	<1.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Fluoride, in mg/L—Continued						
122	Brush Creek near Beulah, N. Dak.	99	1974–1990	<1.0	<1.0	<1.0
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	47	1977–1981	<1.0	<1.0	<1.0
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	<1.0	<1.0	<1.0
125	Spring Creek at Zap, N. Dak.	159	1970–2008	<1.0	<1.0	<1.0
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1995	<1.0	<1.0	<1.0
127	Knife River at Hazen, N. Dak.	188	1970–2008	<1.0	<1.0	<1.0
128	Antelope Creek above Hazen, N. Dak.	27	1977–1982	<1.0	<1.0	<1.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	10	1977–1982	<1.0	<1.0	<1.0
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	<1.0	<1.0	<1.0
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	<1.0	<1.0	<1.0
132	Alderin Creek near Fort Clark, N. Dak.	35	1977–1982	<1.0	<1.0	<1.0
133	Coal Lake Coulee near Hensler, N. Dak.	16	1978–1982	<1.0	<1.0	<1.0
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	<1.0	<1.0	<1.0
135	Turtle Creek above Washburn, N. Dak.	100	1987–2003	<1.0	<1.0	<1.0
136	Painted Woods Creek near Wilton, N. Dak.	199	1970–2003	<1.0	<1.0	<1.0
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	<1.0	<1.0	<1.0
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	56	1977–1982	<1.0	<1.0	<1.0
139	Hagel Creek near Center, N. Dak.	38	1977–1982	<1.0	<1.0	<1.0
140	Square Butte Creek below Center, N. Dak.	79	1972–2008	<1.0	<1.0	<1.0
141	Burnt Creek near Bismarck, N. Dak.	48	1972–2008	<1.0	<1.0	2.0
142	Missouri River at Bismarck, N. Dak.	97	1974–2008	<1.0	<1.0	<1.0
143	South Branch Heart River near South Heart, N. Dak.	19	1979–1983	<1.0	<1.0	<1.0
144	North Creek near South Heart, N. Dak.	16	1978–1981	<1.0	<1.0	<1.0
145	Heart River near South Heart, N. Dak.	76	1975–2005	<1.0	<1.0	2.6
146	Heart River at Dickinson, N. Dak.	17	1986–1994	<1.0	<1.0	<1.0
147	Green River near New Hradec, N. Dak.	116	1972–2008	<1.0	<1.0	1.1
148	Green River near Gladstone, N. Dak.	29	1970–1975	<1.0	<1.0	1.1
149	Heart River near Richardton, N. Dak.	80	1972–2008	<1.0	<1.0	<1.0
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	<1.0	<1.0	<1.0
151	Antelope Creek near Carson, N. Dak.	26	1972–2008	<1.0	<1.0	<1.0
152	Big Muddy Creek near Almont, N. Dak.	36	1991–2008	<1.0	<1.0	1.5
153	Heart River near Lark, N. Dak.	45	1971–1995	<1.0	<1.0	1.3
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	<1.0	<1.0	<1.0
155	Sweetbriar Creek near Judson, N. Dak.	33	1972–2008	<1.0	<1.0	<1.0
156	Heart River near Mandan, N. Dak.	152	1971–2008	<1.0	<1.0	1.1
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	33	1988–2004	<1.0	<1.0	<1.0
158	Apple Creek near Menoken, N. Dak.	125	1972–2008	<1.0	<1.0	1.5
159	Missouri River near Schmidt, N. Dak.	63	1975–1981	<1.0	<1.0	<1.0
160	Cannonball River at New England, N. Dak.	36	1978–1981	<1.0	<1.0	<1.0
161	Coal Bank Creek near Havelock, N. Dak.	84	1974–1983	<1.0	<1.0	<1.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Fluoride, in mg/L —Continued						
162	Cannonball River at Regent, N. Dak.	119	1970–2008	<1.0	<1.0	1.1
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	<1.0	<1.0	<1.0
164	Cannonball River near Raleigh, N. Dak.	15	2001–2008	<1.0	<1.0	<1.0
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	<1.0	<1.0	<1.0
166	Cedar Creek near Haynes, N. Dak.	76	1971–2008	<1.0	<1.0	1.1
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	<1.0	<1.0	<1.0
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	<1.0	<1.0	1.1
169	Cedar Creek near Raleigh, N. Dak.	55	1972–2008	<1.0	<1.0	<1.0
170	Cannonball River at Breien, N. Dak.	188	1970–2008	<1.0	<1.0	1.4
171	Beaver Creek near Linton, N. Dak.	35	1972–1989	<1.0	<1.0	<1.0
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	<1.0	<1.0	<1.0
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	<1.0	<1.0	1.5
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	<1.0	<1.0	1.8
175	James River near Manfred, N. Dak.	24	1972–1995	<1.0	<1.0	<1.0
176	James River near Grace City, N. Dak.	73	1972–2008	<1.0	<1.0	2.8
177	James River above Arrowwood Lake near Kensal, N. Dak.	138	1991–2008	<1.0	<1.0	<1.0
179	James River near Pingree, N. Dak.	134	1978–2008	<1.0	<1.0	<1.0
180	Pipestem Creek near Pingree, N. Dak.	54	1974–2008	<1.0	<1.0	<1.0
181	Pipestem Creek near Buchanan, N. Dak.	4	1972–1974	<1.0	<1.0	<1.0
182	James River at Jamestown, N. Dak.	80	1972–2008	<1.0	<1.0	<1.0
183	James River at Lamoure, N. Dak.	213	1970–2008	<1.0	<1.0	2.0
184	Bear Creek near Oakes, N. Dak.	45	1977–2008	<1.0	<1.0	<1.0
185	James River at Oakes, N. Dak.	110	1970–2008	<1.0	<1.0	<1.0
186	James River at N. Dak./S. Dak. State line	88	1974–2008	<1.0	<1.0	<1.0
Silica, in mg/L						
2	Red River of the North at Wahpeton, N. Dak.	35	1973–2008	14.0	2	21.0
6	Red River of the North at Hickson, N. Dak.	92	1975–2008	13.0	<1.0	23.0
7	Wild Rice River near Rutland, N. Dak.	30	1971–2008	11.0	<1.0	42.0
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	14.0	<1.0	25.0
9	Antelope Creek at Dwight, N. Dak.	7	2003–2008	14.8	9.1	17.8
10	Wild Rice River near Abercrombie, N. Dak.	141	1970–2008	21.4	2.3	51.0
11	Red River of the North at Fargo, N. Dak.	104	1970–2008	14.0	1.5	25.8
12	Red River of North below Fargo, N. Dak.	132	1973–1986	13.0	<1.0	46.0
14	Red River of the North near Harwood, N. Dak.	13	2005–2007	20.1	13.6	66.7
15	Sheyenne River above Harvey, N. Dak.	181	1972–2008	24.0	2.2	52.0
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	23.5	2.5	32.0
18	Sheyenne River near Warwick, N. Dak.	87	1970–2008	16.3	2.8	40.0
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	19	1987–2008	18.0	2.4	56.0
20	Mauvais Coulee near Cando, N. Dak.	59	1972–2008	14.0	<1.0	54.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Silica, in mg/L—Continued						
21	Edmore Coulee near Edmore, N. Dak.	57	1972–2008	15.0	<1.0	34.8
22	Edmore Coulee Tributary near Webster, N. Dak.	17	1987–2008	17.0	2.0	35.5
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	15.0	12.0	18.0
24	Starkweather Coulee near Webster, N. Dak.	49	1983–2008	19.0	<1.0	35.0
25	Big Coulee below Churchs Ferry, N. Dak.	6	2003–2008	17.7	8.3	20.6
26	Little Coulee near Leeds, N. Dak.	5	2004–2008	20.8	5.3	31.6
27	Little Coulee near Brinsmade, N. Dak.	24	1976–1994	17.5	1.4	37.0
28	Big Coulee near Churchs Ferry, N. Dak.	113	1970–1994	15.0	<1.0	58.0
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	44	1970–1986	14.0	2.3	38.0
30	Channel A near Penn, N. Dak.	53	1984–2008	13.0	<1.0	33.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	5	2003–2005	12.8	2.1	19.5
32	Sheyenne River near Cooperstown, N. Dak.	213	1970–2008	21.9	<1.0	44.4
33	Baldhill Creek near Dazey, N. Dak.	72	1972–2008	13.8	<1.0	34.0
34	Sheyenne River below Baldhill Dam, N. Dak.	78	1972–2008	15.0	<1.0	31.5
35	Sheyenne River at Valley City, N. Dak.	15	1972–2005	13.0	3.8	29.9
36	Sheyenne River at Lisbon, N. Dak.	213	1970–2008	13.0	<1.0	28.0
37	Sheyenne River near Kindred, N. Dak.	222	1972–2008	17.0	3.9	48.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	23	1993–2008	22.4	9.4	73.9
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	13.0	8.6	21.0
40	Sheyenne River Diversion at West Fargo, N. Dak.	4	1994–2005	17.7	13.3	26.5
41	Sheyenne River at West Fargo, N. Dak.	39	1970–2008	16.0	3.2	24.0
42	Maple River near Hope, N. Dak.	25	1972–2008	19.0	4.5	36.0
43	Maple River near Enderlin, N. Dak.	43	1972–2008	21.0	9.2	29.0
44	Maple River near Mapleton, N. Dak.	15	1972–2008	19.0	9.3	29.2
45	Maple River below Mapleton, N. Dak.	8	2003–2008	22.0	11.7	28.7
46	Sheyenne River at Harwood, N. Dak.	2	2004–2005	18.0	13.1	22.8
47	Rush River at Amenia, N. Dak.	31	1972–2008	16.2	3.1	32.0
48	Rush River near Prosper, N. Dak.	4	1983–1987	15.0	9.4	18.0
49	Lower Branch Rush River near Prosper, N. Dak.	4	1983–1987	16.5	9.5	22.0
51	Elm River near Kelso, N. Dak.	3	1983–1987	12.0	7.8	16.0
52	Red River of the North at Halstad, Minn.	162	1972–2008	15.0	3.8	74.1
53	Beaver Creek near Finley, N. Dak.	105	1970–2003	15.0	3.5	110.0
54	Goose River near Portland, N. Dak.	30	1970–1988	15.5	9.3	28.0
55	Goose River at Hillsboro, N. Dak.	70	1970–2008	17.0	1.7	31.0
56	Red River of the North at Grand Forks, N. Dak.	134	1970–2008	12.6	1.9	24.5
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	89	1991–2008	20.0	4.5	41.0
58	Turtle River at Manvel, N. Dak.	66	1971–2008	15.0	<1.0	33.1
59	Red River of the North at Oslo, Minn.	66	1973–2005	11.0	<1.0	20.0
60	Middle Branch Forest River near Whitman, N. Dak.	14	1972–1990	13.0	4.6	27.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Silica, in mg/L —Continued						
61	Forest River near Fordville, N. Dak.	44	1972–2008	17.0	4.9	29.0
62	Forest River near Minto, N. Dak.	90	1971–2008	17.0	2.0	33.7
63	South Branch Park River below Homme Dam, N. Dak.	27	1972–1994	14.0	1.7	24.0
64	Middle Branch Park River near Union, N. Dak.	15	1972–1984	18.0	3.6	34.0
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	16.0	<1.0	26.0
66	Cart Creek at Mountain, N. Dak.	17	1972–1984	19.0	4.6	28.0
67	Park River at Grafton, N. Dak.	88	1970–2008	17.0	3.8	32.2
68	Red River of the North at Drayton, N. Dak.	37	1972–2008	12.0	2.4	20.9
69	Pembina County Drain 20 near Glasston, N. Dak.	8	1974–1984	9.5	3.0	16.0
70	Hidden Island Coulee near Hansboro, N. Dak.	21	1972–1994	15.0	3.5	28.0
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	18.0	4.9	42.0
72	Pembina River near Vang, N. Dak.	63	1970–1979	18.0	9.4	58.0
73	Little South Pembina River near Walhalla, N. Dak.	73	1970–2008	20.0	8.6	30.0
74	Pembina River at Walhalla, N. Dak.	215	1970–2008	21.0	<1.0	34.0
75	Pembina River at Neche, N. Dak.	62	1972–2008	21.0	<1.0	34.1
76	Tongue River at Akra, N. Dak.	50	1972–2008	14.0	<1.0	25.0
78	Red River of the North at Pembina, N. Dak., site 2	94	1994–2008	15.0	2.0	62.9
79	Red River of the North at Emerson, Manitoba	143	1978–2000	13.0	2.5	38.0
80	Long Creek near Noonan, N. Dak.	41	1972–2008	6.0	<1.0	22.0
81	West Branch Short Creek near Columbus, N. Dak.	20	1978–1981	11.0	1.2	19.0
82	Souris River near Sherwood, N. Dak.	173	1972–1991	8.4	<1.0	580.0
83	Souris River near Foxholm, N. Dak.	147	1972–2008	5.9	<1.0	20.0
84	Des Lacs River at Foxholm, N. Dak.	71	1972–2008	10.0	<1.0	25.0
85	Souris River above Minot, N. Dak.	64	1970–1994	5.5	<1.0	25.0
86	Bonnes Creek near Velva, N. Dak.	9	1987–2005	12.0	4.8	21.0
87	Souris River near Verendrye, N. Dak.	186	1970–1991	9.9	<1.0	32.0
88	Wintering River near Karlsruhe, N. Dak.	103	1972–2008	15.0	3.4	35.0
89	Souris River near Bantry, N. Dak.	67	1970–2008	9.4	<1.0	23.0
90	Willow Creek near Willow City, N. Dak.	38	1972–2008	11.1	1.4	56.0
91	Stone Creek near Kramer, N. Dak.	9	1986–1989	22.0	8.9	36.0
92	Deep River near Upham, N. Dak.	24	1972–2005	7.2	1.1	27.3
93	Egg Creek near Granville, N. Dak.	14	1972–1981	7.5	1.9	12.0
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	12.0	6.5	24.0
95	Cut Bank Creek at Upham, N. Dak.	17	1975–1989	9.8	<1.0	40.0
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	11.0	<1.0	34.0
97	Boundary Creek near Landa, N. Dak.	17	1972–1994	11.0	1.1	28.0
98	Souris River near Westhope, N. Dak.	186	1970–1994	8.9	<1.0	58.0
99	Charbonneau Creek near Charbonneau, N. Dak.	22	1972–1977	7.4	1.5	12.0
100	Missouri River near Williston, N. Dak.	95	1974–1992	8.6	4.8	11.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	48	1972–2008	11.0	3.2	28.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Silica, in mg/L—Continued						
102	Stony Creek near Williston, N. Dak.	32	1977–1981	10.5	4.3	18.0
103	Tobacco Garden Creek near Watford City, N. Dak.	15	1976–1977	16.0	7.1	23.0
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	13.0	4.6	20.0
105	White Earth River at White Earth, N. Dak.	27	1970–1977	7.8	2.7	26.0
106	Bear Den Creek near Mandaree, N. Dak.	211	1970–2008	9.0	<1.0	22.0
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	11.0	3.4	23.0
108	East Fork Shell Creek near Parshall, N. Dak.	51	1991–2008	10.7	<1.0	31.0
109	Deepwater Creek near Mandaree, N. Dak.	49	1991–2008	8.8	<1.0	27.0
110	Little Missouri River at Marmarth, N. Dak.	57	1971–2008	7.0	1.2	35.0
111	Deep Creek near Amidon, N. Dak.	51	1977–1983	7.1	1.3	16.0
112	Little Missouri River at Medora, N. Dak.	15	1972–2008	6.8	2.4	10.3
113	Beaver Creek near Trotters, N. Dak.	68	1977–2008	6.4	<1.0	13.0
114	Little Missouri River near Watford City, N. Dak.	143	1971–2008	9.1	2.7	45.0
115	Missouri River at Garrison Dam, N. Dak.	254	1971–2007	6.7	<1.0	18.0
116	Knife River at Manning, N. Dak.	97	1972–2008	7.0	<1.0	40.0
117	Stray Creek near Manning, N. Dak.	17	1975–1981	3.2	<1.0	9.8
118	Knife River at Marshall, N. Dak.	69	1972–1981	8.1	1.7	16.0
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	6.6	<1.0	56.0
120	Knife River near Golden Valley, N. Dak.	50	1971–2008	8.1	<1.0	16.0
121	Coyote Creek near Zap, N. Dak.	51	1977–1983	8.1	1.2	300.0
122	Brush Creek near Beulah, N. Dak.	98	1974–1988	10.0	5.0	18.0
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	47	1977–1981	9.1	<1.0	23.0
124	Spring Creek near Halliday, N. Dak.	48	1977–1981	7.9	<1.0	19.0
125	Spring Creek at Zap, N. Dak.	143	1970–2008	9.0	1.9	55.0
126	West Branch Otter Creek near Beulah, N. Dak.	14	1972–1994	6.3	<1.0	18.0
127	Knife River at Hazen, N. Dak.	163	1970–2008	10.0	4.8	21.0
128	Antelope Creek above Hazen, N. Dak.	27	1977–1982	7.7	<1.0	19.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	10	1977–1982	7.8	3.3	11.0
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	10.3	5.5	16.0
131	Coal Creek near Stanton, N. Dak.	28	1975–1981	9.1	<1.0	20.0
132	Alderin Creek near Fort Clark, N. Dak.	35	1977–1982	7.7	1.9	14.0
133	Coal Lake Coulee near Hensler, N. Dak.	16	1978–1982	13.5	3.3	20.0
134	Buffalo Creek near Washburn, N. Dak.	38	1978–1983	8.1	<1.0	30.0
135	Turtle Creek above Washburn, N. Dak.	102	1987–2003	9.3	<1.0	34.0
136	Painted Woods Creek near Wilton, N. Dak.	201	1970–2003	9.3	<1.0	34.0
137	Square Butte Creek near Hannover, N. Dak.	23	1977–1981	8.3	<1.0	19.0
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	55	1977–1982	11.0	4.8	25.0
139	Hagel Creek near Center, N. Dak.	38	1977–1982	3.5	<1.0	13.0
140	Square Butte Creek below Center, N. Dak.	57	1972–2008	16.1	1.2	21.0
141	Burnt Creek near Bismarck, N. Dak.	29	1972–2008	4.7	1.8	22.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Silica, in mg/L —Continued						
142	Missouri River at Bismarck, N. Dak.	91	1974–2008	7.3	2.7	21.0
143	South Branch Heart River near South Heart, N. Dak.	19	1979–1983	9.1	1.6	130.0
144	North Creek near South Heart, N. Dak.	16	1978–1981	5.0	<1.0	12.0
145	Heart River near South Heart, N. Dak.	69	1975–2005	8.7	1.5	49.8
146	Heart River at Dickinson, N. Dak.	17	1986–1994	9.2	4.2	16.0
147	Green River near New Hradec, N. Dak.	96	1972–2008	6.2	1.6	16.0
148	Green River near Gladstone, N. Dak.	29	1970–1975	7.9	4.8	17.0
149	Heart River near Richardton, N. Dak.	59	1972–2008	5.2	1.3	13.0
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	19	1989–2008	5.6	2.0	9.7
151	Antelope Creek near Carson, N. Dak.	14	1972–2008	2.9	2.0	8.8
152	Big Muddy Creek near Almont, N. Dak.	15	1991–2008	7.6	2.0	13.0
153	Heart River near Lark, N. Dak.	43	1971–1994	4.8	<1.0	25.0
154	Heart River at Stark Bridge near Judson, N. Dak.	20	1988–2008	4.8	2.7	23.0
155	Sweetbriar Creek near Judson, N. Dak.	27	1972–2008	3.5	<1.0	9.5
156	Heart River near Mandan, N. Dak.	131	1971–2008	5.9	<1.0	15.0
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	17	1988–2004	14.0	6.2	25.6
158	Apple Creek near Menoken, N. Dak.	105	1972–2008	12.0	<1.0	28.0
159	Missouri River near Schmidt, N. Dak.	68	1974–1981	7.5	4.8	8.9
160	Cannonball River at New England, N. Dak.	36	1978–1981	6.8	2.7	11.0
161	Coal Bank Creek near Havelock, N. Dak.	84	1974–1983	4.6	<1.0	15.0
162	Cannonball River at Regent, N. Dak.	98	1970–2008	5.7	<1.0	14.0
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	3.7	<1.0	8.8
164	Cannonball River near Raleigh, N. Dak.	7	2004–2008	4.2	2.0	9.9
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	24	1972–1994	5.2	<1.0	23.0
166	Cedar Creek near Haynes, N. Dak.	55	1971–2008	3.2	<1.0	8.8
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	3.6	<1.0	14.0
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	4.0	1.3	6.7
169	Cedar Creek near Raleigh, N. Dak.	35	1972–2008	4.9	<1.0	20.0
170	Cannonball River at Breien, N. Dak.	167	1970–2008	6.7	<1.0	22.0
171	Beaver Creek near Linton, N. Dak.	35	1972–1989	11.0	2.8	25.0
172	Beaver Creek below Linton, N. Dak.	18	1990–2008	15.8	10.0	24.3
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	14.1	4.8	20.0
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	83	1974–1987	5.7	<1.0	17.0
175	James River near Manfred, N. Dak.	30	1972–1995	12.0	2.5	28.0
176	James River near Grace City, N. Dak.	47	1972–2008	8.7	<1.0	33.6
177	James River above Arrowwood Lake near Kensal, N. Dak.	138	1985–2008	13.6	2.2	47.0
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	4	1986–1987	11.0	4.6	14.0
179	James River near Pingree, N. Dak.	136	1978–2008	12.7	<1.0	42.8
180	Pipestem Creek near Pingree, N. Dak.	33	1974–2008	14.0	1.9	35.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Silica, in mg/L —Continued						
181	Pipestem Creek near Buchanan, N. Dak.	4	1972–1974	12.0	5.2	15.0
182	James River at Jamestown, N. Dak.	59	1972–2008	12.0	2.8	30.0
183	James River at Lamoure, N. Dak.	141	1970–2008	14.0	2.0	44.0
184	Bear Creek near Oakes, N. Dak.	24	1977–2008	10.8	3.2	39.0
185	James River at Oakes, N. Dak.	45	1972–2008	12.0	1.2	990.0
186	James River at N. Dak./S. Dak. State line	82	1974–2008	11.8	<1.0	58.0
Carbonate as CO_3 , in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	4	<1	25
2	Red River of the North at Wahpeton, N. Dak.	16	1993–1996	<1	<1	22
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	<1	<1	11
4	Red River of the North at Brushville, Minn.	61	1993–2007	<1	<1	16
10	Wild Rice River near Abercrombie, N. Dak.	58	1993–2007	<1	<1	17
11	Red River of the North at Fargo, N. Dak.	16	1994–1996	<1	<1	16
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	<1	<1	10
14	Red River of the North near Harwood, N. Dak.	25	1993–1996	<1	<1	15
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	<1	<1	67
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	10	<1	36
32	Sheyenne River near Cooperstown, N. Dak.	80	1994–2007	2	<1	24
33	Baldhill Creek near Dazey, N. Dak.	3	1993–1996	<1	<1	<1
34	Sheyenne River below Baldhill Dam, N. Dak.	73	1994–2007	9	<1	43
35	Sheyenne River at Valley City, N. Dak.	3	1993	<1	<1	<1
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	<1	<1	41
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	<1	<1	18
41	Sheyenne River at West Fargo, N. Dak.	13	1994–2006	<1	<1	36
45	Maple River below Mapleton, N. Dak.	47	1997–2007	<1	<1	19
46	Sheyenne River at Harwood, N. Dak.	9	1993	<1	<1	3
49	Lower Branch Rush River near Prosper, N. Dak.	1	1993	<1	<1	<1
51	Elm River near Kelso, N. Dak.	3	1993	<1	<1	<1
55	Goose River at Hillsboro, N. Dak.	76	1994–2007	<1	<1	45
56	Red River of the North at Grand Forks, N. Dak.	46	1997–2006	<1	<1	22
58	Turtle River at Manvel, N. Dak.	38	1993–2006	<1	<1	10
62	Forest River near Minto, N. Dak.	47	1994–2006	<1	<1	20
67	Park River at Grafton, N. Dak.	40	1994–2006	<1	<1	21
68	Red River of the North at Drayton, N. Dak.	15	1994–1996	<1	<1	13
75	Pembina River at Neche, N. Dak.	55	1994–2006	<1	<1	45
76	Tongue River at Akra, N. Dak.	1	1993	<1	<1	<1
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	<1	<1	<1
78	Red River of the North at Pembina, N. Dak., site 2	52	1997–2006	<1	<1	16
80	Long Creek near Noonan, N. Dak.	10	1997	12	<1	24
83	Souris River near Foxholm, N. Dak.	11	1997–1998	11	<1	24

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Carbonate as CO_3 , in mg/L —Continued						
84	Des Lacs River at Foxholm, N. Dak.	97	1993–2007	10	<1	89
85	Souris River above Minot, N. Dak.	75	1994–2007	2	<1	92
87	Souris River near Verendrye, N. Dak.	76	1997–2007	<1	<1	58
88	Wintering River near Karlsruhe, N. Dak.	11	1997–1998	<1	<1	36
89	Souris River near Bantry, N. Dak.	10	1997–1998	<1	<1	16
90	Willow Creek near Willow City, N. Dak.	6	1997	29	9	44
92	Deep River near Upham, N. Dak.	7	1997	11	<1	39
98	Souris River near Westhope, N. Dak.	7	1997–1998	24	<1	57
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	20	<1	24
110	Little Missouri River at Marmarth, N. Dak.	8	1999	<1	<1	23
112	Little Missouri River at Medora, N. Dak.	88	1993–2007	7	<1	39
113	Beaver Creek near Trotters, N. Dak.	9	1999	20	<1	22
114	Little Missouri River near Watford City, N. Dak.	81	1994–2007	3	<1	34
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	5	<1	60
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	6	1993	18	<1	35
125	Spring Creek at Zap, N. Dak.	77	1993–2007	<1	<1	38
127	Knife River at Hazen, N. Dak.	94	1993–2007	<1	<1	35
140	Square Butte Creek below Center, N. Dak.	3	1993	<1	<1	<1
142	Missouri River at Bismarck, N. Dak.	1	1994	<1	<1	<1
146	Heart River at Dickinson, N. Dak.	5	1993	<1	<1	19
148	Green River near Gladstone, N. Dak.	4	1993	<1	<1	17
149	Heart River near Richardton, N. Dak.	76	1994–2007	3	<1	28
152	Big Muddy Creek near Almont, N. Dak.	3	1993	19	<1	34
156	Heart River near Mandan, N. Dak.	81	1994–2007	7	<1	26
158	Apple Creek near Menoken, N. Dak.	2	1993	<1	<1	<1
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	7	<1	25
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	6	<1	45
170	Cannonball River at Breien, N. Dak.	74	1994–2007	3	<1	34
171	Beaver Creek near Linton, N. Dak.	3	1993	<1	<1	<1
175	James River near Manfred, N. Dak.	6	1998	5	<1	19
176	James River near Grace City, N. Dak.	60	1997–2007	10	<1	69
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	3	<1	37
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	4	<1	33
181	Pipestem Creek near Buchanan, N. Dak.	4	1993	<1	<1	<1
182	James River at Jamestown, N. Dak.	75	1997–2007	<1	<1	40
183	James River at Lamoure, N. Dak.	73	1996–2007	4	<1	65
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	<1	<1	9
185	James River at Oakes, N. Dak.	3	1993	<1	<1	<1
186	James River at N. Dak./S. Dak. State line	9	1998–1999	12	<1	25

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Bicarbonate as HCO_3 , in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	263	92	942
2	Red River of the North at Wahpeton, N. Dak.	17	1993–1996	233	149	442
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	284	230	516
4	Red River of the North at Brushville, Minn.	61	1993–2007	245	124	364
10	Wild Rice River near Abercrombie, N. Dak.	58	1993–2007	368	123	838
11	Red River of the North at Fargo, N. Dak.	16	1994–1996	258	178	290
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	256	131	347
14	Red River of the North near Harwood, N. Dak.	26	1993–1996	261	187	323
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	501	224	709
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	407	305	554
32	Sheyenne River near Cooperstown, N. Dak.	80	1994–2007	439	159	604
33	Baldhill Creek near Dazey, N. Dak.	3	1993–1996	414	300	438
34	Sheyenne River below Baldhill Dam, N. Dak.	73	1994–2007	338	181	618
35	Sheyenne River at Valley City, N. Dak.	4	1993	273	248	336
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	345	201	578
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	357	229	556
41	Sheyenne River at West Fargo, N. Dak.	13	1994–2006	347	199	388
45	Maple River below Mapleton, N. Dak.	47	1997–2007	348	142	1,090
46	Sheyenne River at Harwood, N. Dak.	10	1993	344	255	411
49	Lower Branch Rush River near Prosper, N. Dak.	1	1993	429	429	429
51	Elm River near Kelso, N. Dak.	3	1993	354	321	425
55	Goose River at Hillsboro, N. Dak.	76	1994–2007	347	172	608
56	Red River of the North at Grand Forks, N. Dak.	46	1997–2006	266	159	360
58	Turtle River at Manvel, N. Dak.	38	1993–2006	318	135	441
62	Forest River near Minto, N. Dak.	47	1994–2006	296	131	483
67	Park River at Grafton, N. Dak.	40	1994–2006	303	120	644
68	Red River of the North at Drayton, N. Dak.	15	1994–1996	265	181	312
75	Pembina River at Neche, N. Dak.	55	1994–2006	299	125	518
76	Tongue River at Akra, N. Dak.	1	1993	181	181	181
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	274	162	320
78	Red River of the North at Pembina, N. Dak., site 2	52	1997–2006	266	131	422
80	Long Creek near Noonan, N. Dak.	10	1997	333	176	388
83	Souris River near Foxholm, N. Dak.	11	1997–1998	252	150	584
84	Des Lacs River at Foxholm, N. Dak.	97	1993–2007	445	145	868
85	Souris River above Minot, N. Dak.	75	1994–2007	345	162	1,540
87	Souris River near Verendrye, N. Dak.	76	1997–2007	371	164	654
88	Wintering River near Karlsruhe, N. Dak.	11	1997–1998	386	250	690
89	Souris River near Bantry, N. Dak.	10	1997–1998	416	235	581
90	Willow Creek near Willow City, N. Dak.	6	1997	400	211	491
92	Deep River near Upham, N. Dak.	7	1997	267	164	333

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Bicarbonate as HCO_3 , in mg/L —Continued						
98	Souris River near Westhope, N. Dak.	7	1997–1998	332	295	911
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	628	158	661
110	Little Missouri River at Marmarth, N. Dak.	8	1999	281	148	440
112	Little Missouri River at Medora, N. Dak.	88	1993–2007	325	87	1,330
113	Beaver Creek near Trotters, N. Dak.	9	1999	396	289	484
114	Little Missouri River near Watford City, N. Dak.	81	1994–2007	339	121	875
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	588	172	1,420
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	6	1993	604	313	666
125	Spring Creek at Zap, N. Dak.	77	1993–2007	466	79	719
127	Knife River at Hazen, N. Dak.	94	1993–2007	525	138	882
140	Square Butte Creek below Center, N. Dak.	4	1993	491	404	525
142	Missouri River at Bismarck, N. Dak.	1	1994	192	192	192
146	Heart River at Dickinson, N. Dak.	5	1993	378	221	890
148	Green River near Gladstone, N. Dak.	4	1993	416	290	852
149	Heart River near Richardton, N. Dak.	76	1994–2007	362	102	827
152	Big Muddy Creek near Almont, N. Dak.	3	1993	665	335	703
156	Heart River near Mandan, N. Dak.	81	1994–2007	377	159	850
158	Apple Creek near Menoken, N. Dak.	4	1993	343	147	425
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	340	121	1,310
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	349	121	827
170	Cannonball River at Breien, N. Dak.	74	1994–2007	365	13	871
171	Beaver Creek near Linton, N. Dak.	4	1993	290	183	372
175	James River near Manfred, N. Dak.	6	1998	480	274	534
176	James River near Grace City, N. Dak.	60	1997–2007	386	146	1,090
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	313	174	708
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	391	228	571
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	299	59	448
182	James River at Jamestown, N. Dak.	75	1997–2007	347	194	515
183	James River at Lamoure, N. Dak.	73	1996–2007	303	134	650
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	379	160	451
185	James River at Oakes, N. Dak.	3	1993	272	121	284
186	James River at N. Dak./S. Dak. State line	9	1998–1999	258	227	335
Alkalinity, total, as CaCO_3 , in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	216	75	772
2	Red River of the North at Wahpeton, N. Dak.	17	1993–1996	209	141	362
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	233	188	442
4	Red River of the North at Brushville, Minn.	61	1993–2007	208	102	298
10	Wild Rice River near Abercrombie, N. Dak.	58	1993–2007	307	101	687
11	Red River of the North at Fargo, N. Dak.	16	1994–1996	212	146	254
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	211	107	285

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Alkalinity, total, as CaCO_3 , in mg/L —Continued						
14	Red River of the North near Harwood, N. Dak.	26	1993–1996	214	162	265
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	420	184	581
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	346	277	472
32	Sheyenne River near Cooperstown, N. Dak.	80	1994–2007	371	130	495
33	Baldhill Creek near Dazey, N. Dak.	3	1993–1996	339	246	359
34	Sheyenne River below Baldhill Dam, N. Dak.	73	1994–2007	299	148	506
35	Sheyenne River at Valley City, N. Dak.	4	1993	224	203	275
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	303	165	473
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	301	188	455
41	Sheyenne River at West Fargo, N. Dak.	13	1994–2006	290	163	329
45	Maple River below Mapleton, N. Dak.	47	1997–2007	301	116	893
46	Sheyenne River at Harwood, N. Dak.	10	1993	284	209	337
49	Lower Branch Rush River near Prosper, N. Dak.	1	1993	351	351	351
51	Elm River near Kelso, N. Dak.	3	1993	290	263	348
55	Goose River at Hillsboro, N. Dak.	76	1994–2007	292	141	498
56	Red River of the North at Grand Forks, N. Dak.	46	1997–2006	222	130	295
58	Turtle River at Manvel, N. Dak.	38	1993–2006	260	110	361
62	Forest River near Minto, N. Dak.	47	1994–2006	243	113	396
67	Park River at Grafton, N. Dak.	40	1994–2006	254	98	528
68	Red River of the North at Drayton, N. Dak.	15	1994–1996	217	148	256
75	Pembina River at Neche, N. Dak.	55	1994–2006	262	102	424
76	Tongue River at Akra, N. Dak.	1	1993	148	148	148
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	225	133	262
78	Red River of the North at Pembina, N. Dak., site 2	52	1997–2006	222	107	346
80	Long Creek near Noonan, N. Dak.	10	1997	303	144	346
83	Souris River near Foxholm, N. Dak.	11	1997–1998	246	123	478
84	Des Lacs River at Foxholm, N. Dak.	97	1993–2007	393	119	712
85	Souris River above Minot, N. Dak.	75	1994–2007	319	133	1,260
87	Souris River near Verendrye, N. Dak.	76	1997–2007	318	134	536
88	Wintering River near Karlsruhe, N. Dak.	11	1997–1998	324	205	565
89	Souris River near Bantry, N. Dak.	10	1997–1998	346	192	476
90	Willow Creek near Willow City, N. Dak.	6	1997	359	234	470
92	Deep River near Upham, N. Dak.	7	1997	256	134	294
98	Souris River near Westhope, N. Dak.	7	1997–1998	346	295	746
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	554	129	580
110	Little Missouri River at Marmarth, N. Dak.	8	1999	230	121	399
112	Little Missouri River at Medora, N. Dak.	88	1993–2007	287	71	1,090
113	Beaver Creek near Trotters, N. Dak.	9	1999	361	237	431
114	Little Missouri River near Watford City, N. Dak.	81	1994–2007	299	99	717

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Alkalinity, total, as CaCO_3 , in mg/L —Continued						
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	521	141	1,160
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	6	1993	526	256	604
125	Spring Creek at Zap, N. Dak.	77	1993–2007	397	65	589
127	Knife River at Hazen, N. Dak.	94	1993–2007	438	113	723
140	Square Butte Creek below Center, N. Dak.	4	1993	402	331	430
142	Missouri River at Bismarck, N. Dak.	1	1994	157	157	157
146	Heart River at Dickinson, N. Dak.	5	1993	310	181	729
148	Green River near Gladstone, N. Dak.	4	1993	355	238	698
149	Heart River near Richardton, N. Dak.	76	1994–2007	302	84	678
152	Big Muddy Creek near Almont, N. Dak.	3	1993	576	274	632
156	Heart River near Mandan, N. Dak.	81	1994–2007	330	130	697
158	Apple Creek near Menoken, N. Dak.	4	1993	281	120	348
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	298	99	1,070
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	310	99	710
170	Cannonball River at Breien, N. Dak.	74	1994–2007	319	11	714
171	Beaver Creek near Linton, N. Dak.	4	1993	238	150	305
175	James River near Manfred, N. Dak.	6	1998	400	224	449
176	James River near Grace City, N. Dak.	60	1997–2007	336	148	892
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	279	143	580
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	335	187	468
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	245	48	367
182	James River at Jamestown, N. Dak.	75	1997–2007	297	159	422
183	James River at Lamoure, N. Dak.	73	1996–2007	293	110	532
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	310	131	384
185	James River at Oakes, N. Dak.	3	1993	223	99	233
186	James River at N. Dak./S. Dak. State line	9	1998–1999	237	206	297
Alkalinity, incremental titration, dissolved as CaCO_3 , in mg/L						
2	Red River of the North at Wahpeton, N. Dak.	1	1991	238	238	238
6	Red River of the North at Hickson, N. Dak.	1	1991	208	208	208
10	Wild Rice River near Abercrombie, N. Dak.	1	1994	295	295	295
11	Red River of the North at Fargo, N. Dak.	1	1991	248	248	248
18	Sheyenne River near Warwick, N. Dak.	4	1993	309	256	351
32	Sheyenne River near Cooperstown, N. Dak.	10	1995	206	81	416
33	Baldhill Creek near Dazey, N. Dak.	10	1995	168	60	337
34	Sheyenne River below Baldhill Dam, N. Dak.	10	1995	219	139	371
36	Sheyenne River at Lisbon, N. Dak.	24	1993–1996	256	139	367
37	Sheyenne River near Kindred, N. Dak.	47	1988–1996	262	140	358
41	Sheyenne River at West Fargo, N. Dak.	1	1991	262	262	262
52	Red River of the North at Halstad, Minn.	44	1988–1995	227	100	355
53	Beaver Creek near Finley, N. Dak.	17	1989–1996	253	98	598

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[µg/L, micrograms per liter; <, less than; --, not available; mg/L, milligrams per liter; CO₃, carbonate; HCO₃, bicarbonate; CaCO₃, calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Alkalinity, incremental titration, dissolved as CaCO ₃ , in mg/L—Continued						
55	Goose River at Hillsboro, N. Dak.	1	1994	306	306	306
56	Red River of the North at Grand Forks, N. Dak.	25	1991–1995	207	114	306
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	73	1993–2000	252	90	334
59	Red River of the North at Oslo, Minn.	1	1991	314	314	314
67	Park River at Grafton, N. Dak.	1	1991	286	286	286
68	Red River of the North at Drayton, N. Dak.	2	1991	312	303	320
74	Pembina River at Walhalla, N. Dak.	27	1993–1995	212	86	359
78	Red River of the North at Pembina, N. Dak., site 2	45	1994–2000	199	100	256
79	Red River of the North at Emerson, Manitoba	50	1989–2000	215	112	326
82	Souris River near Sherwood, N. Dak.	6	1991–1992	285	122	396
89	Souris River near Bantry, N. Dak.	1	1992	396	396	396
98	Souris River near Westhope, N. Dak.	17	1988–1993	356	124	1090
106	Bear Den Creek near Mandaree, N. Dak.	38	1988–1995	733	306	1,080
114	Little Missouri River near Watford City, N. Dak.	22	1989–1994	279	98	740
115	Missouri River at Garrison Dam, N. Dak.	93	1988–2007	156	119	196
122	Brush Creek near Beulah, N. Dak.	9	1989–1990	492	260	568
127	Knife River at Hazen, N. Dak.	19	1988–1993	488	311	720
156	Heart River near Mandan, N. Dak.	28	1988–1993	433	256	844
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	1	1989	70	70	70
170	Cannonball River at Breien, N. Dak.	15	1988–1992	323	108	640
Acid neutralizing capacity, total, in mg/L						
2	Red River of the North at Wahpeton, N. Dak.	47	1983–2008	200	70	220
5	Red River of the North below Wahpeton, N. Dak.	20	1997–1999	209	179	233
6	Red River of the North at Hickson, N. Dak.	85	1980–2008	203	70	290
7	Wild Rice River near Rutland, N. Dak.	35	1984–2008	295	62	432
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	199	111	361
10	Wild Rice River near Abercrombie, N. Dak.	62	1980–2008	279	42	750
11	Red River of the North at Fargo, N. Dak.	76	1983–2008	203	70	265
12	Red River of North below Fargo, N. Dak.	46	1980–1986	209	105	270
14	Red River of the North near Harwood, N. Dak.	33	1997–2007	229	92	261
15	Sheyenne River above Harvey, N. Dak.	140	1980–2008	498	96	834
18	Sheyenne River near Warwick, N. Dak.	57	1983–2008	300	99	548
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	154	66	344
20	Mauvais Coulee near Cando, N. Dak.	95	1983–2008	224	63	430
21	Edmore Coulee near Edmore, N. Dak.	95	1983–2008	188	63	697
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	178	76	402
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	215	210	220
24	Starkweather Coulee near Webster, N. Dak.	94	1983–2008	158	34	336
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	235	150	325
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	220	105	335

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Acid neutralizing capacity, total, in mg/L —Continued						
27	Little Coulee near Brinsmade, N. Dak.	19	1980–1998	253	140	380
28	Big Coulee near Churchs Ferry, N. Dak.	62	1983–1997	201	110	463
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	12	1980–1986	374	322	457
30	Channel A near Penn, N. Dak.	87	1984–2008	194	79	473
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	389	167	647
32	Sheyenne River near Cooperstown, N. Dak.	91	1980–2008	320	80	570
33	Baldhill Creek near Dazey, N. Dak.	64	1980–2008	253	63	480
34	Sheyenne River below Baldhill Dam, N. Dak.	79	1980–2008	270	130	415
35	Sheyenne River at Valley City, N. Dak.	18	1987–2005	260	120	391
36	Sheyenne River at Lisbon, N. Dak.	114	1980–2008	260	127	543
37	Sheyenne River near Kindred, N. Dak.	126	1980–2008	267	137	385
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	43	1993–2008	289	127	389
39	Sheyenne River near Horace, N. Dak.	8	1982–1992	195	110	290
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	237	126	360
41	Sheyenne River at West Fargo, N. Dak.	31	1983–2008	266	120	335
42	Maple River near Hope, N. Dak.	33	1983–2008	185	64	510
43	Maple River near Enderlin, N. Dak.	45	1982–2008	272	83	390
44	Maple River near Mapleton, N. Dak.	17	1995–2008	258	97	354
45	Maple River below Mapleton, N. Dak.	28	1995–2008	239	94	368
46	Sheyenne River at Harwood, N. Dak.	26	1997–2005	265	151	371
47	Rush River at Amenia, N. Dak.	44	1983–2008	254	77	410
48	Rush River near Prosper, N. Dak.	4	1983–1987	130	80	400
49	Lower Branch Rush River near Prosper, N. Dak.	4	1983–1987	97	77	120
50	Sheyenne River near Harwood, N. Dak.	1	1996	141	141	141
51	Elm River near Kelso, N. Dak.	3	1983–1987	100	80	340
52	Red River of the North at Halstad, Minn.	139	1980–2008	230	104	350
53	Beaver Creek near Finley, N. Dak.	60	1981–2003	262	73	633
54	Goose River near Portland, N. Dak.	4	1983–1988	120	100	177
55	Goose River at Hillsboro, N. Dak.	57	1983–2008	242	98	414
56	Red River of the North at Grand Forks, N. Dak.	100	1983–2008	199	95	310
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	77	1991–2008	259	101	334
58	Turtle River at Manvel, N. Dak.	47	1981–2008	218	100	317
59	Red River of the North at Oslo, Minn.	20	1987–2005	159	99	236
60	Middle Branch Forest River near Whitman, N. Dak.	8	1983–1990	178	90	300
61	Forest River near Fordville, N. Dak.	47	1983–2008	220	106	290
62	Forest River near Minto, N. Dak.	72	1983–2008	239	98	330
63	South Branch Park River below Homme Dam, N. Dak.	19	1981–1994	190	93	254
64	Middle Branch Park River near Union, N. Dak.	4	1983–1984	210	140	330
66	Cart Creek at Mountain, N. Dak.	3	1983–1984	240	150	270

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Acid neutralizing capacity, total, in mg/L —Continued						
67	Park River at Grafton, N. Dak.	70	1983–2008	245	92	356
68	Red River of the North at Drayton, N. Dak.	50	1983–2008	200	95	310
69	Pembina County Drain 20 near Glasston, N. Dak.	4	1983–1984	137	90	210
70	Hidden Island Coulee near Hansboro, N. Dak.	16	1983–1995	157	110	420
71	Cypress Creek near Sarles, N. Dak.	7	1983–1988	170	90	300
73	Little South Pembina River near Walhalla, N. Dak.	16	2001–2008	189	108	250
74	Pembina River at Walhalla, N. Dak.	79	1980–2008	220	26	349
75	Pembina River at Neche, N. Dak.	69	1983–2008	239	96	402
76	Tongue River at Akra, N. Dak.	46	1983–2008	208	83	300
78	Red River of the North at Pembina, N. Dak., site 2	83	1994–2008	210	106	295
79	Red River of the North at Emerson, Manitoba	111	1980–2004	214	124	360
80	Long Creek near Noonan, N. Dak.	41	1982–2008	230	46	470
82	Souris River near Sherwood, N. Dak.	213	1980–2008	302	65	922
83	Souris River near Foxholm, N. Dak.	90	1982–2008	315	159	639
84	Des Lacs River at Foxholm, N. Dak.	74	1983–2008	371	50	855
85	Souris River above Minot, N. Dak.	105	1981–2008	308	76	826
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	200	82	516
87	Souris River near Verendrye, N. Dak.	180	1980–2008	339	64	594
88	Wintering River near Karlsruhe, N. Dak.	78	1980–2008	311	88	612
89	Souris River near Bantry, N. Dak.	110	1981–2008	319	109	540
90	Willow Creek near Willow City, N. Dak.	68	1983–2008	292	83	519
91	Stone Creek near Kramer, N. Dak.	29	1986–2000	265	52	605
92	Deep River near Upham, N. Dak.	52	1987–2007	265	64	392
93	Egg Creek near Granville, N. Dak.	1	1981	160	160	160
95	Cut Bank Creek at Upham, N. Dak.	21	1987–2000	297	96	470
96	Deep River below Cut Bank Creek near Upham, N. Dak.	13	1986–1989	284	84	436
97	Boundary Creek near Landa, N. Dak.	31	1986–2000	293	64	500
98	Souris River near Westhope, N. Dak.	81	1980–2008	340	126	1,170
100	Missouri River near Williston, N. Dak.	20	1980–1992	160	98	200
101	Little Muddy River below Cow Creek near Williston, N. Dak.	46	1983–2008	530	76	660
102	Stony Creek near Williston, N. Dak.	1	1981	57	57	57
106	Bear Den Creek near Mandaree, N. Dak.	116	1980–2008	697	75	1,060
108	East Fork Shell Creek near Parshall, N. Dak.	58	1991–2008	670	53	909
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	483	56	802
110	Little Missouri River at Marmarth, N. Dak.	50	1983–2008	254	65	649
111	Deep Creek near Amidon, N. Dak.	3	1983	490	258	549
112	Little Missouri River at Medora, N. Dak.	16	2001–2008	253	80	427
113	Beaver Creek near Trotters, N. Dak.	39	1983–2008	310	96	431
114	Little Missouri River near Watford City, N. Dak.	84	1980–2008	277	97	713
115	Missouri River at Garrison Dam, N. Dak.	97	1980–2000	160	106	439

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Acid neutralizing capacity, total, in mg/L —Continued						
116	Knife River at Manning, N. Dak.	57	1980–2008	420	46	910
119	Elm Creek near Golden Valley, N. Dak.	11	1981–1995	180	73	588
120	Knife River near Golden Valley, N. Dak.	48	1983–2008	394	80	690
121	Coyote Creek near Zap, N. Dak.	2	1981–1983	510	390	630
122	Brush Creek near Beulah, N. Dak.	29	1983–1990	495	204	601
124	Spring Creek near Halliday, N. Dak.	1	1981	510	510	510
125	Spring Creek at Zap, N. Dak.	69	1980–2008	357	67	610
126	West Branch Otter Creek near Beulah, N. Dak.	10	1983–1995	172	63	350
127	Knife River at Hazen, N. Dak.	87	1980–2008	430	76	712
128	Antelope Creek above Hazen, N. Dak.	16	1982–1985	282	68	503
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	21	1977–1985	154	26	371
130	West Branch Antelope Creek near Hazen, N. Dak.	1	1983	536	536	536
132	Alderin Creek near Fort Clark, N. Dak.	6	1982–1983	319	142	485
133	Coal Lake Coulee near Hensler, N. Dak.	21	1982–1988	347	56	568
134	Buffalo Creek near Washburn, N. Dak.	2	1983	850	759	941
135	Turtle Creek above Washburn, N. Dak.	99	1987–2003	567	112	1,136
136	Painted Woods Creek near Wilton, N. Dak.	131	1982–2003	277	65	574
140	Square Butte Creek below Center, N. Dak.	48	1983–2008	408	129	446
141	Burnt Creek near Bismarck, N. Dak.	41	1983–2008	337	54	460
142	Missouri River at Bismarck, N. Dak.	55	1986–2008	164	118	200
143	South Branch Heart River near South Heart, N. Dak.	14	1981–1996	133	18	270
144	North Creek near South Heart, N. Dak.	8	1995–1996	156	60	814
145	Heart River near South Heart, N. Dak.	23	1981–2005	270	84	910
146	Heart River at Dickinson, N. Dak.	17	1986–1994	380	185	499
147	Green River near New Hradec, N. Dak.	43	1983–2008	244	43	460
149	Heart River near Richardton, N. Dak.	48	1983–2008	267	86	440
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	40	1989–2008	270	92	600
151	Antelope Creek near Carson, N. Dak.	18	1999–2008	275	152	352
152	Big Muddy Creek near Almont, N. Dak.	36	1991–2008	470	91	873
153	Heart River near Lark, N. Dak.	22	1983–1995	290	100	370
154	Heart River at Stark Bridge near Judson, N. Dak.	41	1988–2008	304	100	417
155	Sweetbriar Creek near Judson, N. Dak.	13	2002–2008	354	118	577
156	Heart River near Mandan, N. Dak.	100	1980–2008	322	99	771
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	33	1988–2004	360	66	547
158	Apple Creek near Menoken, N. Dak.	55	1980–2008	420	49	722
159	Missouri River near Schmidt, N. Dak.	11	1980–1981	150	150	170
161	Coal Bank Creek near Havelock, N. Dak.	5	1981–1983	270	196	379
162	Cannonball River at Regent, N. Dak.	58	1980–2008	350	91	510
164	Cannonball River near Raleigh, N. Dak.	15	2001–2008	264	97	320

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Acid neutralizing capacity, total, in mg/L —Continued						
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	17	1983–1995	200	71	340
166	Cedar Creek near Haynes, N. Dak.	50	1982–2008	308	90	486
169	Cedar Creek near Raleigh, N. Dak.	45	1983–2008	270	66	462
170	Cannonball River at Breien, N. Dak.	93	1980–2008	299	75	607
171	Beaver Creek near Linton, N. Dak.	8	1983–1989	195	39	350
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	324	50	431
173	Porcupine Creek near Fort Yates, N. Dak.	41	1991–1999	354	30	673
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	18	1981–1987	471	106	710
175	James River near Manfred, N. Dak.	35	1983–1995	343	76	607
176	James River near Grace City, N. Dak.	84	1983–2008	294	64	992
177	James River above Arrowwood Lake near Kensal, N. Dak.	157	1985–2008	316	93	799
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	219	134	273
179	James River near Pingree, N. Dak.	131	1980–2008	257	112	424
180	Pipestem Creek near Pingree, N. Dak.	45	1982–2008	252	80	417
182	James River at Jamestown, N. Dak.	112	1983–2008	260	108	509
183	James River at Lamoure, N. Dak.	138	1980–2008	273	86	719
184	Bear Creek near Oakes, N. Dak.	43	1984–2008	270	50	451
185	James River at Oakes, N. Dak.	94	1982–2008	280	77	1,210
186	James River at N. Dak./S. Dak. State line	22	1980–2008	276	118	432
Hardness as CaCO_3 , in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	651.5	119.0	2,150.0
2	Red River of the North at Wahpeton, N. Dak.	17	1993–1996	438.0	215.0	645.0
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	324.5	248.0	330.0
4	Red River of the North at Brushville, Minn.	61	1993–2007	282.0	162.0	437.0
10	Wild Rice River near Abercrombie, N. Dak.	58	1993–2007	621.0	171.0	1,110.0
11	Red River of the North at Fargo, N. Dak.	16	1994–1996	289.0	213.0	442.0
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	328.0	175.0	515.0
14	Red River of the North near Harwood, N. Dak.	26	1993–1996	323.0	239.0	428.0
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	358.0	211.0	544.0
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	362.5	290.0	456.0
32	Sheyenne River near Cooperstown, N. Dak.	80	1994–2007	372.5	177.0	500.0
33	Baldhill Creek near Dazey, N. Dak.	3	1993–1996	351.0	346.0	414.0
34	Sheyenne River below Baldhill Dam, N. Dak.	73	1994–2007	340.0	166.0	618.0
35	Sheyenne River at Valley City, N. Dak.	4	1993	232.5	209.0	282.0
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	400.0	186.0	601.0
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	401.0	284.0	581.0
41	Sheyenne River at West Fargo, N. Dak.	13	1994–2006	382.0	201.0	541.0
45	Maple River below Mapleton, N. Dak.	47	1997–2007	584.0	246.0	1,270.0
46	Sheyenne River at Harwood, N. Dak.	10	1993	341.5	269.0	389.0
49	Lower Branch Rush River near Prosper, N. Dak.	1	1993	522.0	522.0	522.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Hardness as CaCO_3 , in mg/L —Continued						
51	Elm River near Kelso, N. Dak.	3	1993	450.0	392.0	537.0
55	Goose River at Hillsboro, N. Dak.	76	1994–2007	632.5	328.0	1,040.0
56	Red River of the North at Grand Forks, N. Dak.	46	1997–2006	302.5	162.0	465.0
58	Turtle River at Manvel, N. Dak.	38	1993–2006	646.0	304.0	1,110.0
62	Forest River near Minto, N. Dak.	47	1994–2006	413.0	242.0	688.0
67	Park River at Grafton, N. Dak.	40	1994–2006	442.5	172.0	1,040.0
68	Red River of the North at Drayton, N. Dak.	15	1994–1996	319.0	214.0	422.0
75	Pembina River at Neche, N. Dak.	55	1994–2006	376.0	162.0	589.0
76	Tongue River at Akra, N. Dak.	1	1993	217.0	217.0	217.0
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	310.0	222.0	345.0
78	Red River of the North at Pembina, N. Dak., site 2	52	1997–2006	314.0	173.0	526.0
80	Long Creek near Noonan, N. Dak.	10	1997	429.5	211.0	510.0
83	Souris River near Foxholm, N. Dak.	11	1997–1998	246.0	124.0	460.0
84	Des Lacs River at Foxholm, N. Dak.	97	1993–2007	464.0	167.0	844.0
85	Souris River above Minot, N. Dak.	75	1994–2007	325.0	144.0	1,310.0
87	Souris River near Verendrye, N. Dak.	76	1997–2007	377.0	183.0	772.0
88	Wintering River near Karlsruhe, N. Dak.	11	1997–1998	269.0	138.0	313.0
89	Souris River near Bantry, N. Dak.	10	1997–1998	313.5	200.0	461.0
90	Willow Creek near Willow City, N. Dak.	6	1997	381.5	287.0	443.0
92	Deep River near Upham, N. Dak.	7	1997	326.0	188.0	400.0
98	Souris River near Westhope, N. Dak.	7	1997–1998	263.0	234.0	711.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	446.0	145.0	594.0
110	Little Missouri River at Marmarth, N. Dak.	8	1999	335.5	253.0	392.0
112	Little Missouri River at Medora, N. Dak.	88	1993–2007	275.5	44.0	2,610.0
113	Beaver Creek near Trotters, N. Dak.	9	1999	599.0	334.0	745.0
114	Little Missouri River near Watford City, N. Dak.	81	1994–2007	294.0	28.0	817.0
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	263.5	133.0	527.0
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	6	1993	174.0	83.0	200.0
125	Spring Creek at Zap, N. Dak.	77	1993–2007	368.0	69.0	598.0
127	Knife River at Hazen, N. Dak.	94	1993–2007	349.0	125.0	619.0
140	Square Butte Creek below Center, N. Dak.	4	1993	410.0	369.0	453.0
142	Missouri River at Bismarck, N. Dak.	1	1994	200.0	200.0	200.0
146	Heart River at Dickinson, N. Dak.	5	1993	293.0	164.0	555.0
148	Green River near Gladstone, N. Dak.	4	1993	339.0	183.0	512.0
149	Heart River near Richardton, N. Dak.	76	1994–2007	369.5	100.0	647.0
152	Big Muddy Creek near Almont, N. Dak.	3	1993	196.0	109.0	231.0
156	Heart River near Mandan, N. Dak.	81	1994–2007	318.0	150.0	567.0
158	Apple Creek near Menoken, N. Dak.	4	1993	203.0	102.0	221.0
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	421.0	123.0	1,200.0
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	362.0	98.0	1,080.0

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Hardness as CaCO_3 , in mg/L —Continued						
170	Cannonball River at Breien, N. Dak.	74	1994–2007	356.0	1.0	853.0
171	Beaver Creek near Linton, N. Dak.	4	1993	185.0	130.0	243.0
175	James River near Manfred, N. Dak.	6	1998	276.5	197.0	330.0
176	James River near Grace City, N. Dak.	60	1997–2007	377.0	156.0	1,070.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	276.0	146.0	455.0
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	447.0	233.0	578.0
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	240.0	42.0	326.0
182	James River at Jamestown, N. Dak.	75	1997–2007	385.0	195.0	610.0
183	James River at Lamoure, N. Dak.	73	1996–2007	392.0	141.0	598.0
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	473.0	234.0	579.0
185	James River at Oakes, N. Dak.	3	1993	203.0	120.0	252.0
186	James River at N. Dak./S. Dak. State line	9	1998–1999	286.0	266.0	333.0
Sodium absorption ratio, unitless						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	0.85	0.39	1.66
2	Red River of the North at Wahpeton, N. Dak.	17	1993–1996	0.70	0.30	1.24
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	0.55	0.43	6.48
4	Red River of the North at Brushville, Minn.	61	1993–2007	0.48	0.24	1.33
10	Wild Rice River near Abercrombie, N. Dak.	58	1993–2007	1.72	0.63	3.28
11	Red River of the North at Fargo, N. Dak.	16	1994–1996	0.52	0.27	0.78
12	Red River of North below Fargo, N. Dak.	--	--	0.60	0.43	0.87
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	0.74	0.35	1.68
14	Red River of the North near Harwood, N. Dak.	26	1993–1996	0.60	0.43	0.87
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	2.82	1.66	5.00
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	2.63	1.01	3.84
32	Sheyenne River near Cooperstown, N. Dak.	80	1994–2007	2.31	1.17	4.02
33	Baldhill Creek near Dazey, N. Dak.	3	1993–1996	1.55	0.90	2.57
34	Sheyenne River below Baldhill Dam, N. Dak.	73	1994–2007	2.09	1.03	3.09
35	Sheyenne River at Valley City, N. Dak.	4	1993	1.45	1.19	1.74
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	2.26	1.06	3.15
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	1.76	0.58	2.67
41	Sheyenne River at West Fargo, N. Dak.	13	1994–2006	1.57	0.91	2.02
45	Maple River below Mapleton, N. Dak.	47	1997–2007	1.71	0.60	6.10
46	Sheyenne River at Harwood, N. Dak.	10	1993	1.36	0.54	2.67
49	Lower Branch Rush River near Prosper, N. Dak.	1	1993	1.15	1.15	1.15
51	Elm River near Kelso, N. Dak.	3	1993	1.48	1.21	1.80
55	Goose River at Hillsboro, N. Dak.	76	1994–2007	1.37	0.65	2.36
56	Red River of the North at Grand Forks, N. Dak.	46	1997–2006	0.60	0.13	1.29
58	Turtle River at Manvel, N. Dak.	38	1993–2006	4.60	1.17	15.10
62	Forest River near Minto, N. Dak.	47	1994–2006	1.13	0.61	12.20
67	Park River at Grafton, N. Dak.	40	1994–2006	1.97	0.85	4.93

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sodium absorption ratio, unitless—Continued						
68	Red River of the North at Drayton, N. Dak.	15	1994–1996	0.86	0.47	1.16
75	Pembina River at Neche, N. Dak.	55	1994–2006	1.12	0.63	1.53
76	Tongue River at Akra, N. Dak.	1	1993	0.78	0.78	0.78
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	0.78	0.42	1.21
78	Red River of the North at Pembina, N. Dak., site 2	52	1997–2006	0.80	0.38	2.50
80	Long Creek near Noonan, N. Dak.	10	1997	3.29	2.17	5.20
83	Souris River near Foxholm, N. Dak.	11	1997–1998	2.08	1.54	2.82
84	Des Lacs River at Foxholm, N. Dak.	97	1993–2007	4.33	1.63	6.88
85	Souris River above Minot, N. Dak.	75	1994–2007	3.32	1.57	10.90
87	Souris River near Verendrye, N. Dak.	76	1997–2007	3.56	1.55	8.86
88	Wintering River near Karlsruhe, N. Dak.	11	1997–1998	4.38	1.04	7.41
89	Souris River near Bantry, N. Dak.	10	1997–1998	2.89	2.09	3.17
90	Willow Creek near Willow City, N. Dak.	6	1997	2.13	1.50	3.68
92	Deep River near Upham, N. Dak.	7	1997	1.05	0.68	1.56
98	Souris River near Westhope, N. Dak.	7	1997–1998	3.38	2.65	4.78
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	5.77	1.08	8.84
110	Little Missouri River at Marmarth, N. Dak.	8	1999	5.93	2.99	10.80
112	Little Missouri River at Medora, N. Dak.	88	1993–2007	8.89	1.77	21.50
113	Beaver Creek near Trotters, N. Dak.	9	1999	5.92	4.38	7.43
114	Little Missouri River near Watford City, N. Dak.	81	1994–2007	7.69	2.43	16.20
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	9.99	3.87	20.80
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	6	1993	9.06	5.97	10.80
125	Spring Creek at Zap, N. Dak.	77	1993–2007	5.36	1.05	9.67
127	Knife River at Hazen, N. Dak.	94	1993–2007	5.91	2.60	9.34
140	Square Butte Creek below Center, N. Dak.	4	1993	5.53	5.10	6.02
142	Missouri River at Bismarck, N. Dak.	1	1994	1.90	1.90	1.90
146	Heart River at Dickinson, N. Dak.	5	1993	4.67	3.77	9.93
148	Green River near Gladstone, N. Dak.	4	1993	5.39	3.89	9.26
149	Heart River near Richardton, N. Dak.	76	1994–2007	5.28	1.68	9.66
152	Big Muddy Creek near Almont, N. Dak.	3	1993	9.74	6.13	12.20
156	Heart River near Mandan, N. Dak.	81	1994–2007	5.08	2.29	8.81
158	Apple Creek near Menoken, N. Dak.	4	1993	3.53	1.55	4.32
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	5.36	1.21	13.30
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	5.57	1.96	14.00
170	Cannonball River at Breien, N. Dak.	74	1994–2007	5.26	0.04	10.60
171	Beaver Creek near Linton, N. Dak.	4	1993	1.96	1.68	2.07
175	James River near Manfred, N. Dak.	6	1998	2.90	1.63	4.39
176	James River near Grace City, N. Dak.	60	1997–2007	2.21	0.57	8.96
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	1.49	0.53	2.67
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	1.83	1.08	2.28

Table 1–1. Summary statistics for major ion constituents at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; <, less than; --, not available; mg/L , milligrams per liter; CO_3 , carbonate; HCO_3 , bicarbonate; CaCO_3 , calcium carbonate]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Sodium absorption ratio, unitless—Continued						
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	1.05	0.26	1.43
182	James River at Jamestown, N. Dak.	75	1997–2007	1.98	0.89	3.07
183	James River at Lamoure, N. Dak.	73	1996–2007	1.89	0.63	2.93
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	2.03	1.43	2.19
185	James River at Oakes, N. Dak.	3	1993	1.09	0.94	1.38
186	James River at N. Dak./S. Dak. State line	9	1998–1999	1.35	1.11	1.61

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Ammonia, dissolved and total as N, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	<0.04	<0.04	0.20
2	Red River of the North at Wahpeton, N. Dak.	20	1991–2004	<0.04	<0.04	0.33
3	Red River of the North near Wahpeton, N. Dak.	5	1993–2006	0.10	<0.04	0.25
4	Red River of the North at Brushville, Minn.	61	1993–2007	<0.04	<0.04	0.26
5	Red River of the North below Wahpeton, N. Dak.	64	1970–1999	0.10	<0.04	0.86
6	Red River of the North at Hickson, N. Dak.	103	1975–2004	0.05	<0.04	0.66
10	Wild Rice River near Abercrombie, N. Dak.	64	1981–2007	<0.04	<0.04	0.70
11	Red River of the North at Fargo, N. Dak.	78	1991–2008	<0.04	<0.04	1.31
12	Red River of North below Fargo, N. Dak.	45	1970–1981	0.69	<0.04	11.80
13	Red River of the North at Harwood, N. Dak.	52	2000–2007	0.07	<0.04	1.20
14	Red River of the North near Harwood, N. Dak.	59	1993–2007	0.10	<0.04	0.70
15	Sheyenne River above Harvey, N. Dak.	44	1981–2004	0.05	<0.04	0.67
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	<0.04	<0.04	0.24
18	Sheyenne River near Warwick, N. Dak.	25	1993–2007	<0.04	<0.04	0.11
20	Mauvais Coulee near Cando, N. Dak.	68	1987–2004	<0.04	<0.04	0.83
21	Edmore Coulee near Edmore, N. Dak.	68	1987–2004	0.05	<0.04	0.96
22	Edmore Coulee Tributary near Webster, N. Dak.	2	1993	<0.04	<0.04	<0.04
24	Starkweather Coulee near Webster, N. Dak.	62	1987–2004	0.05	<0.04	0.93
25	Big Coulee below Churchs Ferry, N. Dak.	9	1998–1999	0.09	<0.04	1.63
28	Big Coulee near Churchs Ferry, N. Dak.	58	1987–1997	0.09	<0.04	1.30
30	Channel A near Penn, N. Dak.	70	1987–1999	0.05	<0.04	1.84
32	Sheyenne River near Cooperstown, N. Dak.	174	1979–2007	<0.04	<0.04	0.74
33	Baldhill Creek near Dazey, N. Dak.	51	1979–1996	0.06	<0.04	0.84
34	Sheyenne River below Baldhill Dam, N. Dak.	129	1979–2007	0.08	<0.04	1.70
35	Sheyenne River at Valley City, N. Dak.	11	1993	0.16	<0.04	0.38
36	Sheyenne River at Lisbon, N. Dak.	98	1993–2007	<0.04	<0.04	0.37
37	Sheyenne River near Kindred, N. Dak.	281	1976–2007	<0.04	<0.04	0.45
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	15	2003–2007	<0.04	<0.04	0.10
41	Sheyenne River at West Fargo, N. Dak.	14	1991–2006	0.04	<0.04	0.26
45	Maple River below Mapleton, N. Dak.	49	1997–2007	<0.04	<0.04	0.53
46	Sheyenne River at Harwood, N. Dak.	31	1993–1999	0.05	<0.04	0.95
49	Lower Branch Rush River near Prosper, N. Dak.	2	1993	0.04	<0.04	<0.04
50	Sheyenne River near Harwood, N. Dak.	44	1970–1974	0.19	<0.04	0.97
51	Elm River near Kelso, N. Dak.	4	1993	0.11	<0.04	0.35
52	Red River of the North at Halstad, Minn.	139	1978–2007	0.11	<0.04	1.60
53	Beaver Creek near Finley, N. Dak.	50	1981–1996	0.09	<0.04	0.82
55	Goose River at Hillsboro, N. Dak.	90	1994–2008	<0.04	<0.04	0.43
56	Red River of the North at Grand Forks, N. Dak.	114	1991–2008	<0.04	<0.04	0.38
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	82	1993–2000	<0.04	<0.04	0.26

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Ammonia, dissolved and total as N, in mg/L—Continued						
58	Turtle River at Manvel, N. Dak.	69	1993–2008	<0.04	<0.04	1.01
59	Red River of the North at Oslo, Minn.	6	1977–2004	0.22	<0.04	0.53
62	Forest River near Minto, N. Dak.	78	1994–2008	<0.04	<0.04	0.67
67	Park River at Grafton, N. Dak.	71	1994–2008	<0.04	<0.04	0.67
68	Red River of the North at Drayton, N. Dak.	18	1991–2004	<0.04	<0.04	0.23
72	Pembina River near Vang, N. Dak.	50	1976–1979	<0.04	<0.04	0.28
73	Little South Pembina River near Walhalla, N. Dak.	63	1976–1995	<0.04	<0.04	0.44
74	Pembina River at Walhalla, N. Dak.	143	1976–1995	<0.04	<0.04	0.35
75	Pembina River at Neche, N. Dak.	86	1994–2008	<0.04	<0.04	0.24
76	Tongue River at Akra, N. Dak.	25	1979–2004	0.13	<0.04	0.38
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	0.14	<0.04	0.93
78	Red River of the North at Pembina, N. Dak., site 2	167	1970–2008	<0.04	<0.04	0.76
79	Red River of the North at Emerson, Manitoba	149	1978–2004	0.09	<0.04	2.30
80	Long Creek near Noonan, N. Dak.	10	1997	<0.04	<0.04	0.44
81	West Branch Short Creek near Columbus, N. Dak.	19	1978–1981	0.06	<0.04	0.45
82	Souris River near Sherwood, N. Dak.	322	1974–2008	0.07	<0.04	3.30
83	Souris River near Foxholm, N. Dak.	183	1972–1998	0.10	<0.04	4.80
84	Des Lacs River at Foxholm, N. Dak.	138	1981–2007	<0.04	<0.04	2.50
85	Souris River above Minot, N. Dak.	143	1981–2008	<0.04	<0.04	4.72
87	Souris River near Verendrye, N. Dak.	344	1970–2008	0.09	<0.04	3.20
88	Wintering River near Karlsruhe, N. Dak.	57	1981–1998	<0.04	<0.04	0.25
89	Souris River near Bantry, N. Dak.	88	1981–2000	<0.04	<0.04	1.30
90	Willow Creek near Willow City, N. Dak.	47	1982–2000	<0.04	<0.04	0.25
91	Stone Creek near Kramer, N. Dak.	29	1986–2000	<0.04	<0.04	0.45
92	Deep River near Upham, N. Dak.	27	1997–2000	<0.04	<0.04	0.28
95	Cut Bank Creek at Upham, N. Dak.	16	1999–2000	<0.04	<0.04	0.22
96	Deep River below Cut Bank Creek near Upham, N. Dak.	15	1982–1989	0.07	<0.04	0.38
97	Boundary Creek near Landa, N. Dak.	30	1986–2000	<0.04	<0.04	0.28
98	Souris River near Westhope, N. Dak.	258	1970–2007	0.14	<0.04	3.60
100	Missouri River near Williston, N. Dak.	100	1970–1982	<0.04	<0.04	0.80
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	<0.04	<0.04	0.05
102	Stony Creek near Williston, N. Dak.	29	1977–1981	0.08	<0.04	107.00
104	Beaver Creek near Ray, N. Dak.	44	1977–1982	0.06	<0.04	118.00
106	Bear Den Creek near Mandaree, N. Dak.	95	1980–1996	0.05	<0.04	0.86
108	East Fork Shell Creek near Parshall, N. Dak.	47	1991–2000	<0.04	<0.04	0.58
109	Deepwater Creek near Mandaree, N. Dak.	44	1991–2000	<0.04	<0.04	3.32
110	Little Missouri River at Marmarth, N. Dak.	8	1999	<0.04	<0.04	0.06
111	Deep Creek near Amidon, N. Dak.	45	1977–1983	<0.04	<0.04	0.28
112	Little Missouri River at Medora, N. Dak.	89	1979–2007	<0.04	<0.04	1.06
113	Beaver Creek near Trotters, N. Dak.	52	1977–1999	<0.04	<0.04	0.28

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Ammonia, dissolved and total as N, in mg/L—Continued						
114	Little Missouri River near Watford City, N. Dak.	170	1977–2007	<0.04	<0.04	0.54
115	Missouri River at Garrison Dam, N. Dak.	217	1974–2007	<0.04	<0.04	0.22
116	Knife River at Manning, N. Dak.	45	1977–1982	0.06	<0.04	111.00
117	Stray Creek near Manning, N. Dak.	16	1975–1981	0.06	<0.04	100.00
118	Knife River at Marshall, N. Dak.	43	1977–1981	0.07	<0.04	126.00
119	Elm Creek near Golden Valley, N. Dak.	15	1977–1981	0.06	<0.04	0.68
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	<0.04	<0.04	0.40
121	Coyote Creek near Zap, N. Dak.	44	1977–1983	0.06	<0.04	120.00
122	Brush Creek near Beulah, N. Dak.	62	1975–1990	0.07	<0.04	76.00
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	46	1977–1993	0.09	<0.04	2.90
124	Spring Creek near Halliday, N. Dak.	41	1977–1981	0.06	<0.04	104.00
125	Spring Creek at Zap, N. Dak.	172	1974–2007	<0.04	<0.04	0.67
127	Knife River at Hazen, N. Dak.	234	1974–2007	0.05	<0.04	0.62
128	Antelope Creek above Hazen, N. Dak.	26	1977–1982	0.10	<0.04	0.78
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	1	1977	<0.04	<0.04	<0.04
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	0.20	<0.04	0.58
131	Coal Creek near Stanton, N. Dak.	25	1975–1981	0.05	<0.04	0.28
132	Alderin Creek near Fort Clark, N. Dak.	29	1977–1982	0.07	<0.04	0.71
133	Coal Lake Coulee near Hensler, N. Dak.	16	1978–1982	0.06	<0.04	0.45
134	Buffalo Creek near Washburn, N. Dak.	33	1978–1983	0.11	<0.04	129.00
135	Turtle Creek above Washburn, N. Dak.	76	1990–2003	<0.04	<0.04	1.20
136	Painted Woods Creek near Wilton, N. Dak.	77	1970–2003	<0.04	<0.04	0.35
137	Square Butte Creek near Hannover, N. Dak.	21	1977–1981	0.05	<0.04	0.85
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	49	1977–1982	0.13	<0.04	80.00
139	Hagel Creek near Center, N. Dak.	32	1977–1982	0.14	<0.04	80.00
140	Square Butte Creek below Center, N. Dak.	4	1993	0.59	0.10	1.00
142	Missouri River at Bismarck, N. Dak.	205	1970–2001	<0.04	<0.04	0.43
143	South Branch Heart River near South Heart, N. Dak.	27	1979–1996	0.09	<0.04	0.45
144	North Creek near South Heart, N. Dak.	22	1978–1996	0.07	<0.04	43.00
145	Heart River near South Heart, N. Dak.	48	1975–1983	0.09	<0.04	2.10
146	Heart River at Dickinson, N. Dak.	5	1993	0.23	<0.04	0.78
147	Green River near New Hradec, N. Dak.	45	1977–1982	0.06	<0.04	79.00
148	Green River near Gladstone, N. Dak.	4	1993	0.07	<0.04	0.22
149	Heart River near Richardton, N. Dak.	76	1994–2007	<0.04	<0.04	0.42
152	Big Muddy Creek near Almont, N. Dak.	3	1993	0.06	<0.04	0.43
156	Heart River near Mandan, N. Dak.	187	1978–2007	<0.04	<0.04	0.71
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	3	1988–1989	0.09	<0.04	0.27
158	Apple Creek near Menoken, N. Dak.	51	1977–2007	0.07	<0.04	0.72
159	Missouri River near Schmidt, N. Dak.	140	1974–1981	<0.04	<0.04	0.26
160	Cannonball River at New England, N. Dak.	28	1978–1981	0.07	<0.04	0.94

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Ammonia, dissolved and total as N, in mg/L—Continued						
161	Coal Bank Creek near Havelock, N. Dak.	39	1975–1983	0.05	<0.04	0.74
162	Cannonball River at Regent, N. Dak.	40	1977–1981	0.05	<0.04	0.44
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	<0.04	<0.04	0.41
167	Timber Creek near Bentley, N. Dak.	39	1977–1981	0.06	<0.04	1.10
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	<0.04	<0.04	0.43
170	Cannonball River at Breien, N. Dak.	169	1977–2007	<0.04	<0.04	0.43
171	Beaver Creek near Linton, N. Dak.	4	1993	0.07	<0.04	0.20
173	Porcupine Creek near Fort Yates, N. Dak.	36	1991–1999	<0.04	<0.04	0.22
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	45	1975–1987	0.10	<0.04	111.00
175	James River near Manfred, N. Dak.	27	1987–1998	<0.04	<0.04	0.47
176	James River near Grace City, N. Dak.	105	1987–2007	<0.04	<0.04	1.60
177	James River above Arrowwood Lake near Kensal, N. Dak.	140	1987–2008	<0.04	<0.04	2.50
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	5	1987–1989	<0.04	<0.04	0.49
179	James River near Pingree, N. Dak.	82	1987–2008	<0.04	<0.04	1.72
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	<0.04	<0.04	0.41
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	0.10	<0.04	0.95
182	James River at Jamestown, N. Dak.	139	1987–2007	0.09	<0.04	1.10
183	James River at Lamoure, N. Dak.	131	1981–2007	<0.04	<0.04	1.50
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	0.14	<0.04	0.55
185	James River at Oakes, N. Dak.	138	1970–2008	0.07	<0.04	0.86
186	James River at N. Dak./S. Dak. State line	11	1981–2004	0.06	<0.04	0.35
Nitrate + Nitrite dissolved and total as N, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	0.14	<0.10	1.60
2	Red River of the North at Wahpeton, N. Dak.	20	1991–2004	0.12	<0.10	2.93
3	Red River of the North near Wahpeton, N. Dak.	5	1993–2006	<0.10	<0.10	2.07
4	Red River of the North at Brushville, Minn.	54	1996–2007	0.16	<0.10	1.84
5	Red River of the North below Wahpeton, N. Dak.	47	1971–1999	<0.10	<0.10	1.30
6	Red River of the North at Hickson, N. Dak.	104	1975–2004	<0.10	<0.10	2.30
7	Wild Rice River near Rutland, N. Dak.	3	1971–1975	<0.10	<0.10	0.44
10	Wild Rice River near Abercrombie, N. Dak.	163	1971–2007	<0.10	<0.10	3.80
11	Red River of the North at Fargo, N. Dak.	106	1971–2008	0.19	<0.10	2.14
12	Red River of North below Fargo, N. Dak.	155	1971–1986	0.31	<0.10	4.60
13	Red River of the North at Harwood, N. Dak.	52	2000–2007	0.88	0.20	5.56
14	Red River of the North near Harwood, N. Dak.	59	1993–2007	0.48	<0.10	2.28
15	Sheyenne River above Harvey, N. Dak.	154	1977–2004	<0.10	<0.10	2.00
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	0.19	<0.10	0.96
18	Sheyenne River near Warwick, N. Dak.	123	1971–2007	<0.10	<0.10	4.20
20	Mauvais Coulee near Cando, N. Dak.	68	1987–2004	<0.10	<0.10	2.80
21	Edmore Coulee near Edmore, N. Dak.	70	1983–2004	<0.10	<0.10	4.60
22	Edmore Coulee Tributary near Webster, N. Dak.	2	1993	<0.10	<0.10	<0.10

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Nitrate + Nitrite dissolved and total as N, in mg/L—Continued						
24	Starkweather Coulee near Webster, N. Dak.	63	1987–2004	0.11	<0.10	8.30
25	Big Coulee below Churchs Ferry, N. Dak.	9	1998–1999	<0.10	<0.10	0.87
27	Little Coulee near Brinsmade, N. Dak.	16	1976–1981	0.23	<0.10	3.40
28	Big Coulee near Churchs Ferry, N. Dak.	119	1971–1997	0.27	<0.10	3.10
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	41	1971–1986	<0.10	<0.10	9.50
30	Channel A near Penn, N. Dak.	71	1987–1999	<0.10	<0.10	2.90
32	Sheyenne River near Cooperstown, N. Dak.	263	1971–2007	0.13	<0.10	2.10
33	Baldhill Creek near Dazey, N. Dak.	51	1979–1996	<0.10	<0.10	2.20
34	Sheyenne River below Baldhill Dam, N. Dak.	129	1979–2007	0.13	<0.10	1.60
35	Sheyenne River at Valley City, N. Dak.	11	1993	0.21	<0.10	0.30
36	Sheyenne River at Lisbon, N. Dak.	252	1971–2007	0.21	<0.10	1.50
37	Sheyenne River near Kindred, N. Dak.	282	1976–2007	0.13	<0.10	3.60
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	15	2003–2007	<0.10	<0.10	2.38
39	Sheyenne River near Horace, N. Dak.	37	1976–1979	0.19	<0.10	3.50
41	Sheyenne River at West Fargo, N. Dak.	14	1991–2006	<0.10	<0.10	1.59
42	Maple River near Hope, N. Dak.	1	1981	<0.10	<0.10	<0.10
45	Maple River below Mapleton, N. Dak.	49	1997–2007	<0.10	<0.10	7.70
46	Sheyenne River at Harwood, N. Dak.	31	1993–1999	0.36	<0.10	3.85
49	Lower Branch Rush River near Prosper, N. Dak.	2	1993	0.30	<0.10	0.50
50	Sheyenne River near Harwood, N. Dak.	27	1971–1974	0.21	<0.10	1.90
51	Elm River near Kelso, N. Dak.	4	1993	<0.10	<0.10	0.91
52	Red River of the North at Halstad, Minn.	140	1978–2007	0.43	<0.10	4.90
53	Beaver Creek near Finley, N. Dak.	97	1971–1996	<0.10	<0.10	5.00
55	Goose River at Hillsboro, N. Dak.	90	1994–2008	0.39	<0.10	5.91
56	Red River of the North at Grand Forks, N. Dak.	139	1971–2008	0.40	<0.10	4.60
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	82	1993–2000	0.32	<0.10	2.70
58	Turtle River at Manvel, N. Dak.	87	1980–2008	0.16	<0.10	2.60
59	Red River of the North at Oslo, Minn.	57	1973–2004	0.22	<0.10	2.70
62	Forest River near Minto, N. Dak.	78	1994–2008	0.48	<0.10	2.86
63	South Branch Park River below Homme Dam, N. Dak.	1	1981	<0.10	<0.10	<0.10
64	Middle Branch Park River near Union, N. Dak.	1	1980	0.92	0.92	0.92
65	Middle Branch Park River near Edinburg, N. Dak.	13	1978–1980	0.83	<0.10	3.30
66	Cart Creek at Mountain, N. Dak.	6	1978–1979	1.60	0.14	2.50
67	Park River at Grafton, N. Dak.	71	1994–2008	0.54	<0.10	3.32
68	Red River of the North at Drayton, N. Dak.	18	1991–2004	0.37	0.10	1.19
72	Pembina River near Vang, N. Dak.	79	1971–1979	0.14	<0.10	2.70
73	Little South Pembina River near Walhalla, N. Dak.	92	1971–1995	0.64	<0.10	4.00
74	Pembina River at Walhalla, N. Dak.	202	1971–1995	0.13	<0.10	3.00
75	Pembina River at Neche, N. Dak.	86	1994–2008	0.17	<0.10	3.74

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Nitrate + Nitrite dissolved and total as N, in mg/L—Continued						
76	Tongue River at Akra, N. Dak.	25	1979–2004	<0.10	<0.10	4.41
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	0.32	<0.10	2.18
78	Red River of the North at Pembina, N. Dak., site 2	159	1971–2008	0.43	<0.10	4.30
79	Red River of the North at Emerson, Manitoba	148	1978–2004	0.34	<0.10	5.80
80	Long Creek near Noonan, N. Dak.	12	1982–1997	<0.10	<0.10	<0.10
81	West Branch Short Creek near Columbus, N. Dak.	19	1978–1981	<0.10	<0.10	0.30
82	Souris River near Sherwood, N. Dak.	359	1974–2008	<0.10	<0.10	2.10
83	Souris River near Foxholm, N. Dak.	182	1972–1998	<0.10	<0.10	1.40
84	Des Lacs River at Foxholm, N. Dak.	137	1981–2007	<0.10	<0.10	1.54
85	Souris River above Minot, N. Dak.	154	1971–2008	<0.10	<0.10	1.54
87	Souris River near Verendrye, N. Dak.	355	1971–2008	<0.10	<0.10	2.40
88	Wintering River near Karlsruhe, N. Dak.	88	1977–2008	<0.10	<0.10	3.10
89	Souris River near Bantry, N. Dak.	97	1981–2000	<0.10	<0.10	2.10
90	Willow Creek near Willow City, N. Dak.	47	1982–2000	<0.10	<0.10	0.88
91	Stone Creek near Kramer, N. Dak.	30	1986–2000	<0.10	<0.10	3.89
92	Deep River near Upham, N. Dak.	28	1979–2000	<0.10	<0.10	2.30
93	Egg Creek near Granville, N. Dak.	9	1972–1981	<0.10	<0.10	1.50
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	6	1972–1975	<0.10	<0.10	0.40
95	Cut Bank Creek at Upham, N. Dak.	26	1976–2000	<0.10	<0.10	0.60
96	Deep River below Cut Bank Creek near Upham, N. Dak.	46	1975–1989	<0.10	<0.10	2.10
97	Boundary Creek near Landa, N. Dak.	30	1986–2000	<0.10	<0.10	2.24
98	Souris River near Westhope, N. Dak.	261	1971–2008	<0.10	<0.10	1.50
100	Missouri River near Williston, N. Dak.	94	1974–1982	0.16	<0.10	1.50
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	<0.10	<0.10	0.59
102	Stony Creek near Williston, N. Dak.	28	1977–1981	<0.10	<0.10	0.86
104	Beaver Creek near Ray, N. Dak.	42	1977–1982	<0.10	<0.10	1.50
106	Bear Den Creek near Mandaree, N. Dak.	194	1971–1996	<0.10	<0.10	2.10
108	East Fork Shell Creek near Parshall, N. Dak.	47	1991–2000	<0.10	<0.10	1.60
109	Deepwater Creek near Mandaree, N. Dak.	45	1991–2000	<0.10	<0.10	1.50
110	Little Missouri River at Marmarth, N. Dak.	10	1973–1999	<0.10	<0.10	0.26
111	Deep Creek near Amidon, N. Dak.	45	1977–1983	<0.10	<0.10	1.40
112	Little Missouri River at Medora, N. Dak.	90	1974–2007	<0.10	<0.10	1.23
113	Beaver Creek near Trotters, N. Dak.	52	1977–1999	<0.10	<0.10	0.62
114	Little Missouri River near Watford City, N. Dak.	207	1974–2007	0.13	<0.10	2.40
115	Missouri River at Garrison Dam, N. Dak.	264	1971–2007	0.11	<0.10	1.40
116	Knife River at Manning, N. Dak.	44	1977–1982	<0.10	<0.10	1.00
117	Stray Creek near Manning, N. Dak.	15	1975–1981	<0.10	<0.10	0.60
118	Knife River at Marshall, N. Dak.	40	1977–1981	<0.10	<0.10	0.70
119	Elm Creek near Golden Valley, N. Dak.	15	1977–1981	<0.10	<0.10	0.96
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	<0.10	<0.10	0.74

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Nitrate + Nitrite dissolved and total as N, in mg/L—Continued						
121	Coyote Creek near Zap, N. Dak.	43	1977–1983	<0.10	<0.10	1.60
122	Brush Creek near Beulah, N. Dak.	99	1974–1990	<0.10	<0.10	2.10
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	45	1977–1993	<0.10	<0.10	0.72
124	Spring Creek near Halliday, N. Dak.	41	1977–1981	<0.10	<0.10	0.58
125	Spring Creek at Zap, N. Dak.	173	1974–2007	<0.10	<0.10	1.20
127	Knife River at Hazen, N. Dak.	234	1974–2007	<0.10	<0.10	1.20
128	Antelope Creek above Hazen, N. Dak.	26	1977–1982	0.18	<0.10	1.80
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	1	1977	0.21	0.21	0.21
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	0.14	<0.10	0.83
131	Coal Creek near Stanton, N. Dak.	25	1975–1981	<0.10	<0.10	0.65
132	Alderin Creek near Fort Clark, N. Dak.	29	1977–1982	<0.10	<0.10	1.60
133	Coal Lake Coulee near Hensler, N. Dak.	16	1978–1982	<0.10	<0.10	0.72
134	Buffalo Creek near Washburn, N. Dak.	32	1978–1983	<0.10	<0.10	1.80
135	Turtle Creek above Washburn, N. Dak.	95	1987–2003	<0.10	<0.10	1.20
136	Painted Woods Creek near Wilton, N. Dak.	184	1971–2003	<0.10	<0.10	1.60
137	Square Butte Creek near Hannover, N. Dak.	21	1977–1981	<0.10	<0.10	0.50
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	48	1977–1982	0.75	<0.10	4.70
139	Hagel Creek near Center, N. Dak.	31	1977–1982	<0.10	<0.10	0.58
140	Square Butte Creek below Center, N. Dak.	5	1983–1993	0.23	<0.10	0.40
142	Missouri River at Bismarck, N. Dak.	192	1971–2001	0.12	<0.10	0.80
143	South Branch Heart River near South Heart, N. Dak.	27	1979–1996	0.29	<0.10	1.80
144	North Creek near South Heart, N. Dak.	22	1978–1996	<0.10	<0.10	0.85
145	Heart River near South Heart, N. Dak.	49	1975–1984	<0.10	<0.10	1.50
146	Heart River at Dickinson, N. Dak.	5	1993	<0.10	<0.10	0.18
147	Green River near New Hradec, N. Dak.	44	1977–1982	<0.10	<0.10	0.69
148	Green River near Gladstone, N. Dak.	4	1993	<0.10	<0.10	<0.10
149	Heart River near Richardton, N. Dak.	76	1994–2007	<0.10	<0.10	1.52
152	Big Muddy Creek near Almont, N. Dak.	3	1993	<0.10	<0.10	0.12
156	Heart River near Mandan, N. Dak.	187	1978–2007	<0.10	<0.10	1.20
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	3	1988–1989	<0.10	<0.10	0.35
158	Apple Creek near Menoken, N. Dak.	59	1977–2007	<0.10	<0.10	1.40
159	Missouri River near Schmidt, N. Dak.	141	1974–1981	0.13	<0.10	0.47
160	Cannonball River at New England, N. Dak.	28	1978–1981	<0.10	<0.10	2.00
161	Coal Bank Creek near Havelock, N. Dak.	76	1974–1983	<0.10	<0.10	7.00
162	Cannonball River at Regent, N. Dak.	40	1977–1981	<0.10	<0.10	0.86
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	<0.10	<0.10	2.77
166	Cedar Creek near Haynes, N. Dak.	1	1973	<0.10	<0.10	<0.10
167	Timber Creek near Bentley, N. Dak.	39	1977–1981	0.38	<0.10	4.80
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	<0.10	<0.10	3.56
170	Cannonball River at Breien, N. Dak.	204	1971–2007	<0.10	<0.10	3.52

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Nitrate + Nitrite dissolved and total as N, in mg/L—Continued						
171	Beaver Creek near Linton, N. Dak.	4	1993	<0.10	<0.10	0.15
173	Porcupine Creek near Fort Yates, N. Dak.	36	1991–1999	<0.10	<0.10	0.60
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	78	1974–1987	<0.10	<0.10	2.00
175	James River near Manfred, N. Dak.	39	1985–1998	<0.10	<0.10	1.90
176	James River near Grace City, N. Dak.	116	1985–2007	<0.10	<0.10	2.50
177	James River above Arrowwood Lake near Kensal, N. Dak.	158	1985–2008	<0.10	<0.10	2.30
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	10	1986–1989	<0.10	<0.10	0.70
179	James River near Pingree, N. Dak.	131	1978–2008	<0.10	<0.10	1.60
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	<0.10	<0.10	0.88
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	<0.10	<0.10	0.88
182	James River at Jamestown, N. Dak.	159	1984–2007	0.22	<0.10	29.60
183	James River at Lamoure, N. Dak.	253	1971–2007	0.14	<0.10	4.72
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	0.22	<0.10	2.42
185	James River at Oakes, N. Dak.	123	1971–2008	<0.10	<0.10	2.94
186	James River at N. Dak./S. Dak. State line	84	1974–2004	<0.10	<0.10	3.00
Ammonia plus organic nitrogen, dissolved as N, in mg/L						
1	Bois De Sioux River near Doran, Minn.	11	2006–2007	1.02	0.80	1.19
2	Red River of the North at Wahpeton, N. Dak.	3	1991–2004	0.50	0.48	1.10
3	Red River of the North near Wahpeton, N. Dak.	1	2006	0.61	0.61	0.61
4	Red River of the North at Brushville, Minn.	12	2000–2007	0.70	0.51	1.00
6	Red River of the North at Hickson, N. Dak.	3	1991–2004	0.54	0.43	1.00
10	Wild Rice River near Abercrombie, N. Dak.	18	1994–2007	0.99	0.60	1.21
11	Red River of the North at Fargo, N. Dak.	51	1991–2008	0.76	0.38	1.20
12	Red River of North below Fargo, N. Dak.	4	1977–1986	0.83	<0.20	1.00
13	Red River of the North at Harwood, N. Dak.	12	2006–2007	0.83	0.56	1.15
15	Sheyenne River above Harvey, N. Dak.	24	1986–2004	1.10	0.20	1.60
17	Sheyenne River at Warwick, N. Dak.	4	2005–2006	1.08	0.96	1.43
18	Sheyenne River near Warwick, N. Dak.	25	1993–2007	1.00	0.40	1.73
20	Mauvais Coulee near Cando, N. Dak.	3	2004	1.41	0.63	1.77
21	Edmore Coulee near Edmore, N. Dak.	3	2004	1.38	0.71	2.26
24	Starkweather Coulee near Webster, N. Dak.	2	2004	1.14	1.04	1.24
32	Sheyenne River near Cooperstown, N. Dak.	91	1979–2007	1.00	<0.20	2.40
33	Baldhill Creek near Dazey, N. Dak.	38	1979–1981	0.88	0.42	2.30
34	Sheyenne River below Baldhill Dam, N. Dak.	53	1979–2007	1.11	<0.20	2.90
36	Sheyenne River at Lisbon, N. Dak.	49	1986–2007	<0.20	0.20	1.90
37	Sheyenne River near Kindred, N. Dak.	156	1976–2007	0.63	<0.20	1.80
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	2	2003–2004	0.49	0.46	0.52
41	Sheyenne River at West Fargo, N. Dak.	2	1991–2006	1.05	0.81	1.30
45	Maple River below Mapleton, N. Dak.	13	2005–2007	0.88	0.47	1.14

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Ammonia plus organic nitrogen, dissolved as N, in mg/L—Continued						
52	Red River of the North at Halstad, Minn.	64	1978–2004	0.95	0.50	2.90
53	Beaver Creek near Finley, N. Dak.	10	1981–1982	1.50	1.00	2.90
55	Goose River at Hillsboro, N. Dak.	25	1994–2008	0.77	0.57	1.07
56	Red River of the North at Grand Forks, N. Dak.	66	1991–2008	0.77	0.49	1.50
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	82	1993–2000	0.51	0.22	1.52
58	Turtle River at Manvel, N. Dak.	29	2005–2008	0.79	0.60	1.38
59	Red River of the North at Oslo, Minn.	5	1977–2004	0.89	0.69	1.30
62	Forest River near Minto, N. Dak.	30	2005–2008	0.55	0.24	1.21
67	Park River at Grafton, N. Dak.	30	2005–2008	0.68	0.29	1.22
68	Red River of the North at Drayton, N. Dak.	3	1991–2004	0.71	0.65	1.10
73	Little South Pembina River near Walhalla, N. Dak.	11	1994–1995	0.70	0.30	1.20
74	Pembina River at Walhalla, N. Dak.	83	1979–1995	0.73	<0.20	3.90
75	Pembina River at Neche, N. Dak.	30	2005–2008	0.68	0.30	1.17
76	Tongue River at Akra, N. Dak.	8	1979–1980	0.93	0.30	1.30
78	Red River of the North at Pembina, N. Dak., site 2	85	1994–2008	0.76	0.54	1.61
79	Red River of the North at Emerson, Manitoba	79	1978–2004	0.97	<0.20	2.80
81	West Branch Short Creek near Columbus, N. Dak.	2	1981	1.13	0.96	1.30
82	Souris River near Sherwood, N. Dak.	9	1978–2007	1.10	0.85	2.93
84	Des Lacs River at Foxholm, N. Dak.	14	2006–2007	1.26	0.65	2.28
85	Souris River above Minot, N. Dak.	24	1981–2007	1.41	0.84	2.70
87	Souris River near Verendrye, N. Dak.	16	1987–2007	1.39	0.89	3.84
89	Souris River near Bantry, N. Dak.	8	1982–1983	1.55	0.80	2.10
98	Souris River near Westhope, N. Dak.	46	1978–1983	1.65	0.71	3.70
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	0.62	<0.20	0.83
102	Stony Creek near Williston, N. Dak.	2	1981	1.08	0.56	1.60
104	Beaver Creek near Ray, N. Dak.	8	1981–1982	0.76	0.43	1.20
106	Bear Den Creek near Mandaree, N. Dak.	20	1980–1991	1.10	0.60	1.70
110	Little Missouri River at Marmarth, N. Dak.	8	1999	0.37	0.28	0.59
111	Deep Creek near Amidon, N. Dak.	9	1981–1983	0.92	0.66	1.40
112	Little Missouri River at Medora, N. Dak.	20	1999–2007	0.38	<0.20	0.70
113	Beaver Creek near Trotters, N. Dak.	12	1981–1999	0.53	0.36	1.10
114	Little Missouri River near Watford City, N. Dak.	62	1977–2007	0.62	0.24	3.10
115	Missouri River at Garrison Dam, N. Dak.	111	1977–2007	0.23	<0.20	0.88
116	Knife River at Manning, N. Dak.	9	1980–1982	1.40	0.82	2.70
117	Stray Creek near Manning, N. Dak.	3	1980–1981	1.40	0.86	2.10
118	Knife River at Marshall, N. Dak.	5	1980–1981	1.30	1.00	3.50
119	Elm Creek near Golden Valley, N. Dak.	2	1981	0.90	0.50	1.30
120	Knife River near Golden Valley, N. Dak.	20	2005–2007	0.92	0.50	1.44
121	Coyote Creek near Zap, N. Dak.	13	1980–1983	1.00	0.72	2.70
122	Brush Creek near Beulah, N. Dak.	59	1976–1988	0.80	<0.20	4.40

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Ammonia plus organic nitrogen, dissolved as N, in mg/L—Continued						
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	3	1980–1981	1.40	1.10	1.60
124	Spring Creek near Halliday, N. Dak.	5	1980–1981	0.91	0.55	2.10
125	Spring Creek at Zap, N. Dak.	20	2005–2007	0.63	0.30	1.29
127	Knife River at Hazen, N. Dak.	68	1977–2007	0.61	<0.20	1.70
128	Antelope Creek above Hazen, N. Dak.	6	1980–1982	0.99	0.61	1.30
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	8	1977–1980	0.98	0.41	12.00
130	West Branch Antelope Creek near Hazen, N. Dak.	7	1981–1983	1.30	0.22	1.50
131	Coal Creek near Stanton, N. Dak.	3	1980–1981	1.20	1.10	2.50
132	Alderin Creek near Fort Clark, N. Dak.	8	1980–1982	1.05	<0.20	1.40
133	Coal Lake Coulee near Hensler, N. Dak.	6	1980–1982	1.30	<0.20	3.00
134	Buffalo Creek near Washburn, N. Dak.	12	1980–1983	1.30	0.47	2.20
137	Square Butte Creek near Hannover, N. Dak.	3	1980–1981	0.96	0.84	2.70
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	10	1980–1982	1.05	0.42	2.40
139	Hagel Creek near Center, N. Dak.	7	1980–1982	1.30	0.37	2.30
142	Missouri River at Bismarck, N. Dak.	18	1999–2001	<0.20	<0.20	0.29
143	South Branch Heart River near South Heart, N. Dak.	8	1980–1983	1.25	0.95	3.00
144	North Creek near South Heart, N. Dak.	4	1980–1981	1.60	1.40	1.90
145	Heart River near South Heart, N. Dak.	11	1980–1983	1.20	0.47	2.30
147	Green River near New Hradec, N. Dak.	8	1981–1982	1.25	0.40	1.90
149	Heart River near Richardton, N. Dak.	16	2005–2007	0.74	0.48	0.99
156	Heart River near Mandan, N. Dak.	62	1978–2007	0.58	0.21	1.70
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	3	1988–1989	0.80	0.80	1.50
158	Apple Creek near Menoken, N. Dak.	29	1978–1981	1.10	0.54	1.60
160	Cannonball River at New England, N. Dak.	3	1981	0.85	0.77	0.94
161	Coal Bank Creek near Havelock, N. Dak.	43	1976–1983	0.72	<0.20	2.30
162	Cannonball River at Regent, N. Dak.	3	1981	0.67	0.46	1.00
164	Cannonball River near Raleigh, N. Dak.	19	2005–2007	0.69	0.25	1.40
167	Timber Creek near Bentley, N. Dak.	3	1981	1.30	1.10	1.50
169	Cedar Creek near Raleigh, N. Dak.	17	2005–2007	0.71	0.37	1.33
170	Cannonball River at Breien, N. Dak.	68	1977–2007	0.63	0.30	1.50
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	52	1976–1987	1.25	0.44	2.90
175	James River near Manfred, N. Dak.	17	1987–1995	1.10	0.50	1.40
176	James River near Grace City, N. Dak.	53	1987–2007	1.30	0.50	2.80
177	James River above Arrowwood Lake near Kensal, N. Dak.	147	1987–2008	1.30	0.60	5.51
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	5	1987–1989	1.00	0.50	1.70
179	James River near Pingree, N. Dak.	94	1987–2008	1.33	0.67	2.71
182	James River at Jamestown, N. Dak.	82	1987–2007	0.90	<0.20	2.50
183	James River at Lamoure, N. Dak.	73	1987–2007	0.90	0.30	1.90
185	James River at Oakes, N. Dak.	61	1987–2008	0.90	<0.20	3.70
186	James River at N. Dak./S. Dak. State line	1	2004	1.00	1.00	1.00

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total nitrogen, dissolved as N, in mg/L						
1	Bois De Sioux River near Doran, Minn.	11	2006–2007	1.20	0.90	1.90
3	Red River of the North near Wahpeton, N. Dak.	1	2006	0.63	0.63	0.63
4	Red River of the North at Brushville, Minn.	12	2000–2007	0.94	0.53	1.51
10	Wild Rice River near Abercrombie, N. Dak.	12	2006–2007	1.05	0.75	1.69
11	Red River of the North at Fargo, N. Dak.	28	2006–2008	1.14	0.60	2.77
13	Red River of the North at Harwood, N. Dak.	12	2006–2007	1.92	1.20	3.19
17	Sheyenne River at Warwick, N. Dak.	4	2005–2006	1.13	1.04	1.78
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	0.97	0.53	1.47
32	Sheyenne River near Cooperstown, N. Dak.	19	2005–2007	0.80	0.51	1.48
34	Sheyenne River below Baldhill Dam, N. Dak.	19	2005–2007	1.16	0.86	2.30
36	Sheyenne River at Lisbon, N. Dak.	19	2005–2007	0.99	0.48	1.77
37	Sheyenne River near Kindred, N. Dak.	11	2006–2007	0.55	0.37	1.38
41	Sheyenne River at West Fargo, N. Dak.	1	2006	0.83	0.83	0.83
45	Maple River below Mapleton, N. Dak.	11	2006–2007	0.90	0.57	3.08
55	Goose River at Hillsboro, N. Dak.	19	2006–2008	0.86	0.59	2.49
56	Red River of the North at Grand Forks, N. Dak.	25	2006–2008	1.28	0.55	4.40
58	Turtle River at Manvel, N. Dak.	22	2006–2008	0.85	0.63	2.16
62	Forest River near Minto, N. Dak.	23	2006–2008	0.92	0.52	2.61
67	Park River at Grafton, N. Dak.	23	2006–2008	1.27	0.55	4.08
75	Pembina River at Neche, N. Dak.	23	2006–2008	0.76	0.35	4.81
78	Red River of the North at Pembina, N. Dak., site 2	24	2006–2008	1.32	0.64	4.47
84	Des Lacs River at Foxholm, N. Dak.	14	2006–2007	1.28	0.67	2.32
85	Souris River above Minot, N. Dak.	13	2006–2007	1.43	1.08	2.16
87	Souris River near Verendrye, N. Dak.	14	2006–2007	1.52	1.07	4.37
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	0.75	0.02	1.22
110	Little Missouri River at Marmarth, N. Dak.	8	1999	0.44	0.29	0.91
112	Little Missouri River at Medora, N. Dak.	20	1999–2007	0.43	0.22	1.64
113	Beaver Creek near Trotters, N. Dak.	9	1999	0.57	0.37	1.37
114	Little Missouri River near Watford City, N. Dak.	20	1999–2007	0.55	0.27	1.67
120	Knife River near Golden Valley, N. Dak.	20	2005–2007	0.97	0.52	1.65
125	Spring Creek at Zap, N. Dak.	20	2005–2007	0.69	0.33	1.58
127	Knife River at Hazen, N. Dak.	19	2005–2007	0.70	0.38	1.46
149	Heart River near Richardton, N. Dak.	16	2005–2007	0.78	0.50	1.02
156	Heart River near Mandan, N. Dak.	20	2005–2007	0.50	0.34	1.14
164	Cannonball River near Raleigh, N. Dak.	19	2005–2007	0.82	0.29	4.15
169	Cedar Creek near Raleigh, N. Dak.	17	2005–2007	0.79	0.39	4.98
170	Cannonball River at Breien, N. Dak.	18	2005–2007	0.61	0.39	4.72
176	James River near Grace City, N. Dak.	20	2005–2007	1.37	0.54	2.18
182	James River at Jamestown, N. Dak.	20	2005–2007	1.39	0.36	3.75
183	James River at Lamoure, N. Dak.	19	2005–2007	1.04	0.57	4.62

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total nitrogen as N, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	1.47	0.95	2.91
3	Red River of the North near Wahpeton, N. Dak.	1	2006	0.67	0.67	0.67
4	Red River of the North at Brushville, Minn.	52	2000–2007	0.98	0.42	2.52
10	Wild Rice River near Abercrombie, N. Dak.	43	2000–2007	1.22	0.61	3.42
11	Red River of the North at Fargo, N. Dak.	28	2006–2008	1.05	0.52	2.57
13	Red River of the North at Harwood, N. Dak.	52	2000–2007	1.60	0.97	6.27
14	Red River of the North near Harwood, N. Dak.	5	2006–2007	1.51	0.95	2.49
17	Sheyenne River at Warwick, N. Dak.	41	1998–2006	1.32	0.84	2.11
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	0.95	0.55	1.54
32	Sheyenne River near Cooperstown, N. Dak.	67	1998–2007	1.13	0.52	2.01
34	Sheyenne River below Baldhill Dam, N. Dak.	62	1998–2007	1.32	0.91	3.23
36	Sheyenne River at Lisbon, N. Dak.	65	1998–2007	1.12	0.56	2.05
37	Sheyenne River near Kindred, N. Dak.	62	1998–2007	0.90	0.40	2.51
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	0.47	0.44	2.96
41	Sheyenne River at West Fargo, N. Dak.	1	2006	0.77	0.77	0.77
45	Maple River below Mapleton, N. Dak.	45	1998–2007	1.05	0.63	3.94
52	Red River of the North at Halstad, Minn.	5	2006–2007	1.13	0.89	2.46
55	Goose River at Hillsboro, N. Dak.	65	1998–2008	1.31	0.57	4.47
56	Red River of the North at Grand Forks, N. Dak.	69	1998–2008	1.14	0.59	4.26
58	Turtle River at Manvel, N. Dak.	57	1998–2008	1.24	0.67	4.23
62	Forest River near Minto, N. Dak.	58	1998–2008	1.35	0.57	4.08
67	Park River at Grafton, N. Dak.	55	1998–2008	1.26	0.58	4.25
75	Pembina River at Neche, N. Dak.	63	1998–2008	0.70	0.36	4.64
78	Red River of the North at Pembina, N. Dak., site 2	77	1998–2008	1.17	0.58	4.36
84	Des Lacs River at Foxholm, N. Dak.	67	1998–2007	1.47	0.88	3.91
85	Souris River above Minot, N. Dak.	55	1998–2007	1.45	0.82	9.91
87	Souris River near Verendrye, N. Dak.	65	1998–2007	1.29	0.48	4.16
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	0.78	0.53	1.07
110	Little Missouri River at Marmarth, N. Dak.	8	1999	0.38	0.21	0.90
112	Little Missouri River at Medora, N. Dak.	64	1998–2007	0.50	0.19	2.01
113	Beaver Creek near Trotters, N. Dak.	9	1999	0.54	0.21	1.13
114	Little Missouri River near Watford City, N. Dak.	59	1998–2007	0.64	0.23	4.98
120	Knife River near Golden Valley, N. Dak.	56	1998–2007	0.92	0.42	1.84
125	Spring Creek at Zap, N. Dak.	59	1998–2007	0.74	0.23	1.90
127	Knife River at Hazen, N. Dak.	65	1998–2007	0.76	0.31	2.43
149	Heart River near Richardton, N. Dak.	61	1998–2007	0.88	0.47	2.35
156	Heart River near Mandan, N. Dak.	60	1998–2007	0.64	<0.02	2.14
158	Apple Creek near Menoken, N. Dak.	10	2007	1.17	0.85	2.49
164	Cannonball River near Raleigh, N. Dak.	52	1998–2007	0.76	0.22	4.18

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total nitrogen as N, in mg/L—Continued						
169	Cedar Creek near Raleigh, N. Dak.	45	1998–2007	0.84	<0.02	4.81
170	Cannonball River at Breien, N. Dak.	54	1998–2007	0.69	0.34	4.73
175	James River near Manfred, N. Dak.	6	1998	1.21	1.08	1.63
176	James River near Grace City, N. Dak.	56	1998–2007	1.64	0.55	3.02
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	1.22	0.98	1.90
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	1.51	0.92	2.32
182	James River at Jamestown, N. Dak.	70	1998–2007	1.61	0.44	30.50
183	James River at Lamoure, N. Dak.	65	1998–2007	1.57	0.83	6.48
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	1.69	1.22	3.74
186	James River at N. Dak./S. Dak. State line	9	1998–1999	1.31	0.91	2.16
Phosphorus, dissolved as P, in mg/L						
1	Bois De Sioux River near Doran, Minn.	11	2006–2007	0.16	<0.01	0.27
2	Red River of the North at Wahpeton, N. Dak.	3	1991–2004	0.02	<0.01	0.06
3	Red River of the North near Wahpeton, N. Dak.	1	2006	<0.01	<0.01	<0.01
4	Red River of the North at Brushville, Minn.	12	2000–2007	0.09	0.02	0.18
5	Red River of the North below Wahpeton, N. Dak.	26	1970–1999	0.09	<0.01	0.28
6	Red River of the North at Hickson, N. Dak.	93	1975–2004	0.08	<0.01	0.84
7	Wild Rice River near Rutland, N. Dak.	7	1971–1975	0.10	<0.01	0.39
8	Wild Rice River near Cayuga, N. Dak.	3	1970	0.12	0.10	0.41
10	Wild Rice River near Abercrombie, N. Dak.	126	1970–2007	0.25	<0.01	2.00
11	Red River of the North at Fargo, N. Dak.	94	1970–2008	0.11	<0.01	2.40
12	Red River of North below Fargo, N. Dak.	87	1970–1986	0.15	<0.01	1.20
13	Red River of the North at Harwood, N. Dak.	12	2006–2007	0.22	0.11	0.48
14	Red River of the North near Harwood, N. Dak.	30	1997–2007	0.17	<0.01	0.35
15	Sheyenne River above Harvey, N. Dak.	135	1977–2004	0.20	<0.01	0.75
16	Big Coulee near Fort Totten, N. Dak.	1	1970	0.04	0.04	0.04
17	Sheyenne River at Warwick, N. Dak.	4	2005–2006	0.21	0.15	0.23
18	Sheyenne River near Warwick, N. Dak.	129	1970–2007	0.13	<0.01	0.98
20	Mauvais Coulee near Cando, N. Dak.	4	1993–2004	0.28	0.23	0.29
21	Edmore Coulee near Edmore, N. Dak.	5	1983–2004	0.21	0.04	0.53
24	Starkweather Coulee near Webster, N. Dak.	2	2004	0.29	0.14	0.45
27	Little Coulee near Brinsmade, N. Dak.	16	1976–1981	0.36	0.10	1.00
28	Big Coulee near Churchs Ferry, N. Dak.	74	1970–1979	0.26	<0.01	7.30
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	43	1970–1986	0.28	0.04	1.50
30	Channel A near Penn, N. Dak.	4	1992–1993	0.55	0.04	0.75
32	Sheyenne River near Cooperstown, N. Dak.	200	1970–2007	0.16	<0.01	0.78
33	Baldhill Creek near Dazey, N. Dak.	38	1979–1981	0.04	<0.01	0.36
34	Sheyenne River below Baldhill Dam, N. Dak.	63	1979–2007	0.22	0.04	0.43
36	Sheyenne River at Lisbon, N. Dak.	213	1970–2007	0.11	<0.01	0.49
37	Sheyenne River near Kindred, N. Dak.	223	1976–2007	0.07	<0.01	0.30

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Phosphorus, dissolved as P, in mg/L—Continued						
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	12	2003–2007	0.11	0.04	0.25
39	Sheyenne River near Horace, N. Dak.	37	1976–1979	0.07	0.02	0.17
41	Sheyenne River at West Fargo, N. Dak.	2	1991–2006	0.16	0.14	0.17
45	Maple River below Mapleton, N. Dak.	12	2005–2007	0.45	0.16	3.60
46	Sheyenne River at Harwood, N. Dak.	21	1997–1999	0.15	0.04	0.34
50	Sheyenne River near Harwood, N. Dak.	6	1970	0.17	0.07	0.33
52	Red River of the North at Halstad, Minn.	138	1978–2007	0.16	<0.01	1.80
53	Beaver Creek near Finley, N. Dak.	73	1970–1996	0.11	<0.01	0.62
55	Goose River at Hillsboro, N. Dak.	25	1994–2008	0.04	<0.01	0.29
56	Red River of the North at Grand Forks, N. Dak.	112	1970–2008	0.13	<0.01	0.37
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	82	1993–2000	0.07	<0.01	0.36
58	Turtle River at Manvel, N. Dak.	29	2005–2008	0.06	<0.01	0.35
59	Red River of the North at Oslo, Minn.	6	1977–2004	0.10	0.06	0.23
62	Forest River near Minto, N. Dak.	30	2005–2008	0.08	<0.01	0.27
67	Park River at Grafton, N. Dak.	30	2005–2008	0.11	<0.01	0.29
68	Red River of the North at Drayton, N. Dak.	3	1991–2004	0.07	0.06	0.11
72	Pembina River near Vang, N. Dak.	82	1970–1979	0.14	<0.01	5.80
73	Little South Pembina River near Walhalla, N. Dak.	95	1970–1995	0.17	0.06	5.40
74	Pembina River at Walhalla, N. Dak.	218	1970–1995	0.13	<0.01	3.90
75	Pembina River at Neche, N. Dak.	30	2005–2008	0.20	0.03	0.48
76	Tongue River at Akra, N. Dak.	8	1979–1980	0.07	<0.01	0.20
78	Red River of the North at Pembina, N. Dak., site 2	100	1970–2008	0.14	<0.01	0.40
79	Red River of the North at Emerson, Manitoba	146	1978–2004	0.11	<0.01	0.75
81	West Branch Short Creek near Columbus, N. Dak.	19	1978–1981	0.09	0.02	0.67
82	Souris River near Sherwood, N. Dak.	106	1974–2007	0.08	<0.01	0.74
83	Souris River near Foxholm, N. Dak.	1	1979	0.06	0.06	0.06
84	Des Lacs River at Foxholm, N. Dak.	14	2006–2007	0.12	0.03	1.06
85	Souris River above Minot, N. Dak.	32	1981–2007	0.18	0.06	0.53
87	Souris River near Verendrye, N. Dak.	153	1970–2007	0.16	0.03	2.40
88	Wintering River near Karlsruhe, N. Dak.	26	1977–1981	0.08	<0.01	0.38
89	Souris River near Bantry, N. Dak.	35	1981–2000	0.20	0.02	0.82
90	Willow Creek near Willow City, N. Dak.	20	1999–2000	0.15	0.02	0.28
91	Stone Creek near Kramer, N. Dak.	16	1999–2000	0.30	0.04	0.57
92	Deep River near Upham, N. Dak.	20	1999–2000	0.14	<0.01	0.54
93	Egg Creek near Granville, N. Dak.	9	1972–1981	0.32	0.12	3.00
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	6	1972–1975	0.23	0.06	0.47
95	Cut Bank Creek at Upham, N. Dak.	26	1976–2000	0.14	0.05	0.88
96	Deep River below Cut Bank Creek near Upham, N. Dak.	30	1975–1980	0.16	<0.01	1.50
97	Boundary Creek near Landa, N. Dak.	16	1999–2000	0.25	0.04	0.49

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Phosphorus, dissolved as P, in mg/L—Continued						
98	Souris River near Westhope, N. Dak.	188	1970–1994	0.18	<0.01	3.00
100	Missouri River near Williston, N. Dak.	6	1970	0.06	0.03	0.10
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	0.05	0.02	0.31
102	Stony Creek near Williston, N. Dak.	28	1977–1981	0.03	<0.01	0.82
104	Beaver Creek near Ray, N. Dak.	42	1977–1982	0.02	<0.01	0.21
106	Bear Den Creek near Mandaree, N. Dak.	130	1970–1996	0.02	<0.01	0.88
110	Little Missouri River at Marmarth, N. Dak.	10	1973–1999	0.05	<0.01	0.17
111	Deep Creek near Amidon, N. Dak.	46	1977–1983	<0.01	<0.01	0.11
112	Little Missouri River at Medora, N. Dak.	22	1974–2007	0.02	<0.01	0.56
113	Beaver Creek near Trotters, N. Dak.	49	1977–1999	<0.01	<0.01	0.16
114	Little Missouri River near Watford City, N. Dak.	110	1977–2007	<0.01	<0.01	0.45
115	Missouri River at Garrison Dam, N. Dak.	241	1971–2007	<0.01	<0.01	0.21
116	Knife River at Manning, N. Dak.	45	1977–1982	0.03	<0.01	0.17
117	Stray Creek near Manning, N. Dak.	14	1978–1981	0.06	0.02	0.47
118	Knife River at Marshall, N. Dak.	41	1977–1981	0.02	<0.01	0.14
119	Elm Creek near Golden Valley, N. Dak.	15	1977–1981	0.10	0.03	0.44
120	Knife River near Golden Valley, N. Dak.	20	2005–2007	0.03	<0.01	0.12
121	Coyote Creek near Zap, N. Dak.	43	1977–1983	0.02	<0.01	0.34
122	Brush Creek near Beulah, N. Dak.	71	1976–1988	0.03	<0.01	0.29
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	39	1977–1981	0.05	<0.01	0.34
124	Spring Creek near Halliday, N. Dak.	41	1977–1981	0.02	<0.01	0.34
125	Spring Creek at Zap, N. Dak.	21	1977–2007	<0.01	<0.01	0.13
127	Knife River at Hazen, N. Dak.	116	1977–2007	0.02	<0.01	0.37
128	Antelope Creek above Hazen, N. Dak.	26	1977–1982	0.07	<0.01	0.63
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	1	1977	0.10	0.10	0.10
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	0.19	0.06	0.63
131	Coal Creek near Stanton, N. Dak.	24	1977–1981	0.06	<0.01	0.36
132	Alderin Creek near Fort Clark, N. Dak.	29	1977–1982	0.03	<0.01	0.26
133	Coal Lake Coulee near Hensler, N. Dak.	16	1978–1982	0.07	0.04	0.43
134	Buffalo Creek near Washburn, N. Dak.	32	1978–1983	0.05	<0.01	0.51
136	Painted Woods Creek near Wilton, N. Dak.	63	1970–1982	0.07	<0.01	2.10
137	Square Butte Creek near Hannover, N. Dak.	21	1977–1981	0.05	<0.01	0.41
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	48	1977–1982	0.01	<0.01	0.43
139	Hagel Creek near Center, N. Dak.	31	1977–1982	0.06	<0.01	0.27
142	Missouri River at Bismarck, N. Dak.	30	1970–2001	<0.01	<0.01	1.00
143	South Branch Heart River near South Heart, N. Dak.	17	1979–1983	0.10	<0.01	0.52
144	North Creek near South Heart, N. Dak.	14	1978–1981	0.06	0.02	0.34
145	Heart River near South Heart, N. Dak.	47	1977–1983	0.10	<0.01	0.35
147	Green River near New Hradec, N. Dak.	44	1977–1982	0.02	<0.01	0.17
149	Heart River near Richardton, N. Dak.	16	2005–2007	<0.01	<0.01	0.07

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Phosphorus, dissolved as P, in mg/L—Continued						
156	Heart River near Mandan, N. Dak.	126	1978–2007	<0.01	<0.01	0.10
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	3	1988–1989	0.22	0.09	0.71
158	Apple Creek near Menoken, N. Dak.	41	1977–1981	0.28	0.02	1.80
159	Missouri River near Schmidt, N. Dak.	1	1978	0.03	0.03	0.03
160	Cannonball River at New England, N. Dak.	28	1978–1981	0.02	<0.01	0.16
161	Coal Bank Creek near Havelock, N. Dak.	54	1976–1983	0.02	<0.01	0.10
162	Cannonball River at Regent, N. Dak.	41	1977–1981	<0.01	<0.01	0.69
164	Cannonball River near Raleigh, N. Dak.	19	2005–2007	<0.01	<0.01	0.08
166	Cedar Creek near Haynes, N. Dak.	1	1973	0.02	0.02	0.02
167	Timber Creek near Bentley, N. Dak.	40	1977–1981	0.02	<0.01	0.08
169	Cedar Creek near Raleigh, N. Dak.	17	2005–2007	0.02	<0.01	0.09
170	Cannonball River at Breien, N. Dak.	113	1977–2007	<0.01	<0.01	0.17
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	60	1976–1987	0.03	<0.01	0.27
175	James River near Manfred, N. Dak.	33	1985–1995	0.23	0.02	0.84
176	James River near Grace City, N. Dak.	76	1985–2007	0.18	<0.01	0.69
177	James River above Arrowwood Lake near Kensal, N. Dak.	150	1985–2008	0.13	<0.01	1.36
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	0.07	0.02	0.41
179	James River near Pingree, N. Dak.	132	1978–2008	0.11	<0.01	1.08
182	James River at Jamestown, N. Dak.	104	1984–2007	0.09	<0.01	2.91
183	James River at Lamoure, N. Dak.	203	1970–2007	0.13	<0.01	2.06
185	James River at Oakes, N. Dak.	99	1970–2008	0.12	<0.01	1.44
186	James River at N. Dak./S. Dak. State line	75	1974–2004	0.13	<0.01	3.00
Phosphorus, total as P, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	0.23	0.04	0.61
2	Red River of the North at Wahpeton, N. Dak.	19	1993–2004	0.15	0.03	0.51
3	Red River of the North near Wahpeton, N. Dak.	5	1993–2006	0.09	0.02	0.33
4	Red River of the North at Brushville, Minn.	61	1993–2007	0.16	0.03	0.54
5	Red River of the North below Wahpeton, N. Dak.	64	1970–1999	0.15	0.03	0.40
6	Red River of the North at Hickson, N. Dak.	102	1975–2004	0.18	0.03	1.20
10	Wild Rice River near Abercrombie, N. Dak.	63	1993–2007	0.21	0.03	0.68
11	Red River of the North at Fargo, N. Dak.	77	1994–2008	0.19	0.04	1.28
12	Red River of North below Fargo, N. Dak.	96	1970–1977	0.47	0.11	11.00
13	Red River of the North at Harwood, N. Dak.	52	2000–2007	0.30	0.11	1.41
14	Red River of the North near Harwood, N. Dak.	59	1993–2007	0.27	0.05	0.48
15	Sheyenne River above Harvey, N. Dak.	2	2003–2004	0.22	0.21	0.23
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	0.20	0.03	0.50
18	Sheyenne River near Warwick, N. Dak.	25	1993–2007	0.21	0.03	0.51
20	Mauvais Coulee near Cando, N. Dak.	60	1989–2004	0.33	0.06	0.78
21	Edmore Coulee near Edmore, N. Dak.	62	1989–2004	0.40	0.08	1.12
22	Edmore Coulee Tributary near Webster, N. Dak.	2	1993	0.31	0.27	0.34

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Phosphorus, total as P, in mg/L—Continued						
24	Starkweather Coulee near Webster, N. Dak.	56	1989–2004	0.29	0.02	1.19
25	Big Coulee below Churchs Ferry, N. Dak.	9	1998–1999	0.38	0.22	0.99
28	Big Coulee near Churchs Ferry, N. Dak.	50	1989–1997	0.40	0.15	0.92
30	Channel A near Penn, N. Dak.	59	1989–1999	0.30	0.06	0.98
32	Sheyenne River near Cooperstown, N. Dak.	173	1979–2007	0.21	<0.01	0.57
33	Baldhill Creek near Dazey, N. Dak.	51	1979–1996	0.14	0.03	0.69
34	Sheyenne River below Baldhill Dam, N. Dak.	129	1979–2007	0.24	0.05	0.46
35	Sheyenne River at Valley City, N. Dak.	11	1993	0.28	0.12	0.46
36	Sheyenne River at Lisbon, N. Dak.	99	1993–2007	0.22	0.06	1.20
37	Sheyenne River near Kindred, N. Dak.	283	1976–2007	0.18	0.02	1.80
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	15	2003–2007	0.22	0.08	0.72
41	Sheyenne River at West Fargo, N. Dak.	13	1994–2006	0.24	0.04	0.48
45	Maple River below Mapleton, N. Dak.	49	1997–2007	0.26	0.04	11.10
46	Sheyenne River at Harwood, N. Dak.	31	1993–1999	0.38	0.07	0.89
49	Lower Branch Rush River near Prosper, N. Dak.	2	1993	0.25	0.23	0.27
50	Sheyenne River near Harwood, N. Dak.	44	1970–1974	0.30	0.12	0.81
51	Elm River near Kelso, N. Dak.	4	1993	0.51	0.37	0.80
52	Red River of the North at Halstad, Minn.	140	1978–2007	0.28	0.07	2.70
53	Beaver Creek near Finley, N. Dak.	82	1974–1996	0.18	0.04	0.67
55	Goose River at Hillsboro, N. Dak.	90	1994–2008	0.09	0.02	0.45
56	Red River of the North at Grand Forks, N. Dak.	114	1970–2008	0.18	0.03	0.68
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	83	1993–2000	0.09	0.02	1.27
58	Turtle River at Manvel, N. Dak.	69	1993–2008	0.15	<0.01	0.50
59	Red River of the North at Oslo, Minn.	56	1973–2004	0.22	0.08	1.50
62	Forest River near Minto, N. Dak.	78	1994–2008	0.11	<0.01	0.44
67	Park River at Grafton, N. Dak.	71	1994–2008	0.14	0.02	0.58
68	Red River of the North at Drayton, N. Dak.	17	1994–2004	0.17	0.08	0.52
73	Little South Pembina River near Walhalla, N. Dak.	11	1994–1995	0.29	0.16	0.46
74	Pembina River at Walhalla, N. Dak.	85	1979–1995	0.23	<0.01	1.40
75	Pembina River at Neche, N. Dak.	86	1994–2008	0.26	0.04	1.34
76	Tongue River at Akra, N. Dak.	25	1979–2004	0.14	0.04	0.43
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	0.25	0.08	0.51
78	Red River of the North at Pembina, N. Dak., site 2	169	1970–2008	0.25	0.02	1.14
79	Red River of the North at Emerson, Manitoba	149	1978–2004	0.19	0.02	0.88
80	Long Creek near Noonan, N. Dak.	10	1997	0.17	0.08	0.51
81	West Branch Short Creek near Columbus, N. Dak.	18	1978–1981	0.17	0.07	0.68
82	Souris River near Sherwood, N. Dak.	341	1974–2008	0.18	0.02	1.90
83	Souris River near Foxholm, N. Dak.	184	1972–1998	0.24	<0.01	2.20
84	Des Lacs River at Foxholm, N. Dak.	138	1981–2007	0.27	0.05	1.70

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Phosphorus, total as P, in mg/L—Continued						
85	Souris River above Minot, N. Dak.	151	1981–2008	0.27	0.02	1.34
87	Souris River near Verendrye, N. Dak.	355	1970–2008	0.27	0.02	3.40
88	Wintering River near Karlsruhe, N. Dak.	57	1981–1998	0.09	<0.01	0.42
89	Souris River near Bantry, N. Dak.	88	1981–2000	0.26	0.04	3.60
90	Willow Creek near Willow City, N. Dak.	47	1982–2000	0.20	0.05	0.64
91	Stone Creek near Kramer, N. Dak.	29	1986–2000	0.36	0.09	1.10
92	Deep River near Upham, N. Dak.	27	1997–2000	0.17	0.03	0.61
95	Cut Bank Creek at Upham, N. Dak.	16	1999–2000	0.20	0.08	0.40
96	Deep River below Cut Bank Creek near Upham, N. Dak.	15	1982–1989	0.18	0.09	0.43
97	Boundary Creek near Landa, N. Dak.	30	1986–2000	0.27	0.09	1.10
98	Souris River near Westhope, N. Dak.	275	1970–2008	0.27	0.02	3.20
100	Missouri River near Williston, N. Dak.	100	1970–1982	0.10	<0.01	0.69
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	0.09	0.05	0.31
102	Stony Creek near Williston, N. Dak.	28	1977–1981	0.08	0.02	0.45
104	Beaver Creek near Ray, N. Dak.	42	1977–1982	0.04	<0.01	0.35
106	Bear Den Creek near Mandaree, N. Dak.	167	1970–1996	0.06	<0.01	2.70
108	East Fork Shell Creek near Parshall, N. Dak.	7	1993	0.38	0.18	0.49
109	Deepwater Creek near Mandaree, N. Dak.	7	1993	0.23	0.10	0.44
110	Little Missouri River at Marmarth, N. Dak.	8	1999	0.28	0.03	0.74
111	Deep Creek near Amidon, N. Dak.	44	1977–1983	0.03	<0.01	0.24
112	Little Missouri River at Medora, N. Dak.	89	1979–2007	0.11	<0.01	2.93
113	Beaver Creek near Trotters, N. Dak.	49	1977–1999	0.03	<0.01	0.43
114	Little Missouri River near Watford City, N. Dak.	207	1974–2007	0.20	<0.01	37.00
115	Missouri River at Garrison Dam, N. Dak.	223	1974–2007	<0.01	<0.01	0.25
116	Knife River at Manning, N. Dak.	45	1977–1982	0.08	0.03	0.25
117	Stray Creek near Manning, N. Dak.	15	1975–1981	0.11	0.04	0.84
118	Knife River at Marshall, N. Dak.	41	1977–1981	0.08	0.02	0.22
119	Elm Creek near Golden Valley, N. Dak.	15	1977–1981	0.19	0.07	0.58
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	0.07	<0.01	0.47
121	Coyote Creek near Zap, N. Dak.	43	1977–1983	0.05	<0.01	0.49
122	Brush Creek near Beulah, N. Dak.	90	1974–1988	0.05	<0.01	0.44
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	45	1977–1993	0.11	0.05	0.47
124	Spring Creek near Halliday, N. Dak.	41	1977–1981	0.05	<0.01	0.48
125	Spring Creek at Zap, N. Dak.	173	1974–2007	0.05	<0.01	0.51
127	Knife River at Hazen, N. Dak.	234	1974–2007	0.06	<0.01	1.02
128	Antelope Creek above Hazen, N. Dak.	26	1977–1982	0.13	0.04	0.68
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	0.26	0.05	0.75
131	Coal Creek near Stanton, N. Dak.	25	1975–1981	0.09	0.05	0.47
132	Alderin Creek near Fort Clark, N. Dak.	29	1977–1982	0.12	<0.01	0.80
133	Coal Lake Coulee near Hensler, N. Dak.	16	1978–1982	0.11	0.05	0.53

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Phosphorus, total as P, in mg/L—Continued						
134	Buffalo Creek near Washburn, N. Dak.	31	1978–1983	0.10	0.04	0.56
136	Painted Woods Creek near Wilton, N. Dak.	1	1970	0.07	0.07	0.07
137	Square Butte Creek near Hannover, N. Dak.	21	1977–1981	0.05	0.03	0.47
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	48	1977–1982	0.05	<0.01	0.52
139	Hagel Creek near Center, N. Dak.	31	1977–1982	0.11	0.03	0.83
140	Square Butte Creek below Center, N. Dak.	4	1993	0.03	<0.01	0.10
142	Missouri River at Bismarck, N. Dak.	197	1970–2001	0.03	<0.01	1.50
143	South Branch Heart River near South Heart, N. Dak.	28	1979–1996	0.28	0.06	7.40
144	North Creek near South Heart, N. Dak.	22	1978–1996	0.25	0.05	0.91
145	Heart River near South Heart, N. Dak.	48	1975–1983	0.20	0.06	1.90
146	Heart River at Dickinson, N. Dak.	5	1993	0.10	0.03	0.26
147	Green River near New Hradec, N. Dak.	44	1977–1982	0.07	<0.01	0.34
148	Green River near Gladstone, N. Dak.	4	1993	0.06	<0.01	0.27
149	Heart River near Richardton, N. Dak.	76	1994–2007	0.06	<0.01	0.22
152	Big Muddy Creek near Almont, N. Dak.	3	1993	0.32	0.29	0.36
156	Heart River near Mandan, N. Dak.	187	1978–2007	0.03	<0.01	0.84
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	3	1988–1989	0.34	0.15	0.96
158	Apple Creek near Menoken, N. Dak.	56	1977–2007	0.36	0.13	2.00
159	Missouri River near Schmidt, N. Dak.	140	1974–1981	0.04	<0.01	0.70
160	Cannonball River at New England, N. Dak.	28	1978–1981	0.05	<0.01	0.42
161	Coal Bank Creek near Havelock, N. Dak.	76	1974–1983	0.04	<0.01	0.47
162	Cannonball River at Regent, N. Dak.	40	1977–1981	0.04	<0.01	0.14
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	0.03	<0.01	0.51
167	Timber Creek near Bentley, N. Dak.	39	1977–1981	0.04	<0.01	1.30
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	0.04	<0.01	0.42
170	Cannonball River at Breien, N. Dak.	204	1974–2007	0.05	<0.01	1.10
171	Beaver Creek near Linton, N. Dak.	4	1993	0.50	0.30	0.77
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	77	1974–1987	0.09	0.03	0.66
175	James River near Manfred, N. Dak.	20	1986–1998	0.28	0.09	0.62
176	James River near Grace City, N. Dak.	84	1986–2007	0.26	0.06	0.73
177	James River above Arrowwood Lake near Kensal, N. Dak.	82	1986–2008	0.25	0.06	1.11
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	8	1986–1989	0.13	0.08	0.48
179	James River near Pingree, N. Dak.	59	1986–2008	0.34	0.08	1.46
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	0.30	0.12	0.72
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	0.47	0.29	0.71
182	James River at Jamestown, N. Dak.	104	1986–2007	0.33	0.06	14.10
183	James River at Lamoure, N. Dak.	103	1984–2007	0.50	0.09	4.08
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	0.35	0.16	1.01
185	James River at Oakes, N. Dak.	79	1970–2008	0.33	0.08	1.53
186	James River at N. Dak./S. Dak. State line	10	1998–2004	0.33	0.19	0.79

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Orthophosphate, dissolved as P, in mg/L						
2	Red River of the North at Wahpeton, N. Dak.	7	1973–2004	0.06	<0.02	0.10
5	Red River of the North below Wahpeton, N. Dak.	12	1972–1974	0.04	<0.02	0.21
6	Red River of the North at Hickson, N. Dak.	3	1991–2004	<0.02	<0.02	0.15
7	Wild Rice River near Rutland, N. Dak.	4	1972–1975	0.07	<0.02	0.12
8	Wild Rice River near Cayuga, N. Dak.	5	1972–1975	0.23	<0.02	0.59
10	Wild Rice River near Abercrombie, N. Dak.	5	1984–2004	0.13	0.09	0.30
11	Red River of the North at Fargo, N. Dak.	12	1991–2004	0.10	0.05	0.30
12	Red River of North below Fargo, N. Dak.	9	1972–1973	0.37	0.11	0.78
15	Sheyenne River above Harvey, N. Dak.	59	1972–2004	0.17	<0.02	0.55
16	Big Coulee near Fort Totten, N. Dak.	6	1972–1975	0.03	<0.02	0.08
18	Sheyenne River near Warwick, N. Dak.	8	1974–2004	0.24	<0.02	0.40
20	Mauvais Coulee near Cando, N. Dak.	59	1972–2001	0.26	<0.02	0.60
21	Edmore Coulee near Edmore, N. Dak.	60	1972–2001	0.30	<0.02	0.97
22	Edmore Coulee Tributary near Webster, N. Dak.	2	1993	0.25	0.20	0.29
24	Starkweather Coulee near Webster, N. Dak.	51	1990–2001	0.21	<0.02	1.07
25	Big Coulee below Churchs Ferry, N. Dak.	9	1998–1999	0.24	0.04	0.72
28	Big Coulee near Churchs Ferry, N. Dak.	48	1992–1997	0.30	<0.02	0.81
30	Channel A near Penn, N. Dak.	57	1990–1999	0.19	<0.02	0.70
32	Sheyenne River near Cooperstown, N. Dak.	78	1979–2004	0.14	<0.02	0.44
33	Baldhill Creek near Dazey, N. Dak.	53	1972–1995	0.04	<0.02	0.53
34	Sheyenne River below Baldhill Dam, N. Dak.	48	1972–2004	0.13	<0.02	0.28
35	Sheyenne River at Valley City, N. Dak.	6	1972–1975	0.22	<0.02	0.39
36	Sheyenne River at Lisbon, N. Dak.	27	1993–2004	0.10	0.03	0.34
37	Sheyenne River near Kindred, N. Dak.	191	1972–2004	0.05	<0.02	0.31
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	2	2003–2004	0.08	0.03	0.14
41	Sheyenne River at West Fargo, N. Dak.	7	1972–1991	0.13	<0.02	0.20
42	Maple River near Hope, N. Dak.	3	1972–1975	0.14	<0.02	0.16
43	Maple River near Enderlin, N. Dak.	14	1972–1974	0.10	<0.02	0.31
44	Maple River near Mapleton, N. Dak.	6	1972–1975	0.17	<0.02	0.20
47	Rush River at Amenia, N. Dak.	4	1972–1975	0.11	<0.02	0.22
50	Sheyenne River near Harwood, N. Dak.	12	1972–1974	0.12	0.03	0.48
52	Red River of the North at Halstad, Minn.	89	1972–2004	0.13	<0.02	0.55
53	Beaver Creek near Finley, N. Dak.	42	1980–1996	0.09	<0.02	0.47
54	Goose River near Portland, N. Dak.	10	1971–1975	<0.02	<0.02	0.42
55	Goose River at Hillsboro, N. Dak.	14	1971–2004	0.03	<0.02	0.91
56	Red River of the North at Grand Forks, N. Dak.	36	1974–2004	0.10	0.03	0.33
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	82	1993–2000	0.07	<0.02	0.35
58	Turtle River at Manvel, N. Dak.	29	1971–1982	0.07	<0.02	0.45
59	Red River of the North at Oslo, Minn.	4	1976–2004	0.09	0.07	0.11

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Orthophosphate, dissolved as P, in mg/L—Continued						
60	Middle Branch Forest River near Whitman, N. Dak.	3	1972–1975	0.14	<0.02	0.23
61	Forest River near Fordville, N. Dak.	12	1972–1975	0.04	<0.02	0.16
62	Forest River near Minto, N. Dak.	25	1971–1975	<0.02	<0.02	0.13
63	South Branch Park River below Homme Dam, N. Dak.	5	1972–1981	0.19	<0.02	0.22
64	Middle Branch Park River near Union, N. Dak.	6	1972–1980	0.11	<0.02	0.36
65	Middle Branch Park River near Edinburg, N. Dak.	12	1978–1980	0.20	0.03	0.47
66	Cart Creek at Mountain, N. Dak.	11	1972–1979	0.14	<0.02	0.28
67	Park River at Grafton, N. Dak.	7	1971–1975	0.04	<0.02	0.25
68	Red River of the North at Drayton, N. Dak.	7	1972–2004	0.11	<0.02	0.17
69	Pembina County Drain 20 near Glasston, N. Dak.	2	1974–1975	0.13	0.05	0.22
70	Hidden Island Coulee near Hansboro, N. Dak.	4	1972–1975	0.08	<0.02	0.39
71	Cypress Creek near Sarles, N. Dak.	3	1972–1975	0.11	<0.02	0.39
72	Pembina River near Vang, N. Dak.	51	1976–1979	0.11	0.03	0.49
73	Little South Pembina River near Walhalla, N. Dak.	65	1973–1995	0.13	0.03	0.58
74	Pembina River at Walhalla, N. Dak.	143	1976–1995	0.10	<0.02	0.57
75	Pembina River at Neche, N. Dak.	5	1972–1975	0.13	<0.02	0.20
76	Tongue River at Akra, N. Dak.	20	1972–1980	0.06	<0.02	0.16
78	Red River of the North at Pembina, N. Dak., site 2	60	1972–2000	0.12	<0.02	0.34
79	Red River of the North at Emerson, Manitoba	104	1981–2004	0.10	<0.02	0.35
80	Long Creek near Noonan, N. Dak.	16	1972–1984	0.06	<0.02	0.29
82	Souris River near Sherwood, N. Dak.	76	1972–2007	0.08	<0.02	0.90
83	Souris River near Foxholm, N. Dak.	136	1972–1991	0.10	<0.02	1.20
84	Des Lacs River at Foxholm, N. Dak.	43	1972–1991	0.12	<0.02	1.20
85	Souris River above Minot, N. Dak.	21	1971–2007	0.11	<0.02	0.48
87	Souris River near Verendrye, N. Dak.	133	1972–2007	0.15	<0.02	2.70
88	Wintering River near Karlsruhe, N. Dak.	57	1972–1991	0.04	<0.02	0.33
89	Souris River near Bantry, N. Dak.	17	1971–1983	0.08	<0.02	0.82
90	Willow Creek near Willow City, N. Dak.	23	1972–1989	0.10	<0.02	0.29
91	Stone Creek near Kramer, N. Dak.	8	1986–1989	0.37	0.19	1.00
92	Deep River near Upham, N. Dak.	6	1972–1975	0.04	<0.02	0.07
93	Egg Creek near Granville, N. Dak.	4	1972–1974	0.88	<0.02	1.11
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	3	1972–1973	0.25	<0.02	0.91
95	Cut Bank Creek at Upham, N. Dak.	1	1975	0.07	0.07	0.07
96	Deep River below Cut Bank Creek near Upham, N. Dak.	12	1986–1989	0.08	0.04	0.33
97	Boundary Creek near Landa, N. Dak.	14	1972–1990	0.11	<0.02	0.46
98	Souris River near Westhope, N. Dak.	119	1972–1994	0.11	<0.02	2.90
99	Charbonneau Creek near Charbonneau, N. Dak.	6	1972–1975	0.03	<0.02	0.07
100	Missouri River near Williston, N. Dak.	16	1975–1976	<0.02	<0.02	0.06
101	Little Muddy River below Cow Creek near Williston, N. Dak.	16	1972–1975	<0.02	<0.02	0.09
105	White Earth River at White Earth, N. Dak.	5	1973–1975	0.18	0.10	0.30

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Orthophosphate, dissolved as P, in mg/L—Continued						
106	Bear Den Creek near Mandaree, N. Dak.	82	1979–1996	<0.02	<0.02	0.42
107	Shell Creek near Parshall, N. Dak.	6	1972–1975	0.05	<0.02	0.15
108	East Fork Shell Creek near Parshall, N. Dak.	47	1991–2000	0.21	<0.02	0.64
109	Deepwater Creek near Mandaree, N. Dak.	44	1991–2000	0.08	<0.02	0.39
110	Little Missouri River at Marmarth, N. Dak.	15	1972–1975	0.04	<0.02	0.16
112	Little Missouri River at Medora, N. Dak.	4	1972–1974	0.04	<0.02	0.13
114	Little Missouri River near Watford City, N. Dak.	57	1971–1994	<0.02	<0.02	0.11
115	Missouri River at Garrison Dam, N. Dak.	132	1977–2007	<0.02	<0.02	0.06
116	Knife River at Manning, N. Dak.	16	1972–1975	0.06	<0.02	0.22
118	Knife River at Marshall, N. Dak.	14	1972–1975	0.04	<0.02	0.11
119	Elm Creek near Golden Valley, N. Dak.	4	1973–1975	0.07	0.06	0.10
120	Knife River near Golden Valley, N. Dak.	17	1971–1975	<0.02	<0.02	0.10
122	Brush Creek near Beulah, N. Dak.	16	1975–1990	<0.02	<0.02	0.08
125	Spring Creek at Zap, N. Dak.	30	1972–1976	<0.02	<0.02	0.08
126	West Branch Otter Creek near Beulah, N. Dak.	3	1972–1974	<0.02	<0.02	0.03
127	Knife River at Hazen, N. Dak.	58	1971–1993	<0.02	<0.02	0.32
134	Buffalo Creek near Washburn, N. Dak.	1	1981	0.08	0.08	0.08
135	Turtle Creek above Washburn, N. Dak.	96	1987–2003	0.08	<0.02	0.59
136	Painted Woods Creek near Wilton, N. Dak.	129	1982–2003	<0.02	<0.02	0.39
140	Square Butte Creek below Center, N. Dak.	16	1972–1983	<0.02	<0.02	0.04
141	Burnt Creek near Bismarck, N. Dak.	4	1972–1975	0.04	<0.02	0.07
142	Missouri River at Bismarck, N. Dak.	22	1973–1976	<0.02	<0.02	0.09
145	Heart River near South Heart, N. Dak.	1	1984	0.07	0.07	0.07
147	Green River near New Hradec, N. Dak.	17	1972–1975	0.03	<0.02	0.36
148	Green River near Gladstone, N. Dak.	19	1971–1974	<0.02	<0.02	0.05
149	Heart River near Richardton, N. Dak.	17	1972–1975	0.03	<0.02	0.11
151	Antelope Creek near Carson, N. Dak.	7	1972–1975	<0.02	<0.02	0.04
153	Heart River near Lark, N. Dak.	18	1971–1975	<0.02	<0.02	0.03
155	Sweetbriar Creek near Judson, N. Dak.	6	1972–1975	<0.02	<0.02	0.09
156	Heart River near Mandan, N. Dak.	80	1971–1993	<0.02	<0.02	0.03
158	Apple Creek near Menoken, N. Dak.	63	1972–1984	0.24	<0.02	1.20
159	Missouri River near Schmidt, N. Dak.	14	1975–1977	<0.02	<0.02	0.05
161	Coal Bank Creek near Havelock, N. Dak.	17	1975–1976	<0.02	<0.02	0.10
162	Cannonball River at Regent, N. Dak.	10	1971–1975	<0.02	<0.02	0.08
163	Cannonball River below Bentley, N. Dak.	26	1972–1975	<0.02	<0.02	0.07
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	5	1972–1975	<0.02	<0.02	0.39
166	Cedar Creek near Haynes, N. Dak.	17	1972–1975	<0.02	<0.02	0.08
168	Cedar Creek near Pretty Rock, N. Dak.	29	1971–1975	<0.02	<0.02	0.12
169	Cedar Creek near Raleigh, N. Dak.	6	1972–1975	0.03	<0.02	0.15
170	Cannonball River at Breien, N. Dak.	59	1971–1992	<0.02	<0.02	0.10

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Orthophosphate, dissolved as P, in mg/L—Continued						
171	Beaver Creek near Linton, N. Dak.	16	1972–1975	0.18	<0.02	0.43
173	Porcupine Creek near Fort Yates, N. Dak.	36	1991–1999	<0.02	<0.02	0.14
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	13	1975–1976	<0.02	<0.02	0.06
175	James River near Manfred, N. Dak.	33	1972–1995	0.20	<0.02	0.88
176	James River near Grace City, N. Dak.	59	1972–1995	0.11	<0.02	0.66
177	James River above Arrowwood Lake near Kensal, N. Dak.	155	1985–2008	0.09	<0.02	1.20
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	0.04	<0.02	0.35
179	James River near Pingree, N. Dak.	103	1986–2008	0.10	<0.02	0.99
180	Pipestem Creek near Pingree, N. Dak.	3	1974–1975	0.23	0.19	0.23
181	Pipestem Creek near Buchanan, N. Dak.	4	1972–1974	0.09	<0.02	0.26
182	James River at Jamestown, N. Dak.	82	1972–1995	0.07	<0.02	0.55
183	James River at Lamoure, N. Dak.	69	1981–1995	0.11	<0.02	0.41
185	James River at Oakes, N. Dak.	105	1972–2008	0.10	<0.02	1.47
186	James River at N. Dak./S. Dak. State line	1	1981	0.28	0.28	0.28
Organic carbon, dissolved as C, in mg/L						
1	Bois De Sioux River near Doran, Minn.	11	2006–2007	12.8	7.0	13.9
2	Red River of the North at Wahpeton, N. Dak.	1	1991	8.8	8.8	8.8
3	Red River of the North near Wahpeton, N. Dak.	1	2006	8.6	8.6	8.6
4	Red River of the North at Brushville, Minn.	12	2000–2007	8.0	6.2	9.9
6	Red River of the North at Hickson, N. Dak.	68	1975–1986	9.8	6.5	27.0
10	Wild Rice River near Abercrombie, N. Dak.	14	1994–2007	12.5	7.2	15.0
11	Red River of the North at Fargo, N. Dak.	27	1991–2008	8.4	6.2	10.4
12	Red River of North below Fargo, N. Dak.	3	1977	10.0	8.9	10.0
13	Red River of the North at Harwood, N. Dak.	12	2006–2007	8.3	7.2	10.4
17	Sheyenne River at Warwick, N. Dak.	2	2006	11.3	10.3	12.3
18	Sheyenne River near Warwick, N. Dak.	16	1993–2007	13.3	5.9	17.0
32	Sheyenne River near Cooperstown, N. Dak.	83	1979–2007	14.0	5.0	34.0
33	Baldhill Creek near Dazey, N. Dak.	37	1979–1981	12.0	3.3	41.0
34	Sheyenne River below Baldhill Dam, N. Dak.	42	1979–2007	11.7	6.8	28.0
36	Sheyenne River at Lisbon, N. Dak.	23	1993–2007	9.1	6.7	12.0
37	Sheyenne River near Kindred, N. Dak.	67	1976–2007	8.9	4.7	25.0
41	Sheyenne River at West Fargo, N. Dak.	1	2006	8.7	8.7	8.7
45	Maple River below Mapleton, N. Dak.	11	2006–2007	10.5	8.1	15.0
52	Red River of the North at Halstad, Minn.	37	1978–1995	10.0	7.4	39.0
53	Beaver Creek near Finley, N. Dak.	4	1981–1982	19.0	14.0	23.0
55	Goose River at Hillsboro, N. Dak.	22	1994–2008	8.6	6.6	13.0
56	Red River of the North at Grand Forks, N. Dak.	33	1991–2008	8.8	6.3	14.0
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	37	1993–1997	8.2	4.3	18.0
58	Turtle River at Manvel, N. Dak.	22	2006–2008	8.5	5.1	14.7
59	Red River of the North at Oslo, Minn.	2	1977	10.9	9.7	12.0

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Organic carbon, dissolved as C, in mg/L—Continued						
62	Forest River near Minto, N. Dak.	33	1974–2008	6.2	3.2	19.0
67	Park River at Grafton, N. Dak.	23	2006–2008	7.8	6.7	10.4
68	Red River of the North at Drayton, N. Dak.	1	1991	9.1	9.1	9.1
74	Pembina River at Walhalla, N. Dak.	66	1979–1995	11.0	2.6	36.0
75	Pembina River at Neche, N. Dak.	23	2006–2008	7.2	4.5	11.7
76	Tongue River at Akra, N. Dak.	8	1979–1980	16.0	8.0	150.0
78	Red River of the North at Pembina, N. Dak., site 2	42	1994–2008	10.0	6.8	14.0
79	Red River of the North at Emerson, Manitoba	52	1978–1996	12.0	8.7	41.0
81	West Branch Short Creek near Columbus, N. Dak.	19	1978–1981	24.0	4.6	49.0
82	Souris River near Sherwood, N. Dak.	26	1978–1983	11.0	7.1	71.0
83	Souris River near Foxholm, N. Dak.	8	1978–1980	16.0	11.0	71.0
84	Des Lacs River at Foxholm, N. Dak.	13	2006–2007	16.4	10.3	24.7
85	Souris River above Minot, N. Dak.	18	1981–2007	15.0	10.0	22.6
87	Souris River near Verendrye, N. Dak.	13	2006–2007	14.4	11.7	21.0
89	Souris River near Bantry, N. Dak.	4	1983	13.0	12.0	14.0
98	Souris River near Westhope, N. Dak.	51	1978–1983	16.0	7.1	35.0
100	Missouri River near Williston, N. Dak.	82	1975–1982	4.9	2.8	37.0
102	Stony Creek near Williston, N. Dak.	28	1977–1981	13.0	8.3	97.0
104	Beaver Creek near Ray, N. Dak.	42	1977–1982	11.0	5.2	40.0
106	Bear Den Creek near Mandaree, N. Dak.	4	1980–1982	21.0	13.0	50.0
111	Deep Creek near Amidon, N. Dak.	45	1977–1983	18.0	0.8	33.0
112	Little Missouri River at Medora, N. Dak.	13	1979–2007	8.8	5.3	14.3
113	Beaver Creek near Trotters, N. Dak.	40	1977–1981	12.0	5.1	30.0
114	Little Missouri River near Watford City, N. Dak.	38	1977–2007	9.7	5.4	28.0
115	Missouri River at Garrison Dam, N. Dak.	117	1975–2007	3.3	2.2	30.0
116	Knife River at Manning, N. Dak.	44	1977–1982	15.0	8.4	110.0
117	Stray Creek near Manning, N. Dak.	15	1975–1981	22.0	15.0	46.0
118	Knife River at Marshall, N. Dak.	41	1977–1981	13.0	7.5	42.0
119	Elm Creek near Golden Valley, N. Dak.	15	1977–1981	17.0	9.6	31.0
120	Knife River near Golden Valley, N. Dak.	14	2006–2007	17.0	14.0	20.6
121	Coyote Creek near Zap, N. Dak.	43	1977–1983	12.0	0.8	43.0
122	Brush Creek near Beulah, N. Dak.	87	1974–1988	11.0	5.0	40.0
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	38	1977–1981	18.0	3.8	39.0
124	Spring Creek near Halliday, N. Dak.	40	1977–1981	13.5	2.1	40.0
125	Spring Creek at Zap, N. Dak.	94	1975–2007	11.0	4.5	42.0
127	Knife River at Hazen, N. Dak.	73	1975–2007	10.0	1.0	45.0
128	Antelope Creek above Hazen, N. Dak.	26	1977–1982	16.5	8.7	33.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	1	1977	9.5	9.5	9.5
130	West Branch Antelope Creek near Hazen, N. Dak.	14	1978–1983	17.0	10.0	26.0
131	Coal Creek near Stanton, N. Dak.	25	1975–1981	23.0	10.0	41.0

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Organic carbon, dissolved as C, in mg/L—Continued						
132	Alderin Creek near Fort Clark, N. Dak.	28	1977–1982	23.5	7.6	50.0
133	Coal Lake Coulee near Hensler, N. Dak.	16	1978–1982	18.0	7.7	29.0
134	Buffalo Creek near Washburn, N. Dak.	32	1978–1983	20.0	11.0	65.0
137	Square Butte Creek near Hannover, N. Dak.	21	1977–1981	14.0	7.8	39.0
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	47	1977–1982	10.0	5.2	47.0
139	Hagel Creek near Center, N. Dak.	30	1977–1982	18.0	7.6	39.0
142	Missouri River at Bismarck, N. Dak.	69	1975–1980	3.7	2.4	15.0
143	South Branch Heart River near South Heart, N. Dak.	17	1979–1983	14.0	3.8	39.0
144	North Creek near South Heart, N. Dak.	14	1978–1981	21.5	8.9	42.0
145	Heart River near South Heart, N. Dak.	48	1975–1983	17.0	1.0	44.0
147	Green River near New Hradec, N. Dak.	46	1977–1982	12.0	5.4	28.0
149	Heart River near Richardton, N. Dak.	13	2006–2007	11.4	9.6	15.7
156	Heart River near Mandan, N. Dak.	39	1978–2007	7.9	3.7	24.0
158	Apple Creek near Menoken, N. Dak.	11	1977–1979	13.0	7.3	20.0
159	Missouri River near Schmidt, N. Dak.	57	1975–1979	3.7	2.5	10.0
160	Cannonball River at New England, N. Dak.	27	1978–1981	17.0	7.5	66.0
161	Coal Bank Creek near Havelock, N. Dak.	74	1974–1983	16.0	8.3	37.0
162	Cannonball River at Regent, N. Dak.	40	1977–1981	12.5	8.7	120.0
164	Cannonball River near Raleigh, N. Dak.	13	2006–2007	12.3	8.3	25.9
167	Timber Creek near Bentley, N. Dak.	37	1977–1981	15.0	5.5	41.0
169	Cedar Creek near Raleigh, N. Dak.	12	2006–2007	12.8	8.0	18.0
170	Cannonball River at Breien, N. Dak.	42	1975–2007	9.6	7.1	28.0
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	75	1974–1987	30.0	13.0	77.0
176	James River near Grace City, N. Dak.	14	2006–2007	17.9	5.3	26.2
182	James River at Jamestown, N. Dak.	14	2006–2007	12.7	5.3	16.4
183	James River at Lamoure, N. Dak.	14	2006–2007	11.4	6.3	14.8
Organic carbon, total as C, in mg/L						
1	Bois De Sioux River near Doran, Minn.	13	2006–2007	11.5	6.9	14.4
3	Red River of the North near Wahpeton, N. Dak.	1	2006	8.6	8.6	8.6
4	Red River of the North at Brushville, Minn.	14	2000–2007	7.9	6.3	9.0
5	Red River of the North below Wahpeton, N. Dak.	2	1970	9.0	9.0	9.0
10	Wild Rice River near Abercrombie, N. Dak.	14	2006–2007	12.0	8.1	13.7
11	Red River of the North at Fargo, N. Dak.	27	2006–2008	7.8	5.6	9.6
12	Red River of North below Fargo, N. Dak.	17	1970–1977	12.0	7.0	22.0
13	Red River of the North at Harwood, N. Dak.	14	2006–2007	7.7	6.7	10.2
17	Sheyenne River at Warwick, N. Dak.	2	2006	11.3	10.1	12.4
18	Sheyenne River near Warwick, N. Dak.	12	2006–2007	11.6	5.8	16.3
32	Sheyenne River near Cooperstown, N. Dak.	14	2006–2007	9.6	5.0	15.2
34	Sheyenne River below Baldhill Dam, N. Dak.	14	2006–2007	10.6	9.1	12.6

Table 1–2. Summary statistics for nutrient constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[N, nitrogen; mg/L, milligrams per liter; <, less than; --, not available; P, phosphorus; C, carbon]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Organic carbon, total as C, in mg/L—Continued						
36	Sheyenne River at Lisbon, N. Dak.	14	2006–2007	8.0	6.5	12.0
37	Sheyenne River near Kindred, N. Dak.	34	1978–2007	8.7	2.8	43.0
41	Sheyenne River at West Fargo, N. Dak.	1	2006	8.5	8.5	8.5
45	Maple River below Mapleton, N. Dak.	13	2006–2007	11.0	7.2	16.3
50	Sheyenne River near Harwood, N. Dak.	2	1970	17.0	13.0	21.0
52	Red River of the North at Halstad, Minn.	17	1979–1981	15.0	7.8	28.0
53	Beaver Creek near Finley, N. Dak.	7	1973–1982	17.0	12.0	22.0
55	Goose River at Hillsboro, N. Dak.	22	2006–2008	8.6	7.5	11.5
56	Red River of the North at Grand Forks, N. Dak.	24	2006–2008	8.0	5.3	10.6
58	Turtle River at Manvel, N. Dak.	22	2006–2008	8.8	4.9	13.4
59	Red River of the North at Oslo, Minn.	18	1973–1977	15.5	11.0	33.0
62	Forest River near Minto, N. Dak.	23	2006–2008	5.5	3.2	10.8
67	Park River at Grafton, N. Dak.	23	2006–2008	7.8	6.7	9.7
75	Pembina River at Neche, N. Dak.	23	2006–2008	7.0	4.2	10.6
78	Red River of the North at Pembina, N. Dak., site 2	25	1970–2008	8.0	6.7	15.0
79	Red River of the North at Emerson, Manitoba	16	1979–1981	15.5	7.4	35.0
82	Souris River near Sherwood, N. Dak.	233	1974–2008	16.0	3.2	52.0
83	Souris River near Foxholm, N. Dak.	48	1974–1998	17.5	12.0	43.0
84	Des Lacs River at Foxholm, N. Dak.	13	2006–2007	17.3	10.1	29.3
85	Souris River above Minot, N. Dak.	78	1981–2008	17.8	2.1	33.4
87	Souris River near Verendrye, N. Dak.	125	1970–2008	15.0	9.0	34.0
89	Souris River near Bantry, N. Dak.	43	1992–1998	16.0	8.6	33.0
90	Willow Creek near Willow City, N. Dak.	6	1992–1993	19.0	14.0	23.0
91	Stone Creek near Kramer, N. Dak.	5	1992–1993	18.0	13.0	24.0
97	Boundary Creek near Landa, N. Dak.	6	1992–1993	17.5	10.0	29.0
98	Souris River near Westhope, N. Dak.	123	1970–2008	21.0	1.2	62.0
100	Missouri River near Williston, N. Dak.	7	1970–1981	6.0	2.9	12.0
106	Bear Den Creek near Mandaree, N. Dak.	18	1972–1993	16.0	11.0	38.0
108	East Fork Shell Creek near Parshall, N. Dak.	5	1993	24.0	22.0	27.0
109	Deepwater Creek near Mandaree, N. Dak.	5	1993	22.0	19.0	24.0
112	Little Missouri River at Medora, N. Dak.	13	2006–2007	7.5	5.0	10.6
114	Little Missouri River near Watford City, N. Dak.	45	1974–2007	13.0	1.6	125.0
115	Missouri River at Garrison Dam, N. Dak.	21	1974–1981	5.0	2.7	9.4
120	Knife River near Golden Valley, N. Dak.	14	2006–2007	16.1	13.4	20.2
122	Brush Creek near Beulah, N. Dak.	1	1975	14.0	14.0	14.0
125	Spring Creek at Zap, N. Dak.	14	2006–2007	11.0	7.9	13.8
127	Knife River at Hazen, N. Dak.	36	1974–2007	12.0	2.9	33.0
142	Missouri River at Bismarck, N. Dak.	72	1970–1978	4.2	2.1	17.0
149	Heart River near Richardton, N. Dak.	13	2006–2007	12.3	10.1	18.0
156	Heart River near Mandan, N. Dak.	24	1979–2007	7.6	3.1	19.0

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Organic carbon, total as C, in mg/L—Continued						
159	Missouri River near Schmidt, N. Dak.	67	1974–1978	4.0	2.0	58.0
164	Cannonball River near Raleigh, N. Dak.	13	2006–2007	10.2	4.6	22.8
169	Cedar Creek near Raleigh, N. Dak.	12	2006–2007	11.6	6.9	18.4
170	Cannonball River at Breien, N. Dak.	45	1974–2007	12.0	5.0	35.0
175	James River near Manfred, N. Dak.	4	1987–1989	14.5	14.0	17.0
176	James River near Grace City, N. Dak.	22	1987–2007	17.6	5.5	28.4
177	James River above Arrowwood Lake near Kensal, N. Dak.	13	1987–1993	15.0	11.0	23.0
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	5	1987–1989	15.0	12.0	17.0
179	James River near Pingree, N. Dak.	4	1987–1993	16.0	15.0	20.0
182	James River at Jamestown, N. Dak.	33	1987–2007	12.8	5.1	16.0
183	James River at Lamoure, N. Dak.	36	1980–2007	13.0	5.6	27.0
185	James River at Oakes, N. Dak.	22	1970–1994	14.5	4.6	22.0

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.[$\mu\text{g/L}$, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Aluminum, total, in $\mu\text{g/L}$						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	705	113	5,090
3	Red River of the North near Wahpeton, N. Dak.	1	2006	238	238	238
4	Red River of the North at Brushville, Minn.	52	2000–2007	659	<100	5,470
10	Wild Rice River near Abercrombie, N. Dak.	43	2000–2007	1,530	138	6,640
11	Red River of the North at Fargo, N. Dak.	1	2006	<100	<100	<100
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	2,800	<100	15,400
14	Red River of the North near Harwood, N. Dak.	5	2006–2007	3,380	1,750	11,300
17	Sheyenne River at Warwick, N. Dak.	44	1997–2006	688	141	2,420
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	577	148	1,650
32	Sheyenne River near Cooperstown, N. Dak.	73	1997–2007	831	129	5,140
34	Sheyenne River below Baldhill Dam, N. Dak.	65	1997–2007	103	<100	2,150
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	870	<100	9,090
37	Sheyenne River near Kindred, N. Dak.	65	1997–2007	1,190	117	15,900
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	3,140	752	12,600
41	Sheyenne River at West Fargo, N. Dak.	1	2006	1,720	1,720	1,720
45	Maple River below Mapleton, N. Dak.	47	1997–2007	1,570	153	12,000
52	Red River of the North at Halstad, Minn.	5	2006–2007	4,720	2,600	13,100
55	Goose River at Hillsboro, N. Dak.	61	1997–2007	777	<100	8,690
56	Red River of the North at Grand Forks, N. Dak.	47	1997–2006	1,440	<100	15,000
58	Turtle River at Manvel, N. Dak.	38	1997–2006	513	<100	6,520
62	Forest River near Minto, N. Dak.	39	1997–2006	416	<100	7,790
67	Park River at Grafton, N. Dak.	35	1997–2006	377	<100	17,000
75	Pembina River at Neche, N. Dak.	44	1997–2006	1,255	<100	44,400
78	Red River of the North at Pembina, N. Dak., site 2	58	1997–2007	2,565	<100	22,200
80	Long Creek near Noonan, N. Dak.	10	1997	160	<100	606
82	Souris River near Sherwood, N. Dak.	97	1993–2008	154	<100	1,084
83	Souris River near Foxholm, N. Dak.	28	1993–1998	<100	<100	384
84	Des Lacs River at Foxholm, N. Dak.	78	1997–2007	515	194	3,920
85	Souris River above Minot, N. Dak.	122	1997–2008	<100	<100	1,013
87	Souris River near Verendrye, N. Dak.	162	1993–2008	313	<100	13,000
88	Wintering River near Karlsruhe, N. Dak.	10	1997–1998	101	<100	114
89	Souris River near Bantry, N. Dak.	32	1993–1998	235	<100	743
90	Willow Creek near Willow City, N. Dak.	8	1993–1997	204	<100	332
91	Stone Creek near Kramer, N. Dak.	3	1993	<100	<100	170
92	Deep River near Upham, N. Dak.	6	1997	<100	<100	181
97	Boundary Creek near Landa, N. Dak.	3	1993	<100	<100	160
98	Souris River near Westhope, N. Dak.	19	1995–2008	326	<100	1,361
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	369	261	2,700
110	Little Missouri River at Marmarth, N. Dak.	8	1999	20,050	1,090	80,000

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Aluminum, total, in µg/L—Continued						
112	Little Missouri River at Medora, N. Dak.	70	1997–2007	6,430	<100	509,000
113	Beaver Creek near Trotters, N. Dak.	9	1999	185	<100	1,840
114	Little Missouri River near Watford City, N. Dak.	64	1997–2007	12,350	150	657,000
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	1,415	160	19,000
125	Spring Creek at Zap, N. Dak.	64	1997–2007	215	<100	7,550
127	Knife River at Hazen, N. Dak.	71	1997–2007	484	<100	29,600
149	Heart River near Richardton, N. Dak.	64	1997–2007	528	<100	6,000
156	Heart River near Mandan, N. Dak.	65	1997–2007	272	<100	24,400
164	Cannonball River near Raleigh, N. Dak.	57	1997–2007	1,430	116	25,300
169	Cedar Creek near Raleigh, N. Dak.	49	1997–2007	780	171	25,600
170	Cannonball River at Breien, N. Dak.	59	1997–2007	1,230	<100	99,000
175	James River near Manfred, N. Dak.	6	1998	<100	<100	207
176	James River near Grace City, N. Dak.	60	1997–2007	269	<100	1,520
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	239	107	642
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	210	103	421
182	James River at Jamestown, N. Dak.	75	1997–2007	299	<100	1,300
183	James River at Lamoure, N. Dak.	68	1997–2007	767	<100	5,900
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	451	138	1,050
186	James River at N. Dak./S. Dak. State line	9	1998–1999	786	177	1,130
Arsenic, total, in µg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	6.1	2.9	30.0
2	Red River of the North at Wahpeton, N. Dak.	2	1996	7.2	4.1	10.4
3	Red River of the North near Wahpeton, N. Dak.	1	2006	24.9	24.9	24.9
4	Red River of the North at Brushville, Minn.	54	1996–2007	3.3	1.5	9.6
5	Red River of the North below Wahpeton, N. Dak.	20	1997–1999	3.0	1.5	7.3
6	Red River of the North at Hickson, N. Dak.	21	1997–1999	4.2	<1.0	7.0
10	Wild Rice River near Abercrombie, N. Dak.	45	1996–2007	7.4	3.3	19.7
11	Red River of the North at Fargo, N. Dak.	6	1996–2006	3.8	2.5	4.7
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	5.2	1.8	8.2
14	Red River of the North near Harwood, N. Dak.	31	1996–2007	4.8	2.0	7.0
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	5.1	2.4	14.7
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	6.0	2.6	13.8
32	Sheyenne River near Cooperstown, N. Dak.	74	1996–2007	5.0	<1.0	12.8
33	Baldhill Creek near Dazey, N. Dak.	1	1996	3.1	3.1	3.1
34	Sheyenne River below Baldhill Dam, N. Dak.	67	1996–2007	4.8	1.9	14.7
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	5.9	2.0	9.9
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	6.8	3.0	15.9
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	8.1	<1.0	10.4
41	Sheyenne River at West Fargo, N. Dak.	6	1996–2006	6.4	3.5	11.7

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Arsenic, total, in µg/L—Continued						
45	Maple River below Mapleton, N. Dak.	47	1997–2007	7.9	<1.0	27.0
46	Sheyenne River at Harwood, N. Dak.	21	1997–1999	7.2	3.9	12.0
52	Red River of the North at Halstad, Minn.	5	2006–2007	6.2	2.4	8.5
55	Goose River at Hillsboro, N. Dak.	64	1996–2007	5.1	2.5	12.2
56	Red River of the North at Grand Forks, N. Dak.	47	1997–2006	4.3	1.3	10.3
58	Turtle River at Manvel, N. Dak.	38	1997–2006	4.6	<1.0	16.2
62	Forest River near Minto, N. Dak.	43	1996–2006	3.7	1.4	11.3
67	Park River at Grafton, N. Dak.	37	1996–2006	3.4	1.5	13.3
68	Red River of the North at Drayton, N. Dak.	5	1996	3.8	3.1	5.6
75	Pembina River at Neche, N. Dak.	47	1996–2006	5.4	<1.0	27.7
78	Red River of the North at Pembina, N. Dak., site 2	58	1997–2007	5.5	1.4	12.7
80	Long Creek near Noonan, N. Dak.	10	1997	6.0	3.2	11.8
82	Souris River near Sherwood, N. Dak.	112	1993–2008	3.3	<1.0	28.3
83	Souris River near Foxholm, N. Dak.	35	1993–1998	6.3	1.6	15.0
84	Des Lacs River at Foxholm, N. Dak.	83	1996–2007	5.4	<1.0	27.4
85	Souris River above Minot, N. Dak.	128	1996–2008	6.0	1.8	18.8
87	Souris River near Verendrye, N. Dak.	174	1993–2008	4.7	<1.0	24.4
88	Wintering River near Karlsruhe, N. Dak.	10	1997–1998	2.9	<1.0	6.9
89	Souris River near Bantry, N. Dak.	65	1993–2000	4.0	<1.0	13.0
90	Willow Creek near Willow City, N. Dak.	29	1993–2000	5.0	1.6	8.8
91	Stone Creek near Kramer, N. Dak.	19	1993–2000	5.2	2.0	11.2
92	Deep River near Upham, N. Dak.	26	1997–2000	4.1	<1.0	5.7
95	Cut Bank Creek at Upham, N. Dak.	16	1999–2000	3.4	1.2	5.0
97	Boundary Creek near Landa, N. Dak.	19	1993–2000	5.4	2.0	11.0
98	Souris River near Westhope, N. Dak.	20	1995–2008	5.1	2.0	12.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	5.5	1.5	7.4
110	Little Missouri River at Marmarth, N. Dak.	8	1999	8.2	1.3	28.4
112	Little Missouri River at Medora, N. Dak.	74	1996–2007	4.0	<1.0	226.0
113	Beaver Creek near Trotters, N. Dak.	9	1999	1.6	<1.0	3.0
114	Little Missouri River near Watford City, N. Dak.	69	1996–2007	6.9	<1.0	266.0
115	Missouri River at Garrison Dam, N. Dak.	7	1999–2000	2.0	1.7	2.7
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	3.0	<1.0	14.3
125	Spring Creek at Zap, N. Dak.	64	1997–2007	1.9	<1.0	7.0
127	Knife River at Hazen, N. Dak.	76	1996–2007	2.2	<1.0	13.0
142	Missouri River at Bismarck, N. Dak.	23	1999–2001	2.0	<1.0	2.5
149	Heart River near Richardton, N. Dak.	68	1996–2007	2.0	<1.0	8.2
156	Heart River near Mandan, N. Dak.	68	1996–2007	1.3	<1.0	7.9
164	Cannonball River near Raleigh, N. Dak.	62	1996–2007	2.1	<1.0	23.1
169	Cedar Creek near Raleigh, N. Dak.	54	1996–2007	2.5	<1.0	7.2
170	Cannonball River at Breien, N. Dak.	64	1996–2007	2.2	<1.0	26.7

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Arsenic, total, in µg/L—Continued						
175	James River near Manfred, N. Dak.	14	1993–1998	4.2	2.0	6.0
176	James River near Grace City, N. Dak.	69	1993–2007	4.3	2.0	18.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	47	1993–2006	3.7	1.4	9.5
179	James River near Pingree, N. Dak.	36	1993–2006	4.0	<1.0	19.0
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	5.3	1.5	11.7
182	James River at Jamestown, N. Dak.	84	1993–2007	3.9	<1.0	9.6
183	James River at Lamoure, N. Dak.	81	1993–2007	4.9	1.7	13.8
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	5.0	2.0	8.6
185	James River at Oakes, N. Dak.	9	1993–1995	3.0	2.0	5.0
186	James River at N. Dak./S. Dak. State line	9	1998–1999	4.1	2.0	6.1
Arsenic, dissolved, in µg/L						
2	Red River of the North at Wahpeton, N. Dak.	31	1993–2008	4.0	2.0	7.0
4	Red River of the North at Brushville, Minn.	1	2005	2.9	2.9	2.9
6	Red River of the North at Hickson, N. Dak.	29	1993–2008	4.0	1.9	6.0
7	Wild Rice River near Rutland, N. Dak.	28	1993–2008	5.0	<1.0	13.0
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	4.5	2.7	16.5
10	Wild Rice River near Abercrombie, N. Dak.	32	1993–2008	5.6	3.0	20.9
11	Red River of the North at Fargo, N. Dak.	56	1993–2008	4.5	<1.0	13.3
13	Red River of the North at Harwood, N. Dak.	1	2005	3.6	3.6	3.6
14	Red River of the North near Harwood, N. Dak.	7	2005–2006	3.4	3.2	6.9
15	Sheyenne River above Harvey, N. Dak.	35	1993–2008	4.0	<1.0	12.5
17	Sheyenne River at Warwick, N. Dak.	2	2005	5.2	4.6	5.8
18	Sheyenne River near Warwick, N. Dak.	37	1993–2008	5.3	<1.0	14.1
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	31	1993–2008	4.6	<1.0	12.0
20	Mauvais Coulee near Cando, N. Dak.	73	1993–2008	4.0	<1.0	9.0
21	Edmore Coulee near Edmore, N. Dak.	75	1993–2008	4.1	<1.0	13.0
22	Edmore Coulee Tributary near Webster, N. Dak.	32	1993–2008	4.2	2.0	11.0
24	Starkweather Coulee near Webster, N. Dak.	67	1993–2008	6.0	2.0	12.0
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	5.0	2.0	12.3
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	6.1	1.5	17.0
27	Little Coulee near Brinsmade, N. Dak.	11	1993–1998	4.0	2.0	8.0
28	Big Coulee near Churchs Ferry, N. Dak.	43	1993–1997	4.0	<1.0	7.0
30	Channel A near Penn, N. Dak.	63	1993–2008	5.0	2.0	14.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	20.1	6.0	28.7
32	Sheyenne River near Cooperstown, N. Dak.	39	1993–2008	5.1	<1.0	19.3
33	Baldhill Creek near Dazey, N. Dak.	29	1993–2008	3.5	<1.0	7.0
34	Sheyenne River below Baldhill Dam, N. Dak.	40	1993–2008	5.0	<1.0	19.4
35	Sheyenne River at Valley City, N. Dak.	13	1994–2005	3.0	<1.0	8.0
36	Sheyenne River at Lisbon, N. Dak.	31	1996–2008	5.0	<1.0	9.0
37	Sheyenne River near Kindred, N. Dak.	25	1996–2008	5.0	2.0	10.0

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Arsenic, dissolved, in $\mu\text{g/L}$ —Continued						
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	35	1993–2008	5.4	<1.0	11.0
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	4.4	2.0	8.5
41	Sheyenne River at West Fargo, N. Dak.	16	1993–2008	6.3	3.0	10.0
42	Maple River near Hope, N. Dak.	22	1993–2008	3.4	<1.0	13.1
43	Maple River near Enderlin, N. Dak.	31	1993–2008	5.0	3.0	10.5
44	Maple River near Mapleton, N. Dak.	17	1995–2008	8.0	3.0	15.3
45	Maple River below Mapleton, N. Dak.	28	1995–2008	6.1	3.0	17.7
46	Sheyenne River at Harwood, N. Dak.	6	2000–2005	4.0	3.0	5.0
47	Rush River at Amenias, N. Dak.	32	1993–2008	6.5	2.0	21.9
52	Red River of the North at Halstad, Minn.	31	1996–2008	5.0	2.0	19.6
53	Beaver Creek near Finley, N. Dak.	11	1998–2003	5.0	<1.0	18.5
55	Goose River at Hillsboro, N. Dak.	39	1993–2008	4.2	2.0	11.9
56	Red River of the North at Grand Forks, N. Dak.	47	1996–2008	4.0	<1.0	9.0
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	17	1996–2008	4.0	2.0	11.4
58	Turtle River at Manvel, N. Dak.	30	2005–2008	6.8	3.2	22.4
59	Red River of the North at Oslo, Minn.	12	1993–2005	3.5	2.0	7.0
61	Forest River near Fordville, N. Dak.	31	1993–2008	3.0	<1.0	7.0
62	Forest River near Minto, N. Dak.	54	1993–2008	3.2	<1.0	20.0
63	South Branch Park River below Homme Dam, N. Dak.	4	1993–1994	3.0	<1.0	7.0
67	Park River at Grafton, N. Dak.	53	1993–2008	3.6	<1.0	11.0
68	Red River of the North at Drayton, N. Dak.	30	1993–2008	4.0	<1.0	7.2
70	Hidden Island Coulee near Hansboro, N. Dak.	4	1993–1995	3.0	<1.0	6.0
73	Little South Pembina River near Walhalla, N. Dak.	16	2001–2008	3.5	<1.0	5.8
74	Pembina River at Walhalla, N. Dak.	16	2001–2008	4.3	2.0	6.0
75	Pembina River at Neche, N. Dak.	52	1993–2008	4.0	<1.0	11.1
76	Tongue River at Akra, N. Dak.	32	1993–2008	3.0	<1.0	12.0
78	Red River of the North at Pembina, N. Dak., site 2	37	2001–2008	4.0	2.0	7.8
80	Long Creek near Noonan, N. Dak.	38	1993–2008	4.4	<1.0	21.6
83	Souris River near Foxholm, N. Dak.	29	1997–2008	6.5	<1.0	21.0
84	Des Lacs River at Foxholm, N. Dak.	41	1993–2008	5.0	<1.0	28.4
85	Souris River above Minot, N. Dak.	21	1993–1998	7.0	<1.0	15.0
86	Bonnes Creek near Velva, N. Dak.	13	1993–2005	2.0	<1.0	7.0
87	Souris River near Verendrye, N. Dak.	9	1997–1998	6.2	2.2	8.3
88	Wintering River near Karlsruhe, N. Dak.	40	1993–2008	3.5	<1.0	11.9
89	Souris River near Bantry, N. Dak.	27	1997–2008	6.1	<1.0	21.5
90	Willow Creek near Willow City, N. Dak.	32	1994–2008	5.0	<1.0	13.0
92	Deep River near Upham, N. Dak.	30	1993–2007	3.3	<1.0	9.3
97	Boundary Creek near Landa, N. Dak.	1	1994	2.0	2.0	2.0
98	Souris River near Westhope, N. Dak.	11	1997–2001	5.2	<1.0	6.8

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Arsenic, dissolved, in µg/L—Continued						
101	Little Muddy River below Cow Creek near Williston, N. Dak.	39	1993–2008	4.0	<1.0	12.6
106	Bear Den Creek near Mandaree, N. Dak.	21	1997–2008	2.2	<1.0	8.2
108	East Fork Shell Creek near Parshall, N. Dak.	43	1993–2008	4.0	<1.0	9.0
109	Deepwater Creek near Mandaree, N. Dak.	44	1993–2008	4.9	<1.0	441.0
110	Little Missouri River at Marmarth, N. Dak.	41	1993–2008	1.9	<1.0	6.0
112	Little Missouri River at Medora, N. Dak.	26	1999–2008	1.7	<1.0	3.3
113	Beaver Creek near Trotters, N. Dak.	36	1993–2008	1.1	<1.0	3.5
114	Little Missouri River near Watford City, N. Dak.	36	1995–2008	1.8	<1.0	8.3
115	Missouri River at Garrison Dam, N. Dak.	57	1996–2007	2.0	<1.0	3.0
116	Knife River at Manning, N. Dak.	31	1993–2008	1.3	<1.0	9.0
120	Knife River near Golden Valley, N. Dak.	37	1993–2008	1.7	<1.0	13.7
125	Spring Creek at Zap, N. Dak.	37	1993–2008	1.1	<1.0	6.7
127	Knife River at Hazen, N. Dak.	36	1994–2008	1.4	<1.0	4.7
140	Square Butte Creek below Center, N. Dak.	30	1993–2008	2.0	<1.0	5.8
141	Burnt Creek near Bismarck, N. Dak.	29	1993–2008	1.7	<1.0	5.6
142	Missouri River at Bismarck, N. Dak.	23	1993–2008	2.0	<1.0	3.7
145	Heart River near South Heart, N. Dak.	12	1993–2005	2.7	<1.0	15.0
146	Heart River at Dickinson, N. Dak.	4	1993–1994	1.5	<1.0	2.0
147	Green River near New Hradec, N. Dak.	29	1993–2008	<1.0	<1.0	6.0
149	Heart River near Richardton, N. Dak.	35	1993–2008	<1.0	<1.0	5.4
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	32	1993–2008	<1.0	<1.0	6.5
151	Antelope Creek near Carson, N. Dak.	18	1999–2008	<1.0	<1.0	3.8
152	Big Muddy Creek near Almont, N. Dak.	32	1993–2008	3.0	<1.0	18.5
153	Heart River near Lark, N. Dak.	6	1993–1995	<1.0	<1.0	2.0
154	Heart River at Stark Bridge near Judson, N. Dak.	32	1993–2008	<1.0	<1.0	3.8
155	Sweetbriar Creek near Judson, N. Dak.	13	2002–2008	2.0	<1.0	14.0
156	Heart River near Mandan, N. Dak.	38	1994–2008	<1.0	<1.0	6.3
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	24	1993–2004	4.5	<1.0	17.3
158	Apple Creek near Menoken, N. Dak.	31	1993–2008	5.0	<1.0	30.0
162	Cannonball River at Regent, N. Dak.	31	1993–2008	<1.0	<1.0	5.3
164	Cannonball River near Raleigh, N. Dak.	21	2001–2008	1.4	<1.0	5.1
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	5	1993–1995	2.0	<1.0	5.0
166	Cedar Creek near Haynes, N. Dak.	32	1993–2008	2.0	<1.0	16.3
169	Cedar Creek near Raleigh, N. Dak.	35	1993–2008	1.2	<1.0	4.6
170	Cannonball River at Breien, N. Dak.	40	1993–2008	1.1	<1.0	8.9
172	Beaver Creek below Linton, N. Dak.	32	1993–2008	6.0	<1.0	14.4
173	Porcupine Creek near Fort Yates, N. Dak.	35	1993–1999	<1.0	<1.0	5.2
175	James River near Manfred, N. Dak.	22	1993–1998	5.0	<1.0	7.0
176	James River near Grace City, N. Dak.	61	1993–2008	4.0	<1.0	17.8
177	James River above Arrowwood Lake near Kensal, N. Dak.	129	1993–2008	3.6	<1.0	10.0

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Arsenic, dissolved, in µg/L—Continued						
179	James River near Pingree, N. Dak.	87	1993–2008	4.4	1.8	17.0
180	Pipestem Creek near Pingree, N. Dak.	40	1993–2008	5.0	<1.0	16.4
182	James River at Jamestown, N. Dak.	63	1993–2008	3.0	<1.0	10.8
183	James River at Lamoure, N. Dak.	59	1993–2008	4.0	<1.0	12.2
184	Bear Creek near Oakes, N. Dak.	40	1993–2008	4.7	<1.0	16.1
185	James River at Oakes, N. Dak.	28	1993–2008	3.0	2.0	10.7
186	James River at N. Dak./S. Dak. State line	22	1998–2008	4.3	<1.0	23.0
Barium, total, in µg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	<100	<100	160
2	Red River of the North at Wahpeton, N. Dak.	2	1996	<100	<100	<100
3	Red River of the North near Wahpeton, N. Dak.	1	2006	<100	<100	<100
4	Red River of the North at Brushville, Minn.	54	1996–2007	<100	<100	116
10	Wild Rice River near Abercrombie, N. Dak.	45	1996–2007	102	<100	188
11	Red River of the North at Fargo, N. Dak.	5	1996	<100	<100	<100
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	<100	<100	163
14	Red River of the North near Harwood, N. Dak.	5	1996	<100	<100	110
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	<100	<100	126
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	<100	<100	148
32	Sheyenne River near Cooperstown, N. Dak.	69	1996–2007	<100	<100	114
33	Baldhill Creek near Dazey, N. Dak.	1	1996	<100	<100	<100
34	Sheyenne River below Baldhill Dam, N. Dak.	62	1996–2007	<100	<100	<100
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	<100	<100	154
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	102	<100	256
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	144	114	211
41	Sheyenne River at West Fargo, N. Dak.	6	1996–2006	103	<100	134
45	Maple River below Mapleton, N. Dak.	47	1997–2007	<100	<100	161
52	Red River of the North at Halstad, Minn.	5	2006–2007	105	<100	136
55	Goose River at Hillsboro, N. Dak.	64	1996–2007	<100	<100	167
56	Red River of the North at Grand Forks, N. Dak.	46	1997–2006	<100	<100	164
58	Turtle River at Manvel, N. Dak.	37	1997–2006	<100	<100	122
62	Forest River near Minto, N. Dak.	42	1996–2006	<100	<100	153
67	Park River at Grafton, N. Dak.	36	1996–2006	<100	<100	204
68	Red River of the North at Drayton, N. Dak.	5	1996	<100	<100	103
75	Pembina River at Neche, N. Dak.	46	1996–2006	<100	<100	618
78	Red River of the North at Pembina, N. Dak., site 2	52	1997–2006	<100	<100	238
80	Long Creek near Noonan, N. Dak.	10	1997	<100	<100	<100
82	Souris River near Sherwood, N. Dak.	121	1993–2008	<100	<100	225
83	Souris River near Foxholm, N. Dak.	11	1997–1998	<100	<100	146
84	Des Lacs River at Foxholm, N. Dak.	83	1996–2007	<100	<100	171

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Barium, total, in µg/L—Continued						
85	Souris River above Minot, N. Dak.	69	1996–2007	<100	<100	304
87	Souris River near Verendrye, N. Dak.	75	1997–2007	<100	<100	144
88	Wintering River near Karlsruhe, N. Dak.	10	1997–1998	117	<100	178
89	Souris River near Bantry, N. Dak.	9	1997–1998	107	<100	154
90	Willow Creek near Willow City, N. Dak.	5	1997	<100	<100	<100
91	Stone Creek near Kramer, N. Dak.	3	1993	<100	<100	<100
92	Deep River near Upham, N. Dak.	6	1997	<100	<100	<100
97	Boundary Creek near Landa, N. Dak.	3	1993	<100	<100	<100
98	Souris River near Westhope, N. Dak.	7	1997–1998	<100	<100	249
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	<100	<100	<100
110	Little Missouri River at Marmarth, N. Dak.	8	1999	241	<100	699
112	Little Missouri River at Medora, N. Dak.	73	1996–2007	114	<100	3,600
113	Beaver Creek near Trotters, N. Dak.	9	1999	<100	<100	<100
114	Little Missouri River near Watford City, N. Dak.	69	1996–2007	185	<100	4,320
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	<100	<100	207
125	Spring Creek at Zap, N. Dak.	64	1997–2007	<100	<100	185
127	Knife River at Hazen, N. Dak.	76	1996–2007	<100	<100	405
149	Heart River near Richardton, N. Dak.	68	1996–2007	<100	<100	141
156	Heart River near Mandan, N. Dak.	68	1996–2007	<100	<100	208
164	Cannonball River near Raleigh, N. Dak.	62	1996–2007	<100	<100	375
169	Cedar Creek near Raleigh, N. Dak.	54	1996–2007	<100	<100	199
170	Cannonball River at Breien, N. Dak.	64	1996–2007	<100	<100	731
175	James River near Manfred, N. Dak.	6	1998	<100	<100	<100
176	James River near Grace City, N. Dak.	60	1997–2007	<100	<100	201
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	<100	<100	138
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	<100	<100	122
182	James River at Jamestown, N. Dak.	75	1997–2007	<100	<100	149
183	James River at Lamoure, N. Dak.	73	1996–2007	<100	<100	188
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	<100	<100	134
186	James River at N. Dak./S. Dak. State line	9	1998–1999	<100	<100	126
Chromium, total, in µg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	<1.2	<1.2	6.7
2	Red River of the North at Wahpeton, N. Dak.	2	1996	1.8	<1.2	2.5
3	Red River of the North near Wahpeton, N. Dak.	1	2006	1.3	1.3	1.3
4	Red River of the North at Brushville, Minn.	54	1996–2007	<1.2	<1.2	7.5
10	Wild Rice River near Abercrombie, N. Dak.	45	1996–2007	2.2	<1.2	8.6
11	Red River of the North at Fargo, N. Dak.	6	1996–2006	1.9	<1.2	3.7
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	4.1	<1.2	21.2
14	Red River of the North near Harwood, N. Dak.	10	1996–2007	5.1	1.5	13.6
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	<1.2	<1.2	3.2

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Chromium, total, in $\mu\text{g/L}$ —Continued						
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	<1.2	<1.2	3.8
32	Sheyenne River near Cooperstown, N. Dak.	74	1996–2007	1.3	<1.2	6.4
33	Baldhill Creek near Dazey, N. Dak.	1	1996	<1.2	<1.2	<1.2
34	Sheyenne River below Baldhill Dam, N. Dak.	67	1996–2007	<1.2	<1.2	5.7
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	1.5	<1.2	13.1
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	1.8	<1.2	23.1
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	4.9	3.2	15.8
41	Sheyenne River at West Fargo, N. Dak.	6	1996–2006	4.9	<1.2	6.6
45	Maple River below Mapleton, N. Dak.	47	1997–2007	2.3	<1.2	16.4
52	Red River of the North at Halstad, Minn.	5	2006–2007	6.8	3.3	15.8
55	Goose River at Hillsboro, N. Dak.	64	1996–2007	1.4	<1.2	13.9
56	Red River of the North at Grand Forks, N. Dak.	47	1997–2006	2.3	<1.2	21.1
58	Turtle River at Manvel, N. Dak.	38	1997–2006	<1.2	<1.2	9.9
62	Forest River near Minto, N. Dak.	43	1996–2006	<1.2	<1.2	11.1
67	Park River at Grafton, N. Dak.	37	1996–2006	<1.2	<1.2	23.0
68	Red River of the North at Drayton, N. Dak.	5	1996	3.6	<1.2	6.3
75	Pembina River at Neche, N. Dak.	47	1996–2006	2.4	<1.2	79.0
78	Red River of the North at Pembina, N. Dak., site 2	58	1997–2007	4.5	<1.2	36.3
80	Long Creek near Noonan, N. Dak.	10	1997	<1.2	<1.2	1.8
82	Souris River near Sherwood, N. Dak.	98	1993–2008	<1.2	<1.2	2.3
83	Souris River near Foxholm, N. Dak.	35	1993–1998	<1.2	<1.2	<1.2
84	Des Lacs River at Foxholm, N. Dak.	83	1996–2007	<1.2	<1.2	4.6
85	Souris River above Minot, N. Dak.	117	1996–2008	<1.2	<1.2	7.4
87	Souris River near Verendrye, N. Dak.	154	1993–2008	<1.2	<1.2	20.0
88	Wintering River near Karlsruhe, N. Dak.	10	1997–1998	<1.2	<1.2	1.8
89	Souris River near Bantry, N. Dak.	45	1993–1998	<1.2	<1.2	14.0
90	Willow Creek near Willow City, N. Dak.	8	1993–1997	<1.2	<1.2	3.6
91	Stone Creek near Kramer, N. Dak.	3	1993	<1.2	<1.2	<1.2
92	Deep River near Upham, N. Dak.	6	1997	<1.2	<1.2	1.6
97	Boundary Creek near Landa, N. Dak.	3	1993	<1.2	<1.2	<1.2
98	Souris River near Westhope, N. Dak.	18	1995–2008	<1.2	<1.2	2.3
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	<1.2	<1.2	3.5
110	Little Missouri River at Marmarth, N. Dak.	8	1999	21.0	1.4	84.3
112	Little Missouri River at Medora, N. Dak.	74	1996–2007	8.8	<1.2	708.0
113	Beaver Creek near Trotters, N. Dak.	9	1999	<1.2	<1.2	2.3
114	Little Missouri River near Watford City, N. Dak.	69	1996–2007	15.1	<1.2	845.0
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	2.2	<1.2	19.2
125	Spring Creek at Zap, N. Dak.	64	1997–2007	<1.2	<1.2	9.5
127	Knife River at Hazen, N. Dak.	76	1996–2007	<1.2	<1.2	32.3

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Chromium, total, in µg/L—Continued						
149	Heart River near Richardton, N. Dak.	68	1996–2007	<1.2	<1.2	9.5
156	Heart River near Mandan, N. Dak.	68	1996–2007	<1.2	<1.2	22.0
164	Cannonball River near Raleigh, N. Dak.	62	1996–2007	1.8	<1.2	30.8
169	Cedar Creek near Raleigh, N. Dak.	54	1996–2007	1.4	<1.2	29.0
170	Cannonball River at Breien, N. Dak.	64	1996–2007	2.0	<1.2	111.0
175	James River near Manfred, N. Dak.	6	1998	<1.2	<1.2	<1.2
176	James River near Grace City, N. Dak.	60	1997–2007	<1.2	<1.2	6.3
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	<1.2	<1.2	<1.2
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	<1.2	<1.2	<1.2
182	James River at Jamestown, N. Dak.	75	1997–2007	<1.2	<1.2	49.8
183	James River at Lamoure, N. Dak.	73	1996–2007	1.4	<1.2	162.0
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	<1.2	<1.2	1.3
186	James River at N. Dak./S. Dak. State line	9	1998–1999	1.3	<1.2	1.9
Copper, total, in µg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	2.5	<1.0	7.3
4	Red River of the North at Brushville, Minn.	54	1996–2007	1.9	<1.0	6.0
11	Red River of the North at Fargo, N. Dak.	1	2006	1.0	1.0	1.0
14	Red River of the North near Harwood, N. Dak.	5	2006–2007	7.8	5.5	9.8
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	3.2	<1.0	11.9
32	Sheyenne River near Cooperstown, N. Dak.	5	2006–2007	4.0	3.2	114.0
34	Sheyenne River below Baldhill Dam, N. Dak.	5	2006–2007	2.0	1.6	3.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	5.4	4.2	14.9
52	Red River of the North at Halstad, Minn.	5	2006–2007	6.5	5.1	12.3
56	Red River of the North at Grand Forks, N. Dak.	1	2006	<1.0	<1.0	<1.0
58	Turtle River at Manvel, N. Dak.	1	2006	5.8	5.8	5.8
62	Forest River near Minto, N. Dak.	1	2006	<1.0	<1.0	1.0
67	Park River at Grafton, N. Dak.	1	2006	2.1	2.1	2.1
75	Pembina River at Neche, N. Dak.	1	2006	1.7	1.7	1.7
78	Red River of the North at Pembina, N. Dak., site 2	6	2006–2007	7.0	1.0	15.3
82	Souris River near Sherwood, N. Dak.	114	1993–2008	2.6	<1.0	18.6
83	Souris River near Foxholm, N. Dak.	25	1993–1998	2.0	<1.0	39.0
85	Souris River above Minot, N. Dak.	51	1999–2008	2.5	<1.0	11.8
87	Souris River near Verendrye, N. Dak.	104	1993–2008	3.1	<1.0	17.0
89	Souris River near Bantry, N. Dak.	37	1993–1998	2.0	<1.0	5.0
90	Willow Creek near Willow City, N. Dak.	3	1993	2.0	2.0	3.0
91	Stone Creek near Kramer, N. Dak.	3	1993	2.0	<1.0	3.0
97	Boundary Creek near Landa, N. Dak.	3	1993	2.0	<1.0	3.0
98	Souris River near Westhope, N. Dak.	13	1995–2008	3.8	<1.0	7.2

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Copper, dissolved, in $\mu\text{g/L}$ —Continued						
2	Red River of the North at Wahpeton, N. Dak.	8	2005–2008	1.1	<1.0	2.2
4	Red River of the North at Brushville, Minn.	1	2005	1.6	1.6	1.6
6	Red River of the North at Hickson, N. Dak.	8	2005–2008	1.8	<1.0	5.0
7	Wild Rice River near Rutland, N. Dak.	8	2005–2008	2.7	1.5	17.0
9	Antelope Creek at Dwight, N. Dak.	8	2005–2008	2.8	1.8	21.5
10	Wild Rice River near Abercrombie, N. Dak.	9	2005–2008	2.5	<1.0	27.4
11	Red River of the North at Fargo, N. Dak.	38	2005–2008	1.8	<1.0	7.4
13	Red River of the North at Harwood, N. Dak.	1	2005	2.4	2.4	2.4
14	Red River of the North near Harwood, N. Dak.	7	2005–2006	2.3	1.0	2.9
15	Sheyenne River above Harvey, N. Dak.	20	1993–2008	<1.0	<1.0	7.5
17	Sheyenne River at Warwick, N. Dak.	2	2005	4.0	2.8	5.2
18	Sheyenne River near Warwick, N. Dak.	12	2005–2008	2.2	<1.0	4.8
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	7	2005–2008	2.6	1.3	4.1
20	Mauvais Coulee near Cando, N. Dak.	16	2005–2008	2.1	1.0	3.7
21	Edmore Coulee near Edmore, N. Dak.	17	2005–2008	3.1	1.9	4.2
22	Edmore Coulee Tributary near Webster, N. Dak.	7	2005–2008	2.6	2.0	4.5
24	Starkweather Coulee near Webster, N. Dak.	16	2005–2008	3.3	2.3	4.9
25	Big Coulee below Churchs Ferry, N. Dak.	7	2005–2008	2.2	<1.0	3.3
26	Little Coulee near Leeds, N. Dak.	5	2005–2008	1.8	1.2	3.8
30	Channel A near Penn, N. Dak.	7	2005–2008	2.4	2.0	5.1
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	6	2005–2007	7.8	3.9	20.8
32	Sheyenne River near Cooperstown, N. Dak.	18	2005–2008	2.5	<1.0	4.0
33	Baldhill Creek near Dazey, N. Dak.	8	2005–2008	1.5	<1.0	1.8
34	Sheyenne River below Baldhill Dam, N. Dak.	19	2005–2008	2.3	<1.0	6.2
35	Sheyenne River at Valley City, N. Dak.	1	2005	4.1	4.1	4.1
36	Sheyenne River at Lisbon, N. Dak.	14	2005–2008	3.0	2.0	15.0
37	Sheyenne River near Kindred, N. Dak.	9	2005–2008	2.4	<1.0	5.8
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	14	2005–2008	2.6	<1.0	10.1
40	Sheyenne River Diversion at West Fargo, N. Dak.	4	2005–2007	3.3	2.3	3.5
41	Sheyenne River at West Fargo, N. Dak.	4	2006–2008	2.0	<1.0	6.0
42	Maple River near Hope, N. Dak.	6	2005–2008	2.8	2.0	8.7
43	Maple River near Enderlin, N. Dak.	8	2005–2008	1.9	<1.0	30.9
44	Maple River near Mapleton, N. Dak.	8	2005–2008	3.2	1.8	31.0
45	Maple River below Mapleton, N. Dak.	9	2005–2008	3.2	2.1	18.5
46	Sheyenne River at Harwood, N. Dak.	1	2005	2.2	2.2	2.2
47	Rush River at Amenias, N. Dak.	8	2005–2008	1.4	<1.0	28.1
52	Red River of the North at Halstad, Minn.	13	2005–2008	2.5	<1.0	6.6
55	Goose River at Hillsboro, N. Dak.	15	2005–2008	2.0	<1.0	6.1
56	Red River of the North at Grand Forks, N. Dak.	30	2005–2008	2.3	<1.0	3.4

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Copper, dissolved, in µg/L—Continued						
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	8	2005–2008	1.5	<1.0	2.1
58	Turtle River at Manvel, N. Dak.	30	2005–2008	3.6	<1.0	13.2
59	Red River of the North at Oslo, Minn.	1	2005	2.3	2.3	2.3
61	Forest River near Fordville, N. Dak.	8	2005–2008	1.6	<1.0	4.2
62	Forest River near Minto, N. Dak.	30	2005–2008	1.5	<1.0	3.3
67	Park River at Grafton, N. Dak.	30	2005–2008	2.4	<1.0	4.3
68	Red River of the North at Drayton, N. Dak.	8	2005–2008	3.0	2.1	4.4
73	Little South Pembina River near Walhalla, N. Dak.	8	2005–2008	2.5	1.9	4.6
74	Pembina River at Walhalla, N. Dak.	8	2005–2008	2.3	<1.0	4.9
75	Pembina River at Neche, N. Dak.	30	2005–2008	2.5	<1.0	4.3
76	Tongue River at Akra, N. Dak.	8	2005–2008	1.6	<1.0	2.8
78	Red River of the North at Pembina, N. Dak., site 2	33	2005–2008	2.7	1.3	5.0
80	Long Creek near Noonan, N. Dak.	17	1997–2008	4.9	1.1	8.8
83	Souris River near Foxholm, N. Dak.	17	1997–2008	2.6	1.7	3.9
84	Des Lacs River at Foxholm, N. Dak.	17	1997–2008	4.7	2.2	7.6
85	Souris River above Minot, N. Dak.	9	1997–1998	4.5	2.2	5.6
86	Bonnes Creek near Velva, N. Dak.	1	2005	4.0	4.0	4.0
87	Souris River near Verendrye, N. Dak.	9	1997–1998	4.4	2.7	5.5
88	Wintering River near Karlsruhe, N. Dak.	17	1997–2008	2.8	<1.0	8.8
89	Souris River near Bantry, N. Dak.	17	1997–2008	3.2	<1.0	4.7
90	Willow Creek near Willow City, N. Dak.	13	1997–2008	3.0	1.3	5.9
92	Deep River near Upham, N. Dak.	11	1997–2007	2.0	1.5	3.6
98	Souris River near Westhope, N. Dak.	7	1997–1998	3.9	3.2	6.8
101	Little Muddy River below Cow Creek near Williston, N. Dak.	17	1999–2008	3.2	1.2	7.6
106	Bear Den Creek near Mandaree, N. Dak.	8	2005–2008	7.2	4.0	20.5
108	East Fork Shell Creek near Parshall, N. Dak.	5	2005–2008	7.2	3.6	8.0
109	Deepwater Creek near Mandaree, N. Dak.	7	2005–2008	3.8	2.2	10.0
110	Little Missouri River at Marmarth, N. Dak.	17	1999–2008	6.2	3.1	26.8
112	Little Missouri River at Medora, N. Dak.	18	1999–2008	4.7	3.3	13.0
113	Beaver Creek near Trotters, N. Dak.	17	1999–2008	4.0	2.8	7.8
114	Little Missouri River near Watford City, N. Dak.	18	1999–2008	5.6	3.1	16.3
115	Missouri River at Garrison Dam, N. Dak.	10	1997–1998	1.9	1.2	2.4
116	Knife River at Manning, N. Dak.	8	2005–2008	5.6	3.2	9.0
120	Knife River near Golden Valley, N. Dak.	14	2005–2008	6.2	4.2	10.1
125	Spring Creek at Zap, N. Dak.	14	2005–2008	3.7	2.2	5.4
127	Knife River at Hazen, N. Dak.	14	2005–2008	3.7	2.8	7.5
140	Square Butte Creek below Center, N. Dak.	8	2005–2008	3.1	2.1	5.5
141	Burnt Creek near Bismarck, N. Dak.	6	2005–2008	2.3	1.4	25.0
142	Missouri River at Bismarck, N. Dak.	8	2005–2008	1.8	1.3	3.1
145	Heart River near South Heart, N. Dak.	1	2005	6.7	6.7	6.7

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Copper, dissolved, in $\mu\text{g/L}$ —Continued						
147	Green River near New Hradec, N. Dak.	7	2005–2008	3.7	1.2	16.3
149	Heart River near Richardton, N. Dak.	11	2005–2008	3.7	2.3	19.2
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	8	2005–2008	3.7	2.4	21.1
151	Antelope Creek near Carson, N. Dak.	7	2005–2008	1.9	<1.0	38.6
152	Big Muddy Creek near Almont, N. Dak.	8	2005–2008	6.4	2.9	12.5
154	Heart River at Stark Bridge near Judson, N. Dak.	8	2005–2008	4.2	1.8	4.9
155	Sweetbriar Creek near Judson, N. Dak.	7	2005–2008	4.4	2.0	42.9
156	Heart River near Mandan, N. Dak.	14	2005–2008	3.8	2.0	6.2
158	Apple Creek near Menoken, N. Dak.	8	2005–2008	3.7	1.7	5.5
162	Cannonball River at Regent, N. Dak.	8	2005–2008	4.6	2.1	17.9
164	Cannonball River near Raleigh, N. Dak.	15	2005–2008	4.5	<1.0	27.4
166	Cedar Creek near Haynes, N. Dak.	8	2005–2008	4.9	2.1	18.1
169	Cedar Creek near Raleigh, N. Dak.	14	2005–2008	5.4	2.5	11.6
170	Cannonball River at Breien, N. Dak.	15	2005–2008	5.0	2.8	16.1
172	Beaver Creek below Linton, N. Dak.	8	2005–2008	3.9	<1.0	8.8
175	James River near Manfred, N. Dak.	6	1998	1.9	1.0	2.2
176	James River near Grace City, N. Dak.	21	1998–2008	1.8	<1.0	4.4
177	James River above Arrowwood Lake near Kensal, N. Dak.	32	1993–2008	<1.0	<1.0	4.0
179	James River near Pingree, N. Dak.	17	1993–2008	<1.0	<1.0	2.2
180	Pipestem Creek near Pingree, N. Dak.	16	1998–2008	1.7	<1.0	9.4
182	James River at Jamestown, N. Dak.	30	1993–2008	1.4	<1.0	2.9
183	James River at Lamoure, N. Dak.	36	1993–2008	1.8	<1.0	13.9
184	Bear Creek near Oakes, N. Dak.	16	1998–2008	1.7	<1.0	4.5
185	James River at Oakes, N. Dak.	20	1993–2006	2.0	<1.0	7.0
186	James River at N. Dak./S. Dak. State line	16	1998–2008	1.7	<1.0	4.6
Iron, total, in $\mu\text{g/L}$						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	955	230	5,940
2	Red River of the North at Wahpeton, N. Dak.	17	1993–1996	400	<10	2,150
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	505	302	1,510
4	Red River of the North at Brushville, Minn.	61	1993–2007	806	168	6,190
5	Red River of the North below Wahpeton, N. Dak.	20	1997–1999	1,011	159	2,090
6	Red River of the North at Hickson, N. Dak.	21	1997–1999	2,540	204	11,900
10	Wild Rice River near Abercrombie, N. Dak.	58	1993–2007	1,605	251	7,510
11	Red River of the North at Fargo, N. Dak.	19	1994–2006	1,410	<10	4,630
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	2,960	180	17,700
14	Red River of the North near Harwood, N. Dak.	52	1993–2007	2,725	<10	8,760
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	701	142	3,010
18	Sheyenne River near Warwick, N. Dak.	18	2001–2007	585	<10	2,530
24	Starkweather Coulee near Webster, N. Dak.	2	2001	1,455	<10	2,900
32	Sheyenne River near Cooperstown, N. Dak.	85	1994–2007	857	145	5,520

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Iron, total, in µg/L—Continued						
33	Baldhill Creek near Dazey, N. Dak.	3	1993–1996	161	64	291
34	Sheyenne River below Baldhill Dam, N. Dak.	80	1994–2007	134	<10	2,620
35	Sheyenne River at Valley City, N. Dak.	4	1993	691	83	1,210
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	1,010	68	11,400
37	Sheyenne River near Kindred, N. Dak.	72	1996–2007	1,730	322	20,700
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	2,800	481	5,020
41	Sheyenne River at West Fargo, N. Dak.	13	1994–2006	1,620	377	5,750
45	Maple River below Mapleton, N. Dak.	47	1997–2007	1,680	165	13,800
46	Sheyenne River at Harwood, N. Dak.	31	1993–1999	3,160	<10	9,760
52	Red River of the North at Halstad, Minn.	7	2001–2007	5,100	2,850	16,000
55	Goose River at Hillsboro, N. Dak.	76	1994–2007	1,030	66	12,100
56	Red River of the North at Grand Forks, N. Dak.	48	1997–2006	1,830	18	18,100
58	Turtle River at Manvel, N. Dak.	39	1993–2006	742	55	9,870
62	Forest River near Minto, N. Dak.	48	1994–2006	522	<10	10,500
67	Park River at Grafton, N. Dak.	41	1994–2006	578	<10	22,600
68	Red River of the North at Drayton, N. Dak.	15	1994–1996	1,810	671	4,810
75	Pembina River at Neche, N. Dak.	56	1994–2006	1,200	<10	50,200
76	Tongue River at Akra, N. Dak.	1	1993	649	649	649
78	Red River of the North at Pembina, N. Dak., site 2	59	1997–2007	3,220	<10	26,900
79	Red River of the North at Emerson, Manitoba	2	2001	11	<10	11
80	Long Creek near Noonan, N. Dak.	10	1997	481	236	1,010
82	Souris River near Sherwood, N. Dak.	120	1993–2008	554	16	4,717
83	Souris River near Foxholm, N. Dak.	35	1993–1998	170	32	579
84	Des Lacs River at Foxholm, N. Dak.	97	1993–2007	858	68	4,180
85	Souris River above Minot, N. Dak.	136	1994–2008	305	33	1,726
87	Souris River near Verendrye, N. Dak.	177	1993–2008	709	147	21,000
88	Wintering River near Karlsruhe, N. Dak.	11	1997–1998	353	201	426
89	Souris River near Bantry, N. Dak.	64	1993–2000	790	140	4,380
90	Willow Creek near Willow City, N. Dak.	30	1993–2000	497	19	1,600
91	Stone Creek near Kramer, N. Dak.	19	1993–2000	226	42	2,490
92	Deep River near Upham, N. Dak.	28	1997–2000	195	55	1,740
95	Cut Bank Creek at Upham, N. Dak.	16	1999–2000	50	<10	4,660
97	Boundary Creek near Landa, N. Dak.	19	1993–2000	272	61	4,320
98	Souris River near Westhope, N. Dak.	21	1995–2008	500	121	2,130
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	783	384	3,470
110	Little Missouri River at Marmarth, N. Dak.	8	1999	20,150	984	82,900
112	Little Missouri River at Medora, N. Dak.	88	1993–2007	5,650	<10	892,000
113	Beaver Creek near Trotters, N. Dak.	9	1999	273	113	2,420
114	Little Missouri River near Watford City, N. Dak.	81	1994–2007	10,800	<10	960,000

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Iron, total, in µg/L—Continued						
115	Missouri River at Garrison Dam, N. Dak.	8	1999–2000	74	16	260
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	1,865	430	21,700
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	6	1993	879	372	1,140
125	Spring Creek at Zap, N. Dak.	77	1993–2007	593	275	10,600
127	Knife River at Hazen, N. Dak.	94	1993–2007	782	273	39,200
140	Square Butte Creek below Center, N. Dak.	4	1993	860	318	1,440
142	Missouri River at Bismarck, N. Dak.	25	1994–2001	420	<10	2,020
146	Heart River at Dickinson, N. Dak.	5	1993	788	285	5,140
149	Heart River near Richardton, N. Dak.	76	1994–2007	838	143	8,540
152	Big Muddy Creek near Almont, N. Dak.	3	1993	1,350	1,050	1,740
156	Heart River near Mandan, N. Dak.	81	1994–2007	422	157	23,200
158	Apple Creek near Menoken, N. Dak.	4	1993	1,173	532	1,840
164	Cannonball River near Raleigh, N. Dak.	76	1993–2007	1,130	126	41,700
169	Cedar Creek near Raleigh, N. Dak.	68	1993–2007	919	124	34,600
170	Cannonball River at Breien, N. Dak.	74	1994–2007	1,004	12	91,800
171	Beaver Creek near Linton, N. Dak.	4	1993	1,350	714	3,490
175	James River near Manfred, N. Dak.	6	1998	170	123	438
176	James River near Grace City, N. Dak.	60	1997–2007	458	98	1,640
177	James River above Arrowwood Lake near Kensal, N. Dak.	12	1993–1999	375	170	1,050
179	James River near Pingree, N. Dak.	2	1993	170	140	200
180	Pipestem Creek near Pingree, N. Dak.	17	1994–1999	397	131	1,530
182	James River at Jamestown, N. Dak.	78	1993–2007	532	185	1,870
183	James River at Lamoure, N. Dak.	78	1993–2007	1,280	238	7,170
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	596	179	1,330
185	James River at Oakes, N. Dak.	8	1993–1994	503	260	1,300
186	James River at N. Dak./S. Dak. State line	9	1998–1999	1,130	298	1,760
Iron, dissolved, in µg/L						
2	Red River of the North at Wahpeton, N. Dak.	33	1993–2008	<50	<50	337
6	Red River of the North at Hickson, N. Dak.	27	1993–2006	<50	<50	100
7	Wild Rice River near Rutland, N. Dak.	25	1993–2008	<50	<50	109
9	Antelope Creek at Dwight, N. Dak.	9	2001–2006	<50	<50	<50
10	Wild Rice River near Abercrombie, N. Dak.	36	1993–2008	<50	<50	100
11	Red River of the North at Fargo, N. Dak.	58	1993–2008	<50	<50	127
14	Red River of the North near Harwood, N. Dak.	7	2005–2006	<50	<50	170
15	Sheyenne River above Harvey, N. Dak.	35	1993–2008	78	<50	370
18	Sheyenne River near Warwick, N. Dak.	39	1993–2008	<50	<50	130
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	28	1993–2006	<50	<50	159
20	Mauvais Coulee near Cando, N. Dak.	66	1993–2008	<50	<50	260
21	Edmore Coulee near Edmore, N. Dak.	65	1993–2006	<50	<50	200
22	Edmore Coulee Tributary near Webster, N. Dak.	30	1993–2006	<50	<50	169

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Iron, dissolved, in µg/L—Continued						
24	Starkweather Coulee near Webster, N. Dak.	57	1993–2006	<50	<50	147
25	Big Coulee below Churchs Ferry, N. Dak.	21	1998–2008	<50	<50	141
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	55	<50	222
27	Little Coulee near Brinsmade, N. Dak.	11	1993–1998	<50	<50	100
28	Big Coulee near Churchs Ferry, N. Dak.	43	1993–1997	<50	<50	140
30	Channel A near Penn, N. Dak.	59	1993–2006	<50	<50	210
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	10	2002–2006	70	<50	115
32	Sheyenne River near Cooperstown, N. Dak.	35	1993–2008	<50	<50	477
33	Baldhill Creek near Dazey, N. Dak.	29	1993–2008	<50	<50	140
34	Sheyenne River below Baldhill Dam, N. Dak.	36	1993–2008	<50	<50	146
35	Sheyenne River at Valley City, N. Dak.	13	1994–2005	<50	<50	90
36	Sheyenne River at Lisbon, N. Dak.	52	1993–2008	<50	<50	490
37	Sheyenne River near Kindred, N. Dak.	56	1993–2008	<50	<50	130
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	33	1993–2006	<50	<50	160
40	Sheyenne River Diversion at West Fargo, N. Dak.	12	1994–2006	<50	<50	110
41	Sheyenne River at West Fargo, N. Dak.	15	1993–2008	<50	<50	120
42	Maple River near Hope, N. Dak.	19	1993–2006	<50	<50	90
43	Maple River near Enderlin, N. Dak.	29	1993–2008	<50	<50	120
44	Maple River near Mapleton, N. Dak.	14	1995–2007	<50	<50	91
45	Maple River below Mapleton, N. Dak.	27	1995–2008	<50	<50	150
46	Sheyenne River at Harwood, N. Dak.	6	2000–2005	<50	<50	<50
47	Rush River at Amenia, N. Dak.	27	1993–2006	<50	<50	161
52	Red River of the North at Halstad, Minn.	54	1993–2006	<50	<50	1,710
53	Beaver Creek near Finley, N. Dak.	24	1993–2003	<50	<50	210
55	Goose River at Hillsboro, N. Dak.	42	1993–2008	<50	<50	140
56	Red River of the North at Grand Forks, N. Dak.	80	1993–2008	<50	<50	500
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	86	1993–2006	<50	<50	146
58	Turtle River at Manvel, N. Dak.	30	2005–2008	<50	<50	213
59	Red River of the North at Oslo, Minn.	14	1993–2005	<50	<50	6,000
61	Forest River near Fordville, N. Dak.	27	1993–2006	<50	<50	150
62	Forest River near Minto, N. Dak.	54	1993–2008	<50	<50	150
63	South Branch Park River below Homme Dam, N. Dak.	4	1993–1994	<50	<50	<50
67	Park River at Grafton, N. Dak.	53	1993–2008	<50	<50	130
68	Red River of the North at Drayton, N. Dak.	32	1993–2008	<50	<50	160
70	Hidden Island Coulee near Hansboro, N. Dak.	4	1993–1995	<50	<50	80
73	Little South Pembina River near Walhalla, N. Dak.	13	2001–2007	<50	<50	110
74	Pembina River at Walhalla, N. Dak.	40	1993–2006	<50	<50	440
75	Pembina River at Neche, N. Dak.	53	1993–2008	<50	<50	160
76	Tongue River at Akra, N. Dak.	32	1993–2008	<50	<50	240

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Iron, dissolved, in µg/L—Continued						
78	Red River of the North at Pembina, N. Dak., site 2	85	1994–2008	<50	<50	146
79	Red River of the North at Emerson, Manitoba	37	1993–2004	<50	<50	260
80	Long Creek near Noonan, N. Dak.	29	1993–2008	80	<50	440
83	Souris River near Foxholm, N. Dak.	20	1999–2008	<50	<50	60
84	Des Lacs River at Foxholm, N. Dak.	32	1993–2008	65	<50	350
85	Souris River above Minot, N. Dak.	12	1993–1998	<50	<50	170
86	Bonnes Creek near Velva, N. Dak.	14	1993–2005	194	60	310
88	Wintering River near Karlsruhe, N. Dak.	32	1993–2008	184	<50	550
89	Souris River near Bantry, N. Dak.	19	1999–2008	<50	<50	163
90	Willow Creek near Willow City, N. Dak.	28	1994–2008	64	<50	350
92	Deep River near Upham, N. Dak.	25	1993–2007	<50	<50	190
97	Boundary Creek near Landa, N. Dak.	1	1994	130	130	130
98	Souris River near Westhope, N. Dak.	10	1993–2001	56	<50	250
101	Little Muddy River below Cow Creek near Williston, N. Dak.	31	1993–2008	67	<50	340
106	Bear Den Creek near Mandaree, N. Dak.	35	1993–2007	81	<50	780
108	East Fork Shell Creek near Parshall, N. Dak.	48	1993–2007	69	<50	520
109	Deepwater Creek near Mandaree, N. Dak.	49	1993–2008	51	<50	480
110	Little Missouri River at Marmarth, N. Dak.	32	1993–2008	<50	<50	10,000
112	Little Missouri River at Medora, N. Dak.	16	2001–2008	<50	<50	363
113	Beaver Creek near Trotters, N. Dak.	28	1993–2008	52	<50	1,000
114	Little Missouri River near Watford City, N. Dak.	29	1993–2008	<50	<50	6,150
115	Missouri River at Garrison Dam, N. Dak.	71	1993–2007	<50	<50	<50
116	Knife River at Manning, N. Dak.	30	1993–2008	170	<50	740
120	Knife River near Golden Valley, N. Dak.	32	1993–2008	56	<50	430
125	Spring Creek at Zap, N. Dak.	32	1993–2008	95	<50	440
127	Knife River at Hazen, N. Dak.	35	1993–2008	<50	<50	5,200
135	Turtle Creek above Washburn, N. Dak.	63	1993–2003	<50	<50	1,500
136	Painted Woods Creek near Wilton, N. Dak.	61	1993–2003	<50	<50	480
140	Square Butte Creek below Center, N. Dak.	31	1993–2008	<50	<50	400
141	Burnt Creek near Bismarck, N. Dak.	28	1993–2008	94	<50	280
142	Missouri River at Bismarck, N. Dak.	23	1993–2008	<50	<50	140
145	Heart River near South Heart, N. Dak.	12	1993–2005	100	<50	3,870
146	Heart River at Dickinson, N. Dak.	4	1993–1994	75	<50	140
147	Green River near New Hradec, N. Dak.	29	1993–2008	130	<50	760
149	Heart River near Richardton, N. Dak.	32	1993–2008	<50	<50	319
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	29	1993–2007	57	<50	409
151	Antelope Creek near Carson, N. Dak.	17	1999–2008	70	<50	271
152	Big Muddy Creek near Almont, N. Dak.	32	1993–2008	70	<50	2,600
153	Heart River near Lark, N. Dak.	6	1993–1995	55	<50	270
154	Heart River at Stark Bridge near Judson, N. Dak.	29	1993–2007	<50	<50	390

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Iron, dissolved, in $\mu\text{g/L}$ —Continued						
155	Sweetbriar Creek near Judson, N. Dak.	12	2002–2008	54	<50	287
156	Heart River near Mandan, N. Dak.	35	1993–2008	<50	<50	360
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	24	1993–2004	110	<50	850
158	Apple Creek near Menoken, N. Dak.	31	1993–2008	63	<50	1,100
162	Cannonball River at Regent, N. Dak.	29	1993–2008	60	<50	540
164	Cannonball River near Raleigh, N. Dak.	15	2001–2008	<50	<50	392
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	5	1993–1995	70	<50	150
166	Cedar Creek near Haynes, N. Dak.	31	1993–2008	60	<50	364
169	Cedar Creek near Raleigh, N. Dak.	29	1993–2008	<50	<50	386
170	Cannonball River at Breien, N. Dak.	34	1993–2008	<50	<50	410
172	Beaver Creek below Linton, N. Dak.	32	1993–2008	<50	<50	590
173	Porcupine Creek near Fort Yates, N. Dak.	35	1993–1999	<50	<50	6,180
175	James River near Manfred, N. Dak.	16	1993–1995	67	<50	170
176	James River near Grace City, N. Dak.	48	1993–2008	<50	<50	180
177	James River above Arrowwood Lake near Kensal, N. Dak.	124	1993–2008	<50	<50	280
179	James River near Pingree, N. Dak.	75	1993–2008	<50	<50	140
180	Pipestem Creek near Pingree, N. Dak.	32	1993–2008	60	<50	190
182	James River at Jamestown, N. Dak.	49	1993–2008	<50	<50	152
183	James River at Lamoure, N. Dak.	45	1993–2008	<50	<50	190
184	Bear Creek near Oakes, N. Dak.	32	1993–2008	<50	<50	230
185	James River at Oakes, N. Dak.	23	1993–2008	<50	<50	110
186	James River at N. Dak./S. Dak. State line	14	2002–2008	<50	<50	160
Lead, total, in $\mu\text{g/L}$						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	<1.0	<1.0	4.7
2	Red River of the North at Wahpeton, N. Dak.	2	1996	6.4	4.0	8.7
3	Red River of the North near Wahpeton, N. Dak.	1	2006	1.1	1.1	1.1
4	Red River of the North at Brushville, Minn.	54	1996–2007	<1.0	<1.0	3.1
10	Wild Rice River near Abercrombie, N. Dak.	45	1996–2007	1.6	<1.0	5.2
11	Red River of the North at Fargo, N. Dak.	6	1996–2006	1.8	<1.0	6.6
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	1.6	<1.0	6.7
14	Red River of the North near Harwood, N. Dak.	10	1996–2007	3.4	<1.0	9.0
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	<1.0	<1.0	7.9
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	<1.0	<1.0	1.5
32	Sheyenne River near Cooperstown, N. Dak.	74	1996–2007	<1.0	<1.0	6.2
33	Baldhill Creek near Dazey, N. Dak.	1	1996	6.8	6.8	6.8
34	Sheyenne River below Baldhill Dam, N. Dak.	67	1996–2007	<1.0	<1.0	7.6
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	<1.0	<1.0	8.4
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	1.4	<1.0	14.4
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	2.2	1.2	9.4

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Lead, total, in µg/L—Continued						
45	Maple River below Mapleton, N. Dak.	47	1997–2007	1.5	<1.0	7.3
52	Red River of the North at Halstad, Minn.	5	2006–2007	3.4	<1.0	7.6
55	Goose River at Hillsboro, N. Dak.	64	1996–2007	<1.0	<1.0	8.0
56	Red River of the North at Grand Forks, N. Dak.	47	1997–2006	<1.0	<1.0	15.3
58	Turtle River at Manvel, N. Dak.	38	1997–2006	<1.0	<1.0	44.3
62	Forest River near Minto, N. Dak.	43	1996–2006	<1.0	<1.0	8.3
67	Park River at Grafton, N. Dak.	37	1996–2006	<1.0	<1.0	12.7
68	Red River of the North at Drayton, N. Dak.	5	1996	2.5	<1.0	5.6
75	Pembina River at Neche, N. Dak.	47	1996–2006	<1.0	<1.0	35.4
78	Red River of the North at Pembina, N. Dak., site 2	58	1997–2007	1.4	<1.0	13.7
80	Long Creek near Noonan, N. Dak.	10	1997	1.9	<1.0	8.2
82	Souris River near Sherwood, N. Dak.	115	1993–2008	<1.0	<1.0	3.0
83	Souris River near Foxholm, N. Dak.	35	1993–1998	<1.0	<1.0	11.2
84	Des Lacs River at Foxholm, N. Dak.	83	1996–2007	<1.0	<1.0	356.0
85	Souris River above Minot, N. Dak.	121	1996–2008	<1.0	<1.0	55.1
87	Souris River near Verendrye, N. Dak.	169	1993–2008	<1.0	<1.0	14.0
88	Wintering River near Karlsruhe, N. Dak.	10	1997–1998	2.8	<1.0	4.9
89	Souris River near Bantry, N. Dak.	45	1993–1998	<1.0	<1.0	7.9
90	Willow Creek near Willow City, N. Dak.	8	1993–1997	<1.0	<1.0	2.9
91	Stone Creek near Kramer, N. Dak.	3	1993	<1.0	<1.0	<1.0
92	Deep River near Upham, N. Dak.	6	1997	1.3	<1.0	5.4
97	Boundary Creek near Landa, N. Dak.	3	1993	<1.0	<1.0	<1.0
98	Souris River near Westhope, N. Dak.	19	1995–2008	1.1	<1.0	7.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	<1.0	<1.0	<1.0
110	Little Missouri River at Marmarth, N. Dak.	8	1999	12.8	<1.0	57.0
112	Little Missouri River at Medora, N. Dak.	74	1996–2007	6.6	<1.0	535.0
113	Beaver Creek near Trotters, N. Dak.	9	1999	<1.0	<1.0	1.8
114	Little Missouri River near Watford City, N. Dak.	69	1996–2007	12.4	<1.0	498.0
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	1.4	<1.0	17.3
125	Spring Creek at Zap, N. Dak.	64	1997–2007	<1.0	<1.0	11.3
127	Knife River at Hazen, N. Dak.	76	1996–2007	<1.0	<1.0	20.3
149	Heart River near Richardton, N. Dak.	68	1996–2007	<1.0	<1.0	8.6
156	Heart River near Mandan, N. Dak.	68	1996–2007	<1.0	<1.0	11.8
164	Cannonball River near Raleigh, N. Dak.	62	1996–2007	1.3	<1.0	23.2
169	Cedar Creek near Raleigh, N. Dak.	54	1996–2007	1.1	<1.0	13.8
170	Cannonball River at Breien, N. Dak.	64	1996–2007	1.4	<1.0	76.6
175	James River near Manfred, N. Dak.	6	1998	<1.0	<1.0	<1.0
176	James River near Grace City, N. Dak.	60	1997–2007	<1.0	<1.0	16.4
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	<1.0	<1.0	8.0
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	<1.0	<1.0	<1.0

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Lead, total, in µg/L—Continued						
182	James River at Jamestown, N. Dak.	75	1997–2007	<1.0	<1.0	11.7
183	James River at Lamoure, N. Dak.	73	1996–2007	<1.0	<1.0	6.2
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	<1.0	<1.0	2.6
186	James River at N. Dak./S. Dak. State line	9	1998–1999	<1.0	<1.0	1.3
Lithium, dissolved, in µg/L						
2	Red River of the North at Wahpeton, N. Dak.	23	1993–2004	20	<10	100
6	Red River of the North at Hickson, N. Dak.	21	1993–2004	24	<10	100
7	Wild Rice River near Rutland, N. Dak.	20	1993–2004	120	40	293
9	Antelope Creek at Dwight, N. Dak.	5	2001–2004	71	38	100
10	Wild Rice River near Abercrombie, N. Dak.	23	1993–2004	90	20	160
11	Red River of the North at Fargo, N. Dak.	18	1993–2004	30	20	100
15	Sheyenne River above Harvey, N. Dak.	27	1993–2004	90	17	167
18	Sheyenne River near Warwick, N. Dak.	25	1993–2004	80	<10	112
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	24	1993–2004	40	<10	107
20	Mauvais Coulee near Cando, N. Dak.	57	1993–2004	50	<10	100
21	Edmore Coulee near Edmore, N. Dak.	58	1993–2004	40	<10	103
22	Edmore Coulee Tributary near Webster, N. Dak.	25	1993–2004	50	<10	130
24	Starkweather Coulee near Webster, N. Dak.	51	1993–2004	30	<10	100
25	Big Coulee below Churchs Ferry, N. Dak.	16	1998–2004	40	30	100
26	Little Coulee near Leeds, N. Dak.	11	1998–2004	70	20	100
27	Little Coulee near Brinsmade, N. Dak.	11	1993–1998	50	30	60
28	Big Coulee near Churchs Ferry, N. Dak.	43	1993–1997	30	20	60
30	Channel A near Penn, N. Dak.	56	1993–2004	30	20	100
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	6	2002–2004	342	130	400
32	Sheyenne River near Cooperstown, N. Dak.	21	1993–2004	70	19	100
33	Baldhill Creek near Dazey, N. Dak.	21	1993–2004	50	<10	100
34	Sheyenne River below Baldhill Dam, N. Dak.	21	1993–2004	69	20	100
35	Sheyenne River at Valley City, N. Dak.	12	1994–2004	65	20	100
36	Sheyenne River at Lisbon, N. Dak.	17	1996–2004	70	30	100
37	Sheyenne River near Kindred, N. Dak.	23	1993–2004	60	20	100
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	21	1993–2004	70	20	100
40	Sheyenne River Diversion at West Fargo, N. Dak.	9	1994–2004	50	20	100
41	Sheyenne River at West Fargo, N. Dak.	12	1993–2004	70	50	78
42	Maple River near Hope, N. Dak.	16	1993–2004	55	20	200
43	Maple River near Enderlin, N. Dak.	23	1993–2004	70	20	130
44	Maple River near Mapleton, N. Dak.	9	1995–2004	60	20	106
45	Maple River below Mapleton, N. Dak.	19	1995–2004	62	20	110
46	Sheyenne River at Harwood, N. Dak.	5	2000–2004	62	60	100
47	Rush River at Amenias, N. Dak.	24	1993–2004	80	<10	130

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Lithium, dissolved, in µg/L—Continued						
52	Red River of the North at Halstad, Minn.	24	1993–2004	39	19	100
53	Beaver Creek near Finley, N. Dak.	24	1993–2003	78	20	160
55	Goose River at Hillsboro, N. Dak.	24	1993–2004	60	20	123
56	Red River of the North at Grand Forks, N. Dak.	17	1996–2004	20	20	100
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	9	1996–2004	45	22	100
59	Red River of the North at Oslo, Minn.	11	1993–2004	20	<10	100
61	Forest River near Fordville, N. Dak.	23	1993–2004	40	20	100
62	Forest River near Minto, N. Dak.	24	1993–2004	30	20	100
63	South Branch Park River below Homme Dam, N. Dak.	4	1993–1994	45	30	50
67	Park River at Grafton, N. Dak.	23	1993–2004	60	<10	100
68	Red River of the North at Drayton, N. Dak.	22	1993–2004	30	19	100
70	Hidden Island Coulee near Hansboro, N. Dak.	4	1993–1995	40	30	70
73	Little South Pembina River near Walhalla, N. Dak.	8	2001–2004	55	33	100
74	Pembina River at Walhalla, N. Dak.	8	2001–2004	60	24	100
75	Pembina River at Neche, N. Dak.	23	1993–2004	60	20	100
76	Tongue River at Akra, N. Dak.	24	1993–2004	30	<10	100
78	Red River of the North at Pembina, N. Dak., site 2	4	2001–2004	35	19	100
79	Red River of the North at Emerson, Manitoba	7	1993–1994	28	25	39
80	Long Creek near Noonan, N. Dak.	21	1993–2004	60	<10	150
83	Souris River near Foxholm, N. Dak.	12	1999–2004	58	<10	100
84	Des Lacs River at Foxholm, N. Dak.	24	1993–2004	50	<10	100
85	Souris River above Minot, N. Dak.	12	1993–1998	45	20	70
86	Bonnes Creek near Velva, N. Dak.	13	1993–2004	30	<10	180
88	Wintering River near Karlsruhe, N. Dak.	24	1993–2004	50	<10	100
89	Souris River near Bantry, N. Dak.	12	1999–2004	58	20	100
90	Willow Creek near Willow City, N. Dak.	22	1994–2004	88	20	210
92	Deep River near Upham, N. Dak.	21	1993–2004	40	<10	100
97	Boundary Creek near Landa, N. Dak.	1	1994	30	30	30
98	Souris River near Westhope, N. Dak.	10	1993–2001	70	20	180
101	Little Muddy River below Cow Creek near Williston, N. Dak.	23	1993–2004	70	<10	100
106	Bear Den Creek near Mandaree, N. Dak.	25	1993–2004	60	<10	100
108	East Fork Shell Creek near Parshall, N. Dak.	39	1993–2004	134	<10	201
109	Deepwater Creek near Mandaree, N. Dak.	37	1993–2004	73	<10	110
110	Little Missouri River at Marmarth, N. Dak.	24	1993–2004	55	<10	170
112	Little Missouri River at Medora, N. Dak.	8	2001–2004	64	22	100
113	Beaver Creek near Trotters, N. Dak.	20	1993–2004	40	<10	100
114	Little Missouri River near Watford City, N. Dak.	23	1993–2004	53	<10	100
115	Missouri River at Garrison Dam, N. Dak.	74	1993–2007	42	26	60
116	Knife River at Manning, N. Dak.	24	1993–2004	20	<10	100
120	Knife River near Golden Valley, N. Dak.	24	1993–2004	30	<10	100

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Lithium, dissolved, in µg/L—Continued						
125	Spring Creek at Zap, N. Dak.	24	1993–2004	45	<10	100
127	Knife River at Hazen, N. Dak.	27	1993–2004	36	<10	100
140	Square Butte Creek below Center, N. Dak.	23	1993–2004	46	16	100
141	Burnt Creek near Bismarck, N. Dak.	23	1993–2004	70	<10	120
142	Missouri River at Bismarck, N. Dak.	15	1993–2004	40	20	50
145	Heart River near South Heart, N. Dak.	11	1993–2004	13	<10	100
146	Heart River at Dickinson, N. Dak.	4	1993–1994	35	20	50
147	Green River near New Hradec, N. Dak.	22	1993–2004	15	<10	100
149	Heart River near Richardton, N. Dak.	24	1993–2004	30	<10	100
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	24	1993–2004	33	<10	100
151	Antelope Creek near Carson, N. Dak.	11	1999–2004	60	26	100
152	Big Muddy Creek near Almont, N. Dak.	24	1993–2004	40	<10	100
153	Heart River near Lark, N. Dak.	6	1993–1995	35	<10	40
154	Heart River at Stark Bridge near Judson, N. Dak.	24	1993–2004	40	<10	100
155	Sweetbriar Creek near Judson, N. Dak.	6	2002–2004	43	17	63
156	Heart River near Mandan, N. Dak.	27	1993–2004	49	<10	120
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	24	1993–2004	160	<10	270
158	Apple Creek near Menoken, N. Dak.	23	1993–2004	150	<10	290
162	Cannonball River at Regent, N. Dak.	23	1993–2004	40	<10	100
164	Cannonball River near Raleigh, N. Dak.	6	2001–2004	50	12	100
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	5	1993–1995	30	<10	50
166	Cedar Creek near Haynes, N. Dak.	24	1993–2004	55	<10	100
169	Cedar Creek near Raleigh, N. Dak.	21	1993–2004	60	<10	170
170	Cannonball River at Breien, N. Dak.	25	1993–2004	50	<10	110
172	Beaver Creek below Linton, N. Dak.	24	1993–2004	115	<10	243
173	Porcupine Creek near Fort Yates, N. Dak.	35	1993–1999	73	<10	130
176	James River near Grace City, N. Dak.	18	1996–2004	50	<10	100
179	James River near Pingree, N. Dak.	2	1993	26	23	28
180	Pipestem Creek near Pingree, N. Dak.	24	1993–2004	60	<10	126
182	James River at Jamestown, N. Dak.	17	1996–2004	50	20	100
183	James River at Lamoure, N. Dak.	18	1996–2004	45	20	100
184	Bear Creek near Oakes, N. Dak.	24	1993–2004	85	20	137
186	James River at N. Dak./S. Dak. State line	6	2002–2004	66	42	90
Molybdenum, total, in µg/L						
82	Souris River near Sherwood, N. Dak.	116	1993–2008	2.5	<1.0	32.0
83	Souris River near Foxholm, N. Dak.	25	1993–1998	2.1	<1.0	6.0
85	Souris River above Minot, N. Dak.	65	1999–2008	3.2	1.1	5.8
87	Souris River near Verendrye, N. Dak.	104	1993–2008	3.3	<1.0	12.2
89	Souris River near Bantry, N. Dak.	37	1993–1998	1.9	<1.0	6.0
90	Willow Creek near Willow City, N. Dak.	3	1993	<1.0	<1.0	<1.0

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Molybdenum, total, in µg/L—Continued						
91	Stone Creek near Kramer, N. Dak.	3	1993	<1.0	<1.0	<1.0
97	Boundary Creek near Landa, N. Dak.	3	1993	<1.0	<1.0	<1.0
98	Souris River near Westhope, N. Dak.	13	1995–2008	2.2	<1.0	4.9
Nickel, total, in µg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	7.5	4.9	19.0
3	Red River of the North near Wahpeton, N. Dak.	1	2006	17.4	17.4	17.4
4	Red River of the North at Brushville, Minn.	52	2000–2007	4.0	<1.0	7.8
10	Wild Rice River near Abercrombie, N. Dak.	43	2000–2007	10.3	3.7	16.6
11	Red River of the North at Fargo, N. Dak.	1	2006	7.7	7.7	7.7
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	7.8	1.7	20.2
14	Red River of the North near Harwood, N. Dak.	5	2006–2007	14.9	8.1	22.3
17	Sheyenne River at Warwick, N. Dak.	44	1997–2006	5.4	2.8	12.0
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	5.7	3.1	8.3
32	Sheyenne River near Cooperstown, N. Dak.	73	1997–2007	7.6	3.9	14.2
34	Sheyenne River below Baldhill Dam, N. Dak.	65	1997–2007	6.1	2.9	11.8
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	11.1	6.0	29.5
37	Sheyenne River near Kindred, N. Dak.	65	1997–2007	10.7	4.2	40.9
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	16.2	11.2	33.3
41	Sheyenne River at West Fargo, N. Dak.	1	2006	13.1	13.1	13.1
45	Maple River below Mapleton, N. Dak.	47	1997–2007	10.6	4.4	26.4
52	Red River of the North at Halstad, Minn.	5	2006–2007	13.9	8.4	18.7
55	Goose River at Hillsboro, N. Dak.	61	1997–2007	10.7	4.5	53.5
56	Red River of the North at Grand Forks, N. Dak.	47	1997–2006	7.7	<1.0	29.0
58	Turtle River at Manvel, N. Dak.	38	1997–2006	9.5	<1.0	25.0
62	Forest River near Minto, N. Dak.	39	1997–2006	7.5	2.6	16.9
67	Park River at Grafton, N. Dak.	35	1997–2006	9.3	4.2	47.5
75	Pembina River at Neche, N. Dak.	44	1997–2006	9.0	5.7	109.0
78	Red River of the North at Pembina, N. Dak., site 2	58	1997–2007	9.1	2.8	38.6
80	Long Creek near Noonan, N. Dak.	10	1997	5.3	5.0	7.1
82	Souris River near Sherwood, N. Dak.	119	1993–2008	3.8	1.9	8.5
83	Souris River near Foxholm, N. Dak.	35	1993–1998	4.0	1.4	10.0
84	Des Lacs River at Foxholm, N. Dak.	78	1997–2007	6.9	3.6	15.8
85	Souris River above Minot, N. Dak.	127	1997–2008	4.6	2.1	67.2
87	Souris River near Verendrye, N. Dak.	177	1993–2008	5.5	<1.0	27.0
88	Wintering River near Karlsruhe, N. Dak.	10	1997–1998	2.8	2.4	4.4
89	Souris River near Bantry, N. Dak.	45	1993–1998	3.6	2.0	8.1
90	Willow Creek near Willow City, N. Dak.	8	1993–1997	4.8	2.0	7.7
91	Stone Creek near Kramer, N. Dak.	3	1993	3.0	2.0	4.0
92	Deep River near Upham, N. Dak.	6	1997	4.1	3.6	5.6

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Nickel, total, in µg/L—Continued						
97	Boundary Creek near Landa, N. Dak.	3	1993	2.0	2.0	5.0
98	Souris River near Westhope, N. Dak.	21	1995–2008	4.5	2.0	8.1
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	4.7	3.5	6.8
110	Little Missouri River at Marmarth, N. Dak.	8	1999	26.0	4.6	104.0
112	Little Missouri River at Medora, N. Dak.	70	1997–2007	13.6	4.5	994.0
113	Beaver Creek near Trotters, N. Dak.	9	1999	4.2	3.4	11.4
114	Little Missouri River near Watford City, N. Dak.	64	1997–2007	21.7	3.3	1,210.0
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	9.0	<1.0	46.7
125	Spring Creek at Zap, N. Dak.	64	1997–2007	5.4	3.0	13.9
127	Knife River at Hazen, N. Dak.	71	1997–2007	7.0	3.5	54.4
149	Heart River near Richardton, N. Dak.	64	1997–2007	7.6	4.6	33.9
156	Heart River near Mandan, N. Dak.	65	1997–2007	5.3	2.8	23.4
164	Cannonball River near Raleigh, N. Dak.	57	1997–2007	9.9	4.4	119.0
169	Cedar Creek near Raleigh, N. Dak.	49	1997–2007	9.6	4.8	31.9
170	Cannonball River at Breien, N. Dak.	59	1997–2007	9.2	4.6	116.0
175	James River near Manfred, N. Dak.	6	1998	4.7	3.3	9.0
176	James River near Grace City, N. Dak.	60	1997–2007	5.2	2.5	22.3
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	3.9	3.2	8.7
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	5.9	4.1	14.4
182	James River at Jamestown, N. Dak.	75	1997–2007	6.1	2.1	68.9
183	James River at Lamoure, N. Dak.	68	1997–2007	7.0	3.7	33.5
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	6.0	3.9	16.1
186	James River at N. Dak./S. Dak. State line	9	1998–1999	6.3	3.8	10.9
Nickel, dissolved, in µg/L						
2	Red River of the North at Wahpeton, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
4	Red River of the North at Brushville, Minn.	1	2005	<10.0	<10.0	<10.0
6	Red River of the North at Hickson, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
7	Wild Rice River near Rutland, N. Dak.	8	2005–2008	<10.0	<10.0	19.4
9	Antelope Creek at Dwight, N. Dak.	8	2005–2008	<10.0	<10.0	18.0
10	Wild Rice River near Abercrombie, N. Dak.	9	2005–2008	<10.0	<10.0	15.5
11	Red River of the North at Fargo, N. Dak.	38	2005–2008	<10.0	<10.0	10.6
14	Red River of the North near Harwood, N. Dak.	7	2005–2006	<10.0	<10.0	<10.0
15	Sheyenne River above Harvey, N. Dak.	20	1993–2008	<10.0	<10.0	<10.0
17	Sheyenne River at Warwick, N. Dak.	2	2005	<10.0	<10.0	<10.0
18	Sheyenne River near Warwick, N. Dak.	9	1993–2008	<10.0	<10.0	<10.0
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	7	2005–2008	<10.0	<10.0	<10.0
20	Mauvais Coulee near Cando, N. Dak.	16	2005–2008	<10.0	<10.0	11.8
21	Edmore Coulee near Edmore, N. Dak.	17	2005–2008	<10.0	<10.0	10.3
22	Edmore Coulee Tributary near Webster, N. Dak.	7	2005–2008	<10.0	<10.0	13.0
24	Starkweather Coulee near Webster, N. Dak.	16	2005–2008	<10.0	<10.0	13.8

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Nickel, dissolved, in µg/L—Continued						
25	Big Coulee below Churchs Ferry, N. Dak.	7	2005–2008	<10.0	<10.0	<10.0
26	Little Coulee near Leeds, N. Dak.	5	2005–2008	<10.0	<10.0	<10.0
30	Channel A near Penn, N. Dak.	7	2005–2008	<10.0	<10.0	<10.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	6	2005–2007	<10.0	<10.0	<10.0
32	Sheyenne River near Cooperstown, N. Dak.	13	2005–2008	<10.0	<10.0	<10.0
33	Baldhill Creek near Dazey, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
34	Sheyenne River below Baldhill Dam, N. Dak.	14	2005–2008	<10.0	<10.0	11.3
35	Sheyenne River at Valley City, N. Dak.	1	2005	<10.0	<10.0	<10.0
36	Sheyenne River at Lisbon, N. Dak.	9	2005–2008	<10.0	<10.0	16.4
37	Sheyenne River near Kindred, N. Dak.	16	1993–2008	<10.0	<10.0	15.4
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	14	2005–2008	<10.0	<10.0	18.1
40	Sheyenne River Diversion at West Fargo, N. Dak.	4	2005–2007	<10.0	<10.0	12.2
41	Sheyenne River at West Fargo, N. Dak.	4	2006–2008	<10.0	<10.0	10.6
42	Maple River near Hope, N. Dak.	6	2005–2008	<10.0	<10.0	11.8
43	Maple River near Enderlin, N. Dak.	8	2005–2008	<10.0	<10.0	20.5
44	Maple River near Mapleton, N. Dak.	8	2005–2008	<10.0	<10.0	35.0
45	Maple River below Mapleton, N. Dak.	9	2005–2008	<10.0	<10.0	17.7
46	Sheyenne River at Harwood, N. Dak.	1	2005	<10.0	<10.0	<10.0
47	Rush River at Amenia, N. Dak.	8	2005–2008	<10.0	<10.0	14.8
52	Red River of the North at Halstad, Minn.	19	1993–2008	<10.0	<10.0	11.0
53	Beaver Creek near Finley, N. Dak.	13	1993–1996	<10.0	<10.0	<10.0
55	Goose River at Hillsboro, N. Dak.	15	2005–2008	<10.0	<10.0	11.3
56	Red River of the North at Grand Forks, N. Dak.	30	2005–2008	<10.0	<10.0	11.6
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	8	2005–2008	<10.0	<10.0	10.8
58	Turtle River at Manvel, N. Dak.	30	2005–2008	10.1	<10.0	25.2
59	Red River of the North at Oslo, Minn.	1	2005	<10.0	<10.0	<10.0
61	Forest River near Fordville, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
62	Forest River near Minto, N. Dak.	30	2005–2008	<10.0	<10.0	15.2
67	Park River at Grafton, N. Dak.	30	2005–2008	<10.0	<10.0	16.9
68	Red River of the North at Drayton, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
73	Little South Pembina River near Walhalla, N. Dak.	8	2005–2008	<10.0	<10.0	14.4
74	Pembina River at Walhalla, N. Dak.	8	2005–2008	<10.0	<10.0	16.8
75	Pembina River at Neche, N. Dak.	30	2005–2008	<10.0	<10.0	16.8
76	Tongue River at Akra, N. Dak.	8	2005–2008	<10.0	<10.0	11.1
78	Red River of the North at Pembina, N. Dak., site 2	33	2005–2008	<10.0	<10.0	<10.0
79	Red River of the North at Emerson, Manitoba	7	1993–1994	<10.0	<10.0	<10.0
80	Long Creek near Noonan, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
83	Souris River near Foxholm, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
84	Des Lacs River at Foxholm, N. Dak.	8	2005–2008	<10.0	<10.0	12.9

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Nickel, dissolved, in µg/L—Continued						
86	Bonnes Creek near Velva, N. Dak.	1	2005	<10.0	<10.0	<10.0
88	Wintering River near Karlsruhe, N. Dak.	8	2005–2008	<10.0	<10.0	10.9
89	Souris River near Bantry, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
90	Willow Creek near Willow City, N. Dak.	7	2005–2008	<10.0	<10.0	<10.0
92	Deep River near Upham, N. Dak.	5	2005–2007	<10.0	<10.0	<10.0
98	Souris River near Westhope, N. Dak.	6	1993–1994	<10.0	<10.0	<10.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
106	Bear Den Creek near Mandaree, N. Dak.	19	1993–2008	<10.0	<10.0	10.2
108	East Fork Shell Creek near Parshall, N. Dak.	5	2005–2008	<10.0	<10.0	<10.0
109	Deepwater Creek near Mandaree, N. Dak.	7	2005–2008	<10.0	<10.0	120.0
110	Little Missouri River at Marmarth, N. Dak.	9	2005–2008	<10.0	<10.0	<10.0
112	Little Missouri River at Medora, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
113	Beaver Creek near Trotters, N. Dak.	8	2005–2008	<10.0	<10.0	11.3
114	Little Missouri River near Watford City, N. Dak.	13	1993–2008	<10.0	<10.0	18.4
115	Missouri River at Garrison Dam, N. Dak.	21	1993–1998	<10.0	<10.0	<10.0
116	Knife River at Manning, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
120	Knife River near Golden Valley, N. Dak.	8	2005–2008	<10.0	<10.0	16.2
125	Spring Creek at Zap, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
127	Knife River at Hazen, N. Dak.	12	1993–2008	<10.0	<10.0	<10.0
140	Square Butte Creek below Center, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
141	Burnt Creek near Bismarck, N. Dak.	6	2005–2008	<10.0	<10.0	<10.0
142	Missouri River at Bismarck, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
145	Heart River near South Heart, N. Dak.	1	2005	<10.0	<10.0	<10.0
147	Green River near New Hradec, N. Dak.	7	2005–2008	<10.0	<10.0	<10.0
149	Heart River near Richardton, N. Dak.	8	2005–2008	<10.0	<10.0	12.1
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	8	2005–2008	<10.0	<10.0	12.4
151	Antelope Creek near Carson, N. Dak.	7	2005–2008	<10.0	<10.0	<10.0
152	Big Muddy Creek near Almont, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
154	Heart River at Stark Bridge near Judson, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
155	Sweetbriar Creek near Judson, N. Dak.	7	2005–2008	<10.0	<10.0	<10.0
156	Heart River near Mandan, N. Dak.	11	1993–2008	<10.0	<10.0	<10.0
158	Apple Creek near Menoken, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
162	Cannonball River at Regent, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
164	Cannonball River near Raleigh, N. Dak.	9	2005–2008	<10.0	<10.0	<10.0
166	Cedar Creek near Haynes, N. Dak.	8	2005–2008	<10.0	<10.0	24.7
169	Cedar Creek near Raleigh, N. Dak.	9	2005–2008	<10.0	<10.0	10.3
170	Cannonball River at Breien, N. Dak.	9	2005–2008	<10.0	<10.0	11.5
172	Beaver Creek below Linton, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
176	James River near Grace City, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	24	2005–2008	<10.0	<10.0	<10.0

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Nickel, dissolved, in $\mu\text{g/L}$ —Continued						
179	James River near Pingree, N. Dak.	19	1997–2008	<10.0	<10.0	<10.0
180	Pipestem Creek near Pingree, N. Dak.	8	2005–2008	<10.0	<10.0	<10.0
182	James River at Jamestown, N. Dak.	9	2005–2008	<10.0	<10.0	<10.0
183	James River at Lamoure, N. Dak.	7	2005–2008	<10.0	<10.0	<10.0
184	Bear Creek near Oakes, N. Dak.	8	2005–2008	<10.0	<10.0	10.3
185	James River at Oakes, N. Dak.	7	2006–2008	<10.0	<10.0	<10.0
186	James River at N. Dak./S. Dak. State line	8	2005–2008	<10.0	<10.0	<10.0
Selenium, total, in $\mu\text{g/L}$						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	<2.6	<2.6	7.6
2	Red River of the North at Wahpeton, N. Dak.	2	1996	<2.6	<2.6	2.7
4	Red River of the North at Brushville, Minn.	54	1996–2007	<2.6	<2.6	4.4
5	Red River of the North below Wahpeton, N. Dak.	20	1997–1999	<2.6	<2.6	6.3
6	Red River of the North at Hickson, N. Dak.	21	1997–1999	<2.6	<2.6	9.2
10	Wild Rice River near Abercrombie, N. Dak.	45	1996–2007	<2.6	<2.6	10.5
11	Red River of the North at Fargo, N. Dak.	6	1996–2006	<2.6	<2.6	<2.6
14	Red River of the North near Harwood, N. Dak.	31	1996–2007	<2.6	<2.6	41.1
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	<2.6	<2.6	5.6
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	<2.6	<2.6	16.8
32	Sheyenne River near Cooperstown, N. Dak.	74	1996–2007	<2.6	<2.6	12.0
33	Baldhill Creek near Dazey, N. Dak.	1	1996	<2.6	<2.6	<2.6
34	Sheyenne River below Baldhill Dam, N. Dak.	67	1996–2007	<2.6	<2.6	46.5
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	<2.6	<2.6	16.2
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	<2.6	<2.6	30.9
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	5	2006–2007	<2.6	<2.6	3.7
41	Sheyenne River at West Fargo, N. Dak.	6	1996–2006	<2.6	<2.6	<2.6
45	Maple River below Mapleton, N. Dak.	47	1997–2007	<2.6	<2.6	11.2
46	Sheyenne River at Harwood, N. Dak.	21	1997–1999	<2.6	<2.6	5.9
52	Red River of the North at Halstad, Minn.	5	2006–2007	<2.6	<2.6	<2.6
55	Goose River at Hillsboro, N. Dak.	64	1996–2007	2.9	<2.6	15.7
56	Red River of the North at Grand Forks, N. Dak.	47	1997–2006	<2.6	<2.6	7.0
58	Turtle River at Manvel, N. Dak.	38	1997–2006	3.5	<2.6	38.7
62	Forest River near Minto, N. Dak.	43	1996–2006	<2.6	<2.6	7.3
67	Park River at Grafton, N. Dak.	37	1996–2006	<2.6	<2.6	6.5
68	Red River of the North at Drayton, N. Dak.	5	1996	<2.6	<2.6	2.7
75	Pembina River at Neche, N. Dak.	47	1996–2006	<2.6	<2.6	10.1
78	Red River of the North at Pembina, N. Dak., site 2	58	1997–2007	<2.6	<2.6	5.4
80	Long Creek near Noonan, N. Dak.	10	1997	<2.6	<2.6	10.5
82	Souris River near Sherwood, N. Dak.	119	1993–2008	<2.6	<2.6	14.0
83	Souris River near Foxholm, N. Dak.	35	1993–1998	<2.6	<2.6	8.4

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued[$\mu\text{g/L}$, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Selenium, total, in $\mu\text{g/L}$ —Continued						
84	Des Lacs River at Foxholm, N. Dak.	83	1996–2007	<2.6	<2.6	127.0
85	Souris River above Minot, N. Dak.	128	1996–2008	<2.6	<2.6	18.8
87	Souris River near Verendrye, N. Dak.	175	1993–2008	<2.6	<2.6	31.5
88	Wintering River near Karlsruhe, N. Dak.	10	1997–1998	<2.6	<2.6	7.3
89	Souris River near Bantry, N. Dak.	64	1993–2000	<2.6	<2.6	10.0
90	Willow Creek near Willow City, N. Dak.	28	1993–2000	<2.6	<2.6	8.7
91	Stone Creek near Kramer, N. Dak.	19	1993–2000	<2.6	<2.6	10.0
92	Deep River near Upham, N. Dak.	26	1997–2000	<2.6	<2.6	9.6
95	Cut Bank Creek at Upham, N. Dak.	16	1999–2000	<2.6	<2.6	<2.6
97	Boundary Creek near Landa, N. Dak.	19	1993–2000	<2.6	<2.6	4.0
98	Souris River near Westhope, N. Dak.	20	1995–2008	<2.6	<2.6	14.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	<2.6	<2.6	4.5
110	Little Missouri River at Marmarth, N. Dak.	8	1999	<2.6	<2.6	7.7
112	Little Missouri River at Medora, N. Dak.	74	1996–2007	<2.6	<2.6	30.5
113	Beaver Creek near Trotters, N. Dak.	9	1999	<2.6	<2.6	7.8
114	Little Missouri River near Watford City, N. Dak.	69	1996–2007	2.8	<2.6	173.0
115	Missouri River at Garrison Dam, N. Dak.	7	1999–2000	<2.6	<2.6	3.8
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	<2.6	<2.6	21.4
125	Spring Creek at Zap, N. Dak.	64	1997–2007	<2.6	<2.6	16.3
127	Knife River at Hazen, N. Dak.	76	1996–2007	<2.6	<2.6	21.4
142	Missouri River at Bismarck, N. Dak.	23	1999–2001	<2.6	<2.6	<2.6
149	Heart River near Richardton, N. Dak.	68	1996–2007	<2.6	<2.6	19.5
156	Heart River near Mandan, N. Dak.	68	1996–2007	<2.6	<2.6	26.1
164	Cannonball River near Raleigh, N. Dak.	62	1996–2007	<2.6	<2.6	67.0
169	Cedar Creek near Raleigh, N. Dak.	54	1996–2007	<2.6	<2.6	56.5
170	Cannonball River at Breien, N. Dak.	64	1996–2007	<2.6	<2.6	48.5
175	James River near Manfred, N. Dak.	14	1993–1998	<2.6	<2.6	<2.6
176	James River near Grace City, N. Dak.	69	1993–2007	<2.6	<2.6	13.4
177	James River above Arrowwood Lake near Kensal, N. Dak.	50	1993–2006	<2.6	<2.6	3.0
179	James River near Pingree, N. Dak.	37	1993–2006	<2.6	<2.6	3.0
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	<2.6	<2.6	5.7
182	James River at Jamestown, N. Dak.	84	1993–2007	<2.6	<2.6	8.3
183	James River at Lamoure, N. Dak.	81	1993–2007	<2.6	<2.6	14.3
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	<2.6	<2.6	3.7
185	James River at Oakes, N. Dak.	9	1993–1995	<2.6	<2.6	<2.6
186	James River at N. Dak./S. Dak. State line	9	1998–1999	<2.6	<2.6	<2.6
Selenium, dissolved, in $\mu\text{g/L}$						
2	Red River of the North at Wahpeton, N. Dak.	31	1993–2008	<2.6	<2.6	3.4
4	Red River of the North at Brushville, Minn.	1	2005	<2.6	<2.6	<2.6
6	Red River of the North at Hickson, N. Dak.	29	1993–2008	<2.6	<2.6	4.1

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Selenium, dissolved, in µg/L—Continued						
7	Wild Rice River near Rutland, N. Dak.	28	1993–2008	<2.6	<2.6	10.4
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	<2.6	<2.6	7.6
10	Wild Rice River near Abercrombie, N. Dak.	32	1993–2008	<2.6	<2.6	9.4
11	Red River of the North at Fargo, N. Dak.	56	1993–2008	<2.6	<2.6	7.0
14	Red River of the North near Harwood, N. Dak.	7	2005–2006	<2.6	<2.6	4.2
15	Sheyenne River above Harvey, N. Dak.	35	1993–2008	<2.6	<2.6	27.5
17	Sheyenne River at Warwick, N. Dak.	2	2005	<2.6	<2.6	<2.6
18	Sheyenne River near Warwick, N. Dak.	33	1993–2008	<2.6	<2.6	6.4
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	31	1993–2008	<2.6	<2.6	16.3
20	Mauvais Coulee near Cando, N. Dak.	73	1993–2008	<2.6	<2.6	5.2
21	Edmore Coulee near Edmore, N. Dak.	75	1993–2008	<2.6	<2.6	3.7
22	Edmore Coulee Tributary near Webster, N. Dak.	32	1993–2008	<2.6	<2.6	3.0
24	Starkweather Coulee near Webster, N. Dak.	67	1993–2008	<2.6	<2.6	5.2
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	<2.6	<2.6	3.0
26	Little Coulee near Leeds, N. Dak.	16	1998–2008	<2.6	<2.6	3.0
27	Little Coulee near Brinsmade, N. Dak.	11	1993–1998	<2.6	<2.6	<2.6
28	Big Coulee near Churchs Ferry, N. Dak.	43	1993–1997	<2.6	<2.6	<2.6
30	Channel A near Penn, N. Dak.	63	1993–2008	<2.6	<2.6	3.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	9.4	<2.6	21.4
32	Sheyenne River near Cooperstown, N. Dak.	34	1993–2008	<2.6	<2.6	57.1
33	Baldhill Creek near Dazey, N. Dak.	29	1993–2008	<2.6	<2.6	7.7
34	Sheyenne River below Baldhill Dam, N. Dak.	35	1993–2008	<2.6	<2.6	57.9
35	Sheyenne River at Valley City, N. Dak.	13	1994–2005	<2.6	<2.6	4.8
36	Sheyenne River at Lisbon, N. Dak.	26	1996–2008	<2.6	<2.6	4.4
37	Sheyenne River near Kindred, N. Dak.	32	1993–2008	<2.6	<2.6	4.6
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	35	1993–2008	<2.6	<2.6	7.7
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	<2.6	<2.6	5.3
41	Sheyenne River at West Fargo, N. Dak.	16	1993–2008	<2.6	<2.6	<2.6
42	Maple River near Hope, N. Dak.	22	1993–2008	<2.6	<2.6	4.4
43	Maple River near Enderlin, N. Dak.	31	1993–2008	<2.6	<2.6	7.0
44	Maple River near Mapleton, N. Dak.	17	1995–2008	<2.6	<2.6	7.1
45	Maple River below Mapleton, N. Dak.	28	1995–2008	<2.6	<2.6	7.1
46	Sheyenne River at Harwood, N. Dak.	6	2000–2005	<2.6	<2.6	8.0
47	Rush River at Amenia, N. Dak.	32	1993–2008	<2.6	<2.6	5.6
52	Red River of the North at Halstad, Minn.	37	1993–2008	<2.6	<2.6	57.1
53	Beaver Creek near Finley, N. Dak.	24	1993–2003	<2.6	<2.6	7.7
55	Goose River at Hillsboro, N. Dak.	39	1993–2008	<2.6	<2.6	9.0
56	Red River of the North at Grand Forks, N. Dak.	47	1996–2008	<2.6	<2.6	10.5
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	17	1996–2008	<2.6	<2.6	5.5

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Selenium, dissolved, in µg/L—Continued						
58	Turtle River at Manvel, N. Dak.	30	2005–2008	9.4	3.5	39.2
59	Red River of the North at Oslo, Minn.	12	1993–2005	<2.6	<2.6	4.1
61	Forest River near Fordville, N. Dak.	31	1993–2008	<2.6	<2.6	3.5
62	Forest River near Minto, N. Dak.	54	1993–2008	<2.6	<2.6	12.0
63	South Branch Park River below Homme Dam, N. Dak.	4	1993–1994	<2.6	<2.6	<2.6
67	Park River at Grafton, N. Dak.	53	1993–2008	<2.6	<2.6	17.2
68	Red River of the North at Drayton, N. Dak.	30	1993–2008	<2.6	<2.6	4.4
70	Hidden Island Coulee near Hansboro, N. Dak.	4	1993–1995	<2.6	<2.6	<2.6
73	Little South Pembina River near Walhalla, N. Dak.	16	2001–2008	2.7	<2.6	6.9
74	Pembina River at Walhalla, N. Dak.	16	2001–2008	2.7	<2.6	4.8
75	Pembina River at Neche, N. Dak.	53	1993–2008	<2.6	<2.6	6.7
76	Tongue River at Akra, N. Dak.	32	1993–2008	<2.6	<2.6	3.0
78	Red River of the North at Pembina, N. Dak., site 2	37	2001–2008	<2.6	<2.6	10.9
79	Red River of the North at Emerson, Manitoba	7	1993–1994	<2.6	<2.6	<2.6
80	Long Creek near Noonan, N. Dak.	29	1993–2008	<2.6	<2.6	6.1
83	Souris River near Foxholm, N. Dak.	20	1999–2008	<2.6	<2.6	27.5
84	Des Lacs River at Foxholm, N. Dak.	32	1993–2008	<2.6	<2.6	7.3
85	Souris River above Minot, N. Dak.	12	1993–1998	<2.6	<2.6	<2.6
86	Bonnes Creek near Velva, N. Dak.	13	1993–2005	<2.6	<2.6	<2.6
88	Wintering River near Karlsruhe, N. Dak.	31	1993–2008	<2.6	<2.6	280.0
89	Souris River near Bantry, N. Dak.	19	1999–2008	<2.6	<2.6	8.2
90	Willow Creek near Willow City, N. Dak.	27	1994–2008	<2.6	<2.6	4.3
92	Deep River near Upham, N. Dak.	25	1993–2007	<2.6	<2.6	5.0
97	Boundary Creek near Landa, N. Dak.	1	1994	<2.6	<2.6	<2.6
98	Souris River near Westhope, N. Dak.	10	1993–2001	<2.6	<2.6	3.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	30	1993–2008	<2.6	<2.6	13.6
106	Bear Den Creek near Mandaree, N. Dak.	32	1993–2008	<2.6	<2.6	8.9
108	East Fork Shell Creek near Parshall, N. Dak.	43	1993–2008	<2.6	<2.6	3.7
109	Deepwater Creek near Mandaree, N. Dak.	43	1993–2008	<2.6	<2.6	47.4
110	Little Missouri River at Marmarth, N. Dak.	33	1993–2008	<2.6	<2.6	3.6
112	Little Missouri River at Medora, N. Dak.	16	2001–2008	<2.6	<2.6	9.6
113	Beaver Creek near Trotters, N. Dak.	28	1993–2008	<2.6	<2.6	6.9
114	Little Missouri River near Watford City, N. Dak.	31	1993–2008	<2.6	<2.6	31.7
115	Missouri River at Garrison Dam, N. Dak.	74	1993–2007	<2.6	<2.6	<2.6
116	Knife River at Manning, N. Dak.	31	1993–2008	<2.6	<2.6	8.1
120	Knife River near Golden Valley, N. Dak.	31	1993–2008	<2.6	<2.6	5.3
125	Spring Creek at Zap, N. Dak.	31	1993–2008	<2.6	<2.6	12.0
127	Knife River at Hazen, N. Dak.	34	1993–2008	<2.6	<2.6	9.5
140	Square Butte Creek below Center, N. Dak.	30	1993–2008	<2.6	<2.6	16.9
141	Burnt Creek near Bismarck, N. Dak.	29	1993–2008	<2.6	<2.6	3.0

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Selenium, dissolved, in µg/L—Continued						
142	Missouri River at Bismarck, N. Dak.	23	1993–2008	<2.6	<2.6	2.9
145	Heart River near South Heart, N. Dak.	12	1993–2005	<2.6	<2.6	4.0
146	Heart River at Dickinson, N. Dak.	4	1993–1994	<2.6	<2.6	<2.6
147	Green River near New Hradec, N. Dak.	29	1993–2008	<2.6	<2.6	8.0
149	Heart River near Richardton, N. Dak.	32	1993–2008	<2.6	<2.6	3.0
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	32	1993–2008	<2.6	<2.6	4.1
151	Antelope Creek near Carson, N. Dak.	18	1999–2008	<2.6	<2.6	3.0
152	Big Muddy Creek near Almont, N. Dak.	32	1993–2008	<2.6	<2.6	6.5
153	Heart River near Lark, N. Dak.	6	1993–1995	<2.6	<2.6	3.0
154	Heart River at Stark Bridge near Judson, N. Dak.	32	1993–2008	<2.6	<2.6	3.0
155	Sweetbriar Creek near Judson, N. Dak.	13	2002–2008	<2.6	<2.6	10.1
156	Heart River near Mandan, N. Dak.	35	1993–2008	<2.6	<2.6	4.8
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	24	1993–2004	<2.6	<2.6	3.0
158	Apple Creek near Menoken, N. Dak.	31	1993–2008	<2.6	<2.6	30.0
162	Cannonball River at Regent, N. Dak.	31	1993–2008	<2.6	<2.6	4.5
164	Cannonball River near Raleigh, N. Dak.	15	2001–2008	<2.6	<2.6	10.1
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	5	1993–1995	<2.6	<2.6	<2.6
166	Cedar Creek near Haynes, N. Dak.	32	1993–2008	<2.6	<2.6	3.0
169	Cedar Creek near Raleigh, N. Dak.	30	1993–2008	<2.6	<2.6	5.6
170	Cannonball River at Breien, N. Dak.	34	1993–2008	<2.6	<2.6	5.8
172	Beaver Creek below Linton, N. Dak.	32	1993–2008	<2.6	<2.6	30.1
173	Porcupine Creek near Fort Yates, N. Dak.	35	1993–1999	<2.6	<2.6	<2.6
175	James River near Manfred, N. Dak.	16	1993–1995	<2.6	<2.6	<2.6
176	James River near Grace City, N. Dak.	48	1993–2008	<2.6	<2.6	10.8
177	James River above Arrowwood Lake near Kensal, N. Dak.	122	1993–2008	<2.6	<2.6	4.0
179	James River near Pingree, N. Dak.	83	1993–2008	<2.6	<2.6	12.0
180	Pipestem Creek near Pingree, N. Dak.	32	1993–2008	<2.6	<2.6	29.9
182	James River at Jamestown, N. Dak.	49	1993–2008	<2.6	<2.6	10.0
183	James River at Lamoure, N. Dak.	45	1993–2008	<2.6	<2.6	28.1
184	Bear Creek near Oakes, N. Dak.	32	1993–2008	<2.6	<2.6	26.8
185	James River at Oakes, N. Dak.	28	1993–2008	<2.6	<2.6	<2.6
186	James River at N. Dak./S. Dak. State line	14	2002–2008	<2.6	<2.6	8.8
Strontium, dissolved, in µg/L						
2	Red River of the North at Wahpeton, N. Dak.	23	1993–2004	190	100	320
6	Red River of the North at Hickson, N. Dak.	21	1993–2004	220	130	340
7	Wild Rice River near Rutland, N. Dak.	20	1993–2004	645	170	980
9	Antelope Creek at Dwight, N. Dak.	5	2001–2004	350	250	593
10	Wild Rice River near Abercrombie, N. Dak.	23	1993–2004	430	220	821
11	Red River of the North at Fargo, N. Dak.	18	1993–2004	214	130	340
15	Sheyenne River above Harvey, N. Dak.	27	1993–2004	230	82	610

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Strontium, dissolved, in µg/L—Continued						
18	Sheyenne River near Warwick, N. Dak.	25	1993–2004	290	130	400
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	24	1993–2004	295	130	630
20	Mauvais Coulee near Cando, N. Dak.	57	1993–2004	320	140	640
21	Edmore Coulee near Edmore, N. Dak.	58	1993–2004	290	100	610
22	Edmore Coulee Tributary near Webster, N. Dak.	25	1993–2004	290	120	760
24	Starkweather Coulee near Webster, N. Dak.	51	1993–2004	270	100	440
25	Big Coulee below Churchs Ferry, N. Dak.	16	1998–2004	292	210	540
26	Little Coulee near Leeds, N. Dak.	11	1998–2004	320	150	400
27	Little Coulee near Brinsmade, N. Dak.	11	1993–1998	250	140	330
28	Big Coulee near Churchs Ferry, N. Dak.	43	1993–1997	260	120	460
30	Channel A near Penn, N. Dak.	56	1993–2004	250	100	620
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	6	2002–2004	427	220	547
32	Sheyenne River near Cooperstown, N. Dak.	21	1993–2004	300	92	480
33	Baldhill Creek near Dazey, N. Dak.	21	1993–2004	380	147	580
34	Sheyenne River below Baldhill Dam, N. Dak.	21	1993–2004	345	180	420
35	Sheyenne River at Valley City, N. Dak.	12	1994–2004	340	180	500
36	Sheyenne River at Lisbon, N. Dak.	17	1996–2004	380	210	560
37	Sheyenne River near Kindred, N. Dak.	23	1993–2004	363	200	550
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	21	1993–2004	360	150	540
40	Sheyenne River Diversion at West Fargo, N. Dak.	9	1994–2004	230	150	460
41	Sheyenne River at West Fargo, N. Dak.	12	1993–2004	411	330	550
42	Maple River near Hope, N. Dak.	16	1993–2004	365	200	824
43	Maple River near Enderlin, N. Dak.	23	1993–2004	490	210	875
44	Maple River near Mapleton, N. Dak.	9	1995–2004	400	210	574
45	Maple River below Mapleton, N. Dak.	19	1995–2004	400	160	690
46	Sheyenne River at Harwood, N. Dak.	5	2000–2004	320	280	550
47	Rush River at Amenia, N. Dak.	24	1993–2004	495	150	770
52	Red River of the North at Halstad, Minn.	24	1993–2004	275	131	380
53	Beaver Creek near Finley, N. Dak.	24	1993–2003	500	190	1,100
55	Goose River at Hillsboro, N. Dak.	24	1993–2004	415	140	753
56	Red River of the North at Grand Forks, N. Dak.	17	1996–2004	210	150	375
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	9	1996–2004	328	141	420
59	Red River of the North at Oslo, Minn.	11	1993–2004	199	110	310
61	Forest River near Fordville, N. Dak.	22	1993–2004	300	130	410
62	Forest River near Minto, N. Dak.	24	1993–2004	310	120	410
63	South Branch Park River below Homme Dam, N. Dak.	4	1993–1994	335	120	420
67	Park River at Grafton, N. Dak.	23	1993–2004	370	120	590
68	Red River of the North at Drayton, N. Dak.	22	1993–2004	230	130	345
70	Hidden Island Coulee near Hansboro, N. Dak.	4	1993–1995	320	120	470

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Strontium, dissolved, in µg/L—Continued						
73	Little South Pembina River near Walhalla, N. Dak.	8	2001–2004	333	231	507
74	Pembina River at Walhalla, N. Dak.	8	2001–2004	352	175	503
75	Pembina River at Neche, N. Dak.	23	1993–2004	350	120	518
76	Tongue River at Akra, N. Dak.	24	1993–2004	270	110	380
78	Red River of the North at Pembina, N. Dak., site 2	4	2001–2004	195	128	350
79	Red River of the North at Emerson, Manitoba	7	1993–1994	270	210	280
80	Long Creek near Noonan, N. Dak.	21	1993–2004	400	120	670
83	Souris River near Foxholm, N. Dak.	12	1999–2004	362	230	540
84	Des Lacs River at Foxholm, N. Dak.	24	1993–2004	368	110	617
85	Souris River above Minot, N. Dak.	12	1993–1998	395	240	470
86	Bonnes Creek near Velva, N. Dak.	13	1993–2004	290	170	1,100
88	Wintering River near Karlsruhe, N. Dak.	24	1993–2004	235	58	360
89	Souris River near Bantry, N. Dak.	12	1999–2004	339	170	460
90	Willow Creek near Willow City, N. Dak.	22	1994–2004	305	130	620
92	Deep River near Upham, N. Dak.	21	1993–2004	210	100	450
97	Boundary Creek near Landa, N. Dak.	1	1994	160	160	160
98	Souris River near Westhope, N. Dak.	10	1993–2001	265	150	810
101	Little Muddy River below Cow Creek near Williston, N. Dak.	23	1993–2004	680	130	810
106	Bear Den Creek near Mandaree, N. Dak.	25	1993–2004	370	260	610
108	East Fork Shell Creek near Parshall, N. Dak.	39	1993–2004	950	110	1,998
109	Deepwater Creek near Mandaree, N. Dak.	38	1993–2004	715	78	1,172
110	Little Missouri River at Marmarth, N. Dak.	24	1993–2004	365	170	760
112	Little Missouri River at Medora, N. Dak.	8	2001–2004	470	216	970
113	Beaver Creek near Trotters, N. Dak.	20	1993–2004	855	210	1,850
114	Little Missouri River near Watford City, N. Dak.	23	1993–2004	620	180	840
115	Missouri River at Garrison Dam, N. Dak.	74	1993–2007	484	227	554
116	Knife River at Manning, N. Dak.	24	1993–2004	360	105	680
120	Knife River near Golden Valley, N. Dak.	24	1993–2004	515	184	1,200
125	Spring Creek at Zap, N. Dak.	24	1993–2004	1,095	180	1,600
127	Knife River at Hazen, N. Dak.	27	1993–2004	830	200	1,600
140	Square Butte Creek below Center, N. Dak.	23	1993–2004	940	377	1,300
141	Burnt Creek near Bismarck, N. Dak.	23	1993–2004	550	140	810
142	Missouri River at Bismarck, N. Dak.	15	1993–2004	490	220	600
145	Heart River near South Heart, N. Dak.	11	1993–2004	340	142	1,500
146	Heart River at Dickinson, N. Dak.	4	1993–1994	615	390	870
147	Green River near New Hradec, N. Dak.	22	1993–2004	245	70	650
149	Heart River near Richardton, N. Dak.	24	1993–2004	820	239	1,100
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	24	1993–2004	740	230	1,400
151	Antelope Creek near Carson, N. Dak.	11	1999–2004	640	435	1,270
152	Big Muddy Creek near Almont, N. Dak.	24	1993–2004	591	185	1,000

Table 1–3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Strontium, dissolved, in µg/L—Continued						
153	Heart River near Lark, N. Dak.	6	1993–1995	550	300	810
154	Heart River at Stark Bridge near Judson, N. Dak.	24	1993–2004	705	160	950
155	Sweetbriar Creek near Judson, N. Dak.	6	2002–2004	556	305	885
156	Heart River near Mandan, N. Dak.	27	1993–2004	720	221	1,400
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	24	1993–2004	320	90	470
158	Apple Creek near Menoken, N. Dak.	23	1993–2004	350	70	731
162	Cannonball River at Regent, N. Dak.	23	1993–2004	1,100	296	1,700
164	Cannonball River near Raleigh, N. Dak.	6	2001–2004	781	266	1,100
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	5	1993–1995	1,000	580	2,700
166	Cedar Creek near Haynes, N. Dak.	24	1993–2004	960	210	2,000
169	Cedar Creek near Raleigh, N. Dak.	21	1993–2004	850	250	1,500
170	Cannonball River at Breien, N. Dak.	25	1993–2004	727	170	1,200
172	Beaver Creek below Linton, N. Dak.	24	1993–2004	398	130	630
173	Porcupine Creek near Fort Yates, N. Dak.	35	1993–1999	220	18	288
176	James River near Grace City, N. Dak.	18	1996–2004	280	144	430
179	James River near Pingree, N. Dak.	2	1993	175	140	210
180	Pipestem Creek near Pingree, N. Dak.	24	1993–2004	340	160	579
182	James River at Jamestown, N. Dak.	17	1996–2004	340	190	490
183	James River at Lamoure, N. Dak.	18	1996–2004	295	214	480
184	Bear Creek near Oakes, N. Dak.	24	1993–2004	485	210	732
186	James River at N. Dak./S. Dak. State line	6	2002–2004	383	260	470
Zinc, total, in µg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	<40	<40	47
2	Red River of the North at Wahpeton, N. Dak.	2	1996	<40	<40	<40
3	Red River of the North near Wahpeton, N. Dak.	1	2006	<40	<40	<40
4	Red River of the North at Brushville, Minn.	54	1996–2007	<40	<40	94
10	Wild Rice River near Abercrombie, N. Dak.	45	1996–2007	<40	<40	70
11	Red River of the North at Fargo, N. Dak.	5	1996	<40	<40	50
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	<40	<40	237
14	Red River of the North near Harwood, N. Dak.	5	1996	<40	<40	<40
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	<40	<40	42
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	<40	<40	<40
32	Sheyenne River near Cooperstown, N. Dak.	69	1996–2007	<40	<40	202
33	Baldhill Creek near Dazey, N. Dak.	1	1996	<40	<40	<40
34	Sheyenne River below Baldhill Dam, N. Dak.	62	1996–2007	<40	<40	<40
36	Sheyenne River at Lisbon, N. Dak.	69	1997–2007	<40	<40	54
37	Sheyenne River near Kindred, N. Dak.	70	1996–2007	<40	<40	83
41	Sheyenne River at West Fargo, N. Dak.	6	1996–2006	<40	<40	63
45	Maple River below Mapleton, N. Dak.	47	1997–2007	<40	<40	54
55	Goose River at Hillsboro, N. Dak.	64	1996–2007	<40	<40	67

Table 1-3. Summary statistics for trace-metal constituents at selected sites in North Dakota from 1993 through 2008.—Continued

[µg/L, micrograms per liter; --, not available; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Zinc, total, in µg/L—Continued						
56	Red River of the North at Grand Forks, N. Dak.	46	1997–2006	<40	<40	73
58	Turtle River at Manvel, N. Dak.	37	1997–2006	<40	<40	86
62	Forest River near Minto, N. Dak.	42	1996–2006	<40	<40	351
67	Park River at Grafton, N. Dak.	36	1996–2006	<40	<40	89
68	Red River of the North at Drayton, N. Dak.	5	1996	<40	<40	42
75	Pembina River at Neche, N. Dak.	46	1996–2006	<40	<40	238
78	Red River of the North at Pembina, N. Dak., site 2	52	1997–2006	<40	<40	158
80	Long Creek near Noonan, N. Dak.	10	1997	<40	<40	<40
83	Souris River near Foxholm, N. Dak.	11	1997–1998	<40	<40	<40
84	Des Lacs River at Foxholm, N. Dak.	82	1996–2007	<40	<40	83
85	Souris River above Minot, N. Dak.	68	1996–2007	<40	<40	41
87	Souris River near Verendrye, N. Dak.	75	1997–2007	<40	<40	187
88	Wintering River near Karlsruhe, N. Dak.	10	1997–1998	<40	<40	<40
89	Souris River near Bantry, N. Dak.	9	1997–1998	<40	<40	<40
90	Willow Creek near Willow City, N. Dak.	5	1997	<40	<40	<40
92	Deep River near Upham, N. Dak.	6	1997	<40	<40	<40
98	Souris River near Westhope, N. Dak.	7	1997–1998	<40	<40	<40
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	<40	<40	<40
110	Little Missouri River at Marmarth, N. Dak.	8	1999	53	<40	261
112	Little Missouri River at Medora, N. Dak.	73	1996–2007	<40	<40	2,500
113	Beaver Creek near Trotters, N. Dak.	9	1999	<40	<40	<40
114	Little Missouri River near Watford City, N. Dak.	68	1996–2007	53	<40	2,770
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	<40	<40	81
125	Spring Creek at Zap, N. Dak.	64	1997–2007	<40	<40	60
127	Knife River at Hazen, N. Dak.	75	1996–2007	<40	<40	159
149	Heart River near Richardton, N. Dak.	67	1996–2007	<40	<40	49
156	Heart River near Mandan, N. Dak.	67	1996–2007	<40	<40	59
164	Cannonball River near Raleigh, N. Dak.	61	1996–2007	<40	<40	471
169	Cedar Creek near Raleigh, N. Dak.	53	1996–2007	<40	<40	81
170	Cannonball River at Breien, N. Dak.	63	1996–2007	<40	<40	266
175	James River near Manfred, N. Dak.	6	1998	<40	<40	<40
176	James River near Grace City, N. Dak.	60	1997–2007	<40	<40	41
177	James River above Arrowwood Lake near Kensal, N. Dak.	9	1998–1999	<40	<40	<40
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	<40	<40	<40
182	James River at Jamestown, N. Dak.	75	1997–2007	<40	<40	42
183	James River at Lamoure, N. Dak.	73	1996–2007	<40	<40	45
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	<40	<40	<40
186	James River at N. Dak./S. Dak. State line	9	1998–1999	<40	<40	<40

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Sulfate, in mg/L					
1	Bois De Sioux River near Doran, Minn.	623	403	420	462
2	Red River of the North at Wahpeton, N. Dak.	416	96	42	86
3	Red River of the North near Wahpeton, N. Dak.	49	176	433	176
4	Red River of the North at Brushville, Minn.	43	147	73	87
5	Red River of the North below Wahpeton, N. Dak.	32	63	37	38
6	Red River of the North at Hickson, N. Dak.	38	91	50	67
7	Wild Rice River near Rutland, N. Dak.	--	475	600	490
8	Wild Rice River near Cayuga, N. Dak.	1,310	340	260	320
9	Antelope Creek at Dwight, N. Dak.	--	190	318	235
10	Wild Rice River near Abercrombie, N. Dak.	510	350	360	394
11	Red River of the North at Fargo, N. Dak.	47	110	79	86
12	Red River of North below Fargo, N. Dak.	54	84	92	69
13	Red River of the North at Harwood, N. Dak.	97	198	146	146
14	Red River of the North near Harwood, N. Dak.	91	180	145	152
15	Sheyenne River above Harvey, N. Dak.	240	210	200	210
16	Big Coulee near Fort Totten, N. Dak.	--	21	19	20
17	Sheyenne River at Warwick, N. Dak.	264	222	207	217
18	Sheyenne River near Warwick, N. Dak.	95	125	120	110
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	--	108	247	179
20	Mauvais Coulee near Cando, N. Dak.	190	179	310	230
21	Edmore Coulee near Edmore, N. Dak.	140	170	220	170
22	Edmore Coulee Tributary near Webster, N. Dak.	--	140	298	190
23	Webster Coulee at Webster, N. Dak.	--	155	--	155
24	Starkweather Coulee near Webster, N. Dak.	--	110	150	115
25	Big Coulee below Churchs Ferry, N. Dak.	--	243	200	227
26	Little Coulee near Leeds, N. Dak.	--	269	276	270
27	Little Coulee near Brinsmade, N. Dak.	--	160	160	160
28	Big Coulee near Churchs Ferry, N. Dak.	310	136	170	150
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	1,350	640	1,100	910
30	Channel A near Penn, N. Dak.	180	185	150	172
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	--	1,165	1,835	1,385
32	Sheyenne River near Cooperstown, N. Dak.	160	142	180	160
33	Baldhill Creek near Dazey, N. Dak.	235	140	200	170
34	Sheyenne River below Baldhill Dam, N. Dak.	238	167	220	208
35	Sheyenne River at Valley City, N. Dak.	--	155	120	140
36	Sheyenne River at Lisbon, N. Dak.	200	160	210	200
37	Sheyenne River near Kindred, N. Dak.	200	160	170	170
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	270	214	227	227
39	Sheyenne River near Horace, N. Dak.	--	120	95	115

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Sulfate, in mg/L—Continued					
40	Sheyenne River Diversion at West Fargo, N. Dak.	--	170	282	180
41	Sheyenne River at West Fargo, N. Dak.	207	143	184	170
42	Maple River near Hope, N. Dak.	--	305	630	322
43	Maple River near Enderlin, N. Dak.	520	310	460	450
44	Maple River near Mapleton, N. Dak.	--	295	440	370
45	Maple River below Mapleton, N. Dak.	524	340	428	419
46	Sheyenne River at Harwood, N. Dak.	274	212	226	222
47	Rush River at Amenia, N. Dak.	--	233	338	280
48	Rush River near Prosper, N. Dak.	--	75	--	75
49	Lower Branch Rush River near Prosper, N. Dak.	--	27	--	27
50	Sheyenne River near Harwood, N. Dak.	192	170	180	180
51	Elm River near Kelso, N. Dak.	--	140	266	208
52	Red River of the North at Halstad, Minn.	120	110	120	110
53	Beaver Creek near Finley, N. Dak.	530	280	360	320
54	Goose River near Portland, N. Dak.	578	270	420	405
55	Goose River at Hillsboro, N. Dak.	581	410	443	445
56	Red River of the North at Grand Forks, N. Dak.	59	108	83	87
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	180	185	226	205
58	Turtle River at Manvel, N. Dak.	568	375	434	425
59	Red River of the North at Oslo, Minn.	48	81	60	74
60	Middle Branch Forest River near Whitman, N. Dak.	--	160	550	185
61	Forest River near Fordville, N. Dak.	120	177	180	174
62	Forest River near Minto, N. Dak.	218	210	227	216
63	South Branch Park River below Homme Dam, N. Dak.	--	140	195	180
64	Middle Branch Park River near Union, N. Dak.	--	62	75	63
65	Middle Branch Park River near Edinburg, N. Dak.	--	71	94	87
66	Cart Creek at Mountain, N. Dak.	--	150	245	180
67	Park River at Grafton, N. Dak.	372	198	280	260
68	Red River of the North at Drayton, N. Dak.	188	99	110	103
69	Pembina County Drain 20 near Glasston, N. Dak.	--	120	--	120
70	Hidden Island Coulee near Hansboro, N. Dak.	--	190	240	200
71	Cypress Creek near Sarles, N. Dak.	--	100	190	100
72	Pembina River near Vang, N. Dak.	265	120	205	180
73	Little South Pembina River near Walhalla, N. Dak.	205	140	228	180
74	Pembina River at Walhalla, N. Dak.	210	170	190	180
75	Pembina River at Neche, N. Dak.	229	165	200	195
76	Tongue River at Akra, N. Dak.	88	78	96	88
77	Red River of the North at Pembina, N. Dak., site 1	84	122	136	120

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Sulfate, in mg/L—Continued					
78	Red River of the North at Pembina, N. Dak., site 2	101	125	103	110
79	Red River of the North at Emerson, Manitoba	83	100	100	94
80	Long Creek near Noonan, N. Dak.	310	250	590	376
81	West Branch Short Creek near Columbus, N. Dak.	1,100	490	580	495
82	Souris River near Sherwood, N. Dak.	300	190	220	230
83	Souris River near Foxholm, N. Dak.	190	190	170	180
84	Des Lacs River at Foxholm, N. Dak.	565	390	494	456
85	Souris River above Minot, N. Dak.	377	250	250	267
86	Bonnes Creek near Velva, N. Dak.	--	395	253	390
87	Souris River near Verendrye, N. Dak.	372	250	272	284
88	Wintering River near Karlsruhe, N. Dak.	62	110	87	94
89	Souris River near Bantry, N. Dak.	251	180	236	215
90	Willow Creek near Willow City, N. Dak.	340	210	255	235
91	Stone Creek near Kramer, N. Dak.	--	272	198	227
92	Deep River near Upham, N. Dak.	320	125	143	141
93	Egg Creek near Granville, N. Dak.	--	150	400	160
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	390	170	320	250
95	Cut Bank Creek at Upham, N. Dak.	400	209	241	236
96	Deep River below Cut Bank Creek near Upham, N. Dak.	360	185	200	200
97	Boundary Creek near Landa, N. Dak.	--	240	403	286
98	Souris River near Westhope, N. Dak.	315	140	190	200
99	Charbonneau Creek near Charbonneau, N. Dak.	--	890	--	710
100	Missouri River near Williston, N. Dak.	225	184	180	200
101	Little Muddy River below Cow Creek near Williston, N. Dak.	555	410	623	570
102	Stony Creek near Williston, N. Dak.	660	350	550	530
103	Tobacco Garden Creek near Watford City, N. Dak.	875	480	580	640
104	Beaver Creek near Ray, N. Dak.	650	510	610	610
105	White Earth River at White Earth, N. Dak.	470	390	428	421
106	Bear Den Creek near Mandaree, N. Dak.	760	590	690	690
107	Shell Creek near Parshall, N. Dak.	730	575	730	680
108	East Fork Shell Creek near Parshall, N. Dak.	1,101	998	1,000	1,000
109	Deepwater Creek near Mandaree, N. Dak.	836	520	570	570
110	Little Missouri River at Marmarth, N. Dak.	395	306	600	484
111	Deep Creek near Amidon, N. Dak.	2,000	1,600	1,500	1,700
112	Little Missouri River at Medora, N. Dak.	936	428	815	615
113	Beaver Creek near Trotters, N. Dak.	1,150	700	1,000	994
114	Little Missouri River near Watford City, N. Dak.	802	480	680	610
115	Missouri River at Garrison Dam, N. Dak.	180	170	170	170

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Sulfate, in mg/L—Continued					
116	Knife River at Manning, N. Dak.	665	336	455	440
117	Stray Creek near Manning, N. Dak.	700	800	1,115	760
118	Knife River at Marshall, N. Dak.	825	575	540	570
119	Elm Creek near Golden Valley, N. Dak.	290	375	220	340
120	Knife River near Golden Valley, N. Dak.	851	459	575	564
121	Coyote Creek near Zap, N. Dak.	605	490	550	510
122	Brush Creek near Beulah, N. Dak.	590	465	470	490
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	600	460	770	580
124	Spring Creek near Halliday, N. Dak.	660	400	635	605
125	Spring Creek at Zap, N. Dak.	600	400	500	492
126	West Branch Otter Creek near Beulah, N. Dak.	110	420	410	410
127	Knife River at Hazen, N. Dak.	560	428	420	459
128	Antelope Creek above Hazen, N. Dak.	560	450	380	465
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	111	165	450	170
130	West Branch Antelope Creek near Hazen, N. Dak.	54	210	--	190
131	Coal Creek near Stanton, N. Dak.	720	530	300	600
132	Alderin Creek near Fort Clark, N. Dak.	665	360	505	440
133	Coal Lake Coulee near Hensler, N. Dak.	170	320	460	315
134	Buffalo Creek near Washburn, N. Dak.	510	390	490	485
135	Turtle Creek above Washburn, N. Dak.	510	296	315	324
136	Painted Woods Creek near Wilton, N. Dak.	640	425	635	550
137	Square Butte Creek near Hannover, N. Dak.	340	290	335	330
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	250	220	250	240
139	Hagel Creek near Center, N. Dak.	310	170	210	240
140	Square Butte Creek below Center, N. Dak.	185	340	370	340
141	Burnt Creek near Bismarck, N. Dak.	105	190	393	262
142	Missouri River at Bismarck, N. Dak.	190	170	170	170
143	South Branch Heart River near South Heart, N. Dak.	180	250	230	225
144	North Creek near South Heart, N. Dak.	1,400	500	248	560
145	Heart River near South Heart, N. Dak.	1,000	510	705	720
146	Heart River at Dickinson, N. Dak.	758	425	610	565
147	Green River near New Hradec, N. Dak.	250	200	250	230
148	Green River near Gladstone, N. Dak.	540	433	510	490
149	Heart River near Richardton, N. Dak.	764	446	587	550
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	--	316	520	415
151	Antelope Creek near Carson, N. Dak.	--	190	240	200
152	Big Muddy Creek near Almont, N. Dak.	--	324	542	473

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Sulfate, in mg/L—Continued					
153	Heart River near Lark, N. Dak.	360	250	410	340
154	Heart River at Stark Bridge near Judson, N. Dak.	--	290	448	388
155	Sweetbriar Creek near Judson, N. Dak.	340	210	385	320
156	Heart River near Mandan, N. Dak.	520	354	448	440
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	160	130	180	141
158	Apple Creek near Menoken, N. Dak.	315	186	240	230
159	Missouri River near Schmidt, N. Dak.	185	180	185	180
160	Cannonball River at New England, N. Dak.	1,050	1,150	695	935
161	Coal Bank Creek near Havelock, N. Dak.	820	725	800	790
162	Cannonball River at Regent, N. Dak.	685	560	675	640
163	Cannonball River below Bentley, N. Dak.	880	620	885	820
164	Cannonball River near Raleigh, N. Dak.	932	590	640	640
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	2,300	1,310	1,600	1,500
166	Cedar Creek near Haynes, N. Dak.	1,250	548	800	707
167	Timber Creek near Bentley, N. Dak.	1,600	1,100	875	1,100
168	Cedar Creek near Pretty Rock, N. Dak.	1,270	920	1,200	1,115
169	Cedar Creek near Raleigh, N. Dak.	742	570	532	570
170	Cannonball River at Breien, N. Dak.	885	467	544	568
171	Beaver Creek near Linton, N. Dak.	280	120	140	140
172	Beaver Creek below Linton, N. Dak.	62	145	260	224
173	Porcupine Creek near Fort Yates, N. Dak.	--	211	209	211
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	2,700	2,300	2,000	2,400
175	James River near Manfred, N. Dak.	170	140	145	150
176	James River near Grace City, N. Dak.	310	141	205	190
177	James River above Arrowwood Lake near Kensal, N. Dak.	245	160	170	185
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	100	103	100
179	James River near Pingree, N. Dak.	170	135	169	153
180	Pipestem Creek near Pingree, N. Dak.	338	180	244	220
181	Pipestem Creek near Buchanan, N. Dak.	--	98	112	110
182	James River at Jamestown, N. Dak.	220	160	185	190
183	James River at Lamoure, N. Dak.	242	147	160	170
184	Bear Creek near Oakes, N. Dak.	--	260	349	339
185	James River at Oakes, N. Dak.	270	150	160	170
186	James River at N. Dak./S. Dak. State line	225	153	181	176
Chloride, in mg/L					
1	Bois De Sioux River near Doran, Minn.	24.7	13.9	15.6	16.5
2	Red River of the North at Wahpeton, N. Dak.	29.2	12.8	11.0	11.9
3	Red River of the North near Wahpeton, N. Dak.	16.3	14.2	9.3	14.1

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Chloride, in mg/L—Continued					
4	Red River of the North at Brushville, Minn.	18.0	13.3	18.3	15.3
5	Red River of the North below Wahpeton, N. Dak.	7.8	7.2	6.9	7.1
6	Red River of the North at Hickson, N. Dak.	9.6	11.0	11.5	11.0
7	Wild Rice River near Rutland, N. Dak.	--	27.5	46.0	32.0
8	Wild Rice River near Cayuga, N. Dak.	408.0	35.0	20.0	30.0
9	Antelope Creek at Dwight, N. Dak.	--	24.1	27.1	24.3
10	Wild Rice River near Abercrombie, N. Dak.	61.9	29.8	36.0	38.9
11	Red River of the North at Fargo, N. Dak.	9.6	12.7	14.0	13.0
12	Red River of North below Fargo, N. Dak.	12.0	11.0	13.4	11.0
13	Red River of the North at Harwood, N. Dak.	25.5	18.4	23.2	21.3
14	Red River of the North near Harwood, N. Dak.	20.6	17.2	19.3	18.7
15	Sheyenne River above Harvey, N. Dak.	19.0	14.0	17.0	17.0
16	Big Coulee near Fort Totten, N. Dak.	--	<4.0	9.5	8.5
17	Sheyenne River at Warwick, N. Dak.	21.6	16.8	15.6	17.0
18	Sheyenne River near Warwick, N. Dak.	14.0	14.0	13.1	14.0
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	--	9.8	35.2	17.2
20	Mauvais Coulee near Cando, N. Dak.	31.0	16.0	25.0	19.0
21	Edmore Coulee near Edmore, N. Dak.	30.0	18.5	26.0	20.4
22	Edmore Coulee Tributary near Webster, N. Dak.	--	15.4	26.5	20.1
23	Webster Coulee at Webster, N. Dak.	--	20.0	--	20.0
24	Starkweather Coulee near Webster, N. Dak.	--	13.9	19.0	14.0
25	Big Coulee below Churchs Ferry, N. Dak.	--	25.5	24.5	24.5
26	Little Coulee near Leeds, N. Dak.	--	24.5	23.5	24.5
27	Little Coulee near Brinsmade, N. Dak.	--	23.0	17.5	23.0
28	Big Coulee near Churchs Ferry, N. Dak.	45.0	15.0	20.0	18.5
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	280.0	130.0	230.0	195.0
30	Channel A near Penn, N. Dak.	21.5	19.0	17.0	19.0
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	--	227.5	376.0	278.5
32	Sheyenne River near Cooperstown, N. Dak.	20.0	14.3	16.0	16.0
33	Baldhill Creek near Dazey, N. Dak.	23.5	10.9	17.6	15.0
34	Sheyenne River below Baldhill Dam, N. Dak.	18.0	14.1	15.0	15.3
35	Sheyenne River at Valley City, N. Dak.	--	19.0	13.0	18.0
36	Sheyenne River at Lisbon, N. Dak.	32.0	20.5	29.6	27.0
37	Sheyenne River near Kindred, N. Dak.	28.4	22.4	29.6	26.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	25.2	22.1	27.0	24.0
39	Sheyenne River near Horace, N. Dak.	--	18.0	22.0	19.5
40	Sheyenne River Diversion at West Fargo, N. Dak.	--	15.7	12.2	15.7
41	Sheyenne River at West Fargo, N. Dak.	31.3	22.6	28.6	26.6

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Chloride, in mg/L—Continued					
42	Maple River near Hope, N. Dak.	--	24.5	39.0	26.0
43	Maple River near Enderlin, N. Dak.	95.0	38.7	68.0	53.0
44	Maple River near Mapleton, N. Dak.	--	37.4	61.9	45.6
45	Maple River below Mapleton, N. Dak.	79.8	37.1	49.9	55.4
46	Sheyenne River at Harwood, N. Dak.	36.9	21.7	33.9	31.4
47	Rush River at Amenia, N. Dak.	--	15.5	18.0	17.0
48	Rush River near Prosper, N. Dak.	--	10.4	--	10.4
49	Lower Branch Rush River near Prosper, N. Dak.	--	4.8	--	4.8
50	Sheyenne River near Harwood, N. Dak.	47.0	36.0	39.0	39.0
51	Elm River near Kelso, N. Dak.	--	22.0	62.5	36.7
52	Red River of the North at Halstad, Minn.	20.8	14.5	16.7	17.0
53	Beaver Creek near Finley, N. Dak.	45.0	16.5	22.0	19.0
54	Goose River near Portland, N. Dak.	27.5	20.0	33.0	25.0
55	Goose River at Hillsboro, N. Dak.	72.4	31.5	36.4	36.5
56	Red River of the North at Grand Forks, N. Dak.	12.0	12.6	12.0	12.0
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	22.0	21.2	26.0	23.0
58	Turtle River at Manvel, N. Dak.	780.0	370.0	570.0	446.5
59	Red River of the North at Oslo, Minn.	16.5	16.0	14.5	15.0
60	Middle Branch Forest River near Whitman, N. Dak.	--	13.0	40.0	15.0
61	Forest River near Fordville, N. Dak.	8.5	11.7	13.0	13.0
62	Forest River near Minto, N. Dak.	28.1	21.0	26.1	25.0
63	South Branch Park River below Homme Dam, N. Dak.	--	11.0	15.0	14.0
64	Middle Branch Park River near Union, N. Dak.	--	11.0	12.0	11.0
65	Middle Branch Park River near Edinburg, N. Dak.	--	8.4	7.2	8.0
66	Cart Creek at Mountain, N. Dak.	--	14.0	23.0	16.0
67	Park River at Grafton, N. Dak.	130.0	50.7	94.5	74.3
68	Red River of the North at Drayton, N. Dak.	110.0	26.5	37.3	33.5
69	Pembina County Drain 20 near Glasston, N. Dak.	--	5.9	--	5.9
70	Hidden Island Coulee near Hansboro, N. Dak.	--	11.0	16.0	11.0
71	Cypress Creek near Sarles, N. Dak.	--	6.8	11.1	9.2
72	Pembina River near Vang, N. Dak.	19.5	8.0	13.5	11.0
73	Little South Pembina River near Walhalla, N. Dak.	18.0	8.7	17.0	15.0
74	Pembina River at Walhalla, N. Dak.	15.0	12.0	13.0	13.0
75	Pembina River at Neche, N. Dak.	20.2	12.5	16.0	15.0
76	Tongue River at Akra, N. Dak.	8.3	9.8	11.0	10.0
77	Red River of the North at Pembina, N. Dak., site 1	34.4	30.9	27.2	27.8
78	Red River of the North at Pembina, N. Dak., site 2	34.0	23.1	26.2	26.0
79	Red River of the North at Emerson, Manitoba	41.0	29.0	34.0	34.0

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Chloride, in mg/L—Continued					
80	Long Creek near Noonan, N. Dak.	12.5	12.0	25.0	18.0
81	West Branch Short Creek near Columbus, N. Dak.	21.0	13.0	17.0	14.5
82	Souris River near Sherwood, N. Dak.	80.0	25.0	48.5	47.5
83	Souris River near Foxholm, N. Dak.	22.5	24.0	20.0	22.0
84	Des Lacs River at Foxholm, N. Dak.	34.5	22.3	29.6	26.1
85	Souris River above Minot, N. Dak.	51.0	27.0	31.4	29.8
86	Bonnes Creek near Velva, N. Dak.	--	7.6	6.8	7.6
87	Souris River near Verendrye, N. Dak.	45.1	25.1	38.2	32.5
88	Wintering River near Karlsruhe, N. Dak.	11.0	11.0	13.0	11.2
89	Souris River near Bantry, N. Dak.	38.8	20.6	29.0	26.7
90	Willow Creek near Willow City, N. Dak.	38.0	19.5	25.5	22.2
91	Stone Creek near Kramer, N. Dak.	--	13.2	11.0	12.4
92	Deep River near Upham, N. Dak.	55.0	34.5	54.4	45.5
93	Egg Creek near Granville, N. Dak.	--	14.0	44.0	20.0
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	51.5	21.0	47.0	31.0
95	Cut Bank Creek at Upham, N. Dak.	58.0	26.0	31.9	26.4
96	Deep River below Cut Bank Creek near Upham, N. Dak.	110.0	33.0	42.0	39.0
97	Boundary Creek near Landa, N. Dak.	--	13.1	17.4	14.0
98	Souris River near Westhope, N. Dak.	44.0	19.0	25.0	28.0
99	Charbonneau Creek near Charbonneau, N. Dak.	--	6.2	--	5.4
100	Missouri River near Williston, N. Dak.	13.0	10.0	9.6	10.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	8.8	6.5	9.8	8.0
102	Stony Creek near Williston, N. Dak.	9.6	5.6	8.3	7.9
103	Tobacco Garden Creek near Watford City, N. Dak.	6.4	5.0	4.6	5.1
104	Beaver Creek near Ray, N. Dak.	11.0	11.0	14.0	12.0
105	White Earth River at White Earth, N. Dak.	22.0	42.5	32.0	34.0
106	Bear Den Creek near Mandaree, N. Dak.	4.5	4.8	4.1	4.4
107	Shell Creek near Parshall, N. Dak.	11.5	7.4	8.8	8.5
108	East Fork Shell Creek near Parshall, N. Dak.	26.8	16.7	21.0	19.0
109	Deepwater Creek near Mandaree, N. Dak.	23.2	9.9	10.9	10.9
110	Little Missouri River at Marmarth, N. Dak.	10.0	6.3	10.8	9.0
111	Deep Creek near Amidon, N. Dak.	13.0	8.8	9.5	9.8
112	Little Missouri River at Medora, N. Dak.	16.0	7.2	12.1	9.6
113	Beaver Creek near Trotters, N. Dak.	11.5	7.9	9.6	9.2
114	Little Missouri River near Watford City, N. Dak.	16.0	7.2	10.4	9.4
115	Missouri River at Garrison Dam, N. Dak.	9.7	9.3	9.4	9.5
116	Knife River at Manning, N. Dak.	7.4	5.6	7.0	6.6
117	Stray Creek near Manning, N. Dak.	9.3	6.5	10.1	7.0

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Chloride, in mg/L—Continued					
118	Knife River at Marshall, N. Dak.	7.3	5.1	4.8	5.3
119	Elm Creek near Golden Valley, N. Dak.	11.0	4.4	4.5	4.5
120	Knife River near Golden Valley, N. Dak.	9.0	5.7	6.8	6.4
121	Coyote Creek near Zap, N. Dak.	9.5	6.2	6.5	6.9
122	Brush Creek near Beulah, N. Dak.	7.4	5.5	7.0	6.7
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	6.5	5.9	8.1	6.8
124	Spring Creek near Halliday, N. Dak.	6.8	5.0	6.9	6.5
125	Spring Creek at Zap, N. Dak.	8.7	5.9	7.7	7.3
126	West Branch Otter Creek near Beulah, N. Dak.	<4.0	<4.0	5.0	<4.0
127	Knife River at Hazen, N. Dak.	8.4	6.1	7.4	7.2
128	Antelope Creek above Hazen, N. Dak.	15.0	8.8	9.6	11.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	4.2	<4.0	--	<4.0
130	West Branch Antelope Creek near Hazen, N. Dak.	<4.0	<4.0	--	<4.0
131	Coal Creek near Stanton, N. Dak.	12.0	6.1	8.3	8.1
132	Alderin Creek near Fort Clark, N. Dak.	6.5	4.4	6.0	5.1
133	Coal Lake Coulee near Hensler, N. Dak.	4.1	<4.0	5.8	<4.0
134	Buffalo Creek near Washburn, N. Dak.	6.6	4.7	7.0	6.5
135	Turtle Creek above Washburn, N. Dak.	18.0	10.2	13.9	12.2
136	Painted Woods Creek near Wilton, N. Dak.	19.0	12.0	18.0	17.0
137	Square Butte Creek near Hannover, N. Dak.	6.9	5.5	7.0	5.9
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	7.2	5.7	7.0	7.0
139	Hagel Creek near Center, N. Dak.	6.6	<4.0	4.6	4.3
140	Square Butte Creek below Center, N. Dak.	7.6	11.0	11.0	10.0
141	Burnt Creek near Bismarck, N. Dak.	5.6	6.2	9.1	7.3
142	Missouri River at Bismarck, N. Dak.	9.8	9.6	9.6	9.6
143	South Branch Heart River near South Heart, N. Dak.	<4.0	4.8	5.0	4.8
144	North Creek near South Heart, N. Dak.	9.5	5.1	<4.0	5.2
145	Heart River near South Heart, N. Dak.	34.0	12.0	17.5	18.0
146	Heart River at Dickinson, N. Dak.	43.2	33.0	50.0	48.0
147	Green River near New Hradec, N. Dak.	6.8	4.9	6.2	5.9
148	Green River near Gladstone, N. Dak.	6.7	5.0	7.9	6.3
149	Heart River near Richardton, N. Dak.	19.7	12.0	20.1	17.0
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	--	12.0	17.0	13.5
151	Antelope Creek near Carson, N. Dak.	--	5.1	9.3	5.9
152	Big Muddy Creek near Almont, N. Dak.	--	5.8	7.5	7.0
153	Heart River near Lark, N. Dak.	5.0	5.4	8.9	5.9
154	Heart River at Stark Bridge near Judson, N. Dak.	--	8.1	12.0	10.0
155	Sweetbriar Creek near Judson, N. Dak.	4.1	4.9	6.3	5.1

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Chloride, in mg/L—Continued					
156	Heart River near Mandan, N. Dak.	16.3	8.7	13.1	12.0
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	4.5	4.2	9.1	6.2
158	Apple Creek near Menoken, N. Dak.	48.5	13.4	32.0	30.0
159	Missouri River near Schmidt, N. Dak.	9.9	9.1	9.7	9.4
160	Cannonball River at New England, N. Dak.	8.9	9.4	6.8	8.1
161	Coal Bank Creek near Havelock, N. Dak.	11.0	8.3	11.0	10.0
162	Cannonball River at Regent, N. Dak.	11.0	8.2	10.0	9.7
163	Cannonball River below Bentley, N. Dak.	12.0	8.0	11.0	11.0
164	Cannonball River near Raleigh, N. Dak.	17.8	8.7	10.3	9.9
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26.0	17.0	20.0	18.5
166	Cedar Creek near Haynes, N. Dak.	17.0	9.6	12.0	11.0
167	Timber Creek near Bentley, N. Dak.	16.0	12.5	10.5	14.0
168	Cedar Creek near Pretty Rock, N. Dak.	12.0	9.3	13.0	11.5
169	Cedar Creek near Raleigh, N. Dak.	13.2	9.0	9.2	9.3
170	Cannonball River at Breien, N. Dak.	19.0	7.6	12.0	11.0
171	Beaver Creek near Linton, N. Dak.	11.0	6.0	9.0	7.8
172	Beaver Creek below Linton, N. Dak.	6.2	8.7	13.0	11.0
173	Porcupine Creek near Fort Yates, N. Dak.	--	12.5	16.0	13.7
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	18.0	13.0	13.5	14.0
175	James River near Manfred, N. Dak.	15.0	7.9	10.0	9.8
176	James River near Grace City, N. Dak.	52.4	12.9	19.6	18.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	34.0	16.0	17.3	18.0
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	11.0	13.5	11.0
179	James River near Pingree, N. Dak.	15.0	13.5	14.4	14.5
180	Pipestem Creek near Pingree, N. Dak.	16.6	11.0	14.2	12.0
181	Pipestem Creek near Buchanan, N. Dak.	--	6.3	14.5	7.3
182	James River at Jamestown, N. Dak.	44.0	14.8	17.5	21.6
183	James River at Lamoure, N. Dak.	50.2	19.9	22.9	28.3
184	Bear Creek near Oakes, N. Dak.	--	41.0	56.9	50.2
185	James River at Oakes, N. Dak.	73.0	22.0	33.0	38.7
186	James River at N. Dak./S. Dak. State line	44.5	26.7	28.9	30.0
Total dissolved solids, in mg/L					
1	Bois De Sioux River near Doran, Minn.	1,145	795	874	894
2	Red River of the North at Wahpeton, N. Dak.	875	344	284	324
3	Red River of the North near Wahpeton, N. Dak.	321	442	1,090	442
4	Red River of the North at Brushville, Minn.	339	392	350	352
5	Red River of the North below Wahpeton, N. Dak.	318	301	278	299
6	Red River of the North at Hickson, N. Dak.	320	324	334	331

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

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Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Total dissolved solids, in mg/L—Continued					
7	Wild Rice River near Rutland, N. Dak.	--	859	1,160	969
8	Wild Rice River near Cayuga, N. Dak.	3,340	795	764	795
9	Antelope Creek at Dwight, N. Dak.	--	434	--	434
10	Wild Rice River near Abercrombie, N. Dak.	1,370	827	876	925
11	Red River of the North at Fargo, N. Dak.	331	332	317	324
12	Red River of North below Fargo, N. Dak.	345	366	354	355
13	Red River of the North at Harwood, N. Dak.	416	504	435	446
14	Red River of the North near Harwood, N. Dak.	329	496	391	428
15	Sheyenne River above Harvey, N. Dak.	1,040	804	912	922
16	Big Coulee near Fort Totten, N. Dak.	--	359	423	380
17	Sheyenne River at Warwick, N. Dak.	853	725	720	727
18	Sheyenne River near Warwick, N. Dak.	490	492	561	506
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	--	316	672	424
20	Mauvais Coulee near Cando, N. Dak.	771	446	754	545
21	Edmore Coulee near Edmore, N. Dak.	754	401	608	486
22	Edmore Coulee Tributary near Webster, N. Dak.	--	275	676	413
23	Webster Coulee at Webster, N. Dak.	--	492	--	492
24	Starkweather Coulee near Webster, N. Dak.	--	323	510	373
25	Big Coulee below Churchs Ferry, N. Dak.	--	460	555	545
26	Little Coulee near Leeds, N. Dak.	--	574	643	578
27	Little Coulee near Brinsmade, N. Dak.	--	572	555	572
28	Big Coulee near Churchs Ferry, N. Dak.	972	419	547	498
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	3,095	1,480	2,380	2,060
30	Channel A near Penn, N. Dak.	596	520	446	516
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	--	2,650	4,980	3,970
32	Sheyenne River near Cooperstown, N. Dak.	698	576	628	622
33	Baldhill Creek near Dazey, N. Dak.	809	423	613	555
34	Sheyenne River below Baldhill Dam, N. Dak.	694	543	574	579
35	Sheyenne River at Valley City, N. Dak.	--	509	403	473
36	Sheyenne River at Lisbon, N. Dak.	654	485	630	605
37	Sheyenne River near Kindred, N. Dak.	668	523	562	562
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	--	505	679	633
39	Sheyenne River near Horace, N. Dak.	687	508	539	539
40	Sheyenne River Diversion at West Fargo, N. Dak.	--	472	743	499
41	Sheyenne River at West Fargo, N. Dak.	628	430	576	565
42	Maple River near Hope, N. Dak.	--	616	1,330	654
43	Maple River near Enderlin, N. Dak.	1,260	752	1,140	1,070
44	Maple River near Mapleton, N. Dak.	--	691	1,050	859

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

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Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Total dissolved solids, in mg/L—Continued					
45	Maple River below Mapleton, N. Dak.	1,280	817	940	940
46	Sheyenne River at Harwood, N. Dak.	598	581	548	569
47	Rush River at Amenia, N. Dak.	--	589	868	766
48	Rush River near Prosper, N. Dak.	--	294	--	294
49	Lower Branch Rush River near Prosper, N. Dak.	--	172	--	172
50	Sheyenne River near Harwood, N. Dak.	681	632	560	632
51	Elm River near Kelso, N. Dak.	--	466	761	684
52	Red River of the North at Halstad, Minn.	514	404	420	429
53	Beaver Creek near Finley, N. Dak.	1,200	691	919	787
54	Goose River near Portland, N. Dak.	1,430	726	941	939
55	Goose River at Hillsboro, N. Dak.	1,345	855	988	983
56	Red River of the North at Grand Forks, N. Dak.	349	354	331	344
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	618	558	667	614
58	Turtle River at Manvel, N. Dak.	2,405	1,280	1,810	1,460
59	Red River of the North at Oslo, Minn.	321	340	321	334
60	Middle Branch Forest River near Whitman, N. Dak.	--	409	1,130	430
61	Forest River near Fordville, N. Dak.	493	443	518	465
62	Forest River near Minto, N. Dak.	649	516	582	570
63	South Branch Park River below Homme Dam, N. Dak.	--	404	542	486
64	Middle Branch Park River near Union, N. Dak.	--	293	419	381
65	Middle Branch Park River near Edinburg, N. Dak.	--	267	379	296
66	Cart Creek at Mountain, N. Dak.	--	402	706	459
67	Park River at Grafton, N. Dak.	975	552	808	781
68	Red River of the North at Drayton, N. Dak.	718	395	436	411
69	Pembina County Drain 20 near Glasston, N. Dak.	--	326	--	326
70	Hidden Island Coulee near Hansboro, N. Dak.	--	472	809	476
71	Cypress Creek near Sarles, N. Dak.	--	327	573	345
72	Pembina River near Vang, N. Dak.	774	336	570	485
73	Little South Pembina River near Walhalla, N. Dak.	616	354	609	511
74	Pembina River at Walhalla, N. Dak.	637	491	559	554
75	Pembina River at Neche, N. Dak.	696	421	584	551
76	Tongue River at Akra, N. Dak.	425	329	387	361
77	Red River of the North at Pembina, N. Dak., site 1	403	452	443	436
78	Red River of the North at Pembina, N. Dak., site 2	441	401	413	414
79	Red River of the North at Emerson, Manitoba	460	419	428	438
80	Long Creek near Noonan, N. Dak.	897	598	1,230	875
81	West Branch Short Creek near Columbus, N. Dak.	2,270	1,060	1,390	1,095
82	Souris River near Sherwood, N. Dak.	1,035	598	721	746

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

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Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Total dissolved solids, in mg/L—Continued					
83	Souris River near Foxholm, N. Dak.	711	654	562	626
84	Des Lacs River at Foxholm, N. Dak.	1,360	920	1,150	1,090
85	Souris River above Minot, N. Dak.	1,112	706	745	745
86	Bonnes Creek near Velva, N. Dak.	--	703	591	703
87	Souris River near Verendrye, N. Dak.	1,080	689	805	808
88	Wintering River near Karlsruhe, N. Dak.	456	426	506	454
89	Souris River near Bantry, N. Dak.	829	533	684	684
90	Willow Creek near Willow City, N. Dak.	1,011	545	723	658
91	Stone Creek near Kramer, N. Dak.	--	434	566	434
92	Deep River near Upham, N. Dak.	--	361	632	503
93	Egg Creek near Granville, N. Dak.	--	428	1,130	448
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	1,030	464	924	780
95	Cut Bank Creek at Upham, N. Dak.	1,380	391	788	636
96	Deep River below Cut Bank Creek near Upham, N. Dak.	1,310	564	774	691
97	Boundary Creek near Landa, N. Dak.	--	512	821	588
98	Souris River near Westhope, N. Dak.	1,080	516	623	680
99	Charbonneau Creek near Charbonneau, N. Dak.	--	2,260	--	1,690
100	Missouri River near Williston, N. Dak.	528	448	433	476
101	Little Muddy River below Cow Creek near Williston, N. Dak.	1,440	1,020	1,480	1,410
102	Stony Creek near Williston, N. Dak.	1,800	852	1,480	1,430
103	Tobacco Garden Creek near Watford City, N. Dak.	2,440	1,410	1,615	1,800
104	Beaver Creek near Ray, N. Dak.	1,490	1,210	1,430	1,420
105	White Earth River at White Earth, N. Dak.	1,630	1,095	1,355	1,350
106	Bear Den Creek near Mandaree, N. Dak.	2,000	1,505	1,835	1,815
107	Shell Creek near Parshall, N. Dak.	1,935	1,445	1,840	1,760
108	East Fork Shell Creek near Parshall, N. Dak.	2,469	2,019	2,336	2,230
109	Deepwater Creek near Mandaree, N. Dak.	1,908	1,096	1,485	1,326
110	Little Missouri River at Marmarth, N. Dak.	807	762	1,210	1,040
111	Deep Creek near Amidon, N. Dak.	3,480	2,720	2,810	3,100
112	Little Missouri River at Medora, N. Dak.	1,710	922	1,565	1,205
113	Beaver Creek near Trotters, N. Dak.	2,170	1,400	1,795	1,800
114	Little Missouri River near Watford City, N. Dak.	1,645	975	1,430	1,235
115	Missouri River at Garrison Dam, N. Dak.	429	423	418	424
116	Knife River at Manning, N. Dak.	1,650	806	1,165	1,160
117	Stray Creek near Manning, N. Dak.	1,450	1,720	2,045	1,610
118	Knife River at Marshall, N. Dak.	1,965	1,255	1,310	1,400
119	Elm Creek near Golden Valley, N. Dak.	912	743	1,155	762
120	Knife River near Golden Valley, N. Dak.	2,015	1,030	1,320	1,310

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Total dissolved solids, in mg/L—Continued					
121	Coyote Creek near Zap, N. Dak.	1,495	1,050	1,165	1,220
122	Brush Creek near Beulah, N. Dak.	1,375	1,165	1,240	1,270
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	1,330	1,090	1,760	1,300
124	Spring Creek near Halliday, N. Dak.	1,455	916	1,330	1,325
125	Spring Creek at Zap, N. Dak.	1,380	880	1,130	1,120
126	West Branch Otter Creek near Beulah, N. Dak.	236	833	867	833
127	Knife River at Hazen, N. Dak.	1,410	998	1,040	1,110
128	Antelope Creek above Hazen, N. Dak.	1,510	1,050	920	1,125
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	457	596	999	598
130	West Branch Antelope Creek near Hazen, N. Dak.	187	755	--	614
131	Coal Creek near Stanton, N. Dak.	1,855	1,285	915	1,445
132	Alderin Creek near Fort Clark, N. Dak.	1,615	902	1,240	1,075
133	Coal Lake Coulee near Hensler, N. Dak.	479	925	1,110	925
134	Buffalo Creek near Washburn, N. Dak.	1,820	1,056	1,670	1,655
135	Turtle Creek above Washburn, N. Dak.	1,408	1,190	1,329	1,310
136	Painted Woods Creek near Wilton, N. Dak.	1,530	953	1,250	1,140
137	Square Butte Creek near Hannover, N. Dak.	799	756	733	772
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	824	702	806	775
139	Hagel Creek near Center, N. Dak.	1,050	476	746	762
140	Square Butte Creek below Center, N. Dak.	729	793	903	839
141	Burnt Creek near Bismarck, N. Dak.	335	424	972	709
142	Missouri River at Bismarck, N. Dak.	433	436	436	436
143	South Branch Heart River near South Heart, N. Dak.	460	589	512	462
144	North Creek near South Heart, N. Dak.	2,730	959	566	1,175
145	Heart River near South Heart, N. Dak.	2,350	1,220	1,540	1,655
146	Heart River at Dickinson, N. Dak.	1,675	915	1,400	1,245
147	Green River near New Hradec, N. Dak.	720	559	712	685
148	Green River near Gladstone, N. Dak.	1,205	935	1,080	1,080
149	Heart River near Richardton, N. Dak.	1,575	941	1,230	1,130
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	--	751	1,150	1,010
151	Antelope Creek near Carson, N. Dak.	--	559	812	615
152	Big Muddy Creek near Almont, N. Dak.	--	748	1,515	1,130
153	Heart River near Lark, N. Dak.	897	626	877	750
154	Heart River at Stark Bridge near Judson, N. Dak.	--	728	991	886
155	Sweetbriar Creek near Judson, N. Dak.	1,080	573	1,040	809
156	Heart River near Mandan, N. Dak.	1,255	816	959	961
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	458	410	697	595
158	Apple Creek near Menoken, N. Dak.	1,195	601	999	970

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Total dissolved solids, in mg/L—Continued					
159	Missouri River near Schmidt, N. Dak.	441	441	442	441
160	Cannonball River at New England, N. Dak.	2,100	1,930	1,410	1,790
161	Coal Bank Creek near Havelock, N. Dak.	1,670	1,380	1,520	1,550
162	Cannonball River at Regent, N. Dak.	1,460	1,120	1,335	1,320
163	Cannonball River below Bentley, N. Dak.	1,750	1,115	1,670	1,530
164	Cannonball River near Raleigh, N. Dak.	2,100	1,150	1,240	1,235
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	3,970	2,125	2,650	2,575
166	Cedar Creek near Haynes, N. Dak.	2,100	1,175	1,620	1,520
167	Timber Creek near Bentley, N. Dak.	2,880	1,945	1,650	1,990
168	Cedar Creek near Pretty Rock, N. Dak.	2,160	1,640	1,970	1,900
169	Cedar Creek near Raleigh, N. Dak.	1,510	1,045	1,175	1,150
170	Cannonball River at Breien, N. Dak.	1,810	976	1,140	1,175
171	Beaver Creek near Linton, N. Dak.	819	364	563	538
172	Beaver Creek below Linton, N. Dak.	184	375	767	639
173	Porcupine Creek near Fort Yates, N. Dak.	--	766	788	777
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	4,780	3,900	3,650	4,270
175	James River near Manfred, N. Dak.	707	480	649	593
176	James River near Grace City, N. Dak.	1,040	476	660	646
177	James River above Arrowwood Lake near Kensal, N. Dak.	857	559	620	656
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	358	446	362
179	James River near Pingree, N. Dak.	584	467	590	552
180	Pipestem Creek near Pingree, N. Dak.	810	458	673	580
181	Pipestem Creek near Buchanan, N. Dak.	--	372	527	376
182	James River at Jamestown, N. Dak.	760	483	569	591
183	James River at Lamoure, N. Dak.	783	487	563	609
184	Bear Creek near Oakes, N. Dak.	--	557	989	857
185	James River at Oakes, N. Dak.	920	510	620	672
186	James River at N. Dak./S. Dak. State line	734	457	541	541
Ammonia, dissolved and total as N, in mg/L					
1	Bois De Sioux River near Doran, Minn.	<0.04	0.06	<0.04	<0.04
2	Red River of the North at Wahpeton, N. Dak.	0.18	<0.04	0.06	<0.04
3	Red River of the North near Wahpeton, N. Dak.	0.25	0.10	<0.04	0.10
4	Red River of the North at Brushville, Minn.	0.08	<0.04	<0.04	<0.04
5	Red River of the North below Wahpeton, N. Dak.	0.25	0.10	0.07	0.10
6	Red River of the North at Hickson, N. Dak.	0.12	0.06	<0.04	0.05
10	Wild Rice River near Abercrombie, N. Dak.	<0.04	0.05	<0.04	<0.04
11	Red River of the North at Fargo, N. Dak.	0.11	0.06	<0.04	<0.04
12	Red River of North below Fargo, N. Dak.	0.98	0.44	0.81	0.69

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Ammonia, dissolved and total as N, in mg/L—Continued					
13	Red River of the North at Harwood, N. Dak.	0.13	0.06	<0.04	0.07
14	Red River of the North near Harwood, N. Dak.	0.27	0.11	0.09	0.10
15	Sheyenne River above Harvey, N. Dak.	0.25	<0.04	<0.04	0.05
17	Sheyenne River at Warwick, N. Dak.	<0.04	<0.04	<0.04	<0.04
18	Sheyenne River near Warwick, N. Dak.	<0.04	<0.04	0.07	<0.04
20	Mauvais Coulee near Cando, N. Dak.	<0.04	<0.04	<0.04	<0.04
21	Edmore Coulee near Edmore, N. Dak.	0.05	0.05	<0.04	0.05
22	Edmore Coulee Tributary near Webster, N. Dak.	--	--	<0.04	<0.04
24	Starkweather Coulee near Webster, N. Dak.	--	0.08	<0.04	0.05
25	Big Coulee below Churchs Ferry, N. Dak.	--	0.06	0.81	0.09
28	Big Coulee near Churchs Ferry, N. Dak.	0.17	<0.04	0.10	0.09
30	Channel A near Penn, N. Dak.	0.06	0.05	0.06	0.05
32	Sheyenne River near Cooperstown, N. Dak.	<0.04	0.06	<0.04	<0.04
33	Baldhill Creek near Dazey, N. Dak.	0.13	0.06	<0.04	0.06
34	Sheyenne River below Baldhill Dam, N. Dak.	0.20	0.05	0.07	0.08
35	Sheyenne River at Valley City, N. Dak.	0.19	0.18	0.09	0.16
36	Sheyenne River at Lisbon, N. Dak.	0.06	<0.04	<0.04	<0.04
37	Sheyenne River near Kindred, N. Dak.	0.10	<0.04	<0.04	<0.04
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	0.07	<0.04	<0.04	<0.04
41	Sheyenne River at West Fargo, N. Dak.	<0.04	<0.04	<0.04	<0.04
45	Maple River below Mapleton, N. Dak.	<0.04	<0.04	<0.04	<0.04
46	Sheyenne River at Harwood, N. Dak.	0.10	0.05	<0.04	0.05
49	Lower Branch Rush River near Prosper, N. Dak.	--	<0.04	--	<0.04
50	Sheyenne River near Harwood, N. Dak.	0.26	0.22	0.19	0.19
51	Elm River near Kelso, N. Dak.	--	<0.04	0.27	0.11
52	Red River of the North at Halstad, Minn.	0.31	0.12	<0.04	0.11
53	Beaver Creek near Finley, N. Dak.	0.50	0.10	0.06	0.09
55	Goose River at Hillsboro, N. Dak.	0.16	<0.04	<0.04	<0.04
56	Red River of the North at Grand Forks, N. Dak.	0.10	<0.04	<0.04	<0.04
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	0.10	<0.04	<0.04	<0.04
58	Turtle River at Manvel, N. Dak.	0.37	<0.04	<0.04	<0.04
59	Red River of the North at Oslo, Minn.	0.53	0.29	<0.04	0.22
62	Forest River near Minto, N. Dak.	0.10	<0.04	<0.04	<0.04
67	Park River at Grafton, N. Dak.	0.12	<0.04	<0.04	<0.04
68	Red River of the North at Drayton, N. Dak.	<0.04	0.05	<0.04	<0.04
72	Pembina River near Vang, N. Dak.	0.05	<0.04	<0.04	<0.04
73	Little South Pembina River near Walhalla, N. Dak.	<0.04	<0.04	<0.04	<0.04
74	Pembina River at Walhalla, N. Dak.	0.08	0.07	<0.04	<0.04

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <. less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Ammonia, dissolved and total as N, in mg/L—Continued					
75	Pembina River at Neche, N. Dak.	<0.04	<0.04	<0.04	<0.04
76	Tongue River at Akra, N. Dak.	0.17	0.15	0.08	0.13
77	Red River of the North at Pembina, N. Dak., site 1	0.14	0.20	0.10	0.14
78	Red River of the North at Pembina, N. Dak., site 2	0.11	0.05	<0.04	<0.04
79	Red River of the North at Emerson, Manitoba	0.16	0.10	<0.04	0.09
80	Long Creek near Noonan, N. Dak.	<0.04	<0.04	<0.04	<0.04
81	West Branch Short Creek near Columbus, N. Dak.	0.13	0.06	<0.04	0.06
82	Souris River near Sherwood, N. Dak.	0.15	0.08	<0.04	0.07
83	Souris River near Foxholm, N. Dak.	0.16	0.06	0.07	0.10
84	Des Lacs River at Foxholm, N. Dak.	0.30	<0.04	<0.04	<0.04
85	Souris River above Minot, N. Dak.	0.17	<0.04	<0.04	<0.04
87	Souris River near Verendrye, N. Dak.	0.21	0.11	<0.04	0.09
88	Wintering River near Karlsruhe, N. Dak.	0.07	<0.04	<0.04	<0.04
89	Souris River near Bantry, N. Dak.	0.12	<0.04	<0.04	<0.04
90	Willow Creek near Willow City, N. Dak.	0.14	<0.04	<0.04	<0.04
91	Stone Creek near Kramer, N. Dak.	--	0.05	<0.04	<0.04
92	Deep River near Upham, N. Dak.	0.06	<0.04	<0.04	<0.04
95	Cut Bank Creek at Upham, N. Dak.	--	<0.04	<0.04	<0.04
96	Deep River below Cut Bank Creek near Upham, N. Dak.	--	0.05	0.09	0.07
97	Boundary Creek near Landa, N. Dak.	--	<0.04	<0.04	<0.04
98	Souris River near Westhope, N. Dak.	0.29	0.11	0.08	0.14
100	Missouri River near Williston, N. Dak.	<0.04	0.05	<0.04	<0.04
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	<0.04	<0.04	<0.04
102	Stony Creek near Williston, N. Dak.	0.08	0.10	<0.04	0.08
104	Beaver Creek near Ray, N. Dak.	0.05	0.08	<0.04	0.06
106	Bear Den Creek near Mandaree, N. Dak.	0.14	0.06	<0.04	0.05
108	East Fork Shell Creek near Parshall, N. Dak.	0.31	0.05	<0.04	<0.04
109	Deepwater Creek near Mandaree, N. Dak.	0.15	<0.04	<0.04	<0.04
110	Little Missouri River at Marmarth, N. Dak.	--	<0.04	<0.04	<0.04
111	Deep Creek near Amidon, N. Dak.	0.07	0.05	<0.04	<0.04
112	Little Missouri River at Medora, N. Dak.	<0.04	<0.04	<0.04	<0.04
113	Beaver Creek near Trotters, N. Dak.	0.07	<0.04	<0.04	<0.04
114	Little Missouri River near Watford City, N. Dak.	0.10	<0.04	<0.04	<0.04
115	Missouri River at Garrison Dam, N. Dak.	<0.04	<0.04	<0.04	<0.04
116	Knife River at Manning, N. Dak.	0.08	0.06	0.06	0.06
117	Stray Creek near Manning, N. Dak.	<0.04	0.08	0.05	0.06
118	Knife River at Marshall, N. Dak.	0.10	0.07	<0.04	0.07
119	Elm Creek near Golden Valley, N. Dak.	0.41	<0.04	0.08	0.06

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Ammonia, dissolved and total as N, in mg/L—Continued					
120	Knife River near Golden Valley, N. Dak.	<0.04	<0.04	<0.04	<0.04
121	Coyote Creek near Zap, N. Dak.	0.13	0.06	<0.04	0.06
122	Brush Creek near Beulah, N. Dak.	0.16	0.08	<0.04	0.07
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	0.33	0.07	0.07	0.09
124	Spring Creek near Halliday, N. Dak.	0.14	0.06	<0.04	0.06
125	Spring Creek at Zap, N. Dak.	0.09	0.05	<0.04	<0.04
127	Knife River at Hazen, N. Dak.	0.13	<0.04	<0.04	0.05
128	Antelope Creek above Hazen, N. Dak.	0.13	0.10	<0.04	0.10
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	--	<0.04	--	<0.04
130	West Branch Antelope Creek near Hazen, N. Dak.	0.40	0.19	--	0.20
131	Coal Creek near Stanton, N. Dak.	0.08	<0.04	0.10	0.05
132	Alderin Creek near Fort Clark, N. Dak.	0.11	0.15	<0.04	0.07
133	Coal Lake Coulee near Hensler, N. Dak.	0.12	0.07	0.05	0.06
134	Buffalo Creek near Washburn, N. Dak.	0.16	0.15	<0.04	0.11
135	Turtle Creek above Washburn, N. Dak.	0.17	<0.04	<0.04	<0.04
136	Painted Woods Creek near Wilton, N. Dak.	<0.04	<0.04	<0.04	<0.04
137	Square Butte Creek near Hannover, N. Dak.	0.05	0.05	0.06	0.05
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	0.21	0.23	0.10	0.13
139	Hagel Creek near Center, N. Dak.	0.19	0.17	0.06	0.14
140	Square Butte Creek below Center, N. Dak.	1.00	0.42	0.43	0.59
142	Missouri River at Bismarck, N. Dak.	<0.04	<0.04	<0.04	<0.04
143	South Branch Heart River near South Heart, N. Dak.	0.12	0.12	0.05	0.09
144	North Creek near South Heart, N. Dak.	<0.04	0.10	0.07	0.07
145	Heart River near South Heart, N. Dak.	0.13	0.12	0.05	0.09
146	Heart River at Dickinson, N. Dak.	0.41	0.14	0.48	0.23
147	Green River near New Hradec, N. Dak.	0.07	0.10	<0.04	0.06
148	Green River near Gladstone, N. Dak.	0.13	<0.04	0.09	0.07
149	Heart River near Richardton, N. Dak.	<0.04	<0.04	<0.04	<0.04
152	Big Muddy Creek near Almont, N. Dak.	--	0.06	--	0.06
156	Heart River near Mandan, N. Dak.	0.08	<0.04	<0.04	<0.04
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	--	0.16	0.09	0.09
158	Apple Creek near Menoken, N. Dak.	0.12	0.08	<0.04	0.07
159	Missouri River near Schmidt, N. Dak.	<0.04	<0.04	<0.04	<0.04
160	Cannonball River at New England, N. Dak.	0.13	0.09	<0.04	0.07
161	Coal Bank Creek near Havelock, N. Dak.	0.10	0.05	0.05	0.05
162	Cannonball River at Regent, N. Dak.	0.08	<0.04	0.05	0.05
164	Cannonball River near Raleigh, N. Dak.	<0.04	<0.04	<0.04	<0.04
167	Timber Creek near Bentley, N. Dak.	0.14	0.08	<0.04	0.06

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Ammonia, dissolved and total as N, in mg/L—Continued					
169	Cedar Creek near Raleigh, N. Dak.	<0.04	<0.04	<0.04	<0.04
170	Cannonball River at Breien, N. Dak.	0.06	<0.04	<0.04	<0.04
171	Beaver Creek near Linton, N. Dak.	--	0.08	0.06	0.07
173	Porcupine Creek near Fort Yates, N. Dak.	--	<0.04	<0.04	<0.04
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	0.12	0.10	0.09	0.10
175	James River near Manfred, N. Dak.	<0.04	0.05	<0.04	<0.04
176	James River near Grace City, N. Dak.	<0.04	<0.04	<0.04	<0.04
177	James River above Arrowwood Lake near Kensal, N. Dak.	0.10	<0.04	<0.04	<0.04
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	0.06	<0.04	<0.04
179	James River near Pingree, N. Dak.	<0.04	<0.04	<0.04	<0.04
180	Pipestem Creek near Pingree, N. Dak.	<0.04	<0.04	<0.04	<0.04
181	Pipestem Creek near Buchanan, N. Dak.	--	0.06	0.11	0.10
182	James River at Jamestown, N. Dak.	0.23	0.12	<0.04	0.09
183	James River at Lamoure, N. Dak.	0.16	0.05	<0.04	<0.04
184	Bear Creek near Oakes, N. Dak.	--	0.14	0.14	0.14
185	James River at Oakes, N. Dak.	0.08	0.07	0.05	0.07
186	James River at N. Dak./S. Dak. State line	--	0.06	<0.04	0.06
Nitrate + Nitrite dissolved and total as N, in mg/L					
1	Bois De Sioux River near Doran, Minn.	0.28	0.24	<0.10	0.14
2	Red River of the North at Wahpeton, N. Dak.	0.17	0.24	<0.10	0.12
3	Red River of the North near Wahpeton, N. Dak.	0.29	<0.10	<0.10	<0.10
4	Red River of the North at Brushville, Minn.	0.21	0.12	0.15	0.16
5	Red River of the North below Wahpeton, N. Dak.	0.14	0.13	<0.10	<0.10
6	Red River of the North at Hickson, N. Dak.	0.17	0.19	<0.10	<0.10
7	Wild Rice River near Rutland, N. Dak.	--	0.27	<0.10	<0.10
10	Wild Rice River near Abercrombie, N. Dak.	<0.10	0.11	<0.10	<0.10
11	Red River of the North at Fargo, N. Dak.	0.19	0.29	0.13	0.19
12	Red River of North below Fargo, N. Dak.	0.26	0.41	0.31	0.31
13	Red River of the North at Harwood, N. Dak.	0.92	0.83	0.80	0.88
14	Red River of the North near Harwood, N. Dak.	0.48	0.48	0.54	0.48
15	Sheyenne River above Harvey, N. Dak.	0.11	<0.10	<0.10	<0.10
17	Sheyenne River at Warwick, N. Dak.	0.52	0.14	0.17	0.19
18	Sheyenne River near Warwick, N. Dak.	0.13	<0.10	<0.10	<0.10
20	Mauvais Coulee near Cando, N. Dak.	<0.10	<0.10	<0.10	<0.10
21	Edmore Coulee near Edmore, N. Dak.	<0.10	0.48	<0.10	<0.10
22	Edmore Coulee Tributary near Webster, N. Dak.	--	--	<0.10	<0.10
24	Starkweather Coulee near Webster, N. Dak.	--	0.60	<0.10	0.11
25	Big Coulee below Churchs Ferry, N. Dak.	--	0.16	<0.10	<0.10

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <. less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Nitrate + Nitrite dissolved and total as N, in mg/L—Continued					
27	Little Coulee near Brinsmade, N. Dak.	--	0.41	0.16	0.23
28	Big Coulee near Churchs Ferry, N. Dak.	0.68	0.27	0.22	0.27
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	0.15	<0.10	<0.10	<0.10
30	Channel A near Penn, N. Dak.	<0.10	<0.10	<0.10	<0.10
32	Sheyenne River near Cooperstown, N. Dak.	0.17	<0.10	0.15	0.13
33	Baldhill Creek near Dazey, N. Dak.	<0.10	0.26	<0.10	<0.10
34	Sheyenne River below Baldhill Dam, N. Dak.	0.20	0.27	<0.10	0.13
35	Sheyenne River at Valley City, N. Dak.	0.21	0.23	0.15	0.21
36	Sheyenne River at Lisbon, N. Dak.	0.37	0.37	<0.10	0.21
37	Sheyenne River near Kindred, N. Dak.	0.40	0.22	<0.10	0.13
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	0.48	0.27	<0.10	<0.10
39	Sheyenne River near Horace, N. Dak.	0.33	0.37	<0.10	0.19
41	Sheyenne River at West Fargo, N. Dak.	0.29	0.30	<0.10	<0.10
42	Maple River near Hope, N. Dak.	--	--	<0.10	<0.10
45	Maple River below Mapleton, N. Dak.	1.28	0.11	<0.10	<0.10
46	Sheyenne River at Harwood, N. Dak.	0.61	0.41	0.29	0.36
49	Lower Branch Rush River near Prosper, N. Dak.	--	0.30	--	0.30
50	Sheyenne River near Harwood, N. Dak.	0.20	0.49	0.16	0.21
51	Elm River near Kelso, N. Dak.	--	0.50	<0.10	<0.10
52	Red River of the North at Halstad, Minn.	0.37	0.63	0.36	0.43
53	Beaver Creek near Finley, N. Dak.	<0.10	<0.10	<0.10	<0.10
55	Goose River at Hillsboro, N. Dak.	2.11	0.25	0.30	0.39
56	Red River of the North at Grand Forks, N. Dak.	0.44	0.44	0.37	0.40
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	0.69	0.33	0.15	0.32
58	Turtle River at Manvel, N. Dak.	0.89	0.15	<0.10	0.16
59	Red River of the North at Oslo, Minn.	0.23	0.45	<0.10	0.22
62	Forest River near Minto, N. Dak.	2.00	0.39	0.37	0.48
63	South Branch Park River below Homme Dam, N. Dak.	--	<0.10	--	<0.10
64	Middle Branch Park River near Union, N. Dak.	--	--	0.92	0.92
65	Middle Branch Park River near Edinburg, N. Dak.	--	1.55	0.23	0.83
66	Cart Creek at Mountain, N. Dak.	--	1.60	--	1.60
67	Park River at Grafton, N. Dak.	1.29	0.96	0.28	0.54
68	Red River of the North at Drayton, N. Dak.	0.23	0.50	0.26	0.37
72	Pembina River near Vang, N. Dak.	<0.10	0.57	<0.10	0.14
73	Little South Pembina River near Walhalla, N. Dak.	0.75	1.00	<0.10	0.64
74	Pembina River at Walhalla, N. Dak.	0.12	0.34	<0.10	0.13
75	Pembina River at Neche, N. Dak.	0.69	0.23	<0.10	0.17
76	Tongue River at Akra, N. Dak.	0.12	0.23	<0.10	<0.10

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <. less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Nitrate + Nitrite dissolved and total as N, in mg/L—Continued					
77	Red River of the North at Pembina, N. Dak., site 1	0.22	0.68	0.21	0.32
78	Red River of the North at Pembina, N. Dak., site 2	0.53	0.53	0.39	0.43
79	Red River of the North at Emerson, Manitoba	0.34	0.50	0.16	0.34
80	Long Creek near Noonan, N. Dak.	<0.10	<0.10	<0.10	<0.10
81	West Branch Short Creek near Columbus, N. Dak.	<0.10	<0.10	<0.10	<0.10
82	Souris River near Sherwood, N. Dak.	<0.10	0.12	<0.10	<0.10
83	Souris River near Foxholm, N. Dak.	<0.10	<0.10	<0.10	<0.10
84	Des Lacs River at Foxholm, N. Dak.	0.15	<0.10	<0.10	<0.10
85	Souris River above Minot, N. Dak.	0.11	<0.10	<0.10	<0.10
87	Souris River near Verendrye, N. Dak.	0.31	0.16	<0.10	<0.10
88	Wintering River near Karlsruhe, N. Dak.	<0.10	<0.10	<0.10	<0.10
89	Souris River near Bantry, N. Dak.	0.14	<0.10	<0.10	<0.10
90	Willow Creek near Willow City, N. Dak.	0.26	<0.10	<0.10	<0.10
91	Stone Creek near Kramer, N. Dak.	--	<0.10	<0.10	<0.10
92	Deep River near Upham, N. Dak.	0.57	<0.10	<0.10	<0.10
93	Egg Creek near Granville, N. Dak.	--	0.11	<0.10	<0.10
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	--	<0.10	<0.10	<0.10
95	Cut Bank Creek at Upham, N. Dak.	<0.10	<0.10	<0.10	<0.10
96	Deep River below Cut Bank Creek near Upham, N. Dak.	0.11	<0.10	<0.10	<0.10
97	Boundary Creek near Landa, N. Dak.	--	<0.10	<0.10	<0.10
98	Souris River near Westhope, N. Dak.	<0.10	<0.10	<0.10	<0.10
100	Missouri River near Williston, N. Dak.	0.22	0.18	<0.10	0.16
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	<0.10	<0.10	<0.10
102	Stony Creek near Williston, N. Dak.	<0.10	0.25	<0.10	<0.10
104	Beaver Creek near Ray, N. Dak.	<0.10	0.12	<0.10	<0.10
106	Bear Den Creek near Mandaree, N. Dak.	<0.10	<0.10	<0.10	<0.10
108	East Fork Shell Creek near Parshall, N. Dak.	0.18	<0.10	<0.10	<0.10
109	Deepwater Creek near Mandaree, N. Dak.	0.37	<0.10	<0.10	<0.10
110	Little Missouri River at Marmarth, N. Dak.	--	0.12	<0.10	<0.10
111	Deep Creek near Amidon, N. Dak.	<0.10	<0.10	<0.10	<0.10
112	Little Missouri River at Medora, N. Dak.	<0.10	0.12	<0.10	<0.10
113	Beaver Creek near Trotters, N. Dak.	0.15	<0.10	<0.10	<0.10
114	Little Missouri River near Watford City, N. Dak.	0.11	0.28	<0.10	0.13
115	Missouri River at Garrison Dam, N. Dak.	0.12	<0.10	0.12	0.11
116	Knife River at Manning, N. Dak.	0.23	<0.10	<0.10	<0.10
117	Stray Creek near Manning, N. Dak.	<0.10	<0.10	<0.10	<0.10
118	Knife River at Marshall, N. Dak.	0.33	<0.10	<0.10	<0.10
119	Elm Creek near Golden Valley, N. Dak.	0.20	<0.10	<0.10	<0.10

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Nitrate + Nitrite dissolved and total as N, in mg/L—Continued					
120	Knife River near Golden Valley, N. Dak.	0.13	<0.10	<0.10	<0.10
121	Coyote Creek near Zap, N. Dak.	0.12	<0.10	<0.10	<0.10
122	Brush Creek near Beulah, N. Dak.	<0.10	<0.10	<0.10	<0.10
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	0.19	<0.10	<0.10	<0.10
124	Spring Creek near Halliday, N. Dak.	0.18	<0.10	<0.10	<0.10
125	Spring Creek at Zap, N. Dak.	0.18	<0.10	<0.10	<0.10
127	Knife River at Hazen, N. Dak.	0.25	<0.10	<0.10	<0.10
128	Antelope Creek above Hazen, N. Dak.	0.35	0.14	<0.10	0.18
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	--	0.21	--	0.21
130	West Branch Antelope Creek near Hazen, N. Dak.	0.78	<0.10	--	0.14
131	Coal Creek near Stanton, N. Dak.	<0.10	<0.10	<0.10	<0.10
132	Alderin Creek near Fort Clark, N. Dak.	0.11	0.15	<0.10	<0.10
133	Coal Lake Coulee near Hensler, N. Dak.	0.19	0.16	<0.10	<0.10
134	Buffalo Creek near Washburn, N. Dak.	0.12	<0.10	<0.10	<0.10
135	Turtle Creek above Washburn, N. Dak.	<0.10	<0.10	<0.10	<0.10
136	Painted Woods Creek near Wilton, N. Dak.	<0.10	<0.10	<0.10	<0.10
137	Square Butte Creek near Hannover, N. Dak.	<0.10	<0.10	<0.10	<0.10
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	1.95	0.60	0.51	0.75
139	Hagel Creek near Center, N. Dak.	<0.10	<0.10	<0.10	<0.10
140	Square Butte Creek below Center, N. Dak.	0.20	0.32	0.20	0.23
142	Missouri River at Bismarck, N. Dak.	0.15	0.11	0.13	0.12
143	South Branch Heart River near South Heart, N. Dak.	0.72	0.17	0.26	0.29
144	North Creek near South Heart, N. Dak.	<0.10	<0.10	0.16	<0.10
145	Heart River near South Heart, N. Dak.	0.11	<0.10	<0.10	<0.10
146	Heart River at Dickinson, N. Dak.	0.14	0.13	<0.10	<0.10
147	Green River near New Hradec, N. Dak.	0.20	<0.10	<0.10	<0.10
148	Green River near Gladstone, N. Dak.	<0.10	<0.10	<0.10	<0.10
149	Heart River near Richardton, N. Dak.	0.18	<0.10	<0.10	<0.10
152	Big Muddy Creek near Almont, N. Dak.	--	<0.10	--	<0.10
156	Heart River near Mandan, N. Dak.	0.20	<0.10	<0.10	<0.10
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	--	0.23	<0.10	<0.10
158	Apple Creek near Menoken, N. Dak.	0.11	<0.10	<0.10	<0.10
159	Missouri River near Schmidt, N. Dak.	0.14	0.11	0.14	0.13
160	Cannonball River at New England, N. Dak.	<0.10	<0.10	<0.10	<0.10
161	Coal Bank Creek near Havelock, N. Dak.	<0.10	0.17	<0.10	<0.10
162	Cannonball River at Regent, N. Dak.	0.31	<0.10	<0.10	<0.10
164	Cannonball River near Raleigh, N. Dak.	<0.10	<0.10	<0.10	<0.10
166	Cedar Creek near Haynes, N. Dak.	--	<0.10	--	<0.10

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Nitrate + Nitrite dissolved and total as N, in mg/L—Continued					
167	Timber Creek near Bentley, N. Dak.	2.40	0.27	<0.10	0.38
169	Cedar Creek near Raleigh, N. Dak.	<0.10	<0.10	<0.10	<0.10
170	Cannonball River at Breien, N. Dak.	0.11	<0.10	<0.10	<0.10
171	Beaver Creek near Linton, N. Dak.	--	0.15	<0.10	<0.10
173	Porcupine Creek near Fort Yates, N. Dak.	--	<0.10	<0.10	<0.10
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	<0.10	<0.10	<0.10	<0.10
175	James River near Manfred, N. Dak.	<0.10	<0.10	<0.10	<0.10
176	James River near Grace City, N. Dak.	<0.10	<0.10	<0.10	<0.10
177	James River above Arrowwood Lake near Kensal, N. Dak.	<0.10	<0.10	<0.10	<0.10
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	<0.10	<0.10	<0.10
179	James River near Pingree, N. Dak.	<0.10	<0.10	<0.10	<0.10
180	Pipestem Creek near Pingree, N. Dak.	<0.10	<0.10	<0.10	<0.10
181	Pipestem Creek near Buchanan, N. Dak.	--	<0.10	<0.10	<0.10
182	James River at Jamestown, N. Dak.	0.23	0.30	0.20	0.22
183	James River at Lamoure, N. Dak.	0.22	0.19	<0.10	0.14
184	Bear Creek near Oakes, N. Dak.	--	0.19	0.29	0.22
185	James River at Oakes, N. Dak.	<0.10	<0.10	<0.10	<0.10
186	James River at N. Dak./S. Dak. State line	<0.10	<0.10	<0.10	<0.10
Phosphorus, dissolved as P, in mg/L					
1	Bois De Sioux River near Doran, Minn.	0.05	0.24	0.19	0.16
2	Red River of the North at Wahpeton, N. Dak.	--	0.04	0.02	0.02
3	Red River of the North near Wahpeton, N. Dak.	--	--	<0.01	<0.01
4	Red River of the North at Brushville, Minn.	0.06	0.14	0.12	0.09
5	Red River of the North below Wahpeton, N. Dak.	0.14	0.08	0.10	0.09
6	Red River of the North at Hickson, N. Dak.	0.07	0.08	0.09	0.08
7	Wild Rice River near Rutland, N. Dak.	--	0.09	0.10	0.10
8	Wild Rice River near Cayuga, N. Dak.	0.12	0.26	--	0.12
10	Wild Rice River near Abercrombie, N. Dak.	0.25	0.21	0.29	0.25
11	Red River of the North at Fargo, N. Dak.	0.10	0.11	0.12	0.11
12	Red River of North below Fargo, N. Dak.	0.16	0.14	0.16	0.15
13	Red River of the North at Harwood, N. Dak.	0.35	0.16	0.24	0.22
14	Red River of the North near Harwood, N. Dak.	0.17	0.14	0.20	0.17
15	Sheyenne River above Harvey, N. Dak.	0.25	0.22	0.16	0.20
16	Big Coulee near Fort Totten, N. Dak.	--	0.04	--	0.04
17	Sheyenne River at Warwick, N. Dak.	--	0.18	0.22	0.21
18	Sheyenne River near Warwick, N. Dak.	0.08	0.15	0.16	0.13
20	Mauvais Coulee near Cando, N. Dak.	0.28	0.26	0.29	0.28
21	Edmore Coulee near Edmore, N. Dak.	0.20	0.21	0.53	0.21

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Phosphorus, dissolved as P, in mg/L—Continued					
24	Starkweather Coulee near Webster, N. Dak.	--	0.29	--	0.29
27	Little Coulee near Brinsmade, N. Dak.	--	0.36	0.35	0.36
28	Big Coulee near Churchs Ferry, N. Dak.	0.19	0.16	0.36	0.26
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	0.40	0.21	0.32	0.28
30	Channel A near Penn, N. Dak.	0.04	--	0.62	0.55
32	Sheyenne River near Cooperstown, N. Dak.	0.12	0.17	0.19	0.16
33	Baldhill Creek near Dazey, N. Dak.	0.02	0.12	0.03	0.04
34	Sheyenne River below Baldhill Dam, N. Dak.	0.24	0.18	0.23	0.22
36	Sheyenne River at Lisbon, N. Dak.	0.16	0.13	0.07	0.11
37	Sheyenne River near Kindred, N. Dak.	0.08	0.07	0.06	0.07
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	0.20	0.11	0.11	0.11
39	Sheyenne River near Horace, N. Dak.	0.06	0.09	0.08	0.07
41	Sheyenne River at West Fargo, N. Dak.	--	0.17	0.14	0.16
45	Maple River below Mapleton, N. Dak.	2.10	0.47	0.19	0.45
46	Sheyenne River at Harwood, N. Dak.	0.13	0.17	0.15	0.15
50	Sheyenne River near Harwood, N. Dak.	0.17	0.20	--	0.17
52	Red River of the North at Halstad, Minn.	0.14	0.15	0.19	0.16
53	Beaver Creek near Finley, N. Dak.	0.10	0.10	0.17	0.11
55	Goose River at Hillsboro, N. Dak.	0.03	0.03	0.05	0.04
56	Red River of the North at Grand Forks, N. Dak.	0.15	0.10	0.14	0.13
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	0.04	0.07	0.14	0.07
58	Turtle River at Manvel, N. Dak.	0.06	0.07	0.07	0.06
59	Red River of the North at Oslo, Minn.	0.23	0.10	0.08	0.10
62	Forest River near Minto, N. Dak.	0.05	0.07	0.10	0.08
67	Park River at Grafton, N. Dak.	0.07	0.13	0.11	0.11
68	Red River of the North at Drayton, N. Dak.	--	0.09	0.07	0.07
72	Pembina River near Vang, N. Dak.	0.10	0.17	0.13	0.14
73	Little South Pembina River near Walhalla, N. Dak.	0.11	0.20	0.15	0.17
74	Pembina River at Walhalla, N. Dak.	0.06	0.15	0.14	0.13
75	Pembina River at Neche, N. Dak.	0.10	0.22	0.21	0.20
76	Tongue River at Akra, N. Dak.	0.02	0.07	0.09	0.07
78	Red River of the North at Pembina, N. Dak., site 2	0.13	0.16	0.14	0.14
79	Red River of the North at Emerson, Manitoba	0.09	0.10	0.12	0.11
81	West Branch Short Creek near Columbus, N. Dak.	0.05	0.09	0.36	0.09
82	Souris River near Sherwood, N. Dak.	0.06	0.08	0.09	0.08
83	Souris River near Foxholm, N. Dak.	--	0.06	--	0.06
84	Des Lacs River at Foxholm, N. Dak.	0.05	0.12	0.25	0.12
85	Souris River above Minot, N. Dak.	0.17	0.15	0.33	0.18

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Phosphorus, dissolved as P, in mg/L—Continued					
87	Souris River near Verendrye, N. Dak.	0.13	0.14	0.22	0.16
88	Wintering River near Karlsruhe, N. Dak.	0.02	0.12	0.08	0.08
89	Souris River near Bantry, N. Dak.	0.23	0.12	0.24	0.20
90	Willow Creek near Willow City, N. Dak.	0.15	0.08	0.21	0.15
91	Stone Creek near Kramer, N. Dak.	--	0.29	0.44	0.30
92	Deep River near Upham, N. Dak.	0.02	0.15	0.16	0.14
93	Egg Creek near Granville, N. Dak.	--	0.26	2.15	0.32
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	--	0.23	0.06	0.23
95	Cut Bank Creek at Upham, N. Dak.	0.88	0.13	0.14	0.14
96	Deep River below Cut Bank Creek near Upham, N. Dak.	0.67	0.13	0.23	0.16
97	Boundary Creek near Landa, N. Dak.	--	0.24	0.30	0.25
98	Souris River near Westhope, N. Dak.	0.16	0.16	0.20	0.18
100	Missouri River near Williston, N. Dak.	0.06	0.06	--	0.06
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	0.20	0.03	0.05
102	Stony Creek near Williston, N. Dak.	0.02	0.06	0.02	0.03
104	Beaver Creek near Ray, N. Dak.	<0.01	0.04	0.03	0.02
106	Bear Den Creek near Mandaree, N. Dak.	<0.01	0.03	0.02	0.02
110	Little Missouri River at Marmarth, N. Dak.	--	0.12	0.03	0.05
111	Deep Creek near Amidon, N. Dak.	<0.01	<0.01	<0.01	<0.01
112	Little Missouri River at Medora, N. Dak.	0.02	0.03	<0.01	0.02
113	Beaver Creek near Trotters, N. Dak.	<0.01	<0.01	0.02	<0.01
114	Little Missouri River near Watford City, N. Dak.	0.02	0.02	<0.01	<0.01
115	Missouri River at Garrison Dam, N. Dak.	<0.01	<0.01	<0.01	<0.01
116	Knife River at Manning, N. Dak.	0.03	0.03	0.03	0.03
117	Stray Creek near Manning, N. Dak.	0.06	0.08	0.04	0.06
118	Knife River at Marshall, N. Dak.	0.02	0.03	0.03	0.02
119	Elm Creek near Golden Valley, N. Dak.	0.17	0.06	0.08	0.10
120	Knife River near Golden Valley, N. Dak.	0.02	0.05	0.02	0.03
121	Coyote Creek near Zap, N. Dak.	0.02	0.03	0.02	0.02
122	Brush Creek near Beulah, N. Dak.	0.02	0.04	0.03	0.03
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	0.05	0.04	0.06	0.05
124	Spring Creek near Halliday, N. Dak.	0.02	0.03	0.02	0.02
125	Spring Creek at Zap, N. Dak.	<0.01	0.04	0.02	<0.01
127	Knife River at Hazen, N. Dak.	<0.01	0.02	0.02	0.02
128	Antelope Creek above Hazen, N. Dak.	0.07	0.07	0.16	0.07
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	--	0.10	--	0.10
130	West Branch Antelope Creek near Hazen, N. Dak.	0.45	0.18	--	0.19
131	Coal Creek near Stanton, N. Dak.	0.06	0.06	0.19	0.06

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Phosphorus, dissolved as P, in mg/L—Continued					
132	Alderin Creek near Fort Clark, N. Dak.	0.04	0.04	0.02	0.03
133	Coal Lake Coulee near Hensler, N. Dak.	0.11	0.05	0.12	0.07
134	Buffalo Creek near Washburn, N. Dak.	0.02	0.08	0.05	0.05
136	Painted Woods Creek near Wilton, N. Dak.	0.07	0.10	0.05	0.07
137	Square Butte Creek near Hannover, N. Dak.	0.03	0.05	0.08	0.05
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	<0.01	0.02	0.02	<0.01
139	Hagel Creek near Center, N. Dak.	0.04	0.06	0.08	0.06
142	Missouri River at Bismarck, N. Dak.	0.02	<0.01	<0.01	<0.01
143	South Branch Heart River near South Heart, N. Dak.	0.25	0.08	0.12	0.10
144	North Creek near South Heart, N. Dak.	0.06	0.05	0.08	0.06
145	Heart River near South Heart, N. Dak.	0.11	0.06	0.10	0.10
147	Green River near New Hradec, N. Dak.	0.02	0.03	0.02	0.02
149	Heart River near Richardton, N. Dak.	<0.01	0.03	<0.01	<0.01
156	Heart River near Mandan, N. Dak.	<0.01	<0.01	<0.01	<0.01
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	--	0.16	0.71	0.22
158	Apple Creek near Menoken, N. Dak.	0.25	0.22	0.58	0.28
159	Missouri River near Schmidt, N. Dak.	--		0.03	0.03
160	Cannonball River at New England, N. Dak.	0.02	0.02	0.02	0.02
161	Coal Bank Creek near Havelock, N. Dak.	0.03	0.02	0.02	0.02
162	Cannonball River at Regent, N. Dak.	<0.01	<0.01	0.02	<0.01
164	Cannonball River near Raleigh, N. Dak.	<0.01	0.02	<0.01	<0.01
166	Cedar Creek near Haynes, N. Dak.	--	0.02	--	0.02
167	Timber Creek near Bentley, N. Dak.	0.02	0.02	0.02	0.02
169	Cedar Creek near Raleigh, N. Dak.	<0.01	0.03	<0.01	0.02
170	Cannonball River at Breien, N. Dak.	<0.01	0.02	<0.01	<0.01
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	0.02	0.04	0.04	0.03
175	James River near Manfred, N. Dak.	0.11	0.23	0.33	0.23
176	James River near Grace City, N. Dak.	0.12	0.19	0.20	0.18
177	James River above Arrowwood Lake near Kensal, N. Dak.	0.08	0.15	0.15	0.13
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	0.04	0.26	0.07
179	James River near Pingree, N. Dak.	0.05	0.09	0.17	0.11
182	James River at Jamestown, N. Dak.	0.06	0.14	0.10	0.09
183	James River at Lamoure, N. Dak.	0.09	0.13	0.15	0.13
185	James River at Oakes, N. Dak.	0.10	0.10	0.14	0.12
186	James River at N. Dak./S. Dak. State line	0.13	0.11	0.14	0.13
Phosphorus, total as P, in mg/L					
1	Bois De Sioux River near Doran, Minn.	0.12	0.17	0.29	0.23
2	Red River of the North at Wahpeton, N. Dak.	0.11	0.25	0.14	0.15

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Phosphorus, total as P, in mg/L—Continued					
3	Red River of the North near Wahpeton, N. Dak.	0.04	0.14	0.02	0.09
4	Red River of the North at Brushville, Minn.	0.09	0.13	0.17	0.16
5	Red River of the North below Wahpeton, N. Dak.	0.13	0.13	0.16	0.15
6	Red River of the North at Hickson, N. Dak.	0.09	0.19	0.18	0.18
10	Wild Rice River near Abercrombie, N. Dak.	0.17	0.21	0.22	0.21
11	Red River of the North at Fargo, N. Dak.	0.15	0.21	0.19	0.19
12	Red River of North below Fargo, N. Dak.	0.42	0.47	0.62	0.47
13	Red River of the North at Harwood, N. Dak.	0.24	0.27	0.34	0.30
14	Red River of the North near Harwood, N. Dak.	0.16	0.24	0.30	0.27
15	Sheyenne River above Harvey, N. Dak.	--	0.23	0.21	0.22
17	Sheyenne River at Warwick, N. Dak.	0.14	0.20	0.29	0.20
18	Sheyenne River near Warwick, N. Dak.	0.08	0.16	0.32	0.21
20	Mauvais Coulee near Cando, N. Dak.	0.32	0.31	0.46	0.33
21	Edmore Coulee near Edmore, N. Dak.	0.26	0.37	0.44	0.40
22	Edmore Coulee Tributary near Webster, N. Dak.	--	--	0.31	0.31
24	Starkweather Coulee near Webster, N. Dak.	--	0.33	0.24	0.29
25	Big Coulee below Churchs Ferry, N. Dak.	--	0.30	0.74	0.38
28	Big Coulee near Churchs Ferry, N. Dak.	0.44	0.33	0.46	0.40
30	Channel A near Penn, N. Dak.	0.10	0.29	0.33	0.30
32	Sheyenne River near Cooperstown, N. Dak.	0.11	0.22	0.24	0.21
33	Baldhill Creek near Dazey, N. Dak.	0.05	0.18	0.10	0.14
34	Sheyenne River below Baldhill Dam, N. Dak.	0.24	0.21	0.27	0.24
35	Sheyenne River at Valley City, N. Dak.	0.15	0.22	0.41	0.28
36	Sheyenne River at Lisbon, N. Dak.	0.24	0.22	0.23	0.22
37	Sheyenne River near Kindred, N. Dak.	0.14	0.21	0.15	0.18
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	0.26	0.26	0.15	0.22
41	Sheyenne River at West Fargo, N. Dak.	0.14	0.24	0.29	0.24
45	Maple River below Mapleton, N. Dak.	0.51	0.29	0.25	0.26
46	Sheyenne River at Harwood, N. Dak.	0.16	0.39	0.42	0.38
49	Lower Branch Rush River near Prosper, N. Dak.	--	0.25	--	0.25
50	Sheyenne River near Harwood, N. Dak.	0.20	0.35	0.34	0.30
51	Elm River near Kelso, N. Dak.	--	0.39	0.70	0.51
52	Red River of the North at Halstad, Minn.	0.18	0.30	0.31	0.28
53	Beaver Creek near Finley, N. Dak.	0.11	0.17	0.24	0.18
55	Goose River at Hillsboro, N. Dak.	0.09	0.08	0.13	0.09
56	Red River of the North at Grand Forks, N. Dak.	0.13	0.21	0.18	0.18
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	0.05	0.10	0.21	0.09
58	Turtle River at Manvel, N. Dak.	0.07	0.15	0.17	0.15

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Phosphorus, total as P, in mg/L—Continued					
59	Red River of the North at Oslo, Minn.	0.21	0.27	0.20	0.22
62	Forest River near Minto, N. Dak.	0.08	0.12	0.13	0.11
67	Park River at Grafton, N. Dak.	0.10	0.14	0.20	0.14
68	Red River of the North at Drayton, N. Dak.	0.18	0.17	0.16	0.17
73	Little South Pembina River near Walhalla, N. Dak.	--	0.34	0.24	0.29
74	Pembina River at Walhalla, N. Dak.	0.13	0.26	0.23	0.23
75	Pembina River at Neche, N. Dak.	0.10	0.52	0.25	0.26
76	Tongue River at Akra, N. Dak.	0.05	0.12	0.18	0.14
77	Red River of the North at Pembina, N. Dak., site 1	0.10	0.25	0.39	0.25
78	Red River of the North at Pembina, N. Dak., site 2	0.17	0.28	0.24	0.25
79	Red River of the North at Emerson, Manitoba	0.12	0.23	0.20	0.19
80	Long Creek near Noonan, N. Dak.	0.08	0.17	0.37	0.17
81	West Branch Short Creek near Columbus, N. Dak.	0.15	0.12	0.49	0.17
82	Souris River near Sherwood, N. Dak.	0.09	0.22	0.19	0.18
83	Souris River near Foxholm, N. Dak.	0.11	0.27	0.36	0.24
84	Des Lacs River at Foxholm, N. Dak.	0.16	0.24	0.40	0.27
85	Souris River above Minot, N. Dak.	0.21	0.20	0.36	0.27
87	Souris River near Verendrye, N. Dak.	0.17	0.26	0.36	0.27
88	Wintering River near Karlsruhe, N. Dak.	0.04	0.11	0.13	0.09
89	Souris River near Bantry, N. Dak.	0.16	0.19	0.34	0.26
90	Willow Creek near Willow City, N. Dak.	0.20	0.16	0.25	0.20
91	Stone Creek near Kramer, N. Dak.	--	0.35	0.56	0.36
92	Deep River near Upham, N. Dak.	0.06	0.13	0.23	0.17
95	Cut Bank Creek at Upham, N. Dak.	--	0.25	0.16	0.20
96	Deep River below Cut Bank Creek near Upham, N. Dak.	--	0.15	0.20	0.18
97	Boundary Creek near Landa, N. Dak.	--	0.25	0.48	0.27
98	Souris River near Westhope, N. Dak.	0.21	0.25	0.31	0.27
100	Missouri River near Williston, N. Dak.	0.04	0.20	0.11	0.10
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	0.26	0.06	0.09
102	Stony Creek near Williston, N. Dak.	0.06	0.12	0.05	0.08
104	Beaver Creek near Ray, N. Dak.	0.02	0.07	0.03	0.04
106	Bear Den Creek near Mandaree, N. Dak.	0.03	0.08	0.07	0.06
108	East Fork Shell Creek near Parshall, N. Dak.	--	0.32	0.45	0.38
109	Deepwater Creek near Mandaree, N. Dak.	--	0.12	0.40	0.23
110	Little Missouri River at Marmarth, N. Dak.	--	0.58	0.05	0.28
111	Deep Creek near Amidon, N. Dak.	0.03	0.05	0.02	0.03
112	Little Missouri River at Medora, N. Dak.	0.04	0.31	0.06	0.11
113	Beaver Creek near Trotters, N. Dak.	0.02	0.08	0.03	0.03

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Phosphorus, total as P, in mg/L—Continued					
114	Little Missouri River near Watford City, N. Dak.	0.05	0.40	0.11	0.20
115	Missouri River at Garrison Dam, N. Dak.	<0.01	<0.01	<0.01	<0.01
116	Knife River at Manning, N. Dak.	0.07	0.09	0.09	0.08
117	Stray Creek near Manning, N. Dak.	0.07	0.13	0.11	0.11
118	Knife River at Marshall, N. Dak.	0.04	0.10	0.10	0.08
119	Elm Creek near Golden Valley, N. Dak.	0.31	0.10	0.20	0.19
120	Knife River near Golden Valley, N. Dak.	0.04	0.09	0.06	0.07
121	Coyote Creek near Zap, N. Dak.	0.04	0.07	0.03	0.05
122	Brush Creek near Beulah, N. Dak.	0.04	0.07	0.05	0.05
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	0.09	0.11	0.12	0.11
124	Spring Creek near Halliday, N. Dak.	0.04	0.09	0.05	0.05
125	Spring Creek at Zap, N. Dak.	0.02	0.08	0.05	0.05
127	Knife River at Hazen, N. Dak.	0.03	0.10	0.06	0.06
128	Antelope Creek above Hazen, N. Dak.	0.13	0.10	0.19	0.13
130	West Branch Antelope Creek near Hazen, N. Dak.	0.59	0.26	--	0.26
131	Coal Creek near Stanton, N. Dak.	0.08	0.09	0.31	0.09
132	Alderin Creek near Fort Clark, N. Dak.	0.09	0.15	0.11	0.12
133	Coal Lake Coulee near Hensler, N. Dak.	0.17	0.10	0.15	0.11
134	Buffalo Creek near Washburn, N. Dak.	0.06	0.21	0.11	0.10
136	Painted Woods Creek near Wilton, N. Dak.	--	--	0.07	0.07
137	Square Butte Creek near Hannover, N. Dak.	0.04	0.06	0.06	0.05
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	0.03	0.08	0.06	0.05
139	Hagel Creek near Center, N. Dak.	0.08	0.12	0.11	0.11
140	Square Butte Creek below Center, N. Dak.	0.02	0.04	0.05	0.03
142	Missouri River at Bismarck, N. Dak.	0.02	0.04	0.04	0.03
143	South Branch Heart River near South Heart, N. Dak.	0.48	0.24	1.05	0.28
144	North Creek near South Heart, N. Dak.	0.12	0.20	0.40	0.25
145	Heart River near South Heart, N. Dak.	0.20	0.19	0.19	0.20
146	Heart River at Dickinson, N. Dak.	0.06	0.11	0.26	0.10
147	Green River near New Hradec, N. Dak.	0.04	0.08	0.09	0.07
148	Green River near Gladstone, N. Dak.	0.02	0.09	0.27	0.06
149	Heart River near Richardton, N. Dak.	0.02	0.07	0.05	0.06
152	Big Muddy Creek near Almont, N. Dak.	--	0.32	--	0.32
156	Heart River near Mandan, N. Dak.	<0.01	0.05	0.02	0.03
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	--	0.25	0.96	0.34
158	Apple Creek near Menoken, N. Dak.	0.30	0.27	0.67	0.36
159	Missouri River near Schmidt, N. Dak.	0.02	0.04	0.04	0.04
160	Cannonball River at New England, N. Dak.	0.04	0.06	0.06	0.05

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Phosphorus, total as P, in mg/L—Continued					
161	Coal Bank Creek near Havelock, N. Dak.	0.04	0.05	0.04	0.04
162	Cannonball River at Regent, N. Dak.	0.02	0.06	0.07	0.04
164	Cannonball River near Raleigh, N. Dak.	0.02	0.04	0.04	0.03
167	Timber Creek near Bentley, N. Dak.	0.03	0.05	0.05	0.04
169	Cedar Creek near Raleigh, N. Dak.	0.02	0.05	0.03	0.04
170	Cannonball River at Breien, N. Dak.	0.03	0.07	0.04	0.05
171	Beaver Creek near Linton, N. Dak.	--	0.30	0.53	0.50
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	0.06	0.10	0.11	0.09
175	James River near Manfred, N. Dak.	--	0.25	0.43	0.28
176	James River near Grace City, N. Dak.	0.17	0.20	0.34	0.26
177	James River above Arrowwood Lake near Kensal, N. Dak.	0.25	0.21	0.37	0.25
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	0.11	0.48	0.13
179	James River near Pingree, N. Dak.	0.58	0.26	0.51	0.34
180	Pipestem Creek near Pingree, N. Dak.	0.13	0.22	0.46	0.30
181	Pipestem Creek near Buchanan, N. Dak.	--	0.36	0.68	0.47
182	James River at Jamestown, N. Dak.	2.10	0.27	0.40	0.33
183	James River at Lamoure, N. Dak.	1.29	0.35	0.50	0.50
184	Bear Creek near Oakes, N. Dak.	--	0.25	0.51	0.35
185	James River at Oakes, N. Dak.	0.25	0.32	0.45	0.33
186	James River at N. Dak./S. Dak. State line	--	0.30	0.50	0.33
Organic carbon, dissolved as C, in mg/L					
1	Bois De Sioux River near Doran, Minn.	12.2	11.7	13.0	12.8
2	Red River of the North at Wahpeton, N. Dak.	--	8.8	--	8.8
3	Red River of the North near Wahpeton, N. Dak.	--	--	8.6	8.6
4	Red River of the North at Brushville, Minn.	7.5	8.1	7.8	8.0
6	Red River of the North at Hickson, N. Dak.	9.9	9.7	9.4	9.8
10	Wild Rice River near Abercrombie, N. Dak.	11.1	12.3	13.2	12.5
11	Red River of the North at Fargo, N. Dak.	7.1	8.7	7.5	8.4
12	Red River of North below Fargo, N. Dak.	10.0	--	8.9	10.0
13	Red River of the North at Harwood, N. Dak.	8.2	10.3	7.8	8.3
17	Sheyenne River at Warwick, N. Dak.	--	--	11.3	11.3
18	Sheyenne River near Warwick, N. Dak.	5.9	12.5	15.5	13.3
32	Sheyenne River near Cooperstown, N. Dak.	17.0	14.0	10.5	14.0
33	Baldhill Creek near Dazey, N. Dak.	12.0	12.5	10.0	12.0
34	Sheyenne River below Baldhill Dam, N. Dak.	16.5	11.0	10.4	11.7
36	Sheyenne River at Lisbon, N. Dak.	10.7	9.2	7.8	9.1
37	Sheyenne River near Kindred, N. Dak.	9.2	10.0	6.3	8.9
41	Sheyenne River at West Fargo, N. Dak.	--	--	8.7	8.7

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Organic carbon, dissolved as C, in mg/L—Continued					
45	Maple River below Mapleton, N. Dak.	12.3	12.0	10.2	10.5
52	Red River of the North at Halstad, Minn.	10.0	10.4	10.0	10.0
53	Beaver Creek near Finley, N. Dak.	23.0	15.0	--	19.0
55	Goose River at Hillsboro, N. Dak.	8.0	10.3	8.5	8.6
56	Red River of the North at Grand Forks, N. Dak.	8.0	9.0	8.8	8.8
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	5.1	7.9	9.8	8.2
58	Turtle River at Manvel, N. Dak.	5.5	8.6	8.7	8.5
59	Red River of the North at Oslo, Minn.	12.0	--	9.7	10.9
62	Forest River near Minto, N. Dak.	3.7	7.4	5.9	6.2
67	Park River at Grafton, N. Dak.	7.6	7.8	8.1	7.8
68	Red River of the North at Drayton, N. Dak.	--	9.1	--	9.1
74	Pembina River at Walhalla, N. Dak.	8.4	12.0	9.6	11.0
75	Pembina River at Neche, N. Dak.	4.7	8.1	6.6	7.2
76	Tongue River at Akra, N. Dak.	12.2	20.5	14.1	16.0
78	Red River of the North at Pembina, N. Dak., site 2	9.1	8.9	11.0	10.0
79	Red River of the North at Emerson, Manitoba	13.5	11.0	12.5	12.0
81	West Branch Short Creek near Columbus, N. Dak.	40.0	24.0	23.0	24.0
82	Souris River near Sherwood, N. Dak.	11.0	13.0	10.5	11.0
83	Souris River near Foxholm, N. Dak.	41.5	16.0	14.5	16.0
84	Des Lacs River at Foxholm, N. Dak.	10.5	14.5	17.3	16.4
85	Souris River above Minot, N. Dak.	18.6	14.4	16.2	15.0
87	Souris River near Verendrye, N. Dak.	17.2	13.0	15.7	14.4
89	Souris River near Bantry, N. Dak.	--	13.5	12.5	13.0
98	Souris River near Westhope, N. Dak.	26.0	15.0	17.0	16.0
100	Missouri River near Williston, N. Dak.	5.5	6.0	4.1	4.9
102	Stony Creek near Williston, N. Dak.	14.0	12.5	11.0	13.0
104	Beaver Creek near Ray, N. Dak.	12.0	11.0	10.5	11.0
106	Bear Den Creek near Mandaree, N. Dak.	13.0	24.0	--	21.0
111	Deep Creek near Amidon, N. Dak.	17.0	20.5	15.0	18.0
112	Little Missouri River at Medora, N. Dak.	10.8	8.9	8.0	8.8
113	Beaver Creek near Trotters, N. Dak.	11.5	13.0	11.0	12.0
114	Little Missouri River near Watford City, N. Dak.	9.4	8.9	10.9	9.7
115	Missouri River at Garrison Dam, N. Dak.	3.4	3.2	3.2	3.3
116	Knife River at Manning, N. Dak.	16.5	14.5	15.5	15.0
117	Stray Creek near Manning, N. Dak.	36.0	20.5	23.5	22.0
118	Knife River at Marshall, N. Dak.	14.0	12.0	13.0	13.0
119	Elm Creek near Golden Valley, N. Dak.	15.0	17.0	18.0	17.0
120	Knife River near Golden Valley, N. Dak.	17.6	15.8	17.5	17.0

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Organic carbon, dissolved as C, in mg/L—Continued					
121	Coyote Creek near Zap, N. Dak.	13.0	13.0	12.0	12.0
122	Brush Creek near Beulah, N. Dak.	12.0	12.0	9.9	11.0
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	22.0	12.5	18.0	18.0
124	Spring Creek near Halliday, N. Dak.	12.5	15.0	14.0	13.5
125	Spring Creek at Zap, N. Dak.	10.0	12.0	11.1	11.0
127	Knife River at Hazen, N. Dak.	8.5	12.0	10.0	10.0
128	Antelope Creek above Hazen, N. Dak.	18.0	16.5	13.0	16.5
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	--	9.5	--	9.5
130	West Branch Antelope Creek near Hazen, N. Dak.	26.0	17.0	--	17.0
131	Coal Creek near Stanton, N. Dak.	20.0	23.5	21.0	23.0
132	Alderin Creek near Fort Clark, N. Dak.	27.5	18.5	22.5	23.5
133	Coal Lake Coulee near Hensler, N. Dak.	22.5	16.0	28.0	18.0
134	Buffalo Creek near Washburn, N. Dak.	20.0	19.0	21.0	20.0
137	Square Butte Creek near Hannover, N. Dak.	15.0	12.5	18.0	14.0
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	9.7	10.0	11.5	10.0
139	Hagel Creek near Center, N. Dak.	20.0	14.5	21.0	18.0
142	Missouri River at Bismarck, N. Dak.	3.8	3.7	3.7	3.7
143	South Branch Heart River near South Heart, N. Dak.	26.0	14.5	13.0	14.0
144	North Creek near South Heart, N. Dak.	40.0	19.0	10.5	21.5
145	Heart River near South Heart, N. Dak.	18.0	15.5	17.0	17.0
147	Green River near New Hradec, N. Dak.	8.4	12.5	14.0	12.0
149	Heart River near Richardton, N. Dak.	11.2	11.4	13.5	11.4
156	Heart River near Mandan, N. Dak.	8.4	9.4	7.4	7.9
158	Apple Creek near Menoken, N. Dak.	14.0	10.3	15.0	13.0
159	Missouri River near Schmidt, N. Dak.	3.7	3.7	3.6	3.7
160	Cannonball River at New England, N. Dak.	19.0	16.0	13.0	17.0
161	Coal Bank Creek near Havelock, N. Dak.	15.0	16.0	17.0	16.0
162	Cannonball River at Regent, N. Dak.	11.0	14.0	12.0	12.5
164	Cannonball River near Raleigh, N. Dak.	23.3	15.0	9.3	12.3
167	Timber Creek near Bentley, N. Dak.	16.0	21.0	13.0	15.0
169	Cedar Creek near Raleigh, N. Dak.	--	15.2	9.5	12.8
170	Cannonball River at Breien, N. Dak.	9.9	9.6	9.3	9.6
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	36.5	28.0	25.0	30.0
176	James River near Grace City, N. Dak.	12.2	19.1	19.5	17.9
182	James River at Jamestown, N. Dak.	5.4	13.9	11.6	12.7
183	James River at Lamoure, N. Dak.	7.5	12.2	10.8	11.4
Organic carbon, total as C, in mg/L					
1	Bois De Sioux River near Doran, Minn.	12.2	11.0	13.0	11.5

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Organic carbon, total as C, in mg/L—Continued					
3	Red River of the North near Wahpeton, N. Dak.	--	--	8.6	8.6
4	Red River of the North at Brushville, Minn.	7.2	8.1	7.7	7.9
5	Red River of the North below Wahpeton, N. Dak.	--	9.0	--	9.0
10	Wild Rice River near Abercrombie, N. Dak.	10.8	11.7	12.8	12.0
11	Red River of the North at Fargo, N. Dak.	6.8	8.0	7.5	7.8
12	Red River of North below Fargo, N. Dak.	10.0	15.5	10.0	12.0
13	Red River of the North at Harwood, N. Dak.	8.4	8.4	7.2	7.7
17	Sheyenne River at Warwick, N. Dak.	--	--	11.3	11.3
18	Sheyenne River near Warwick, N. Dak.	6.0	13.7	12.0	11.6
32	Sheyenne River near Cooperstown, N. Dak.	5.7	11.6	8.1	9.6
34	Sheyenne River below Baldhill Dam, N. Dak.	12.3	10.7	10.3	10.6
36	Sheyenne River at Lisbon, N. Dak.	11.5	9.3	7.3	8.0
37	Sheyenne River near Kindred, N. Dak.	9.1	8.8	6.4	8.7
41	Sheyenne River at West Fargo, N. Dak.	--	--	8.5	8.5
45	Maple River below Mapleton, N. Dak.	12.8	11.4	10.0	11.0
50	Sheyenne River near Harwood, N. Dak.	--	17.0	--	17.0
52	Red River of the North at Halstad, Minn.	16.0	14.0	14.5	15.0
53	Beaver Creek near Finley, N. Dak.	--	18.0	17.0	17.0
55	Goose River at Hillsboro, N. Dak.	8.0	9.6	8.6	8.6
56	Red River of the North at Grand Forks, N. Dak.	7.9	8.2	7.5	8.0
58	Turtle River at Manvel, N. Dak.	5.9	9.4	8.7	8.8
59	Red River of the North at Oslo, Minn.	15.0	17.0	15.0	15.5
62	Forest River near Minto, N. Dak.	3.3	6.7	5.3	5.5
67	Park River at Grafton, N. Dak.	7.5	7.8	8.1	7.8
75	Pembina River at Neche, N. Dak.	4.6	7.7	6.5	7.0
78	Red River of the North at Pembina, N. Dak., site 2	8.4	8.4	7.9	8.0
79	Red River of the North at Emerson, Manitoba	19.0	13.5	14.5	15.5
82	Souris River near Sherwood, N. Dak.	15.3	16.6	15.7	16.0
83	Souris River near Foxholm, N. Dak.	19.0	22.0	16.0	17.5
84	Des Lacs River at Foxholm, N. Dak.	11.2	15.3	18.2	17.3
85	Souris River above Minot, N. Dak.	21.9	16.0	18.5	17.8
87	Souris River near Verendrye, N. Dak.	14.0	15.0	15.9	15.0
89	Souris River near Bantry, N. Dak.	14.0	17.5	20.0	16.0
90	Willow Creek near Willow City, N. Dak.	--	17.0	23.0	19.0
91	Stone Creek near Kramer, N. Dak.	--	16.0	18.0	18.0
97	Boundary Creek near Landa, N. Dak.	--	17.0	22.0	17.5
98	Souris River near Westhope, N. Dak.	22.0	16.0	22.1	21.0
100	Missouri River near Williston, N. Dak.	4.5	7.0	2.9	6.0

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Organic carbon, total as C, in mg/L—Continued					
106	Bear Den Creek near Mandaree, N. Dak.	25.5	18.0	16.0	16.0
108	East Fork Shell Creek near Parshall, N. Dak.	--	25.0	24.0	24.0
109	Deepwater Creek near Mandaree, N. Dak.	--	20.5	24.0	22.0
112	Little Missouri River at Medora, N. Dak.	10.6	7.1	7.8	7.5
114	Little Missouri River near Watford City, N. Dak.	20.0	11.5	13.0	13.0
115	Missouri River at Garrison Dam, N. Dak.	6.6	5.0	4.2	5.0
120	Knife River near Golden Valley, N. Dak.	17.3	15.9	16.1	16.1
122	Brush Creek near Beulah, N. Dak.	--	14.0	--	14.0
125	Spring Creek at Zap, N. Dak.	8.2	11.4	11.6	11.0
127	Knife River at Hazen, N. Dak.	12.0	13.2	11.9	12.0
142	Missouri River at Bismarck, N. Dak.	4.1	4.3	4.1	4.2
149	Heart River near Richardton, N. Dak.	18.0	11.8	13.3	12.3
156	Heart River near Mandan, N. Dak.	8.8	8.7	6.6	7.6
159	Missouri River near Schmidt, N. Dak.	3.9	3.8	4.4	4.0
164	Cannonball River near Raleigh, N. Dak.	22.7	11.7	8.4	10.2
169	Cedar Creek near Raleigh, N. Dak.	--	12.7	8.9	11.6
170	Cannonball River at Breien, N. Dak.	14.0	11.0	10.5	12.0
175	James River near Manfred, N. Dak.	--	14.0	17.0	14.5
176	James River near Grace City, N. Dak.	12.5	17.6	20.2	17.6
177	James River above Arrowwood Lake near Kensal, N. Dak.	--	14.5	16.0	15.0
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	14.5	17.0	15.0
179	James River near Pingree, N. Dak.	--	16.0	20.0	16.0
182	James River at Jamestown, N. Dak.	5.4	13.1	12.0	12.8
183	James River at Lamoure, N. Dak.	12.3	13.2	12.6	13.0
185	James River at Oakes, N. Dak.	--	13.5	18.5	14.5
Aluminum, total, in µg/L					
1	Bois De Sioux River near Doran, Minn.	202	1,080	695	705
3	Red River of the North near Wahpeton, N. Dak.	--	--	238	238
4	Red River of the North at Brushville, Minn.	144	733	836	659
10	Wild Rice River near Abercrombie, N. Dak.	369	2,180	1,745	1,530
11	Red River of the North at Fargo, N. Dak.	<100	--	--	<100
13	Red River of the North at Harwood, N. Dak.	250	3,250	3,010	2,800
14	Red River of the North near Harwood, N. Dak.	--	7,730	2,970	3,380
17	Sheyenne River at Warwick, N. Dak.	234	961	853	688
18	Sheyenne River near Warwick, N. Dak.	232	1,030	714	577
32	Sheyenne River near Cooperstown, N. Dak.	264	1,370	906	831
34	Sheyenne River below Baldhill Dam, N. Dak.	<100	157	101	103
36	Sheyenne River at Lisbon, N. Dak.	253	1,470	962	870

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Aluminum, total, in µg/L—Continued					
37	Sheyenne River near Kindred, N. Dak.	358	3,040	1,170	1,190
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	--	8,470	2,560	3,140
41	Sheyenne River at West Fargo, N. Dak.	--	--	1,720	1,720
45	Maple River below Mapleton, N. Dak.	443	2,635	1,850	1,570
52	Red River of the North at Halstad, Minn.	--	8,910	2,910	4,720
55	Goose River at Hillsboro, N. Dak.	161	914	1,004	777
56	Red River of the North at Grand Forks, N. Dak.	228	2,410	1,660	1,440
58	Turtle River at Manvel, N. Dak.	133	979	490	513
62	Forest River near Minto, N. Dak.	132	571	573	416
67	Park River at Grafton, N. Dak.	124	879	543	377
75	Pembina River at Neche, N. Dak.	156	6,840	1,330	1,255
78	Red River of the North at Pembina, N. Dak., site 2	304	5,135	2,565	2,565
80	Long Creek near Noonan, N. Dak.	134	153	215	160
82	Souris River near Sherwood, N. Dak.	<100	179	346	154
83	Souris River near Foxholm, N. Dak.	115	<100	<100	<100
84	Des Lacs River at Foxholm, N. Dak.	332	742	440	515
85	Souris River above Minot, N. Dak.	<100	125	<100	<100
87	Souris River near Verendrye, N. Dak.	<100	641	400	313
88	Wintering River near Karlsruhe, N. Dak.	<100	103	104	101
89	Souris River near Bantry, N. Dak.	140	235	477	235
90	Willow Creek near Willow City, N. Dak.	--	220	169	204
91	Stone Creek near Kramer, N. Dak.	--	135	<100	<100
92	Deep River near Upham, N. Dak.	--	<100	<100	<100
97	Boundary Creek near Landa, N. Dak.	--	130	<100	<100
98	Souris River near Westhope, N. Dak.	470	104	335	326
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	501	362	369
110	Little Missouri River at Marmarth, N. Dak.	--	52,500	2,680	20,050
112	Little Missouri River at Medora, N. Dak.	1,575	18,200	3,055	6,430
113	Beaver Creek near Trotters, N. Dak.	--	185	150	185
114	Little Missouri River near Watford City, N. Dak.	1,770	40,300	3,335	12,350
120	Knife River near Golden Valley, N. Dak.	328	3,010	1,415	1,415
125	Spring Creek at Zap, N. Dak.	129	433	242	215
127	Knife River at Hazen, N. Dak.	145	1,410	484	484
149	Heart River near Richardton, N. Dak.	107	645	590	528
156	Heart River near Mandan, N. Dak.	115	547	237	272
164	Cannonball River near Raleigh, N. Dak.	401	1,800	1,230	1,430
169	Cedar Creek near Raleigh, N. Dak.	276	1,405	560	780
170	Cannonball River at Breien, N. Dak.	437	2,200	902	1,230

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Aluminum, total, in µg/L—Continued					
175	James River near Manfred, N. Dak.	--	<100	207	100
176	James River near Grace City, N. Dak.	138	286	375	269
177	James River above Arrowwood Lake near Kensal, N. Dak.	--	182	403	239
180	Pipestem Creek near Pingree, N. Dak.	--	186	282	210
182	James River at Jamestown, N. Dak.	115	290	360	299
183	James River at Lamoure, N. Dak.	207	1,015	961	767
184	Bear Creek near Oakes, N. Dak.	--	277	628	451
186	James River at N. Dak./S. Dak. State line	--	753	1,070	786
Arsenic, total, in µg/L					
1	Bois De Sioux River near Doran, Minn.	5.8	5.3	9.2	6.1
2	Red River of the North at Wahpeton, N. Dak.	--	--	7.2	7.2
3	Red River of the North near Wahpeton, N. Dak.	--	--	24.9	24.9
4	Red River of the North at Brushville, Minn.	2.2	2.8	4.6	3.3
5	Red River of the North below Wahpeton, N. Dak.	2.1	2.8	3.3	3.0
6	Red River of the North at Hickson, N. Dak.	2.6	4.3	4.5	4.2
10	Wild Rice River near Abercrombie, N. Dak.	6.1	6.9	11.0	7.4
11	Red River of the North at Fargo, N. Dak.	3.6	4.2	3.9	3.8
13	Red River of the North at Harwood, N. Dak.	2.5	4.1	5.9	5.2
14	Red River of the North near Harwood, N. Dak.	2.4	4.9	5.1	5.1
17	Sheyenne River at Warwick, N. Dak.	3.3	4.7	8.0	5.1
18	Sheyenne River near Warwick, N. Dak.	4.1	5.6	8.4	6.0
32	Sheyenne River near Cooperstown, N. Dak.	3.2	4.1	6.6	5.0
33	Baldhill Creek near Dazey, N. Dak.	--	3.1	--	3.1
34	Sheyenne River below Baldhill Dam, N. Dak.	5.9	3.3	5.4	4.8
36	Sheyenne River at Lisbon, N. Dak.	5.4	4.6	6.5	5.9
37	Sheyenne River near Kindred, N. Dak.	5.3	6.8	7.6	6.8
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	--	9.5	7.7	8.1
41	Sheyenne River at West Fargo, N. Dak.	--	6.4	6.6	6.4
45	Maple River below Mapleton, N. Dak.	5.6	6.8	10.1	7.9
46	Sheyenne River at Harwood, N. Dak.	4.7	7.3	7.7	7.2
52	Red River of the North at Halstad, Minn.	--	5.6	6.3	6.2
55	Goose River at Hillsboro, N. Dak.	3.2	4.6	7.5	5.1
56	Red River of the North at Grand Forks, N. Dak.	2.1	4.4	5.3	4.3
58	Turtle River at Manvel, N. Dak.	2.6	4.4	8.1	4.6
62	Forest River near Minto, N. Dak.	2.2	3.6	5.7	3.7
67	Park River at Grafton, N. Dak.	2.2	3.3	7.2	3.4
68	Red River of the North at Drayton, N. Dak.	--	4.7	3.1	3.8
75	Pembina River at Neche, N. Dak.	1.8	8.6	5.7	5.4

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Arsenic, total, in µg/L—Continued					
78	Red River of the North at Pembina, N. Dak., site 2	2.5	5.6	6.2	5.5
80	Long Creek near Noonan, N. Dak.	3.2	4.7	8.7	6.0
82	Souris River near Sherwood, N. Dak.	2.1	3.0	5.5	3.3
83	Souris River near Foxholm, N. Dak.	4.2	6.0	7.6	6.3
84	Des Lacs River at Foxholm, N. Dak.	2.6	4.8	7.4	5.4
85	Souris River above Minot, N. Dak.	4.6	4.8	8.3	6.0
87	Souris River near Verendrye, N. Dak.	3.0	3.9	8.5	4.7
88	Wintering River near Karlsruhe, N. Dak.	1.4	4.2	3.0	2.9
89	Souris River near Bantry, N. Dak.	3.0	2.9	7.0	4.0
90	Willow Creek near Willow City, N. Dak.	4.0	3.1	6.8	5.0
91	Stone Creek near Kramer, N. Dak.	--	5.0	7.2	5.2
92	Deep River near Upham, N. Dak.	2.0	3.3	4.7	4.1
95	Cut Bank Creek at Upham, N. Dak.	--	3.1	3.4	3.4
97	Boundary Creek near Landa, N. Dak.	--	4.1	7.8	5.4
98	Souris River near Westhope, N. Dak.	5.0	2.8	6.1	5.1
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	5.5	6.0	5.5
110	Little Missouri River at Marmarth, N. Dak.	--	19.8	2.6	8.2
112	Little Missouri River at Medora, N. Dak.	2.5	8.7	3.3	4.0
113	Beaver Creek near Trotters, N. Dak.	--	1.9	1.2	1.6
114	Little Missouri River near Watford City, N. Dak.	2.2	16.3	4.2	6.9
115	Missouri River at Garrison Dam, N. Dak.	--	2.1	2.0	2.0
120	Knife River near Golden Valley, N. Dak.	1.8	3.0	5.4	3.0
125	Spring Creek at Zap, N. Dak.	<1.0	1.9	3.1	1.9
127	Knife River at Hazen, N. Dak.	1.2	2.6	2.3	2.2
142	Missouri River at Bismarck, N. Dak.	2.0	2.0	2.0	2.0
149	Heart River near Richardton, N. Dak.	<1.0	2.2	2.4	2.0
156	Heart River near Mandan, N. Dak.	1.1	1.5	1.2	1.3
164	Cannonball River near Raleigh, N. Dak.	<1.0	2.1	2.8	2.1
169	Cedar Creek near Raleigh, N. Dak.	1.3	2.8	2.5	2.5
170	Cannonball River at Breien, N. Dak.	1.4	2.6	2.1	2.2
175	James River near Manfred, N. Dak.	--	3.0	5.7	4.2
176	James River near Grace City, N. Dak.	3.1	3.6	5.9	4.3
177	James River above Arrowwood Lake near Kensal, N. Dak.	--	2.9	5.2	3.7
179	James River near Pingree, N. Dak.	--	2.9	8.9	4.0
180	Pipestem Creek near Pingree, N. Dak.	--	4.0	8.8	5.3
182	James River at Jamestown, N. Dak.	2.9	3.3	5.4	3.9
183	James River at Lamoure, N. Dak.	3.5	4.0	6.3	4.9
184	Bear Creek near Oakes, N. Dak.	--	3.2	8.6	5.0

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Arsenic, total, in µg/L—Continued					
185	James River at Oakes, N. Dak.	--	2.0	5.0	3.0
186	James River at N. Dak./S. Dak. State line	--	3.5	6.0	4.1
Chromium, total, in µg/L					
1	Bois De Sioux River near Doran, Minn.	<1.2	1.4	1.3	<1.2
2	Red River of the North at Wahpeton, N. Dak.	--	--	1.8	1.8
3	Red River of the North near Wahpeton, N. Dak.	--	--	1.3	1.3
4	Red River of the North at Brushville, Minn.	<1.2	<1.2	1.4	<1.2
10	Wild Rice River near Abercrombie, N. Dak.	<1.2	3.0	2.3	2.2
11	Red River of the North at Fargo, N. Dak.	<1.2	3.1	1.8	1.9
13	Red River of the North at Harwood, N. Dak.	<1.2	5.1	5.2	4.1
14	Red River of the North near Harwood, N. Dak.	--	6.4	4.9	5.1
17	Sheyenne River at Warwick, N. Dak.	<1.2	1.5	<1.2	<1.2
18	Sheyenne River near Warwick, N. Dak.	<1.2	1.3	<1.2	<1.2
32	Sheyenne River near Cooperstown, N. Dak.	<1.2	1.8	1.4	1.3
33	Baldhill Creek near Dazey, N. Dak.	--	<1.2	--	<1.2
34	Sheyenne River below Baldhill Dam, N. Dak.	<1.2	<1.2	<1.2	<1.2
36	Sheyenne River at Lisbon, N. Dak.	<1.2	2.4	1.6	1.5
37	Sheyenne River near Kindred, N. Dak.	<1.2	4.6	1.8	1.8
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	--	11.9	3.8	4.9
41	Sheyenne River at West Fargo, N. Dak.	--	6.2	3.9	4.9
45	Maple River below Mapleton, N. Dak.	<1.2	3.6	2.7	2.3
52	Red River of the North at Halstad, Minn.	--	11.3	3.6	6.8
55	Goose River at Hillsboro, N. Dak.	<1.2	1.6	1.6	1.4
56	Red River of the North at Grand Forks, N. Dak.	<1.2	4.5	2.6	2.3
58	Turtle River at Manvel, N. Dak.	<1.2	1.8	<1.2	<1.2
62	Forest River near Minto, N. Dak.	<1.2	<1.2	<1.2	<1.2
67	Park River at Grafton, N. Dak.	<1.2	1.6	<1.2	<1.2
68	Red River of the North at Drayton, N. Dak.	--	4.2	3.6	3.6
75	Pembina River at Neche, N. Dak.	<1.2	15.8	2.4	2.4
78	Red River of the North at Pembina, N. Dak., site 2	<1.2	8.7	4.5	4.5
80	Long Creek near Noonan, N. Dak.	<1.2	<1.2	<1.2	<1.2
82	Souris River near Sherwood, N. Dak.	<1.2	<1.2	<1.2	<1.2
83	Souris River near Foxholm, N. Dak.	<1.2	<1.2	<1.2	<1.2
84	Des Lacs River at Foxholm, N. Dak.	<1.2	<1.2	<1.2	<1.2
85	Souris River above Minot, N. Dak.	<1.2	<1.2	<1.2	<1.2
87	Souris River near Verendrye, N. Dak.	<1.2	<1.2	<1.2	<1.2
88	Wintering River near Karlsruhe, N. Dak.	<1.2	<1.2	<1.2	<1.2
89	Souris River near Bantry, N. Dak.	<1.2	<1.2	<1.2	<1.2

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Chromium, total, in µg/L—Continued					
90	Willow Creek near Willow City, N. Dak.	--	<1.2	<1.2	<1.2
91	Stone Creek near Kramer, N. Dak.	--	<1.2	<1.2	<1.2
92	Deep River near Upham, N. Dak.	--	<1.2	<1.2	<1.2
97	Boundary Creek near Landa, N. Dak.	--	<1.2	<1.2	<1.2
98	Souris River near Westhope, N. Dak.	1.7	1.5	<1.2	<1.2
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	<1.2	<1.2	<1.2
110	Little Missouri River at Marmarth, N. Dak.	--	54.9	3.4	21.0
112	Little Missouri River at Medora, N. Dak.	3.4	20.9	4.2	8.8
113	Beaver Creek near Trotters, N. Dak.	--	<1.2	<1.2	<1.2
114	Little Missouri River near Watford City, N. Dak.	2.9	39.7	4.5	15.1
120	Knife River near Golden Valley, N. Dak.	<1.2	3.4	2.2	2.2
125	Spring Creek at Zap, N. Dak.	<1.2	<1.2	<1.2	<1.2
127	Knife River at Hazen, N. Dak.	<1.2	2.0	<1.2	<1.2
149	Heart River near Richardton, N. Dak.	<1.2	<1.2	<1.2	<1.2
156	Heart River near Mandan, N. Dak.	<1.2	<1.2	<1.2	<1.2
164	Cannonball River near Raleigh, N. Dak.	<1.2	2.3	1.7	1.8
169	Cedar Creek near Raleigh, N. Dak.	<1.2	2.2	<1.2	1.4
170	Cannonball River at Breien, N. Dak.	<1.2	3.1	1.8	2.0
175	James River near Manfred, N. Dak.	--	<1.2	<1.2	<1.2
176	James River near Grace City, N. Dak.	<1.2	<1.2	<1.2	<1.2
177	James River above Arrowwood Lake near Kensal, N. Dak.	--	<1.2	<1.2	<1.2
180	Pipestem Creek near Pingree, N. Dak.	--	<1.2	<1.2	<1.2
182	James River at Jamestown, N. Dak.	<1.2	<1.2	<1.2	<1.2
183	James River at Lamoure, N. Dak.	<1.2	1.7	1.8	1.4
184	Bear Creek near Oakes, N. Dak.	--	<1.2	<1.2	<1.2
186	James River at N. Dak./S. Dak. State line	--	<1.2	1.6	1.3
Iron, total, in µg/L					
1	Bois De Sioux River near Doran, Minn.	356	1,200	1,020	955
2	Red River of the North at Wahpeton, N. Dak.	310	657	421	400
3	Red River of the North near Wahpeton, N. Dak.	302	1,038	444	505
4	Red River of the North at Brushville, Minn.	288	908	1,110	806
5	Red River of the North below Wahpeton, N. Dak.	262	1,370	1,170	1,011
6	Red River of the North at Hickson, N. Dak.	320	3,885	2,420	2,540
10	Wild Rice River near Abercrombie, N. Dak.	549	2,265	2,090	1,605
11	Red River of the North at Fargo, N. Dak.	306	2,160	810	1,410
13	Red River of the North at Harwood, N. Dak.	392	4,040	3,210	2,960
14	Red River of the North near Harwood, N. Dak.	287	3,405	2,410	2,725
17	Sheyenne River at Warwick, N. Dak.	366	932	987	701

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Iron, total, in µg/L—Continued					
18	Sheyenne River near Warwick, N. Dak.	266	1,021	553	585
24	Starkweather Coulee near Webster, N. Dak.	--	2,900	<10	1,455
32	Sheyenne River near Cooperstown, N. Dak.	309	1,340	911	857
33	Baldhill Creek near Dazey, N. Dak.	--	161	--	161
34	Sheyenne River below Baldhill Dam, N. Dak.	91	202	113	134
35	Sheyenne River at Valley City, N. Dak.	--	647	690	691
36	Sheyenne River at Lisbon, N. Dak.	332	1,855	991	1,010
37	Sheyenne River near Kindred, N. Dak.	511	3,915	1,535	1,730
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	--	2,751	2,800	2,800
41	Sheyenne River at West Fargo, N. Dak.	558	3,625	1,620	1,620
45	Maple River below Mapleton, N. Dak.	439	2,865	1,880	1,680
46	Sheyenne River at Harwood, N. Dak.	502	4,940	3,920	3,160
52	Red River of the North at Halstad, Minn.	--	5,100	5,500	5,100
55	Goose River at Hillsboro, N. Dak.	326	1,115	1,130	1,030
56	Red River of the North at Grand Forks, N. Dak.	339	3,520	1,840	1,830
58	Turtle River at Manvel, N. Dak.	243	1,395	702	742
62	Forest River near Minto, N. Dak.	202	574	768	522
67	Park River at Grafton, N. Dak.	146	798	624	578
68	Red River of the North at Drayton, N. Dak.	1,210	2,920	1,405	1,810
75	Pembina River at Neche, N. Dak.	179	5,850	1,130	1,200
76	Tongue River at Akra, N. Dak.	--	649	--	649
78	Red River of the North at Pembina, N. Dak., site 2	375	6,790	3,275	3,220
79	Red River of the North at Emerson, Manitoba	--	<10	11	11
80	Long Creek near Noonan, N. Dak.	236	375	595	481
82	Souris River near Sherwood, N. Dak.	327	713	672	554
83	Souris River near Foxholm, N. Dak.	150	210	100	170
84	Des Lacs River at Foxholm, N. Dak.	994	1,115	783	858
85	Souris River above Minot, N. Dak.	427	332	213	305
87	Souris River near Verendrye, N. Dak.	429	1,300	700	709
88	Wintering River near Karlsruhe, N. Dak.	390	206	326	353
89	Souris River near Bantry, N. Dak.	490	560	1,100	790
90	Willow Creek near Willow City, N. Dak.	708	510	461	497
91	Stone Creek near Kramer, N. Dak.	--	250	152	226
92	Deep River near Upham, N. Dak.	140	181	220	195
95	Cut Bank Creek at Upham, N. Dak.	--	50	44	50
97	Boundary Creek near Landa, N. Dak.	--	272	284	272
98	Souris River near Westhope, N. Dak.	797	204	532	500
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	1,000	619	783

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Iron, total, in µg/L—Continued					
110	Little Missouri River at Marmarth, N. Dak.	--	63,450	2,470	20,150
112	Little Missouri River at Medora, N. Dak.	2,600	17,600	3,305	5,650
113	Beaver Creek near Trotters, N. Dak.	--	273	272	273
114	Little Missouri River near Watford City, N. Dak.	2,870	34,650	3,005	10,800
115	Missouri River at Garrison Dam, N. Dak.	--	28	80	74
120	Knife River near Golden Valley, N. Dak.	697	3,170	1,855	1,865
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	--	923	631	879
125	Spring Creek at Zap, N. Dak.	469	771	457	593
127	Knife River at Hazen, N. Dak.	634	1,610	655	782
140	Square Butte Creek below Center, N. Dak.	932	788	879	860
142	Missouri River at Bismarck, N. Dak.	410	511	370	420
146	Heart River at Dickinson, N. Dak.	361	850	5,140	788
149	Heart River near Richardton, N. Dak.	268	1,000	888	838
152	Big Muddy Creek near Almont, N. Dak.	--	1,350	--	1,350
156	Heart River near Mandan, N. Dak.	281	795	359	422
158	Apple Creek near Menoken, N. Dak.	--	619	1,740	1,173
164	Cannonball River near Raleigh, N. Dak.	411	1,400	1,040	1,130
169	Cedar Creek near Raleigh, N. Dak.	356	1,405	577	919
170	Cannonball River at Breien, N. Dak.	485	2,330	785	1,004
171	Beaver Creek near Linton, N. Dak.	--	714	1,360	1,350
175	James River near Manfred, N. Dak.	--	167	438	170
176	James River near Grace City, N. Dak.	328	362	535	458
177	James River above Arrowwood Lake near Kensal, N. Dak.	--	309	507	375
179	James River near Pingree, N. Dak.	--	140	200	170
180	Pipestem Creek near Pingree, N. Dak.	216	312	636	397
182	James River at Jamestown, N. Dak.	508	471	594	532
183	James River at Lamoure, N. Dak.	507	1,460	1,360	1,280
184	Bear Creek near Oakes, N. Dak.	--	421	822	596
185	James River at Oakes, N. Dak.	--	401	1,150	503
186	James River at N. Dak./S. Dak. State line	--	1,110	1,580	1,130
Lead, total, in µg/L					
1	Bois De Sioux River near Doran, Minn.	<1.0	<1.0	1.1	<1.0
2	Red River of the North at Wahpeton, N. Dak.	--	--	6.4	6.4
3	Red River of the North near Wahpeton, N. Dak.	--	--	1.1	1.1
4	Red River of the North at Brushville, Minn.	<1.0	<1.0	<1.0	<1.0
10	Wild Rice River near Abercrombie, N. Dak.	<1.0	1.7	1.7	1.6
11	Red River of the North at Fargo, N. Dak.	<1.0	5.6	1.1	1.8
13	Red River of the North at Harwood, N. Dak.	<1.0	1.7	1.9	1.6

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Lead, total, in µg/L—Continued					
14	Red River of the North near Harwood, N. Dak.	--	4.8	2.8	3.4
17	Sheyenne River at Warwick, N. Dak.	<1.0	<1.0	<1.0	<1.0
18	Sheyenne River near Warwick, N. Dak.	<1.0	<1.0	<1.0	<1.0
32	Sheyenne River near Cooperstown, N. Dak.	<1.0	<1.0	<1.0	<1.0
33	Baldhill Creek near Dazey, N. Dak.	--	6.8	--	6.8
34	Sheyenne River below Baldhill Dam, N. Dak.	<1.0	<1.0	<1.0	<1.0
36	Sheyenne River at Lisbon, N. Dak.	<1.0	1.1	<1.0	<1.0
37	Sheyenne River near Kindred, N. Dak.	<1.0	3.4	1.3	1.4
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	--	6.7	2.1	2.2
41	Sheyenne River at West Fargo, N. Dak.	--	8.3	2.8	4.8
45	Maple River below Mapleton, N. Dak.	<1.0	1.8	2.0	1.5
52	Red River of the North at Halstad, Minn.	--	5.3	3.4	3.4
55	Goose River at Hillsboro, N. Dak.	<1.0	<1.0	<1.0	<1.0
56	Red River of the North at Grand Forks, N. Dak.	<1.0	1.6	1.1	<1.0
58	Turtle River at Manvel, N. Dak.	<1.0	1.3	<1.0	<1.0
62	Forest River near Minto, N. Dak.	<1.0	<1.0	<1.0	<1.0
67	Park River at Grafton, N. Dak.	<1.0	1.6	<1.0	<1.0
68	Red River of the North at Drayton, N. Dak.	--	4.5	<1.0	2.5
75	Pembina River at Neche, N. Dak.	<1.0	7.7	<1.0	<1.0
78	Red River of the North at Pembina, N. Dak., site 2	<1.0	3.3	1.7	1.4
80	Long Creek near Noonan, N. Dak.	8.0	1.9	2.3	1.9
82	Souris River near Sherwood, N. Dak.	<1.0	<1.0	<1.0	<1.0
83	Souris River near Foxholm, N. Dak.	6.0	<1.0	<1.0	<1.0
84	Des Lacs River at Foxholm, N. Dak.	<1.0	1.3	<1.0	<1.0
85	Souris River above Minot, N. Dak.	<1.0	<1.0	<1.0	<1.0
87	Souris River near Verendrye, N. Dak.	<1.0	<1.0	<1.0	<1.0
88	Wintering River near Karlsruhe, N. Dak.	3.0	1.2	3.1	2.8
89	Souris River near Bantry, N. Dak.	<1.0	<1.0	1.2	<1.0
90	Willow Creek near Willow City, N. Dak.	--	<1.0	1.6	<1.0
91	Stone Creek near Kramer, N. Dak.	--	<1.0	<1.0	<1.0
92	Deep River near Upham, N. Dak.	--	1.3	3.3	1.3
97	Boundary Creek near Landa, N. Dak.	--	<1.0	<1.0	<1.0
98	Souris River near Westhope, N. Dak.	2.0	1.9	<1.0	1.1
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	<1.0	<1.0	<1.0
110	Little Missouri River at Marmarth, N. Dak.	--	40.7	1.1	12.8
112	Little Missouri River at Medora, N. Dak.	3.0	13.1	2.3	6.6
113	Beaver Creek near Trotters, N. Dak.	--	<1.0	<1.0	<1.0
114	Little Missouri River near Watford City, N. Dak.	4.0	32.0	3.3	12.4

Table 1-5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Lead, total, in µg/L—Continued					
120	Knife River near Golden Valley, N. Dak.	<1.0	1.9	1.3	1.4
125	Spring Creek at Zap, N. Dak.	<1.0	<1.0	<1.0	<1.0
127	Knife River at Hazen, N. Dak.	<1.0	<1.0	<1.0	<1.0
149	Heart River near Richardton, N. Dak.	<1.0	1.2	<1.0	<1.0
156	Heart River near Mandan, N. Dak.	<1.0	<1.0	<1.0	<1.0
164	Cannonball River near Raleigh, N. Dak.	<1.0	2.1	1.4	1.3
169	Cedar Creek near Raleigh, N. Dak.	<1.0	1.6	1.1	1.1
170	Cannonball River at Breien, N. Dak.	<1.0	2.2	1.3	1.4
175	James River near Manfred, N. Dak.	--	<1.0	<1.0	<1.0
176	James River near Grace City, N. Dak.	<1.0	<1.0	<1.0	<1.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	--	<1.0	<1.0	<1.0
180	Pipestem Creek near Pingree, N. Dak.	--	<1.0	<1.0	<1.0
182	James River at Jamestown, N. Dak.	<1.0	<1.0	<1.0	<1.0
183	James River at Lamoure, N. Dak.	<1.0	1.2	1.3	<1.0
184	Bear Creek near Oakes, N. Dak.	--	<1.0	<1.0	<1.0
186	James River at N. Dak./S. Dak. State line	--	<1.0	<1.0	<1.0
Nickel, total, in µg/L					
1	Bois De Sioux River near Doran, Minn.	8.2	6.8	8.3	7.5
3	Red River of the North near Wahpeton, N. Dak.	--	--	17.4	17.4
4	Red River of the North at Brushville, Minn.	3.4	5.0	4.4	4.0
10	Wild Rice River near Abercrombie, N. Dak.	8.9	10.6	10.7	10.3
11	Red River of the North at Fargo, N. Dak.	7.7	--	--	7.7
13	Red River of the North at Harwood, N. Dak.	4.0	8.5	8.3	7.8
14	Red River of the North near Harwood, N. Dak.	--	15.2	9.5	14.9
17	Sheyenne River at Warwick, N. Dak.	4.5	5.6	5.6	5.4
18	Sheyenne River near Warwick, N. Dak.	4.6	5.8	5.4	5.7
32	Sheyenne River near Cooperstown, N. Dak.	5.3	8.3	8.0	7.6
34	Sheyenne River below Baldhill Dam, N. Dak.	5.9	6.2	6.0	6.1
36	Sheyenne River at Lisbon, N. Dak.	7.4	11.8	12.1	11.1
37	Sheyenne River near Kindred, N. Dak.	8.0	13.5	10.2	10.7
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	--	28.6	12.4	16.2
41	Sheyenne River at West Fargo, N. Dak.	--	--	13.1	13.1
45	Maple River below Mapleton, N. Dak.	8.5	13.8	10.6	10.6
52	Red River of the North at Halstad, Minn.	--	16.3	10.1	13.9
55	Goose River at Hillsboro, N. Dak.	8.8	11.4	10.9	10.7
56	Red River of the North at Grand Forks, N. Dak.	4.2	10.4	9.0	7.7
58	Turtle River at Manvel, N. Dak.	7.0	9.7	9.5	9.5
62	Forest River near Minto, N. Dak.	5.0	8.2	8.9	7.5

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Nickel, total, in µg/L—Continued					
67	Park River at Grafton, N. Dak.	9.1	8.7	10.0	9.3
75	Pembina River at Neche, N. Dak.	6.8	21.4	8.6	9.0
78	Red River of the North at Pembina, N. Dak., site 2	3.6	13.9	9.2	9.1
80	Long Creek near Noonan, N. Dak.	5.1	5.6	5.2	5.3
82	Souris River near Sherwood, N. Dak.	3.4	3.7	4.1	3.8
83	Souris River near Foxholm, N. Dak.	9.1	3.7	3.4	4.0
84	Des Lacs River at Foxholm, N. Dak.	7.7	6.8	6.5	6.9
85	Souris River above Minot, N. Dak.	6.2	4.5	4.6	4.6
87	Souris River near Verendrye, N. Dak.	5.1	5.8	5.5	5.5
88	Wintering River near Karlsruhe, N. Dak.	2.8	3.2	2.9	2.8
89	Souris River near Bantry, N. Dak.	3.0	3.5	5.0	3.6
90	Willow Creek near Willow City, N. Dak.	--	3.9	4.9	4.8
91	Stone Creek near Kramer, N. Dak.	--	2.5	4.0	3.0
92	Deep River near Upham, N. Dak.	--	4.0	4.2	4.1
97	Boundary Creek near Landa, N. Dak.	--	2.0	5.0	2.0
98	Souris River near Westhope, N. Dak.	6.9	3.9	3.8	4.5
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	4.5	5.1	4.7
110	Little Missouri River at Marmarth, N. Dak.	--	66.5	8.8	26.0
112	Little Missouri River at Medora, N. Dak.	10.7	27.3	11.1	13.6
113	Beaver Creek near Trotters, N. Dak.	--	6.3	3.9	4.2
114	Little Missouri River near Watford City, N. Dak.	10.0	47.0	11.3	21.7
120	Knife River near Golden Valley, N. Dak.	6.3	10.1	8.1	9.0
125	Spring Creek at Zap, N. Dak.	4.8	6.0	5.1	5.4
127	Knife River at Hazen, N. Dak.	5.6	8.7	6.4	7.0
149	Heart River near Richardton, N. Dak.	6.8	7.6	7.9	7.6
156	Heart River near Mandan, N. Dak.	5.3	6.6	4.8	5.3
164	Cannonball River near Raleigh, N. Dak.	8.2	10.7	9.8	9.9
169	Cedar Creek near Raleigh, N. Dak.	7.4	10.4	9.6	9.6
170	Cannonball River at Breien, N. Dak.	7.4	13.1	7.6	9.2
175	James River near Manfred, N. Dak.	--	4.8	3.3	4.7
176	James River near Grace City, N. Dak.	5.3	5.3	5.2	5.2
177	James River above Arrowwood Lake near Kensal, N. Dak.	--	4.1	3.9	3.9
180	Pipestem Creek near Pingree, N. Dak.	--	6.0	4.8	5.9
182	James River at Jamestown, N. Dak.	6.0	6.2	6.0	6.1
183	James River at Lamoure, N. Dak.	5.5	7.8	6.9	7.0
184	Bear Creek near Oakes, N. Dak.	--	6.1	5.9	6.0
186	James River at N. Dak./S. Dak. State line	--	6.3	6.0	6.3

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Total suspended solids, in mg/L					
1	Bois De Sioux River near Doran, Minn.	11	36	46	36
2	Red River of the North at Wahpeton, N. Dak.	--	128	--	128
3	Red River of the North near Wahpeton, N. Dak.	--	--	<10	<10
4	Red River of the North at Brushville, Minn.	<10	38	46	36
10	Wild Rice River near Abercrombie, N. Dak.	16	92	80	65
11	Red River of the North at Fargo, N. Dak.	<10	132	69	68
12	Red River of North below Fargo, N. Dak.	<10	70	41	41
13	Red River of the North at Harwood, N. Dak.	12	141	118	95
14	Red River of the North near Harwood, N. Dak.	17	172	139	139
17	Sheyenne River at Warwick, N. Dak.	<10	29	16	20
18	Sheyenne River near Warwick, N. Dak.	<10	24	17	19
20	Mauvais Coulee near Cando, N. Dak.	--	<10	<10	<10
21	Edmore Coulee near Edmore, N. Dak.	--	<10	--	<10
24	Starkweather Coulee near Webster, N. Dak.	--	<10	472	<10
28	Big Coulee near Churchs Ferry, N. Dak.	--	49	99	53
30	Channel A near Penn, N. Dak.	--	24	<10	14
32	Sheyenne River near Cooperstown, N. Dak.	<10	48	32	34
33	Baldhill Creek near Dazey, N. Dak.		19	<10	17
34	Sheyenne River below Baldhill Dam, N. Dak.	<10	12	<10	<10
36	Sheyenne River at Lisbon, N. Dak.	<10	67	40	40
37	Sheyenne River near Kindred, N. Dak.	13	161	54	65
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	40	212	121	102
41	Sheyenne River at West Fargo, N. Dak.	--	223	78	159
45	Maple River below Mapleton, N. Dak.	14	89	64	62
46	Sheyenne River at Harwood, N. Dak.	21	79	130	102
51	Elm River near Kelso, N. Dak.	--	--	46	46
52	Red River of the North at Halstad, Minn.	27	184	137	157
53	Beaver Creek near Finley, N. Dak.	22	13	25	14
55	Goose River at Hillsboro, N. Dak.	<10	43	44	40
56	Red River of the North at Grand Forks, N. Dak.	<10	170	69	79
58	Turtle River at Manvel, N. Dak.	<10	55	33	34
62	Forest River near Minto, N. Dak.	<10	37	19	19
67	Park River at Grafton, N. Dak.	<10	36	22	23
68	Red River of the North at Drayton, N. Dak.	--	112	58	58
75	Pembina River at Neche, N. Dak.	<10	719	72	83
77	Red River of the North at Pembina, N. Dak., site 1	25	140	123	90
78	Red River of the North at Pembina, N. Dak., site 2	12	217	122	139
80	Long Creek near Noonan, N. Dak.	11	<10	19	14

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Total suspended solids, in mg/L—Continued					
82	Souris River near Sherwood, N. Dak.	<10	19	18	13
83	Souris River near Foxholm, N. Dak.	<10	<10	<10	<10
84	Des Lacs River at Foxholm, N. Dak.	16	39	29	31
85	Souris River above Minot, N. Dak.	<10	<10	<10	<10
87	Souris River near Verendrye, N. Dak.	<10	34	23	20
88	Wintering River near Karlsruhe, N. Dak.	<10	<10	<10	<10
89	Souris River near Bantry, N. Dak.	<10	17	35	16
90	Willow Creek near Willow City, N. Dak.	--	<10	15	14
91	Stone Creek near Kramer, N. Dak.	--	14	<10	<10
92	Deep River near Upham, N. Dak.	--	<10	<10	<10
96	Deep River below Cut Bank Creek near Upham, N. Dak.	--	--	15	15
97	Boundary Creek near Landa, N. Dak.	--	11	<10	11
98	Souris River near Westhope, N. Dak.	<10	<10	18	12
100	Missouri River near Williston, N. Dak.	22	--	77	58
101	Little Muddy River below Cow Creek near Williston, N. Dak.	--	26	19	24
106	Bear Den Creek near Mandaree, N. Dak.	33	180	66	48
110	Little Missouri River at Marmarth, N. Dak.	--	2,212	81	257
112	Little Missouri River at Medora, N. Dak.	74	643	96	198
113	Beaver Creek near Trotters, N. Dak.	--	<10	<10	<10
114	Little Missouri River near Watford City, N. Dak.	98	1,138	97	314
115	Missouri River at Garrison Dam, N. Dak.	--	--	<10	<10
120	Knife River near Golden Valley, N. Dak.	14	63	41	41
122	Brush Creek near Beulah, N. Dak.	11	<10	<10	<10
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	--	28	<10	15
125	Spring Creek at Zap, N. Dak.	<10	16	<10	11
127	Knife River at Hazen, N. Dak.	<10	47	18	19
128	Antelope Creek above Hazen, N. Dak.	23	<10	20	16
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	28	13	<10	<10
132	Alderin Creek near Fort Clark, N. Dak.	67	38	49	49
133	Coal Lake Coulee near Hensler, N. Dak.	<10	29	<10	25
142	Missouri River at Bismarck, N. Dak.	17	--	56	37
147	Green River near New Hradec, N. Dak.	--	93	--	93
149	Heart River near Richardton, N. Dak.	<10	32	25	25
156	Heart River near Mandan, N. Dak.	<10	22	<10	12
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	--	14	35	17
158	Apple Creek near Menoken, N. Dak.	--	30	36	32
159	Missouri River near Schmidt, N. Dak.	11	31	23	23
161	Coal Bank Creek near Havelock, N. Dak.	--	--	<10	<10

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—
Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <. less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Total suspended solids, in mg/L—Continued					
164	Cannonball River near Raleigh, N. Dak.	13	47	43	39
169	Cedar Creek near Raleigh, N. Dak.	11	48	26	31
170	Cannonball River at Breien, N. Dak.	19	78	24	35
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	--	--	125	125
175	James River near Manfred, N. Dak.	<10	<10	<10	<10
176	James River near Grace City, N. Dak.	11	14	17	13
177	James River above Arrowwood Lake near Kensal, N. Dak.	11	16	29	16
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	11	45	11
179	James River near Pingree, N. Dak.	<10	21	38	28
180	Pipestem Creek near Pingree, N. Dak.	--	11	39	26
182	James River at Jamestown, N. Dak.	<10	19	26	17
183	James River at Lamoure, N. Dak.	<10	56	54	42
184	Bear Creek near Oakes, N. Dak.	--	16	31	18
185	James River at Oakes, N. Dak.	11	42	77	43
186	James River at N. Dak./S. Dak. State line	--	60	93	62
Suspended-sediment concentration, in mg/L					
5	Red River of the North below Wahpeton, N. Dak.	10	62	49	49
6	Red River of the North at Hickson, N. Dak.	10	108	91	72
10	Wild Rice River near Abercrombie, N. Dak.	24	44	51	42
11	Red River of the North at Fargo, N. Dak.	10	177	103	115
12	Red River of North below Fargo, N. Dak.	13	114	61	43
14	Red River of the North near Harwood, N. Dak.	12	179	179	164
18	Sheyenne River near Warwick, N. Dak.	--	21	95	58
24	Starkweather Coulee near Webster, N. Dak.	--	394	6	200
34	Sheyenne River below Baldhill Dam, N. Dak.	--	17	17	17
36	Sheyenne River at Lisbon, N. Dak.	14	169	48	102
37	Sheyenne River near Kindred, N. Dak.	35	105	74	74
44	Maple River near Mapleton, N. Dak.	--	--	120	120
46	Sheyenne River at Harwood, N. Dak.	30	296	198	225
52	Red River of the North at Halstad, Minn.	16	169	107	76
53	Beaver Creek near Finley, N. Dak.	23	40	16	24
55	Goose River at Hillsboro, N. Dak.	9	30	35	28
56	Red River of the North at Grand Forks, N. Dak.	10	151	98	125
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	16	17	12	15
58	Turtle River at Manvel, N. Dak.	16	41	21	34
59	Red River of the North at Oslo, Minn.	12	115	83	76
62	Forest River near Minto, N. Dak.	38	42	18	38
65	Middle Branch Park River near Edinburg, N. Dak.	--	266	52	192

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Suspended-sediment concentration, in mg/L—Continued					
66	Cart Creek at Mountain, N. Dak.	--	574	--	574
67	Park River at Grafton, N. Dak.	4	22	12	14
72	Pembina River near Vang, N. Dak.	44	668	38	210
73	Little South Pembina River near Walhalla, N. Dak.	19	476	22	122
74	Pembina River at Walhalla, N. Dak.	136	817	150	681
75	Pembina River at Neche, N. Dak.	4	77	39	44
76	Tongue River at Akra, N. Dak.	--	136	14	42
78	Red River of the North at Pembina, N. Dak., site 2	86	189	230	190
79	Red River of the North at Emerson, Manitoba	19	205	153	115
81	West Branch Short Creek near Columbus, N. Dak.	36	19	15	22
82	Souris River near Sherwood, N. Dak.	16	41	18	23
83	Souris River near Foxholm, N. Dak.	10	17	12	13
87	Souris River near Verendrye, N. Dak.	10	31	18	16
88	Wintering River near Karlsruhe, N. Dak.	7	6	8	8
89	Souris River near Bantry, N. Dak.	35	25	33	26
90	Willow Creek near Willow City, N. Dak.	28	11	37	12
91	Stone Creek near Kramer, N. Dak.	--	14	7	14
92	Deep River near Upham, N. Dak.	--	11	16	12
95	Cut Bank Creek at Upham, N. Dak.	--	7	2	7
96	Deep River below Cut Bank Creek near Upham, N. Dak.	--	11	49	11
97	Boundary Creek near Landa, N. Dak.	--	16	24	16
98	Souris River near Westhope, N. Dak.	28	20	17	21
100	Missouri River near Williston, N. Dak.	46	444	182	178
102	Stony Creek near Williston, N. Dak.	121	84	72	78
104	Beaver Creek near Ray, N. Dak.	48	32	25	32
106	Bear Den Creek near Mandaree, N. Dak.	94	103	108	104
111	Deep Creek near Amidon, N. Dak.	88	95	41	71
113	Beaver Creek near Trotters, N. Dak.	64	107	66	80
114	Little Missouri River near Watford City, N. Dak.	192	2,122	1,060	1,028
115	Missouri River at Garrison Dam, N. Dak.	<1	<1	3	2
116	Knife River at Manning, N. Dak.	69	65	43	62
117	Stray Creek near Manning, N. Dak.	50	27	30	31
118	Knife River at Marshall, N. Dak.	54	106	107	89
119	Elm Creek near Golden Valley, N. Dak.	78	69	88	78
121	Coyote Creek near Zap, N. Dak.	57	43	45	48
122	Brush Creek near Beulah, N. Dak.	25	30	17	25
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	18	41	54	41
124	Spring Creek near Halliday, N. Dak.	52	70	45	53

Table 1–5. Median seasonal concentrations for selected constituents at selected sites in North Dakota from 1970 through 2008.—Continued

[Winter, January–February, November–December; Spring, March–June; Summer, July–October; mg/L, milligrams per liter; --, not available; N, nitrogen; <, less than; P, phosphorus; C, carbon; µg/L, micrograms per liter]

Site identification number (table 1)	Site name	Winter	Spring	Summer	Period of record
Suspended-sediment concentration, in mg/L—Continued					
125	Spring Creek at Zap, N. Dak.	21	56	53	39
127	Knife River at Hazen, N. Dak.	41	85	68	66
128	Antelope Creek above Hazen, N. Dak.	32	28	10	28
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	39	28	114	29
130	West Branch Antelope Creek near Hazen, N. Dak.	112	59	--	60
131	Coal Creek near Stanton, N. Dak.	81	44	25	47
132	Alderin Creek near Fort Clark, N. Dak.	170	161	139	159
133	Coal Lake Coulee near Hensler, N. Dak.	65	28	36	35
134	Buffalo Creek near Washburn, N. Dak.	102	73	44	68
137	Square Butte Creek near Hannover, N. Dak.	22	17	10	17
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	40	53	43	44
139	Hagel Creek near Center, N. Dak.	34	28	41	29
142	Missouri River at Bismarck, N. Dak.	84	136	91	97
143	South Branch Heart River near South Heart, N. Dak.	1,901	157	200	179
144	North Creek near South Heart, N. Dak.	57	68	191	68
145	Heart River near South Heart, N. Dak.	135	103	112	125
147	Green River near New Hradec, N. Dak.	43	33	38	34
156	Heart River near Mandan, N. Dak.	26	120	34	42
158	Apple Creek near Menoken, N. Dak.	13	24	20	16
159	Missouri River near Schmidt, N. Dak.	115	352	134	146
160	Cannonball River at New England, N. Dak.	47	66	71	58
161	Coal Bank Creek near Havelock, N. Dak.	42	30	9	22
162	Cannonball River at Regent, N. Dak.	50	60	98	67
167	Timber Creek near Bentley, N. Dak.	45	42	38	44
170	Cannonball River at Breien, N. Dak.	47	406	71	90
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	98	54	37	63
175	James River near Manfred, N. Dak.	71	12	8	11
176	James River near Grace City, N. Dak.	75	10	10	11
177	James River above Arrowwood Lake near Kensal, N. Dak.	51	21	38	30
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	--	8	8	8
179	James River near Pingree, N. Dak.	22	22	39	32
182	James River at Jamestown, N. Dak.	79	28	42	39
183	James River at Lamoure, N. Dak.	47	67	69	65
185	James River at Oakes, N. Dak.	87	59	109	89

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.[$\mu\text{S}/\text{cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, field, in $\mu\text{S}/\text{cm}$ at 25 deg. C						
1	Bois De Sioux River near Doran, Minn.	27	2003–2007	1,228	586	2,130
2	Red River of the North at Wahpeton, N. Dak.	334	1971–2008	526	200	1,050
3	Red River of the North near Wahpeton, N. Dak.	1	2006	1,738	1,738	1,738
4	Red River of the North at Brushville, Minn.	32	2000–2007	655	490	811
5	Red River of the North below Wahpeton, N. Dak.	65	1970–1999	478	396	672
6	Red River of the North at Hickson, N. Dak.	349	1975–2008	550	238	1,590
7	Wild Rice River near Rutland, N. Dak.	166	1971–2008	1,245	100	3,810
8	Wild Rice River near Cayuga, N. Dak.	56	1970–1979	918	180	4,320
9	Antelope Creek at Dwight, N. Dak.	22	2001–2008	957	240	1,430
10	Wild Rice River near Abercrombie, N. Dak.	407	1970–2008	1,190	150	3,750
11	Red River of the North at Fargo, N. Dak.	535	1970–2008	572	180	1,400
12	Red River of North below Fargo, N. Dak.	176	1970–1986	557	290	1,140
13	Red River of the North at Harwood, N. Dak.	32	2003–2007	752	612	1,072
14	Red River of the North near Harwood, N. Dak.	30	1997–2007	759	352	964
15	Sheyenne River above Harvey, N. Dak.	323	1971–2008	1,298	210	2,300
16	Big Coulee near Fort Totten, N. Dak.	43	1970–1975	600	190	932
17	Sheyenne River at Warwick, N. Dak.	17	2003–2006	1,186	635	1,506
18	Sheyenne River near Warwick, N. Dak.	420	1970–2008	852	210	1,900
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	98	1987–2008	764	268	2,130
20	Mauvais Coulee near Cando, N. Dak.	263	1971–2008	970	240	2,900
21	Edmore Coulee near Edmore, N. Dak.	214	1971–2008	740	169	2,120
22	Edmore Coulee Tributary near Webster, N. Dak.	129	1986–2008	710	220	2,740
23	Webster Coulee at Webster, N. Dak.	12	1980–1986	755	660	960
24	Starkweather Coulee near Webster, N. Dak.	164	1980–2008	566	145	1,819
25	Big Coulee below Churchs Ferry, N. Dak.	35	1998–2008	963	525	1,830
26	Little Coulee near Leeds, N. Dak.	36	1998–2008	887	392	2,390
27	Little Coulee near Brinsmade, N. Dak.	97	1976–1998	785	225	2,920
28	Big Coulee near Churchs Ferry, N. Dak.	247	1970–1997	799	300	2,800
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	46	1970–1986	2,745	608	8,400
30	Channel A near Penn, N. Dak.	175	1983–2008	938	260	3,590
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	41	1999–2007	3,976	418	9,360
32	Sheyenne River near Cooperstown, N. Dak.	542	1970–2008	945	220	2,000
33	Baldhill Creek near Dazey, N. Dak.	371	1971–2008	900	210	1,750
34	Sheyenne River below Baldhill Dam, N. Dak.	406	1971–2008	810	285	1,630
35	Sheyenne River at Valley City, N. Dak.	99	1971–2005	725	235	1,480
36	Sheyenne River at Lisbon, N. Dak.	482	1970–2008	890	110	1,865
37	Sheyenne River near Kindred, N. Dak.	589	1971–2008	800	180	1,770
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	175	1992–2008	955	418	2,000

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S}/\text{cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, field, in $\mu\text{S}/\text{cm}$ at 25 deg. C—Continued						
39	Sheyenne River near Horace, N. Dak.	50	1976–1992	820	348	1,160
40	Sheyenne River Diversion at West Fargo, N. Dak.	89	1993–2007	697	310	1,770
41	Sheyenne River at West Fargo, N. Dak.	338	1970–2008	860	237	1,700
42	Maple River near Hope, N. Dak.	158	1972–2008	925	185	3,200
43	Maple River near Enderlin, N. Dak.	340	1971–2008	1,420	275	2,800
44	Maple River near Mapleton, N. Dak.	108	1971–2008	1,110	240	2,620
45	Maple River below Mapleton, N. Dak.	161	1995–2008	1,310	305	3,767
46	Sheyenne River at Harwood, N. Dak.	30	1995–2005	916	365	1,406
47	Rush River at Amenias, N. Dak.	275	1971–2008	1,050	208	4,000
48	Rush River near Prosper, N. Dak.	26	1981–1987	948	195	1,720
49	Lower Branch Rush River near Prosper, N. Dak.	14	1981–1987	367	125	800
50	Sheyenne River near Harwood, N. Dak.	49	1970–1996	944	473	1,500
51	Elm River near Kelso, N. Dak.	23	1981–1987	668	248	1,530
52	Red River of the North at Halstad, Minn.	582	1972–2008	670	245	1,650
53	Beaver Creek near Finley, N. Dak.	311	1970–2003	1,125	205	3,650
54	Goose River near Portland, N. Dak.	104	1970–1992	1,145	260	2,300
55	Goose River at Hillsboro, N. Dak.	378	1970–2008	1,350	204	3,400
56	Red River of the North at Grand Forks, N. Dak.	601	1970–2008	540	200	1,526
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	205	1991–2008	907	283	1,534
58	Turtle River at Manvel, N. Dak.	83	1971–2008	2,610	605	7,300
59	Red River of the North at Oslo, Minn.	80	1973–2005	518	260	1,150
60	Middle Branch Forest River near Whitman, N. Dak.	77	1972–1990	780	180	5,100
61	Forest River near Fordville, N. Dak.	326	1971–2008	710	120	1,520
62	Forest River near Minto, N. Dak.	333	1971–2008	840	240	2,120
63	South Branch Park River below Homme Dam, N. Dak.	214	1971–1994	750	220	1,390
64	Middle Branch Park River near Union, N. Dak.	117	1971–1986	580	97	808
65	Middle Branch Park River near Edinburg, N. Dak.	18	1978–1980	346	227	690
66	Cart Creek at Mountain, N. Dak.	128	1971–1984	835	150	2,000
67	Park River at Grafton, N. Dak.	324	1970–2008	1,180	289	3,920
68	Red River of the North at Drayton, N. Dak.	401	1971–2008	640	275	2,010
69	Pembina County Drain 20 near Glasston, N. Dak.	50	1972–1986	440	233	1,920
70	Hidden Island Coulee near Hansboro, N. Dak.	87	1971–1995	818	232	1,680
71	Cypress Creek near Sarles, N. Dak.	53	1972–1988	590	155	1,900
72	Pembina River near Vang, N. Dak.	90	1970–1979	768	290	1,720
73	Little South Pembina River near Walhalla, N. Dak.	202	1970–2008	823	204	1,120
74	Pembina River at Walhalla, N. Dak.	400	1970–2008	787	239	1,780
75	Pembina River at Neche, N. Dak.	338	1971–2008	840	250	1,700
76	Tongue River at Akra, N. Dak.	262	1971–2008	581	235	1,490
78	Red River of the North at Pembina, N. Dak., site 2	147	1970–2008	706	310	3,258

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S}/\text{cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, field, in $\mu\text{S}/\text{cm}$ at 25 deg. C—Continued						
79	Red River of the North at Emerson, Manitoba	403	1974–2004	600	130	1,810
80	Long Creek near Noonan, N. Dak.	276	1971–2008	1,210	200	11,920
81	West Branch Short Creek near Columbus, N. Dak.	22	1978–1981	1,590	565	3,850
82	Souris River near Sherwood, N. Dak.	502	1970–2008	1,130	128	3,500
83	Souris River near Foxholm, N. Dak.	380	1971–2008	883	260	2,900
84	Des Lacs River at Foxholm, N. Dak.	362	1971–2008	1,471	150	3,330
85	Souris River above Minot, N. Dak.	410	1970–2008	1,045	248	5,293
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	1,100	260	2,860
87	Souris River near Verendrye, N. Dak.	477	1970–2008	1,140	315	3,482
88	Wintering River near Karlsruhe, N. Dak.	342	1971–2008	713	225	2,630
89	Souris River near Bantry, N. Dak.	413	1970–2008	990	355	3,100
90	Willow Creek near Willow City, N. Dak.	267	1971–2008	875	140	3,210
91	Stone Creek near Kramer, N. Dak.	85	1986–2000	928	170	3,640
92	Deep River near Upham, N. Dak.	149	1972–2007	862	208	1,930
93	Egg Creek near Granville, N. Dak.	69	1971–1981	1,100	186	2,450
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	59	1972–1980	1,100	322	2,080
95	Cut Bank Creek at Upham, N. Dak.	74	1975–2000	1,032	215	2,470
96	Deep River below Cut Bank Creek near Upham, N. Dak.	99	1975–1989	865	280	2,120
97	Boundary Creek near Landa, N. Dak.	163	1972–2000	1,000	200	3,200
98	Souris River near Westhope, N. Dak.	663	1970–2008	980	58	4,220
99	Charbonneau Creek near Charbonneau, N. Dak.	126	1971–2006	2,020	280	4,750
100	Missouri River near Williston, N. Dak.	103	1970–1992	700	370	900
101	Little Muddy River below Cow Creek near Williston, N. Dak.	283	1971–2008	2,050	220	3,450
102	Stony Creek near Williston, N. Dak.	36	1977–1981	1,960	220	2,800
103	Tobacco Garden Creek near Watford City, N. Dak.	66	1976–1983	2,425	220	4,500
104	Beaver Creek near Ray, N. Dak.	63	1977–1982	2,000	200	2,400
105	White Earth River at White Earth, N. Dak.	141	1970–1982	1,790	220	3,000
106	Bear Den Creek near Mandaree, N. Dak.	491	1970–2008	2,500	230	4,080
107	Shell Creek near Parshall, N. Dak.	106	1971–1981	2,400	235	3,500
108	East Fork Shell Creek near Parshall, N. Dak.	97	1991–2008	3,090	230	4,220
109	Deepwater Creek near Mandaree, N. Dak.	112	1990–2008	1,998	170	3,680
110	Little Missouri River at Marmarth, N. Dak.	347	1971–2008	1,530	250	3,960
111	Deep Creek near Amidon, N. Dak.	60	1977–1983	3,775	795	5,250
112	Little Missouri River at Medora, N. Dak.	138	1971–2008	1,746	376	5,316
113	Beaver Creek near Trotters, N. Dak.	197	1977–2008	2,260	310	6,200
114	Little Missouri River near Watford City, N. Dak.	724	1971–2008	1,630	400	5,000
115	Missouri River at Garrison Dam, N. Dak.	488	1971–2007	650	530	810
116	Knife River at Manning, N. Dak.	385	1972–2008	1,750	129	4,200
117	Stray Creek near Manning, N. Dak.	23	1975–1981	2,100	550	5,430

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S}/\text{cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, field, in $\mu\text{S}/\text{cm}$ at 25 deg. C—Continued						
118	Knife River at Marshall, N. Dak.	182	1972–1981	1,865	285	3,680
119	Elm Creek near Golden Valley, N. Dak.	98	1972–1995	1,018	185	3,740
120	Knife River near Golden Valley, N. Dak.	382	1971–2008	1,945	179	5,800
121	Coyote Creek near Zap, N. Dak.	67	1977–1983	1,760	120	3,300
122	Brush Creek near Beulah, N. Dak.	170	1974–1990	1,750	150	2,500
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	52	1977–1981	2,028	150	4,400
124	Spring Creek near Halliday, N. Dak.	52	1977–1981	1,875	250	2,200
125	Spring Creek at Zap, N. Dak.	399	1970–2008	1,600	135	3,600
126	West Branch Otter Creek near Beulah, N. Dak.	101	1972–1995	1,010	150	2,220
127	Knife River at Hazen, N. Dak.	601	1970–2008	1,530	180	3,100
128	Antelope Creek above Hazen, N. Dak.	60	1977–1985	1,380	150	3,180
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	82	1977–1986	395	65	1,400
130	West Branch Antelope Creek near Hazen, N. Dak.	21	1978–1983	760	110	2,740
131	Coal Creek near Stanton, N. Dak.	32	1975–1981	2,000	278	3,380
132	Alderin Creek near Fort Clark, N. Dak.	56	1977–1983	1,445	210	3,440
133	Coal Lake Coulee near Hensler, N. Dak.	64	1978–1988	1,050	140	2,300
134	Buffalo Creek near Washburn, N. Dak.	51	1978–1983	2,180	210	4,010
135	Turtle Creek above Washburn, N. Dak.	118	1986–2003	1,410	182	5,100
136	Painted Woods Creek near Wilton, N. Dak.	324	1970–2003	1,522	112	4,600
137	Square Butte Creek near Hannover, N. Dak.	27	1977–1981	1,090	125	1,550
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	70	1977–1982	1,180	110	1,650
139	Hagel Creek near Center, N. Dak.	48	1977–1982	1,110	178	2,130
140	Square Butte Creek below Center, N. Dak.	321	1971–2008	1,290	410	2,600
141	Burnt Creek near Bismarck, N. Dak.	195	1972–2008	970	110	2,250
142	Missouri River at Bismarck, N. Dak.	282	1970–2008	660	360	822
143	South Branch Heart River near South Heart, N. Dak.	38	1979–1996	658	222	2,500
144	North Creek near South Heart, N. Dak.	26	1978–1996	1,603	243	4,740
145	Heart River near South Heart, N. Dak.	108	1975–2005	2,130	226	4,450
146	Heart River at Dickinson, N. Dak.	90	1984–1994	1,945	585	2,770
147	Green River near New Hradec, N. Dak.	408	1971–2008	1,062	150	6,930
148	Green River near Gladstone, N. Dak.	64	1970–1975	1,635	150	2,850
149	Heart River near Richardton, N. Dak.	386	1971–2008	1,670	220	4,800
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	160	1988–2008	1,700	398	3,500
151	Antelope Creek near Carson, N. Dak.	103	1971–2008	909	357	2,030
152	Big Muddy Creek near Almont, N. Dak.	111	1991–2008	1,850	161	2,900
153	Heart River near Lark, N. Dak.	229	1971–1995	1,150	118	2,900
154	Heart River at Stark Bridge near Judson, N. Dak.	152	1988–2008	1,380	260	2,660
155	Sweetbriar Creek near Judson, N. Dak.	127	1971–2008	1,050	200	2,140
156	Heart River near Mandan, N. Dak.	492	1971–2008	1,350	240	3,500

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S}/\text{cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, field, in $\mu\text{S}/\text{cm}$ at 25 deg. C—Continued						
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	117	1988–2004	1,074	121	2,400
158	Apple Creek near Menoken, N. Dak.	339	1971–2008	1,260	100	2,570
159	Missouri River near Schmidt, N. Dak.	141	1974–1981	675	550	801
160	Cannonball River at New England, N. Dak.	39	1978–1981	2,480	405	4,240
161	Coal Bank Creek near Havelock, N. Dak.	109	1974–1983	1,930	145	4,800
162	Cannonball River at Regent, N. Dak.	407	1970–2008	1,830	172	3,310
163	Cannonball River below Bentley, N. Dak.	129	1972–1982	1,930	305	6,930
164	Cannonball River near Raleigh, N. Dak.	72	2001–2008	1,600	402	5,473
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	140	1972–1995	3,100	296	6,500
166	Cedar Creek near Haynes, N. Dak.	343	1971–2008	2,020	255	5,000
167	Timber Creek near Bentley, N. Dak.	50	1977–1981	2,600	810	4,250
168	Cedar Creek near Pretty Rock, N. Dak.	63	1971–1976	2,500	447	6,700
169	Cedar Creek near Raleigh, N. Dak.	333	1972–2008	1,600	200	4,400
170	Cannonball River at Breien, N. Dak.	573	1970–2008	1,632	190	4,860
171	Beaver Creek near Linton, N. Dak.	185	1972–1989	880	130	2,400
172	Beaver Creek below Linton, N. Dak.	141	1989–2008	1,088	150	1,650
173	Porcupine Creek near Fort Yates, N. Dak.	87	1991–1999	1,163	100	2,610
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	111	1974–1987	4,900	555	9,490
175	James River near Manfred, N. Dak.	126	1971–1998	800	75	1,360
176	James River near Grace City, N. Dak.	303	1972–2008	930	130	3,000
177	James River above Arrowwood Lake near Kensal, N. Dak.	212	1985–2008	891	216	2,640
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	17	1986–1989	550	260	890
179	James River near Pingree, N. Dak.	140	1978–2008	772	295	1,620
180	Pipestem Creek near Pingree, N. Dak.	223	1974–2008	940	130	2,566
181	Pipestem Creek near Buchanan, N. Dak.	24	1971–1974	900	350	1,440
182	James River at Jamestown, N. Dak.	349	1972–2008	860	185	1,915
183	James River at Lamoure, N. Dak.	386	1970–2008	820	160	2,585
184	Bear Creek near Oakes, N. Dak.	167	1972–2008	1,200	140	3,327
185	James River at Oakes, N. Dak.	166	1970–2008	920	250	4,650
186	James River at N. Dak./S. Dak. State line	115	1974–2008	840	255	3,900
Specific conductance, laboratory, in $\mu\text{S}/\text{cm}$ at 25 deg. C						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	1,275	261	3,690
2	Red River of the North at Wahpeton, N. Dak.	53	1991–2008	604	414	1,320
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	720	583	1,640
4	Red River of the North at Brushville, Minn.	61	1993–2007	608	338	879
5	Red River of the North below Wahpeton, N. Dak.	20	1997–1999	528	423	1,160
6	Red River of the North at Hickson, N. Dak.	78	1980–2008	549	261	957
7	Wild Rice River near Rutland, N. Dak.	35	1984–2008	1,540	261	3,820
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	944	579	1,400

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S}/\text{cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, laboratory, in $\mu\text{S}/\text{cm}$ at 25 deg. C—Continued						
10	Wild Rice River near Abercrombie, N. Dak.	117	1980–2008	1,360	142	2,800
11	Red River of the North at Fargo, N. Dak.	92	1983–2008	662	236	1,040
12	Red River of North below Fargo, N. Dak.	71	1980–1986	623	399	1,010
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	726	372	1,080
14	Red River of the North near Harwood, N. Dak.	59	1993–2007	734	359	1,200
15	Sheyenne River above Harvey, N. Dak.	140	1980–2008	1,370	322	2,300
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	1,140	621	1,550
18	Sheyenne River near Warwick, N. Dak.	85	1972–2008	939	310	1,420
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	32	1987–2008	705	280	1,980
20	Mauvais Coulee near Cando, N. Dak.	92	1983–2008	885	308	1,700
21	Edmore Coulee near Edmore, N. Dak.	94	1983–2008	762	205	2,080
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	702	268	2,680
23	Webster Coulee at Webster, N. Dak.	1	1984	757	757	757
24	Starkweather Coulee near Webster, N. Dak.	88	1983–2008	576	150	1,260
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	941	526	1,880
26	Little Coulee near Leeds, N. Dak.	15	1999–2008	1,010	400	2,020
27	Little Coulee near Brinsmade, N. Dak.	19	1980–1998	862	545	2,748
28	Big Coulee near Churchs Ferry, N. Dak.	71	1972–1997	692	448	1,640
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	12	1980–1986	2,585	2,190	3,460
30	Channel A near Penn, N. Dak.	72	1988–2008	757	423	1,900
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	3,910	1,890	6,110
32	Sheyenne River near Cooperstown, N. Dak.	150	1980–2008	1,050	314	1,600
33	Baldhill Creek near Dazey, N. Dak.	60	1972–2008	827	233	1,420
34	Sheyenne River below Baldhill Dam, N. Dak.	141	1980–2008	950	410	1,530
35	Sheyenne River at Valley City, N. Dak.	17	1992–2005	784	390	1,230
36	Sheyenne River at Lisbon, N. Dak.	182	1980–2008	983	410	1,500
37	Sheyenne River near Kindred, N. Dak.	193	1981–2008	936	478	1,440
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	42	1993–2008	994	437	1,290
39	Sheyenne River near Horace, N. Dak.	1	1992	796	796	796
40	Sheyenne River Diversion at West Fargo, N. Dak.	13	1994–2007	847	436	1,180
41	Sheyenne River at West Fargo, N. Dak.	44	1983–2008	922	409	1,370
42	Maple River near Hope, N. Dak.	24	1991–2008	1,335	358	2,650
43	Maple River near Enderlin, N. Dak.	32	1992–2008	1,250	474	1,960
44	Maple River near Mapleton, N. Dak.	17	1995–2008	1,140	491	1,740
45	Maple River below Mapleton, N. Dak.	72	1995–2008	1,360	347	3,630
46	Sheyenne River at Harwood, N. Dak.	36	1993–2005	955	546	1,410
47	Rush River at Amenias, N. Dak.	36	1983–2008	1,045	282	1,660
49	Lower Branch Rush River near Prosper, N. Dak.	1	1993	1,350	1,350	1,350

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S}/\text{cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, laboratory, in $\mu\text{S}/\text{cm}$ at 25 deg. C—Continued						
50	Sheyenne River near Harwood, N. Dak.	1	1996	468	468	468
51	Elm River near Kelso, N. Dak.	3	1993	1,160	1,080	1,290
52	Red River of the North at Halstad, Minn.	136	1980–2008	703	299	1,090
53	Beaver Creek near Finley, N. Dak.	58	1981–2003	1,124	225	2,740
55	Goose River at Hillsboro, N. Dak.	117	1988–2008	1,380	402	2,120
56	Red River of the North at Grand Forks, N. Dak.	145	1983–2008	626	274	1,060
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	99	1991–2008	905	282	1,540
58	Turtle River at Manvel, N. Dak.	78	1981–2008	2,690	820	7,280
59	Red River of the North at Oslo, Minn.	16	1991–2005	552	343	832
60	Middle Branch Forest River near Whitman, N. Dak.	1	1987	504	504	504
61	Forest River near Fordville, N. Dak.	33	1992–2008	824	448	1,470
62	Forest River near Minto, N. Dak.	106	1987–2008	965	487	4,820
63	South Branch Park River below Homme Dam, N. Dak.	7	1981–1994	618	294	866
67	Park River at Grafton, N. Dak.	99	1988–2008	1,210	336	3,330
68	Red River of the North at Drayton, N. Dak.	50	1991–2008	677	394	1,450
70	Hidden Island Coulee near Hansboro, N. Dak.	5	1992–1995	676	328	1,070
73	Little South Pembina River near Walhalla, N. Dak.	16	2001–2008	811	473	1,000
74	Pembina River at Walhalla, N. Dak.	80	1980–2008	791	412	1,190
75	Pembina River at Neche, N. Dak.	111	1990–2008	854	350	1,270
76	Tongue River at Akra, N. Dak.	36	1980–2008	584	305	697
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	709	440	786
78	Red River of the North at Pembina, N. Dak., site 2	150	1994–2008	693	316	1,580
79	Red River of the North at Emerson, Manitoba	114	1980–2004	704	413	1,780
80	Long Creek near Noonan, N. Dak.	41	1982–2008	1,350	338	2,850
81	West Branch Short Creek near Columbus, N. Dak.	3	1981	1,330	628	2,120
82	Souris River near Sherwood, N. Dak.	217	1980–2008	1,110	265	3,560
83	Souris River near Foxholm, N. Dak.	113	1972–2008	996	470	2,370
84	Des Lacs River at Foxholm, N. Dak.	168	1983–2008	1,625	196	3,210
85	Souris River above Minot, N. Dak.	174	1981–2008	1,196	324	5,120
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	1,115	269	2,880
87	Souris River near Verendrye, N. Dak.	249	1981–2008	1,390	312	3,400
88	Wintering River near Karlsruhe, N. Dak.	89	1980–2008	762	315	1,990
89	Souris River near Bantry, N. Dak.	158	1981–2008	919	398	2,080
90	Willow Creek near Willow City, N. Dak.	121	1983–2008	959	290	2,290
91	Stone Creek near Kramer, N. Dak.	84	1986–2000	760	220	3,650
92	Deep River near Upham, N. Dak.	54	1987–2007	945	271	1,450
93	Egg Creek near Granville, N. Dak.	1	1981	679	679	679
95	Cut Bank Creek at Upham, N. Dak.	16	1999–2000	1,145	444	1,460
96	Deep River below Cut Bank Creek near Upham, N. Dak.	49	1986–1989	660	285	1,520

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S}/\text{cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, laboratory, in $\mu\text{S}/\text{cm}$ at 25 deg. C—Continued						
97	Boundary Creek near Landa, N. Dak.	86	1986–2000	920	268	2,830
98	Souris River near Westhope, N. Dak.	143	1980–2008	960	415	3,110
99	Charbonneau Creek near Charbonneau, N. Dak.	1	2006	4,060	4,060	4,060
100	Missouri River near Williston, N. Dak.	19	1980–1992	720	417	913
101	Little Muddy River below Cow Creek near Williston, N. Dak.	44	1983–2008	1,975	260	2,530
102	Stony Creek near Williston, N. Dak.	6	1980–1981	1,670	217	2,750
104	Beaver Creek near Ray, N. Dak.	18	1980–1982	2,020	221	2,320
106	Bear Den Creek near Mandaree, N. Dak.	113	1980–2008	2,600	256	3,630
108	East Fork Shell Creek near Parshall, N. Dak.	60	1991–2008	3,140	219	3,920
109	Deepwater Creek near Mandaree, N. Dak.	57	1991–2008	1,890	176	3,360
110	Little Missouri River at Marmarth, N. Dak.	43	1990–2008	1,400	320	3,120
111	Deep Creek near Amidon, N. Dak.	16	1980–1983	3,705	839	5,320
112	Little Missouri River at Medora, N. Dak.	104	1993–2008	1,700	405	5,300
113	Beaver Creek near Trotters, N. Dak.	50	1980–2008	2,295	336	3,380
114	Little Missouri River near Watford City, N. Dak.	164	1980–2008	1,680	401	4,070
115	Missouri River at Garrison Dam, N. Dak.	156	1980–2007	647	547	812
116	Knife River at Manning, N. Dak.	50	1980–2008	1,400	144	2,980
117	Stray Creek near Manning, N. Dak.	4	1981	1,175	675	2,170
118	Knife River at Marshall, N. Dak.	11	1980–1981	1,410	813	3,880
119	Elm Creek near Golden Valley, N. Dak.	7	1981–1995	947	359	2,990
120	Knife River near Golden Valley, N. Dak.	96	1987–2008	1,980	290	4,550
121	Coyote Creek near Zap, N. Dak.	21	1980–1983	1,590	250	2,740
122	Brush Creek near Beulah, N. Dak.	50	1980–1990	1,850	260	2,250
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	17	1980–1993	2,120	714	2,710
124	Spring Creek near Halliday, N. Dak.	12	1980–1981	1,981	505	2,220
125	Spring Creek at Zap, N. Dak.	129	1980–2008	1,620	230	2,440
126	West Branch Otter Creek near Beulah, N. Dak.	4	1992–1995	644	388	948
127	Knife River at Hazen, N. Dak.	181	1980–2008	1,660	295	2,570
128	Antelope Creek above Hazen, N. Dak.	24	1980–1985	1,195	145	3,120
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	13	1981–1985	769	93	1,370
130	West Branch Antelope Creek near Hazen, N. Dak.	7	1981–1983	721	192	2,700
131	Coal Creek near Stanton, N. Dak.	6	1980–1981	2,065	515	3,480
132	Alderin Creek near Fort Clark, N. Dak.	19	1980–1983	1,440	274	3,290
133	Coal Lake Coulee near Hensler, N. Dak.	29	1980–1988	1,590	150	2,280
134	Buffalo Creek near Washburn, N. Dak.	17	1980–1983	2,160	240	2,650
135	Turtle Creek above Washburn, N. Dak.	100	1987–2003	1,585	369	5,100
136	Painted Woods Creek near Wilton, N. Dak.	135	1982–2003	1,700	292	4,060
137	Square Butte Creek near Hannover, N. Dak.	5	1980–1981	807	169	1,240
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	18	1980–1982	1,205	174	1,400

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, laboratory, in $\mu\text{S/cm}$ at 25 deg. C—Continued						
139	Hagel Creek near Center, N. Dak.	14	1980–1982	1,265	173	2,030
140	Square Butte Creek below Center, N. Dak.	38	1983–2008	1,585	560	1,870
141	Burnt Creek near Bismarck, N. Dak.	31	1992–2008	1,070	196	1,680
142	Missouri River at Bismarck, N. Dak.	52	1988–2008	650	441	734
143	South Branch Heart River near South Heart, N. Dak.	22	1980–1996	461	237	1,990
144	North Creek near South Heart, N. Dak.	14	1980–1996	1,159	274	4,130
145	Heart River near South Heart, N. Dak.	31	1980–2005	2,010	265	4,500
146	Heart River at Dickinson, N. Dak.	14	1988–1994	1,855	791	2,990
147	Green River near New Hradec, N. Dak.	50	1980–2008	889	154	2,880
148	Green River near Gladstone, N. Dak.	4	1993	1,555	834	2,740
149	Heart River near Richardton, N. Dak.	110	1987–2008	1,560	402	3,000
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	33	1992–2008	1,340	417	2,330
151	Antelope Creek near Carson, N. Dak.	18	1999–2008	810	583	1,990
152	Big Muddy Creek near Almont, N. Dak.	37	1991–2008	1,760	460	2,730
153	Heart River near Lark, N. Dak.	9	1990–1995	1,000	417	1,400
154	Heart River at Stark Bridge near Judson, N. Dak.	33	1992–2008	1,330	281	1,750
155	Sweetbriar Creek near Judson, N. Dak.	13	2002–2008	1,470	591	2,010
156	Heart River near Mandan, N. Dak.	183	1980–2008	1,460	360	2,760
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	27	1988–2004	922	212	1,520
158	Apple Creek near Menoken, N. Dak.	43	1980–2008	1,180	252	2,010
159	Missouri River near Schmidt, N. Dak.	10	1980–1981	773	749	809
160	Cannonball River at New England, N. Dak.	12	1980–1981	1,980	443	4,060
161	Coal Bank Creek near Havelock, N. Dak.	18	1980–1983	2,000	466	4,590
162	Cannonball River at Regent, N. Dak.	45	1980–2008	1,690	514	3,030
164	Cannonball River near Raleigh, N. Dak.	89	1993–2008	1,750	434	5,360
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	6	1992–1995	1,185	562	3,140
166	Cedar Creek near Haynes, N. Dak.	34	1983–2008	1,700	322	3,200
167	Timber Creek near Bentley, N. Dak.	12	1980–1981	2,450	1,520	3,950
169	Cedar Creek near Raleigh, N. Dak.	95	1992–2008	1,620	364	3,910
170	Cannonball River at Breien, N. Dak.	164	1980–2008	1,610	256	3,220
171	Beaver Creek near Linton, N. Dak.	7	1984–1993	651	219	914
172	Beaver Creek below Linton, N. Dak.	34	1990–2008	1,002	183	1,460
173	Porcupine Creek near Fort Yates, N. Dak.	40	1992–1999	1,160	101	2,090
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	31	1980–1987	5,480	1,127	10,500
175	James River near Manfred, N. Dak.	41	1985–1998	970	197	1,360
176	James River near Grace City, N. Dak.	141	1985–2008	996	202	3,290
177	James River above Arrowwood Lake near Kensal, N. Dak.	172	1985–2008	970	275	2,339
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	572	360	772
179	James River near Pingree, N. Dak.	134	1981–2008	816	321	1,601

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Specific conductance, laboratory, in $\mu\text{S/cm}$ at 25 deg. C—Continued						
180	Pipestem Creek near Pingree, N. Dak.	49	1992–2008	1,050	304	1,820
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	599	135	851
182	James River at Jamestown, N. Dak.	183	1984–2008	955	348	1,640
183	James River at Lamoure, N. Dak.	205	1980–2008	938	293	2,600
184	Bear Creek near Oakes, N. Dak.	42	1990–2008	1,330	422	1,830
185	James River at Oakes, N. Dak.	97	1982–2008	928	238	4,580
186	James River at N. Dak./S. Dak. State line	30	1980–2008	928	527	1,520
pH, field, in standard units						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	8.2	7.4	9.8
2	Red River of the North at Wahpeton, N. Dak.	76	1973–2008	8.1	7.2	8.8
3	Red River of the North near Wahpeton, N. Dak.	5	1993–2006	8.0	7.9	8.5
4	Red River of the North at Brushville, Minn.	60	1993–2007	8.2	7.5	9.0
5	Red River of the North below Wahpeton, N. Dak.	65	1970–1999	8.1	7.4	9.1
6	Red River of the North at Hickson, N. Dak.	171	1975–2008	8.1	7.2	9.4
7	Wild Rice River near Rutland, N. Dak.	47	1971–2008	8.1	6.8	8.6
8	Wild Rice River near Cayuga, N. Dak.	15	1970–1977	8.0	7.4	9.4
9	Antelope Creek at Dwight, N. Dak.	13	2001–2008	7.9	7.2	8.4
10	Wild Rice River near Abercrombie, N. Dak.	246	1970–2008	8.0	6.8	8.9
11	Red River of the North at Fargo, N. Dak.	274	1970–2008	8.0	7.2	8.8
12	Red River of North below Fargo, N. Dak.	174	1970–1986	8.0	7.2	8.9
13	Red River of the North at Harwood, N. Dak.	52	2000–2007	8.1	7.3	8.7
14	Red River of the North near Harwood, N. Dak.	58	1993–2007	8.0	7.0	8.9
15	Sheyenne River above Harvey, N. Dak.	194	1972–2008	8.2	7.4	9.2
16	Big Coulee near Fort Totten, N. Dak.	8	1970–1975	8.0	7.4	8.2
17	Sheyenne River at Warwick, N. Dak.	46	1996–2006	8.3	7.5	8.9
18	Sheyenne River near Warwick, N. Dak.	226	1970–2008	8.1	6.7	9.2
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	38	1987–2008	7.8	6.9	8.9
20	Mauvais Coulee near Cando, N. Dak.	98	1972–2008	7.9	6.8	9.6
21	Edmore Coulee near Edmore, N. Dak.	104	1972–2008	7.9	6.7	9.8
22	Edmore Coulee Tributary near Webster, N. Dak.	38	1987–2008	7.8	6.8	8.8
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	8.2	8.1	8.2
24	Starkweather Coulee near Webster, N. Dak.	93	1983–2008	8.0	6.8	9.4
25	Big Coulee below Churchs Ferry, N. Dak.	23	1998–2008	8.4	7.3	9.0
26	Little Coulee near Leeds, N. Dak.	14	1998–2008	8.4	6.8	9.0
27	Little Coulee near Brinsmade, N. Dak.	31	1976–1998	7.9	7.2	8.9
28	Big Coulee near Churchs Ferry, N. Dak.	151	1970–1997	8.0	6.8	9.5
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	46	1970–1986	8.5	7.3	9.2
30	Channel A near Penn, N. Dak.	99	1984–2008	8.1	6.6	10.1
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	1999–2007	8.7	8.1	9.2

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[μ S/cm, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, field, in standard units—Continued						
32	Sheyenne River near Cooperstown, N. Dak.	364	1970–2008	8.1	6.8	8.9
33	Baldhill Creek near Dazey, N. Dak.	102	1972–2008	8.1	6.7	8.7
34	Sheyenne River below Baldhill Dam, N. Dak.	178	1972–2008	8.4	7.4	9.2
35	Sheyenne River at Valley City, N. Dak.	38	1972–2005	8.0	7.3	8.8
36	Sheyenne River at Lisbon, N. Dak.	338	1970–2008	8.1	7.1	9.0
37	Sheyenne River near Kindred, N. Dak.	378	1972–2008	8.2	6.9	8.9
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	40	1993–2008	8.2	7.5	8.6
39	Sheyenne River near Horace, N. Dak.	46	1976–1992	8.0	7.0	8.5
40	Sheyenne River Diversion at West Fargo, N. Dak.	14	1994–2007	8.1	7.1	8.5
41	Sheyenne River at West Fargo, N. Dak.	63	1970–2008	8.0	6.7	8.6
42	Maple River near Hope, N. Dak.	39	1972–2008	7.8	7.1	8.5
43	Maple River near Enderlin, N. Dak.	66	1972–2008	7.8	6.9	8.4
44	Maple River near Mapleton, N. Dak.	27	1972–2008	8.0	6.5	8.6
45	Maple River below Mapleton, N. Dak.	68	1995–2008	8.2	6.5	8.9
46	Sheyenne River at Harwood, N. Dak.	35	1993–2005	8.0	7.1	8.5
47	Rush River at Amenia, N. Dak.	50	1972–2008	8.0	6.8	8.8
48	Rush River near Prosper, N. Dak.	6	1983–1987	8.0	7.6	8.4
49	Lower Branch Rush River near Prosper, N. Dak.	6	1983–1993	7.8	6.6	8.4
50	Sheyenne River near Harwood, N. Dak.	49	1970–1996	8.0	7.1	8.5
51	Elm River near Kelso, N. Dak.	6	1983–1993	8.1	6.5	8.5
52	Red River of the North at Halstad, Minn.	328	1972–2008	8.1	6.7	9.3
53	Beaver Creek near Finley, N. Dak.	204	1970–2003	8.2	7.1	9.4
54	Goose River near Portland, N. Dak.	34	1970–1992	7.8	7.1	8.8
55	Goose River at Hillsboro, N. Dak.	162	1970–2008	8.1	7.3	9.0
56	Red River of the North at Grand Forks, N. Dak.	233	1970–2008	8.0	7.2	9.0
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	121	1991–2008	8.1	7.0	8.6
58	Turtle River at Manvel, N. Dak.	107	1971–2008	8.1	6.7	8.9
59	Red River of the North at Oslo, Minn.	75	1973–2005	8.0	7.3	8.8
60	Middle Branch Forest River near Whitman, N. Dak.	18	1972–1990	7.9	7.0	8.2
61	Forest River near Fordville, N. Dak.	67	1972–2008	8.1	7.2	8.8
62	Forest River near Minto, N. Dak.	156	1971–2008	8.2	7.1	9.0
63	South Branch Park River below Homme Dam, N. Dak.	26	1972–1994	8.0	7.1	8.3
64	Middle Branch Park River near Union, N. Dak.	17	1972–1984	7.8	7.4	8.4
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	8.2	7.7	8.5
66	Cart Creek at Mountain, N. Dak.	20	1972–1984	8.0	6.9	8.4
67	Park River at Grafton, N. Dak.	144	1970–2008	8.1	7.1	9.0
68	Red River of the North at Drayton, N. Dak.	74	1972–2008	8.1	7.4	8.7
69	Pembina County Drain 20 near Glasston, N. Dak.	9	1974–1984	7.7	7.6	8.1

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, field, in standard units—Continued						
70	Hidden Island Coulee near Hansboro, N. Dak.	20	1972–1995	7.7	7.1	8.2
71	Cypress Creek near Sarles, N. Dak.	13	1972–1988	7.7	6.7	8.0
72	Pembina River near Vang, N. Dak.	87	1970–1979	8.0	7.2	8.6
73	Little South Pembina River near Walhalla, N. Dak.	115	1970–2008	8.0	7.1	8.7
74	Pembina River at Walhalla, N. Dak.	293	1970–2008	8.0	6.9	8.9
75	Pembina River at Neche, N. Dak.	127	1972–2008	8.2	6.7	8.8
76	Tongue River at Akra, N. Dak.	88	1972–2008	8.0	7.1	9.0
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	8.0	7.3	8.4
78	Red River of the North at Pembina, N. Dak., site 2	181	1970–2008	8.2	6.6	9.0
79	Red River of the North at Emerson, Manitoba	389	1978–2004	8.0	6.8	8.9
80	Long Creek near Noonan, N. Dak.	68	1972–2008	8.1	6.6	10.3
81	West Branch Short Creek near Columbus, N. Dak.	21	1978–1981	8.4	7.4	8.9
82	Souris River near Sherwood, N. Dak.	420	1972–2008	8.1	6.9	9.2
83	Souris River near Foxholm, N. Dak.	209	1972–2008	8.4	6.8	9.8
84	Des Lacs River at Foxholm, N. Dak.	187	1972–2008	8.3	7.2	9.3
85	Souris River above Minot, N. Dak.	216	1970–2008	8.2	7.2	9.5
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	8.1	7.4	8.7
87	Souris River near Verendrye, N. Dak.	394	1970–2008	8.1	7.0	9.1
88	Wintering River near Karlsruhe, N. Dak.	137	1972–2008	8.0	7.2	8.8
89	Souris River near Bantry, N. Dak.	169	1970–2008	8.0	7.0	8.9
90	Willow Creek near Willow City, N. Dak.	91	1972–2008	8.2	7.2	9.8
91	Stone Creek near Kramer, N. Dak.	30	1986–2000	8.0	7.1	8.4
92	Deep River near Upham, N. Dak.	65	1972–2007	8.1	7.1	9.9
93	Egg Creek near Granville, N. Dak.	14	1972–1981	7.9	7.3	8.3
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	15	1972–1976	8.0	7.4	9.3
95	Cut Bank Creek at Upham, N. Dak.	31	1975–2000	7.8	7.0	9.6
96	Deep River below Cut Bank Creek near Upham, N. Dak.	43	1975–1989	8.1	7.3	9.7
97	Boundary Creek near Landa, N. Dak.	38	1972–2000	8.0	7.3	8.9
98	Souris River near Westhope, N. Dak.	559	1970–2008	8.4	7.0	9.8
99	Charbonneau Creek near Charbonneau, N. Dak.	23	1972–2006	8.4	8.0	8.9
100	Missouri River near Williston, N. Dak.	102	1970–1992	8.3	7.8	9.4
101	Little Muddy River below Cow Creek near Williston, N. Dak.	74	1972–2008	8.3	7.2	9.0
102	Stony Creek near Williston, N. Dak.	36	1977–1981	8.4	8.0	8.7
103	Tobacco Garden Creek near Watford City, N. Dak.	14	1976–1977	8.4	7.4	8.8
104	Beaver Creek near Ray, N. Dak.	57	1977–1982	8.3	7.8	9.2
105	White Earth River at White Earth, N. Dak.	25	1970–1977	8.3	7.5	8.8
106	Bear Den Creek near Mandaree, N. Dak.	399	1970–2008	8.4	7.1	9.6
107	Shell Creek near Parshall, N. Dak.	21	1972–1977	8.3	7.8	8.9
108	East Fork Shell Creek near Parshall, N. Dak.	54	1991–2008	8.5	7.1	9.2

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Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, field, in standard units—Continued						
109	Deepwater Creek near Mandaree, N. Dak.	62	1990–2008	8.5	7.6	9.3
110	Little Missouri River at Marmarth, N. Dak.	88	1971–2008	8.4	6.9	10.5
111	Deep Creek near Amidon, N. Dak.	59	1977–1983	8.3	6.9	8.7
112	Little Missouri River at Medora, N. Dak.	109	1972–2008	8.3	7.2	10.7
113	Beaver Creek near Trotters, N. Dak.	96	1977–2008	8.3	7.5	10.4
114	Little Missouri River near Watford City, N. Dak.	681	1971–2008	8.4	7.3	9.2
115	Missouri River at Garrison Dam, N. Dak.	474	1971–2007	8.1	7.2	8.8
116	Knife River at Manning, N. Dak.	120	1972–2008	8.2	6.7	9.2
117	Stray Creek near Manning, N. Dak.	22	1975–1981	8.4	7.4	9.6
118	Knife River at Marshall, N. Dak.	70	1972–1981	8.3	7.3	8.8
119	Elm Creek near Golden Valley, N. Dak.	37	1973–1995	8.1	7.1	8.7
120	Knife River near Golden Valley, N. Dak.	127	1971–2008	8.4	6.6	9.4
121	Coyote Creek near Zap, N. Dak.	62	1977–1983	8.3	7.2	8.7
122	Brush Creek near Beulah, N. Dak.	131	1974–1990	8.0	6.9	8.8
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	58	1977–1993	8.2	7.1	8.8
124	Spring Creek near Halliday, N. Dak.	52	1977–1981	8.3	7.0	8.7
125	Spring Creek at Zap, N. Dak.	233	1970–2008	8.2	6.6	9.2
126	West Branch Otter Creek near Beulah, N. Dak.	15	1972–1994	8.0	6.9	9.3
127	Knife River at Hazen, N. Dak.	480	1970–2008	8.3	7.0	9.2
128	Antelope Creek above Hazen, N. Dak.	51	1977–1985	8.0	6.6	8.7
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	22	1977–1985	7.5	7.0	8.2
130	West Branch Antelope Creek near Hazen, N. Dak.	18	1978–1983	7.8	6.7	8.6
131	Coal Creek near Stanton, N. Dak.	32	1975–1981	8.3	7.9	9.0
132	Alderin Creek near Fort Clark, N. Dak.	53	1977–1983	8.3	7.3	8.7
133	Coal Lake Coulee near Hensler, N. Dak.	45	1978–1988	8.3	6.6	8.7
134	Buffalo Creek near Washburn, N. Dak.	48	1978–1983	8.3	7.2	8.8
135	Turtle Creek above Washburn, N. Dak.	99	1987–2003	8.4	7.0	9.2
136	Painted Woods Creek near Wilton, N. Dak.	193	1970–2003	8.3	6.7	9.7
137	Square Butte Creek near Hannover, N. Dak.	26	1977–1981	8.2	7.6	8.6
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	64	1977–1982	8.1	6.8	8.8
139	Hagel Creek near Center, N. Dak.	44	1977–1982	8.2	6.7	9.8
140	Square Butte Creek below Center, N. Dak.	86	1972–2008	8.0	7.1	9.3
141	Burnt Creek near Bismarck, N. Dak.	49	1972–2008	8.0	6.8	8.5
142	Missouri River at Bismarck, N. Dak.	195	1970–2008	8.3	7.4	8.7
143	South Branch Heart River near South Heart, N. Dak.	33	1979–1996	8.1	6.9	8.8
144	North Creek near South Heart, N. Dak.	26	1978–1996	8.2	7.3	9.1
145	Heart River near South Heart, N. Dak.	83	1975–2005	8.3	6.8	8.8
146	Heart River at Dickinson, N. Dak.	21	1986–1994	8.3	7.4	9.0
147	Green River near New Hradec, N. Dak.	120	1972–2008	8.1	6.5	8.9

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Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, field, in standard units—Continued						
148	Green River near Gladstone, N. Dak.	33	1970–1993	7.9	6.8	8.3
149	Heart River near Richardton, N. Dak.	149	1972–2008	8.3	7.4	8.9
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	37	1989–2008	8.4	7.2	9.1
151	Antelope Creek near Carson, N. Dak.	25	1972–2008	8.2	7.4	9.1
152	Big Muddy Creek near Almont, N. Dak.	39	1991–2008	8.3	7.3	9.3
153	Heart River near Lark, N. Dak.	45	1971–1995	8.1	6.6	8.6
154	Heart River at Stark Bridge near Judson, N. Dak.	40	1988–2008	8.3	6.9	8.7
155	Sweetbriar Creek near Judson, N. Dak.	31	1972–2008	8.4	7.5	8.9
156	Heart River near Mandan, N. Dak.	336	1971–2008	8.3	7.0	9.1
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	32	1988–2004	8.2	7.3	9.0
158	Apple Creek near Menoken, N. Dak.	133	1972–2008	8.1	6.9	9.5
159	Missouri River near Schmidt, N. Dak.	143	1974–1981	8.3	7.7	8.8
160	Cannonball River at New England, N. Dak.	39	1978–1981	8.2	7.3	8.6
161	Coal Bank Creek near Havelock, N. Dak.	91	1974–1983	8.1	7.0	10.1
162	Cannonball River at Regent, N. Dak.	118	1970–2008	8.2	6.8	8.9
163	Cannonball River below Bentley, N. Dak.	31	1972–1977	8.1	6.8	8.8
164	Cannonball River near Raleigh, N. Dak.	86	1993–2008	8.4	7.0	9.1
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	26	1972–1995	8.0	7.2	8.8
166	Cedar Creek near Haynes, N. Dak.	76	1971–2008	8.2	7.1	9.5
167	Timber Creek near Bentley, N. Dak.	50	1977–1981	8.2	7.5	8.8
168	Cedar Creek near Pretty Rock, N. Dak.	30	1971–1976	8.0	7.0	8.4
169	Cedar Creek near Raleigh, N. Dak.	117	1972–2008	8.4	6.8	9.1
170	Cannonball River at Breien, N. Dak.	366	1970–2008	8.4	7.2	9.6
171	Beaver Creek near Linton, N. Dak.	38	1972–1993	8.0	6.7	8.6
172	Beaver Creek below Linton, N. Dak.	38	1990–2008	8.2	6.2	8.8
173	Porcupine Creek near Fort Yates, N. Dak.	42	1991–1999	8.0	7.4	8.5
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	96	1974–1987	8.3	7.2	9.6
175	James River near Manfred, N. Dak.	43	1972–1998	8.0	7.1	9.1
176	James River near Grace City, N. Dak.	145	1972–2008	8.3	7.0	9.9
177	James River above Arrowwood Lake near Kensal, N. Dak.	163	1985–2008	8.2	7.0	9.5
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	8.4	7.6	9.4
179	James River near Pingree, N. Dak.	129	1979–2008	8.5	7.3	9.7
180	Pipestem Creek near Pingree, N. Dak.	71	1974–2008	8.1	7.1	9.5
181	Pipestem Creek near Buchanan, N. Dak.	9	1972–1993	8.0	7.5	8.5
182	James River at Jamestown, N. Dak.	187	1972–2008	8.1	6.7	9.1
183	James River at Lamoure, N. Dak.	277	1970–2008	8.2	6.6	9.8
184	Bear Creek near Oakes, N. Dak.	54	1972–2008	8.1	6.5	9.0
185	James River at Oakes, N. Dak.	143	1970–2008	8.1	6.9	9.4
186	James River at N. Dak./S. Dak. State line	92	1974–2008	8.4	7.5	9.6

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, laboratory, in standard units						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	8.3	6.8	8.8
2	Red River of the North at Wahpeton, N. Dak.	56	1983–2008	8.1	6.6	9.1
3	Red River of the North near Wahpeton, N. Dak.	4	1993–2006	8.0	7.8	8.4
4	Red River of the North at Brushville, Minn.	61	1993–2007	8.2	7.0	8.6
5	Red River of the North below Wahpeton, N. Dak.	15	1997–1999	8.1	7.6	8.4
6	Red River of the North at Hickson, N. Dak.	72	1980–2008	8.1	6.7	9.1
7	Wild Rice River near Rutland, N. Dak.	31	1984–2008	8.0	6.7	8.4
9	Antelope Creek at Dwight, N. Dak.	11	2001–2008	7.9	7.6	8.4
10	Wild Rice River near Abercrombie, N. Dak.	107	1980–2008	8.1	6.5	8.5
11	Red River of the North at Fargo, N. Dak.	81	1983–2008	8.1	6.7	8.6
12	Red River of North below Fargo, N. Dak.	45	1980–1986	8.0	7.4	8.9
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	8.1	6.9	8.5
14	Red River of the North near Harwood, N. Dak.	54	1993–2007	8.0	7.5	8.6
15	Sheyenne River above Harvey, N. Dak.	135	1980–2008	8.2	7.0	9.0
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	8.3	7.4	8.6
18	Sheyenne River near Warwick, N. Dak.	62	1983–2008	8.2	6.9	8.9
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	27	1987–2007	7.6	6.7	9.1
20	Mauvais Coulee near Cando, N. Dak.	68	1983–2008	7.9	6.8	9.1
21	Edmore Coulee near Edmore, N. Dak.	74	1983–2008	7.8	6.5	9.6
22	Edmore Coulee Tributary near Webster, N. Dak.	21	1987–2007	7.8	6.7	8.9
23	Webster Coulee at Webster, N. Dak.	2	1983–1984	7.9	7.8	8.0
24	Starkweather Coulee near Webster, N. Dak.	61	1983–2008	7.9	6.5	9.0
25	Big Coulee below Churchs Ferry, N. Dak.	16	1998–2008	8.1	7.7	8.8
26	Little Coulee near Leeds, N. Dak.	12	1999–2008	8.1	6.9	8.6
27	Little Coulee near Brinsmade, N. Dak.	16	1980–1998	7.9	7.5	8.5
28	Big Coulee near Churchs Ferry, N. Dak.	37	1983–1997	7.8	6.8	8.7
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	12	1980–1986	8.5	8.0	8.8
30	Channel A near Penn, N. Dak.	49	1984–2008	7.8	6.8	8.7
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	12	2002–2007	8.5	8.0	9.1
32	Sheyenne River near Cooperstown, N. Dak.	153	1980–2008	8.3	6.7	8.6
33	Baldhill Creek near Dazey, N. Dak.	49	1980–2008	8.0	6.7	8.5
34	Sheyenne River below Baldhill Dam, N. Dak.	132	1980–2008	8.3	6.9	9.0
35	Sheyenne River at Valley City, N. Dak.	15	1987–2005	8.0	6.7	8.3
36	Sheyenne River at Lisbon, N. Dak.	175	1980–2008	8.1	6.6	8.8
37	Sheyenne River near Kindred, N. Dak.	185	1980–2008	8.1	7.4	8.6
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	40	1993–2008	8.2	7.4	8.6
39	Sheyenne River near Horace, N. Dak.	7	1982–1991	7.8	6.6	8.2
40	Sheyenne River Diversion at West Fargo, N. Dak.	9	1995–2007	8.0	7.0	8.5

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, laboratory, in standard units—Continued						
41	Sheyenne River at West Fargo, N. Dak.	40	1983–2008	8.1	6.6	8.6
42	Maple River near Hope, N. Dak.	26	1983–2007	7.7	6.7	8.3
43	Maple River near Enderlin, N. Dak.	35	1982–2008	7.8	6.8	8.4
44	Maple River near Mapleton, N. Dak.	13	1996–2008	8.1	7.3	8.5
45	Maple River below Mapleton, N. Dak.	63	1996–2008	8.2	7.0	8.7
46	Sheyenne River at Harwood, N. Dak.	28	1993–2004	8.0	7.5	8.4
47	Rush River at Amenia, N. Dak.	36	1983–2008	7.8	6.7	8.4
48	Rush River near Prosper, N. Dak.	4	1983–1987	7.8	7.4	8.0
49	Lower Branch Rush River near Prosper, N. Dak.	5	1983–1993	7.8	7.4	8.1
50	Sheyenne River near Harwood, N. Dak.	1	1996	7.8	7.8	7.8
51	Elm River near Kelso, N. Dak.	6	1983–1993	7.9	7.3	8.2
52	Red River of the North at Halstad, Minn.	125	1980–2008	8.0	7.3	8.7
53	Beaver Creek near Finley, N. Dak.	55	1981–2003	8.0	7.0	8.6
54	Goose River near Portland, N. Dak.	4	1983–1988	7.8	7.4	8.0
55	Goose River at Hillsboro, N. Dak.	120	1983–2008	8.1	6.6	8.5
56	Red River of the North at Grand Forks, N. Dak.	129	1983–2008	7.9	6.7	8.7
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	89	1993–2008	8.0	7.2	8.5
58	Turtle River at Manvel, N. Dak.	84	1981–2008	8.0	6.6	8.6
59	Red River of the North at Oslo, Minn.	16	1987–2004	7.7	6.8	8.6
60	Middle Branch Forest River near Whitman, N. Dak.	7	1983–1990	7.9	7.0	8.0
61	Forest River near Fordville, N. Dak.	32	1983–2008	8.1	6.9	8.6
62	Forest River near Minto, N. Dak.	110	1983–2008	8.0	6.7	8.7
63	South Branch Park River below Homme Dam, N. Dak.	15	1981–1994	7.8	6.7	8.8
64	Middle Branch Park River near Union, N. Dak.	4	1983–1984	7.9	7.4	8.2
66	Cart Creek at Mountain, N. Dak.	3	1983–1984	8.3	8.0	8.3
67	Park River at Grafton, N. Dak.	100	1983–2008	7.9	6.9	8.5
68	Red River of the North at Drayton, N. Dak.	55	1983–2008	8.1	6.7	8.6
69	Pembina County Drain 20 near Glasston, N. Dak.	4	1983–1984	7.8	7.8	8.0
70	Hidden Island Coulee near Hansboro, N. Dak.	14	1983–1994	7.7	6.6	8.3
71	Cypress Creek near Sarles, N. Dak.	7	1983–1988	7.8	7.1	8.2
73	Little South Pembina River near Walhalla, N. Dak.	12	2001–2008	8.1	7.4	8.6
74	Pembina River at Walhalla, N. Dak.	76	1980–2008	8.0	6.8	8.5
75	Pembina River at Neche, N. Dak.	113	1983–2008	8.1	6.8	8.5
76	Tongue River at Akra, N. Dak.	35	1980–2008	7.9	6.6	8.7
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	7.9	7.4	8.2
78	Red River of the North at Pembina, N. Dak., site 2	139	1994–2008	8.0	6.9	8.7
79	Red River of the North at Emerson, Manitoba	109	1980–2004	8.0	7.1	8.6
80	Long Creek near Noonan, N. Dak.	36	1982–2008	8.2	6.5	10.2
81	West Branch Short Creek near Columbus, N. Dak.	3	1981	7.8	7.5	8.5

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, laboratory, in standard units—Continued						
82	Souris River near Sherwood, N. Dak.	212	1980–2008	8.1	7.0	9.2
83	Souris River near Foxholm, N. Dak.	108	1972–2008	8.2	7.4	9.9
84	Des Lacs River at Foxholm, N. Dak.	157	1983–2008	8.3	6.7	9.2
85	Souris River above Minot, N. Dak.	171	1981–2008	8.2	6.7	9.5
86	Bonnes Creek near Velva, N. Dak.	13	1987–2005	7.9	7.2	8.3
87	Souris River near Verendrye, N. Dak.	249	1981–2008	8.1	7.0	8.9
88	Wintering River near Karlsruhe, N. Dak.	85	1980–2008	8.1	6.6	8.7
89	Souris River near Bantry, N. Dak.	112	1981–2008	8.0	7.0	9.1
90	Willow Creek near Willow City, N. Dak.	60	1983–2008	8.2	7.1	9.7
91	Stone Creek near Kramer, N. Dak.	25	1986–2000	8.1	6.9	8.8
92	Deep River near Upham, N. Dak.	45	1987–2007	8.2	6.6	9.8
93	Egg Creek near Granville, N. Dak.	1	1981	7.7	7.7	7.7
95	Cut Bank Creek at Upham, N. Dak.	16	1987–2000	7.7	6.9	8.8
96	Deep River below Cut Bank Creek near Upham, N. Dak.	13	1986–1989	8.2	7.5	8.8
97	Boundary Creek near Landa, N. Dak.	27	1986–2000	7.9	7.0	8.7
98	Souris River near Westhope, N. Dak.	84	1980–2008	8.2	7.3	10.0
100	Missouri River near Williston, N. Dak.	20	1980–1992	8.2	8.1	8.7
101	Little Muddy River below Cow Creek near Williston, N. Dak.	45	1983–2008	8.3	6.7	8.8
102	Stony Creek near Williston, N. Dak.	7	1980–1981	8.4	7.3	8.5
104	Beaver Creek near Ray, N. Dak.	17	1980–1982	8.2	7.7	8.5
106	Bear Den Creek near Mandaree, N. Dak.	110	1980–2008	8.4	6.7	9.1
108	East Fork Shell Creek near Parshall, N. Dak.	56	1991–2008	8.4	7.1	9.1
109	Deepwater Creek near Mandaree, N. Dak.	54	1991–2008	8.4	7.0	9.3
110	Little Missouri River at Marmarth, N. Dak.	44	1983–2008	8.2	6.6	8.8
111	Deep Creek near Amidon, N. Dak.	16	1980–1983	8.2	7.8	8.5
112	Little Missouri River at Medora, N. Dak.	98	1993–2007	8.3	6.7	8.7
113	Beaver Creek near Trotters, N. Dak.	48	1980–2008	8.3	6.9	8.9
114	Little Missouri River near Watford City, N. Dak.	153	1980–2007	8.3	6.9	8.7
115	Missouri River at Garrison Dam, N. Dak.	147	1980–2007	8.3	7.5	8.5
116	Knife River at Manning, N. Dak.	48	1980–2008	8.2	6.7	8.9
117	Stray Creek near Manning, N. Dak.	5	1980–1981	8.2	7.2	8.4
118	Knife River at Marshall, N. Dak.	11	1980–1981	8.1	7.8	8.5
119	Elm Creek near Golden Valley, N. Dak.	7	1981–1990	7.4	6.8	7.6
120	Knife River near Golden Valley, N. Dak.	91	1983–2008	8.3	6.8	8.8
121	Coyote Creek near Zap, N. Dak.	21	1980–1983	8.3	7.4	8.6
122	Brush Creek near Beulah, N. Dak.	50	1980–1990	8.0	6.8	8.5
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	17	1980–1993	8.3	7.5	8.6
124	Spring Creek near Halliday, N. Dak.	11	1980–1981	8.2	7.2	8.6
125	Spring Creek at Zap, N. Dak.	132	1980–2008	8.2	6.9	8.9

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, laboratory, in standard units—Continued						
126	West Branch Otter Creek near Beulah, N. Dak.	7	1983–1995	7.7	6.9	8.7
127	Knife River at Hazen, N. Dak.	170	1980–2008	8.2	6.9	8.6
128	Antelope Creek above Hazen, N. Dak.	24	1980–1985	8.0	7.3	8.4
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	13	1981–1985	7.8	7.2	8.2
130	West Branch Antelope Creek near Hazen, N. Dak.	7	1981–1983	8.0	7.3	8.3
131	Coal Creek near Stanton, N. Dak.	6	1980–1981	8.2	7.5	8.3
132	Alderin Creek near Fort Clark, N. Dak.	20	1980–1983	8.2	7.6	8.6
133	Coal Lake Coulee near Hensler, N. Dak.	29	1980–1988	8.2	7.3	8.6
134	Buffalo Creek near Washburn, N. Dak.	18	1980–1983	8.3	7.5	9.0
135	Turtle Creek above Washburn, N. Dak.	100	1987–2003	8.3	7.1	9.1
136	Painted Woods Creek near Wilton, N. Dak.	132	1982–2003	8.2	7.2	8.8
137	Square Butte Creek near Hannover, N. Dak.	5	1980–1981	8.1	6.7	8.1
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	18	1980–1982	8.0	7.5	8.4
139	Hagel Creek near Center, N. Dak.	14	1980–1982	8.2	7.5	9.3
140	Square Butte Creek below Center, N. Dak.	41	1983–2008	8.2	7.1	9.0
141	Burnt Creek near Bismarck, N. Dak.	20	1983–2008	8.2	7.2	8.5
142	Missouri River at Bismarck, N. Dak.	44	1986–2008	8.2	6.9	8.7
143	South Branch Heart River near South Heart, N. Dak.	22	1980–1996	8.0	7.1	9.1
144	North Creek near South Heart, N. Dak.	14	1980–1996	7.9	6.9	8.6
145	Heart River near South Heart, N. Dak.	32	1980–2004	8.1	6.8	8.5
146	Heart River at Dickinson, N. Dak.	17	1986–1993	7.9	7.1	8.5
147	Green River near New Hradec, N. Dak.	40	1980–2006	8.0	6.7	8.8
148	Green River near Gladstone, N. Dak.	4	1993	8.2	7.7	8.4
149	Heart River near Richardton, N. Dak.	110	1983–2008	8.2	6.8	8.9
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	29	1989–2008	8.2	7.0	8.7
151	Antelope Creek near Carson, N. Dak.	14	1999–2008	8.3	7.4	8.9
152	Big Muddy Creek near Almont, N. Dak.	29	1991–2008	8.4	7.6	8.8
153	Heart River near Lark, N. Dak.	19	1983–1995	8.2	7.6	8.7
154	Heart River at Stark Bridge near Judson, N. Dak.	32	1988–2008	8.3	7.5	8.6
155	Sweetbriar Creek near Judson, N. Dak.	11	2002–2008	8.5	8.0	8.8
156	Heart River near Mandan, N. Dak.	174	1980–2008	8.3	6.9	8.7
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	22	1988–2004	8.1	6.7	8.5
158	Apple Creek near Menoken, N. Dak.	45	1980–2008	8.2	7.0	9.3
159	Missouri River near Schmidt, N. Dak.	11	1980–1981	8.2	7.7	8.3
160	Cannonball River at New England, N. Dak.	12	1980–1981	8.1	6.8	8.3
161	Coal Bank Creek near Havelock, N. Dak.	18	1980–1983	8.1	7.0	8.6
162	Cannonball River at Regent, N. Dak.	48	1980–2008	8.2	6.9	8.8
164	Cannonball River near Raleigh, N. Dak.	87	1993–2008	8.4	6.9	9.1
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	15	1983–1995	7.8	6.8	8.5

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
pH, laboratory, in standard units—Continued						
166	Cedar Creek near Haynes, N. Dak.	32	1982–2008	8.4	6.8	9.5
167	Timber Creek near Bentley, N. Dak.	12	1980–1981	8.1	7.9	8.4
169	Cedar Creek near Raleigh, N. Dak.	99	1983–2008	8.3	6.7	9.0
170	Cannonball River at Breien, N. Dak.	158	1980–2008	8.3	6.5	9.0
171	Beaver Creek near Linton, N. Dak.	11	1983–1993	7.9	6.6	8.2
172	Beaver Creek below Linton, N. Dak.	23	1990–2008	8.1	6.4	8.6
173	Porcupine Creek near Fort Yates, N. Dak.	38	1991–1999	8.1	7.1	8.4
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	31	1980–1987	8.2	7.3	8.9
175	James River near Manfred, N. Dak.	42	1983–1998	8.1	6.9	8.6
176	James River near Grace City, N. Dak.	136	1983–2008	8.3	6.7	9.8
177	James River above Arrowwood Lake near Kensal, N. Dak.	168	1985–2008	8.1	7.2	9.0
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	9	1986–1989	8.2	7.5	9.1
179	James River near Pingree, N. Dak.	132	1981–2008	8.3	7.3	9.8
180	Pipestem Creek near Pingree, N. Dak.	52	1982–2008	8.1	6.8	8.9
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	7.8	7.0	8.2
182	James River at Jamestown, N. Dak.	185	1983–2008	8.0	7.3	8.9
183	James River at Lamoure, N. Dak.	200	1980–2008	8.1	7.1	9.3
184	Bear Creek near Oakes, N. Dak.	40	1984–2008	8.0	6.5	8.8
185	James River at Oakes, N. Dak.	98	1982–2008	8.0	7.0	8.8
186	James River at N. Dak./S. Dak. State line	31	1980–2008	8.4	7.7	8.8
Water temperature, in deg. C						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	16.9	-2.2	26.7
2	Red River of the North at Wahpeton, N. Dak.	350	1971–2008	9.0	0.0	30.0
3	Red River of the North near Wahpeton, N. Dak.	5	1993–2006	8.2	0.0	15.0
4	Red River of the North at Brushville, Minn.	60	1993–2007	15.0	-0.1	27.2
5	Red River of the North below Wahpeton, N. Dak.	66	1970–1999	11.9	-0.2	26.0
6	Red River of the North at Hickson, N. Dak.	355	1975–2008	12.0	-0.2	32.0
7	Wild Rice River near Rutland, N. Dak.	172	1971–2008	12.0	0.0	29.5
8	Wild Rice River near Cayuga, N. Dak.	54	1970–1979	10.5	0.0	29.0
9	Antelope Creek at Dwight, N. Dak.	23	2001–2008	14.1	0.0	33.0
10	Wild Rice River near Abercrombie, N. Dak.	408	1970–2008	10.5	-0.1	29.5
11	Red River of the North at Fargo, N. Dak.	507	1970–2008	13.7	-0.5	32.0
12	Red River of North below Fargo, N. Dak.	176	1970–1986	9.0	0.0	28.0
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	15.2	-1.9	27.4
14	Red River of the North near Harwood, N. Dak.	58	1993–2007	15.4	-0.2	26.7
15	Sheyenne River above Harvey, N. Dak.	329	1971–2008	7.2	-0.5	28.5
16	Big Coulee near Fort Totten, N. Dak.	43	1970–1975	6.0	0.0	24.5
17	Sheyenne River at Warwick, N. Dak.	44	1996–2006	13.1	-0.8	26.0
18	Sheyenne River near Warwick, N. Dak.	377	1970–2008	8.0	-1.2	30.0

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Water temperature, in deg. C—Continued						
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	100	1987–2008	11.8	0.0	26.5
20	Mauvais Coulee near Cando, N. Dak.	268	1971–2008	10.3	0.0	27.5
21	Edmore Coulee near Edmore, N. Dak.	218	1971–2008	11.0	0.0	28.0
22	Edmore Coulee Tributary near Webster, N. Dak.	131	1986–2008	10.7	0.0	27.5
23	Webster Coulee at Webster, N. Dak.	11	1980–1985	10.0	1.0	13.0
24	Starkweather Coulee near Webster, N. Dak.	168	1980–2008	11.5	0.0	26.0
25	Big Coulee below Churchs Ferry, N. Dak.	35	1998–2008	12.0	1.0	26.0
26	Little Coulee near Leeds, N. Dak.	38	1998–2008	10.8	0.5	25.5
27	Little Coulee near Brinsmade, N. Dak.	97	1976–1998	8.0	0.0	29.5
28	Big Coulee near Churchs Ferry, N. Dak.	248	1970–1997	8.5	0.0	29.0
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	46	1970–1986	10.0	0.0	24.5
30	Channel A near Penn, N. Dak.	177	1983–2008	7.5	0.0	29.5
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	42	1999–2007	12.5	0.0	26.5
32	Sheyenne River near Cooperstown, N. Dak.	541	1970–2008	9.0	-1.5	28.0
33	Baldhill Creek near Dazey, N. Dak.	382	1971–2008	6.8	0.0	29.0
34	Sheyenne River below Baldhill Dam, N. Dak.	444	1971–2008	8.5	-1.0	26.5
35	Sheyenne River at Valley City, N. Dak.	108	1971–2005	5.5	0.0	26.0
36	Sheyenne River at Lisbon, N. Dak.	463	1970–2008	9.0	-2.2	30.0
37	Sheyenne River near Kindred, N. Dak.	632	1971–2008	9.5	-0.5	28.0
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	177	1992–2008	12.0	-0.5	28.5
39	Sheyenne River near Horace, N. Dak.	50	1976–1992	6.0	0.0	25.5
40	Sheyenne River Diversion at West Fargo, N. Dak.	90	1993–2007	12.5	0.0	28.5
41	Sheyenne River at West Fargo, N. Dak.	346	1970–2008	9.0	-0.5	27.5
42	Maple River near Hope, N. Dak.	161	1972–2008	6.0	0.0	28.5
43	Maple River near Enderlin, N. Dak.	338	1971–2008	6.0	0.0	30.0
44	Maple River near Mapleton, N. Dak.	104	1971–2008	10.4	0.0	31.0
45	Maple River below Mapleton, N. Dak.	169	1995–2008	12.5	-2.2	31.5
46	Sheyenne River at Harwood, N. Dak.	42	1993–2005	9.5	-0.2	26.5
47	Rush River at Amenia, N. Dak.	281	1971–2008	9.0	0.0	28.5
48	Rush River near Prosper, N. Dak.	28	1981–1987	13.8	0.0	27.0
49	Lower Branch Rush River near Prosper, N. Dak.	19	1981–1993	8.0	0.0	27.0
50	Sheyenne River near Harwood, N. Dak.	49	1970–1996	8.0	0.0	25.5
51	Elm River near Kelso, N. Dak.	28	1981–1993	8.3	0.0	27.5
52	Red River of the North at Halstad, Minn.	586	1972–2008	9.5	0.0	28.5
53	Beaver Creek near Finley, N. Dak.	336	1970–2003	10.0	-0.5	30.5
54	Goose River near Portland, N. Dak.	100	1970–1988	7.0	0.0	27.0
55	Goose River at Hillsboro, N. Dak.	419	1970–2008	9.0	-2.2	27.8
56	Red River of the North at Grand Forks, N. Dak.	590	1970–2008	9.5	-0.1	29.0

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Water temperature, in deg. C—Continued						
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	202	1991–2008	9.3	0.0	28.2
58	Turtle River at Manvel, N. Dak.	104	1971–2008	11.8	-0.1	28.6
59	Red River of the North at Oslo, Minn.	81	1973–2005	7.0	0.0	26.5
60	Middle Branch Forest River near Whitman, N. Dak.	76	1972–1990	6.0	0.0	28.0
61	Forest River near Fordville, N. Dak.	327	1971–2008	6.0	0.0	27.5
62	Forest River near Minto, N. Dak.	363	1971–2008	8.8	-2.2	27.0
63	South Branch Park River below Homme Dam, N. Dak.	210	1971–1994	6.3	0.0	27.0
64	Middle Branch Park River near Union, N. Dak.	114	1971–1986	8.0	0.0	30.0
65	Middle Branch Park River near Edinburg, N. Dak.	18	1978–1980	4.3	0.0	27.0
66	Cart Creek at Mountain, N. Dak.	125	1971–1984	3.5	0.0	29.5
67	Park River at Grafton, N. Dak.	351	1970–2008	9.0	-2.1	28.0
68	Red River of the North at Drayton, N. Dak.	424	1971–2008	9.5	0.0	28.5
69	Pembina County Drain 20 near Glasston, N. Dak.	48	1972–1986	6.8	0.0	31.5
70	Hidden Island Coulee near Hansboro, N. Dak.	99	1971–1995	8.0	0.0	28.0
71	Cypress Creek near Sarles, N. Dak.	54	1972–1988	8.5	0.5	25.0
72	Pembina River near Vang, N. Dak.	107	1970–1979	6.5	0.0	26.5
73	Little South Pembina River near Walhalla, N. Dak.	229	1970–2008	4.5	0.0	28.5
74	Pembina River at Walhalla, N. Dak.	392	1970–2008	6.0	0.0	28.5
75	Pembina River at Neche, N. Dak.	405	1971–2008	9.0	-2.2	28.0
76	Tongue River at Akra, N. Dak.	272	1971–2008	10.0	-0.5	28.5
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	10.0	0.0	21.0
78	Red River of the North at Pembina, N. Dak., site 2	178	1970–2008	14.0	-2.2	27.4
79	Red River of the North at Emerson, Manitoba	404	1974–2004	9.2	0.0	29.0
80	Long Creek near Noonan, N. Dak.	285	1971–2008	7.0	0.0	28.9
81	West Branch Short Creek near Columbus, N. Dak.	23	1978–1981	6.5	0.0	22.5
82	Souris River near Sherwood, N. Dak.	500	1970–2008	8.0	0.0	29.0
83	Souris River near Foxholm, N. Dak.	380	1971–2008	8.0	0.0	27.0
84	Des Lacs River at Foxholm, N. Dak.	403	1971–2008	8.0	-1.9	28.0
85	Souris River above Minot, N. Dak.	428	1970–2008	8.0	-1.8	31.5
86	Bonnes Creek near Velva, N. Dak.	18	1987–2005	2.8	0.0	24.0
87	Souris River near Verendrye, N. Dak.	513	1970–2008	8.8	-2.1	30.2
88	Wintering River near Karlsruhe, N. Dak.	344	1971–2008	8.3	0.0	30.0
89	Souris River near Bantry, N. Dak.	457	1970–2008	9.5	0.0	27.5
90	Willow Creek near Willow City, N. Dak.	307	1971–2008	10.0	0.0	29.3
91	Stone Creek near Kramer, N. Dak.	137	1986–2000	7.3	0.0	27.0
92	Deep River near Upham, N. Dak.	148	1972–2007	13.5	0.0	29.0
93	Egg Creek near Granville, N. Dak.	68	1971–1981	9.0	0.0	26.5
94	Cut Bank Creek at North Lake Outlet near Granville, N. Dak.	58	1972–1980	11.0	0.0	28.5
95	Cut Bank Creek at Upham, N. Dak.	74	1975–2000	12.0	0.0	26.0

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Water temperature, in deg. C—Continued						
96	Deep River below Cut Bank Creek near Upham, N. Dak.	131	1975–1989	10.5	0.0	24.0
97	Boundary Creek near Landa, N. Dak.	214	1972–2000	7.0	0.0	28.0
98	Souris River near Westhope, N. Dak.	734	1970–2008	7.5	0.0	27.0
99	Charbonneau Creek near Charbonneau, N. Dak.	126	1971–2006	5.0	-0.2	28.0
100	Missouri River near Williston, N. Dak.	103	1970–1992	10.0	0.0	25.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	285	1971–2008	8.5	0.0	26.0
102	Stony Creek near Williston, N. Dak.	40	1977–1981	4.0	0.0	26.5
103	Tobacco Garden Creek near Watford City, N. Dak.	66	1976–1983	4.0	0.0	23.0
104	Beaver Creek near Ray, N. Dak.	65	1977–1982	7.5	0.0	28.0
105	White Earth River at White Earth, N. Dak.	136	1970–1982	3.0	0.0	25.0
106	Bear Den Creek near Mandaree, N. Dak.	505	1970–2008	6.5	0.0	31.1
107	Shell Creek near Parshall, N. Dak.	107	1971–1981	6.0	0.0	28.0
108	East Fork Shell Creek near Parshall, N. Dak.	105	1991–2008	7.3	0.0	25.5
109	Deepwater Creek near Mandaree, N. Dak.	117	1990–2008	9.0	0.0	26.0
110	Little Missouri River at Marmarth, N. Dak.	354	1971–2008	9.0	0.0	30.1
111	Deep Creek near Amidon, N. Dak.	66	1977–1983	7.5	0.0	29.0
112	Little Missouri River at Medora, N. Dak.	178	1971–2008	12.0	-2.1	30.5
113	Beaver Creek near Trotters, N. Dak.	213	1977–2008	9.0	0.0	26.2
114	Little Missouri River near Watford City, N. Dak.	830	1971–2008	10.0	-2.1	33.5
115	Missouri River at Garrison Dam, N. Dak.	463	1971–2007	7.7	0.0	17.1
116	Knife River at Manning, N. Dak.	382	1972–2008	5.0	0.0	28.5
117	Stray Creek near Manning, N. Dak.	24	1975–1981	7.3	0.0	23.5
118	Knife River at Marshall, N. Dak.	180	1972–1981	6.8	0.0	28.0
119	Elm Creek near Golden Valley, N. Dak.	97	1972–1994	2.0	0.0	22.0
120	Knife River near Golden Valley, N. Dak.	401	1971–2008	8.0	-2.1	27.5
121	Coyote Creek near Zap, N. Dak.	70	1977–1983	8.3	0.0	30.0
122	Brush Creek near Beulah, N. Dak.	174	1974–1990	7.3	0.0	27.5
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	62	1977–1993	9.8	0.0	26.0
124	Spring Creek near Halliday, N. Dak.	51	1977–1981	12.0	0.0	26.0
125	Spring Creek at Zap, N. Dak.	427	1970–2008	6.0	-2.0	33.0
126	West Branch Otter Creek near Beulah, N. Dak.	97	1972–1994	2.0	0.0	26.0
127	Knife River at Hazen, N. Dak.	646	1970–2008	9.9	-2.0	30.5
128	Antelope Creek above Hazen, N. Dak.	66	1977–1985	3.5	0.0	29.0
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	98	1977–1986	2.0	0.0	22.0
130	West Branch Antelope Creek near Hazen, N. Dak.	27	1978–1983	6.6	0.0	26.0
131	Coal Creek near Stanton, N. Dak.	34	1975–1981	5.3	0.0	23.0
132	Alderin Creek near Fort Clark, N. Dak.	61	1977–1983	9.0	0.0	25.0
133	Coal Lake Coulee near Hensler, N. Dak.	68	1978–1988	4.0	-0.5	26.5
134	Buffalo Creek near Washburn, N. Dak.	55	1978–1983	10.5	0.0	25.5

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Water temperature, in deg. C—Continued						
135	Turtle Creek above Washburn, N. Dak.	139	1986–2003	6.5	-0.5	28.0
136	Painted Woods Creek near Wilton, N. Dak.	325	1970–2003	7.5	0.0	28.5
137	Square Butte Creek near Hannover, N. Dak.	30	1977–1981	7.3	0.0	27.0
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	75	1977–1982	6.5	0.0	26.5
139	Hagel Creek near Center, N. Dak.	51	1977–1982	4.0	0.0	31.5
140	Square Butte Creek below Center, N. Dak.	333	1971–2008	9.5	0.0	28.0
141	Burnt Creek near Bismarck, N. Dak.	205	1972–2008	4.8	0.0	27.5
142	Missouri River at Bismarck, N. Dak.	335	1970–2008	10.0	0.0	22.7
143	South Branch Heart River near South Heart, N. Dak.	41	1979–1996	12.0	0.0	27.0
144	North Creek near South Heart, N. Dak.	27	1978–1996	5.5	0.0	25.5
145	Heart River near South Heart, N. Dak.	114	1975–2005	6.0	0.0	28.5
146	Heart River at Dickinson, N. Dak.	96	1984–1994	8.5	-0.5	28.0
147	Green River near New Hradec, N. Dak.	408	1971–2008	6.0	0.0	31.0
148	Green River near Gladstone, N. Dak.	68	1970–1993	5.8	0.0	27.0
149	Heart River near Richardton, N. Dak.	421	1971–2008	8.5	-2.0	29.0
150	Heart River above Lake Tschida near Glen Ullin, N. Dak.	163	1988–2008	9.5	0.0	32.5
151	Antelope Creek near Carson, N. Dak.	104	1971–2008	7.8	0.0	29.5
152	Big Muddy Creek near Almont, N. Dak.	112	1991–2008	11.3	0.0	27.0
153	Heart River near Lark, N. Dak.	222	1971–1995	6.5	0.0	28.5
154	Heart River at Stark Bridge near Judson, N. Dak.	148	1988–2008	10.8	0.0	28.9
155	Sweetbriar Creek near Judson, N. Dak.	126	1971–2008	8.0	0.0	26.5
156	Heart River near Mandan, N. Dak.	543	1971–2008	10.2	-2.0	31.0
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	127	1988–2004	6.0	0.0	27.5
158	Apple Creek near Menoken, N. Dak.	345	1971–2008	5.5	-0.5	29.0
159	Missouri River near Schmidt, N. Dak.	143	1974–1981	8.0	0.0	18.0
160	Cannonball River at New England, N. Dak.	43	1978–1981	9.5	0.0	29.0
161	Coal Bank Creek near Havelock, N. Dak.	110	1974–1983	8.0	0.0	27.5
162	Cannonball River at Regent, N. Dak.	414	1970–2008	8.5	0.0	28.5
163	Cannonball River below Bentley, N. Dak.	129	1972–1982	6.0	0.0	29.0
164	Cannonball River near Raleigh, N. Dak.	115	1993–2008	12.0	-2.1	30.0
165	White Butte Fork Cedar Creek near Scranton, N. Dak.	141	1972–1995	7.0	0.0	27.0
166	Cedar Creek near Haynes, N. Dak.	347	1971–2008	8.0	0.0	28.6
167	Timber Creek near Bentley, N. Dak.	55	1977–1981	8.5	-0.5	28.0
168	Cedar Creek near Pretty Rock, N. Dak.	63	1971–1976	6.5	0.0	28.5
169	Cedar Creek near Raleigh, N. Dak.	376	1972–2008	7.5	-2.1	31.1
170	Cannonball River at Breien, N. Dak.	650	1970–2008	11.0	-2.1	30.5
171	Beaver Creek near Linton, N. Dak.	191	1972–1993	5.0	0.0	32.0
172	Beaver Creek below Linton, N. Dak.	143	1989–2008	7.9	0.0	29.5
173	Porcupine Creek near Fort Yates, N. Dak.	84	1991–1999	13.8	0.0	25.5

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Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Water temperature, in deg. C—Continued						
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	113	1974–1987	9.0	0.0	30.0
175	James River near Manfred, N. Dak.	126	1971–1998	6.5	0.0	28.0
176	James River near Grace City, N. Dak.	327	1972–2008	9.5	-2.2	29.0
177	James River above Arrowwood Lake near Kensal, N. Dak.	221	1985–2008	9.0	0.0	27.0
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	17	1986–1989	4.5	0.5	21.5
179	James River near Pingree, N. Dak.	146	1978–2008	14.6	0.0	27.5
180	Pipestem Creek near Pingree, N. Dak.	228	1974–2008	8.0	0.0	28.5
181	Pipestem Creek near Buchanan, N. Dak.	29	1971–1993	6.5	0.0	25.5
182	James River at Jamestown, N. Dak.	384	1972–2008	8.3	-2.2	27.0
183	James River at Lamoure, N. Dak.	411	1970–2008	10.5	-1.7	27.0
184	Bear Creek near Oakes, N. Dak.	169	1972–2008	10.0	0.0	30.9
185	James River at Oakes, N. Dak.	172	1970–2008	9.0	0.0	28.0
186	James River at N. Dak./S. Dak. State line	113	1974–2008	12.0	0.0	28.1
Dissolved oxygen, in mg/L						
1	Bois De Sioux River near Doran, Minn.	39	2000–2007	9.1	4.5	16.0
2	Red River of the North at Wahpeton, N. Dak.	23	1991–2004	9.5	4.2	13.6
3	Red River of the North near Wahpeton, N. Dak.	5	1993–2006	11.9	8.3	13.4
4	Red River of the North at Brushville, Minn.	60	1993–2007	9.8	5.4	15.6
5	Red River of the North below Wahpeton, N. Dak.	66	1970–1999	10.1	6.0	15.2
6	Red River of the North at Hickson, N. Dak.	124	1975–2004	8.2	0.6	18.6
7	Wild Rice River near Rutland, N. Dak.	1	1971	11.5	11.5	11.5
10	Wild Rice River near Abercrombie, N. Dak.	61	1993–2007	8.6	0.7	17.8
11	Red River of the North at Fargo, N. Dak.	133	1986–2008	8.1	4.7	13.7
12	Red River of North below Fargo, N. Dak.	112	1970–1986	9.2	1.4	16.1
13	Red River of the North at Harwood, N. Dak.	52	2000–2007	9.0	5.3	17.3
14	Red River of the North near Harwood, N. Dak.	52	1993–2006	9.4	6.0	15.1
15	Sheyenne River above Harvey, N. Dak.	72	1982–2004	8.8	0.0	16.6
17	Sheyenne River at Warwick, N. Dak.	46	1996–2006	9.1	4.2	14.6
18	Sheyenne River near Warwick, N. Dak.	28	1986–2007	7.9	2.1	14.2
19	Mauvais Coulee Tributary No. 3 near Cando, N. Dak.	3	1989–1995	10.1	2.4	12.8
20	Mauvais Coulee near Cando, N. Dak.	61	1987–2001	9.1	0.9	13.8
21	Edmore Coulee near Edmore, N. Dak.	59	1983–2001	9.4	2.6	13.5
22	Edmore Coulee Tributary near Webster, N. Dak.	2	1993	9.2	9.0	9.4
24	Starkweather Coulee near Webster, N. Dak.	62	1987–2001	10.0	3.2	15.1
25	Big Coulee below Churchs Ferry, N. Dak.	11	1998–2001	8.6	2.1	17.5
27	Little Coulee near Brinsmade, N. Dak.	2	1993–1995	6.6	6.2	7.0
28	Big Coulee near Churchs Ferry, N. Dak.	61	1985–1997	8.1	1.3	12.3
29	Big Coulee at Graham Island inlet near Fort Totten, N. Dak.	9	1982–1986	10.8	9.3	13.8
30	Channel A near Penn, N. Dak.	70	1985–1999	9.4	2.1	17.8

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Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Dissolved oxygen, in mg/L—Continued						
31	Devils Lake Outlet to Stump Lake near Lakota, N. Dak.	1	1999	10.5	10.5	10.5
32	Sheyenne River near Cooperstown, N. Dak.	165	1979–2007	8.7	1.9	15.8
33	Baldhill Creek near Dazey, N. Dak.	49	1979–2005	10.4	2.8	15.4
34	Sheyenne River below Baldhill Dam, N. Dak.	121	1979–2007	10.7	5.1	15.0
35	Sheyenne River at Valley City, N. Dak.	12	1992–1993	10.7	7.2	15.0
36	Sheyenne River at Lisbon, N. Dak.	127	1982–2007	10.0	6.0	14.7
37	Sheyenne River near Kindred, N. Dak.	380	1976–2007	9.1	4.0	17.3
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	10	2003–2006	10.0	7.5	13.9
39	Sheyenne River near Horace, N. Dak.	38	1976–1979	7.4	2.2	13.3
41	Sheyenne River at West Fargo, N. Dak.	13	1991–2006	8.7	5.7	12.4
43	Maple River near Enderlin, N. Dak.	1	1992	12.4	12.4	12.4
45	Maple River below Mapleton, N. Dak.	45	1998–2007	9.8	3.4	21.2
46	Sheyenne River at Harwood, N. Dak.	29	1993–1999	9.9	5.2	15.9
49	Lower Branch Rush River near Prosper, N. Dak.	2	1993	10.4	9.2	11.5
50	Sheyenne River near Harwood, N. Dak.	48	1970–1974	8.0	3.8	14.4
51	Elm River near Kelso, N. Dak.	3	1993	10.4	9.0	10.6
52	Red River of the North at Halstad, Minn.	313	1978–2006	8.2	1.9	16.2
53	Beaver Creek near Finley, N. Dak.	185	1970–1996	9.7	4.8	13.8
54	Goose River near Portland, N. Dak.	1	1992	5.4	5.4	5.4
55	Goose River at Hillsboro, N. Dak.	90	1991–2008	9.4	4.1	18.1
56	Red River of the North at Grand Forks, N. Dak.	107	1991–2008	9.7	3.9	14.8
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	96	1991–2000	9.9	5.8	19.3
58	Turtle River at Manvel, N. Dak.	67	1993–2008	9.6	0.9	18.1
59	Red River of the North at Oslo, Minn.	55	1973–2004	9.4	5.0	14.1
61	Forest River near Fordville, N. Dak.	1	1992	6.8	6.8	6.8
62	Forest River near Minto, N. Dak.	88	1974–2008	9.3	1.8	14.1
67	Park River at Grafton, N. Dak.	71	1991–2008	9.3	0.8	14.2
68	Red River of the North at Drayton, N. Dak.	19	1991–2004	9.3	5.8	13.4
72	Pembina River near Vang, N. Dak.	55	1976–1979	9.7	0.5	13.2
73	Little South Pembina River near Walhalla, N. Dak.	63	1976–1995	10.8	3.6	13.8
74	Pembina River at Walhalla, N. Dak.	134	1976–1995	10.0	6.2	13.2
75	Pembina River at Neche, N. Dak.	85	1994–2008	9.7	3.3	14.8
76	Tongue River at Akra, N. Dak.	12	1979–2005	10.1	6.5	13.2
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	10.6	2.8	15.0
78	Red River of the North at Pembina, N. Dak., site 2	166	1970–2008	9.3	4.6	16.7
79	Red River of the North at Emerson, Manitoba	328	1978–2004	8.2	1.3	18.2
80	Long Creek near Noonan, N. Dak.	8	1997	10.1	7.8	12.8
81	West Branch Short Creek near Columbus, N. Dak.	21	1978–1981	9.6	3.9	13.1

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Dissolved oxygen, in mg/L—Continued						
82	Souris River near Sherwood, N. Dak.	407	1974–2008	8.0	0.0	19.4
83	Souris River near Foxholm, N. Dak.	180	1972–1999	9.1	0.0	21.0
84	Des Lacs River at Foxholm, N. Dak.	137	1981–2007	9.8	0.0	16.7
85	Souris River above Minot, N. Dak.	164	1981–2008	9.5	0.1	20.0
86	Bonnes Creek near Velva, N. Dak.	3	1994–2000	11.1	10.5	14.5
87	Souris River near Verendrye, N. Dak.	309	1970–2008	8.2	0.3	16.7
88	Wintering River near Karlsruhe, N. Dak.	57	1981–1998	8.3	1.3	13.6
89	Souris River near Bantry, N. Dak.	107	1981–2001	8.3	0.0	25.8
90	Willow Creek near Willow City, N. Dak.	46	1982–2000	9.1	3.7	15.0
91	Stone Creek near Kramer, N. Dak.	30	1986–2000	8.8	5.3	21.6
92	Deep River near Upham, N. Dak.	27	1989–2000	8.9	3.4	19.0
95	Cut Bank Creek at Upham, N. Dak.	16	1999–2000	8.4	1.6	10.7
96	Deep River below Cut Bank Creek near Upham, N. Dak.	16	1982–1989	7.8	0.4	11.4
97	Boundary Creek near Landa, N. Dak.	30	1986–2000	9.7	1.0	21.0
98	Souris River near Westhope, N. Dak.	513	1970–2008	9.0	0.0	22.5
99	Charbonneau Creek near Charbonneau, N. Dak.	1	2006	15.6	15.6	15.6
100	Missouri River near Williston, N. Dak.	97	1974–1992	9.8	7.0	13.0
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999–2005	8.9	6.5	11.5
102	Stony Creek near Williston, N. Dak.	36	1977–1981	11.5	5.3	13.5
104	Beaver Creek near Ray, N. Dak.	56	1977–1982	10.7	7.6	13.8
106	Bear Den Creek near Mandaree, N. Dak.	372	1970–1996	10.5	5.8	16.4
108	East Fork Shell Creek near Parshall, N. Dak.	46	1991–2001	8.9	4.6	12.5
109	Deepwater Creek near Mandaree, N. Dak.	50	1990–2001	8.9	4.9	13.3
110	Little Missouri River at Marmarth, N. Dak.	9	1995–1999	8.8	7.2	10.9
111	Deep Creek near Amidon, N. Dak.	58	1977–1983	11.2	5.5	17.9
112	Little Missouri River at Medora, N. Dak.	86	1979–2007	9.5	0.6	15.4
113	Beaver Creek near Trotters, N. Dak.	57	1977–1999	10.9	6.2	14.0
114	Little Missouri River near Watford City, N. Dak.	666	1974–2007	10.0	3.8	19.4
115	Missouri River at Garrison Dam, N. Dak.	423	1974–2007	11.0	5.8	15.4
116	Knife River at Manning, N. Dak.	55	1977–1982	9.5	2.6	12.7
117	Stray Creek near Manning, N. Dak.	22	1975–1981	10.4	2.6	14.8
118	Knife River at Marshall, N. Dak.	46	1977–1981	9.4	6.0	16.2
119	Elm Creek near Golden Valley, N. Dak.	16	1977–1981	10.1	3.6	12.7
120	Knife River near Golden Valley, N. Dak.	58	1997–2007	9.5	5.5	15.0
121	Coyote Creek near Zap, N. Dak.	61	1977–1983	11.4	6.6	14.4
122	Brush Creek near Beulah, N. Dak.	130	1974–1990	9.4	2.7	13.4
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	55	1977–1993	9.1	2.5	15.4
124	Spring Creek near Halliday, N. Dak.	50	1977–1981	9.9	6.2	14.0
125	Spring Creek at Zap, N. Dak.	167	1974–2007	9.5	4.8	16.6

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Dissolved oxygen, in mg/L—Continued						
127	Knife River at Hazen, N. Dak.	424	1974–2007	9.3	5.6	19.6
128	Antelope Creek above Hazen, N. Dak.	52	1977–1985	11.1	2.0	16.2
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	11	1982–1985	12.2	4.8	21.2
130	West Branch Antelope Creek near Hazen, N. Dak.	20	1978–1983	9.7	3.9	13.4
131	Coal Creek near Stanton, N. Dak.	31	1977–1981	11.0	5.2	17.0
132	Alderin Creek near Fort Clark, N. Dak.	53	1977–1983	10.8	7.0	14.6
133	Coal Lake Coulee near Hensler, N. Dak.	45	1978–1988	10.9	7.0	16.0
134	Buffalo Creek near Washburn, N. Dak.	47	1978–1983	10.8	5.6	15.8
135	Turtle Creek above Washburn, N. Dak.	87	1988–2003	8.9	0.8	15.2
136	Painted Woods Creek near Wilton, N. Dak.	147	1970–2003	9.6	2.8	15.8
137	Square Butte Creek near Hannover, N. Dak.	26	1977–1981	11.1	4.6	12.8
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	64	1977–1982	9.5	3.2	12.8
139	Hagel Creek near Center, N. Dak.	45	1977–1982	10.0	4.7	14.6
140	Square Butte Creek below Center, N. Dak.	9	1983–1993	9.0	6.9	13.4
142	Missouri River at Bismarck, N. Dak.	151	1974–2001	10.6	7.8	13.4
143	South Branch Heart River near South Heart, N. Dak.	33	1979–1996	9.3	4.3	13.4
144	North Creek near South Heart, N. Dak.	25	1978–1996	10.1	2.3	14.6
145	Heart River near South Heart, N. Dak.	63	1975–1994	9.1	4.7	14.2
146	Heart River at Dickinson, N. Dak.	5	1993	9.0	6.8	14.0
147	Green River near New Hradec, N. Dak.	55	1977–2006	9.1	4.2	14.1
148	Green River near Gladstone, N. Dak.	4	1993	9.5	7.1	14.2
149	Heart River near Richardton, N. Dak.	73	1994–2007	9.6	5.2	23.3
152	Big Muddy Creek near Almont, N. Dak.	3	1993	9.0	8.8	11.0
156	Heart River near Mandan, N. Dak.	283	1977–2007	10.1	0.5	14.0
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	3	1988–1989	10.7	8.2	10.8
158	Apple Creek near Menoken, N. Dak.	40	1977–1993	7.5	3.8	12.1
159	Missouri River near Schmidt, N. Dak.	140	1974–1981	10.5	8.4	13.6
160	Cannonball River at New England, N. Dak.	36	1978–1981	9.8	6.4	14.8
161	Coal Bank Creek near Havelock, N. Dak.	86	1974–1983	10.3	1.4	19.2
162	Cannonball River at Regent, N. Dak.	47	1977–1981	9.1	5.9	15.9
164	Cannonball River near Raleigh, N. Dak.	72	1993–2007	9.7	6.2	14.8
166	Cedar Creek near Haynes, N. Dak.	1	1996	11.3	11.3	11.3
167	Timber Creek near Bentley, N. Dak.	47	1977–1981	10.3	3.7	14.5
169	Cedar Creek near Raleigh, N. Dak.	65	1993–2007	9.8	5.3	14.3
170	Cannonball River at Breien, N. Dak.	334	1974–2007	10.0	3.4	17.0
171	Beaver Creek near Linton, N. Dak.	4	1993	9.1	7.7	12.8
173	Porcupine Creek near Fort Yates, N. Dak.	39	1991–1999	7.8	4.2	13.3
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	87	1974–1987	9.7	3.8	21.0
175	James River near Manfred, N. Dak.	41	1985–1998	10.3	3.8	17.0

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Dissolved oxygen, in mg/L—Continued						
176	James River near Grace City, N. Dak.	113	1985–2007	9.4	0.5	18.3
177	James River above Arrowwood Lake near Kensal, N. Dak.	166	1985–2008	9.2	0.8	17.8
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	10	1986–1989	9.2	6.4	14.7
179	James River near Pingree, N. Dak.	127	1980–2008	9.9	1.9	22.4
180	Pipestem Creek near Pingree, N. Dak.	21	1987–1999	10.7	6.2	16.4
181	Pipestem Creek near Buchanan, N. Dak.	5	1993	9.7	4.6	13.5
182	James River at Jamestown, N. Dak.	154	1984–2007	9.2	1.0	17.5
183	James River at Lamoure, N. Dak.	220	1976–2007	9.6	0.5	21.0
184	Bear Creek near Oakes, N. Dak.	14	1972–1999	7.1	4.4	12.6
185	James River at Oakes, N. Dak.	138	1970–2008	9.9	0.5	30.3
186	James River at N. Dak./S. Dak. State line	50	1976–1999	9.5	0.6	30.4
Total suspended solids, in mg/L						
1	Bois De Sioux River near Doran, Minn.	40	2000–2007	36	<10	174
2	Red River of the North at Wahpeton, N. Dak.	2	1996	128	72	183
3	Red River of the North near Wahpeton, N. Dak.	1	2006	<10	<10	<10
4	Red River of the North at Brushville, Minn.	56	1993–2007	36	<10	261
10	Wild Rice River near Abercrombie, N. Dak.	49	1993–2007	65	<10	269
11	Red River of the North at Fargo, N. Dak.	67	1971–2008	68	<10	709
12	Red River of North below Fargo, N. Dak.	19	1973–1977	38	<10	130
13	Red River of the North at Harwood, N. Dak.	53	2000–2007	95	<10	500
14	Red River of the North near Harwood, N. Dak.	17	1993–2007	139	12	470
17	Sheyenne River at Warwick, N. Dak.	48	1996–2006	20	<10	78
18	Sheyenne River near Warwick, N. Dak.	16	2005–2007	19	<10	72
20	Mauvais Coulee near Cando, N. Dak.	6	1987–1988	<10	<10	13
21	Edmore Coulee near Edmore, N. Dak.	3	1988	<10	<10	10
24	Starkweather Coulee near Webster, N. Dak.	5	1988	<10	<10	472
28	Big Coulee near Churchs Ferry, N. Dak.	5	1987–1988	53	17	99
30	Channel A near Penn, N. Dak.	7	1987–1992	14	<10	191
32	Sheyenne River near Cooperstown, N. Dak.	92	1995–2007	34	<10	159
33	Baldhill Creek near Dazey, N. Dak.	11	1995–1996	17	<10	74
34	Sheyenne River below Baldhill Dam, N. Dak.	87	1995–2007	<10	<10	94
36	Sheyenne River at Lisbon, N. Dak.	71	1997–2007	40	<10	415
37	Sheyenne River near Kindred, N. Dak.	72	1996–2007	65	<10	991
38	Sheyenne River above Sheyenne River Diversion near Horace, N. Dak.	13	2005–2007	102	<10	767
41	Sheyenne River at West Fargo, N. Dak.	6	1996–2006	159	19	245
45	Maple River below Mapleton, N. Dak.	49	1997–2007	62	<10	489
46	Sheyenne River at Harwood, N. Dak.	10	1993	102	19	250
51	Elm River near Kelso, N. Dak.	2	1993	46	<10	81

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total suspended solids, in mg/L—Continued						
52	Red River of the North at Halstad, Minn.	12	1978–2007	157	19	621
53	Beaver Creek near Finley, N. Dak.	7	1970–1976	14	<10	40
55	Goose River at Hillsboro, N. Dak.	74	1996–2008	40	<10	503
56	Red River of the North at Grand Forks, N. Dak.	78	1997–2008	79	<10	708
58	Turtle River at Manvel, N. Dak.	67	1997–2008	34	<10	799
62	Forest River near Minto, N. Dak.	73	1996–2008	19	<10	430
67	Park River at Grafton, N. Dak.	67	1996–2008	23	<10	878
68	Red River of the North at Drayton, N. Dak.	5	1996	58	31	174
75	Pembina River at Neche, N. Dak.	77	1996–2008	83	<10	3,740
77	Red River of the North at Pembina, N. Dak., site 1	10	1993	90	<10	320
78	Red River of the North at Pembina, N. Dak., site 2	90	1997–2008	139	<10	1,900
80	Long Creek near Noonan, N. Dak.	10	1997	14	<10	34
82	Souris River near Sherwood, N. Dak.	178	1978–2008	13	<10	96
83	Souris River near Foxholm, N. Dak.	47	1982–1998	<10	<10	62
84	Des Lacs River at Foxholm, N. Dak.	83	1996–2007	31	<10	105
85	Souris River above Minot, N. Dak.	134	1982–2008	<10	<10	99
87	Souris River near Verendrye, N. Dak.	189	1982–2008	20	<10	170
88	Wintering River near Karlsruhe, N. Dak.	14	1982–1998	<10	<10	35
89	Souris River near Bantry, N. Dak.	59	1982–1998	16	<10	63
90	Willow Creek near Willow City, N. Dak.	15	1982–1997	14	<10	24
91	Stone Creek near Kramer, N. Dak.	5	1992–1993	<10	<10	54
92	Deep River near Upham, N. Dak.	7	1997	<10	<10	14
96	Deep River below Cut Bank Creek near Upham, N. Dak.	3	1982	15	<10	33
97	Boundary Creek near Landa, N. Dak.	6	1992–1993	11	<10	26
98	Souris River near Westhope, N. Dak.	116	1971–2008	12	<10	116
100	Missouri River near Williston, N. Dak.	3	1975–1977	58	22	96
101	Little Muddy River below Cow Creek near Williston, N. Dak.	9	1999	24	18	88
106	Bear Den Creek near Mandaree, N. Dak.	9	1970–1977	53	30	180
110	Little Missouri River at Marmarth, N. Dak.	8	1999	257	28	3,750
112	Little Missouri River at Medora, N. Dak.	73	1996–2007	198	<10	20,000
113	Beaver Creek near Trotters, N. Dak.	9	1999	<10	<10	98
114	Little Missouri River near Watford City, N. Dak.	68	1996–2007	314	<10	56,000
115	Missouri River at Garrison Dam, N. Dak.	4	1975–1977	<10	<10	<10
120	Knife River near Golden Valley, N. Dak.	60	1997–2007	41	<10	467
122	Brush Creek near Beulah, N. Dak.	14	1974–1990	<10	<10	26
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	4	2008	15	<10	36
125	Spring Creek at Zap, N. Dak.	80	1975–2008	11	<10	289
127	Knife River at Hazen, N. Dak.	76	1975–2007	19	<10	735
128	Antelope Creek above Hazen, N. Dak.	16	1982–1985	16	<10	233

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Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Total suspended solids, in mg/L—Continued						
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	11	1982–1985	<10	<10	222
132	Alderin Creek near Fort Clark, N. Dak.	6	1982–1983	49	18	170
133	Coal Lake Coulee near Hensler, N. Dak.	22	1982–1988	25	<10	166
142	Missouri River at Bismarck, N. Dak.	2	1975–1978	37	17	56
147	Green River near New Hradec, N. Dak.	1	1982	93	93	93
149	Heart River near Richardton, N. Dak.	67	1996–2007	25	<10	206
156	Heart River near Mandan, N. Dak.	68	1996–2007	12	<10	475
157	Long Lake Creek above Long Lake near Moffit, N. Dak.	3	1988–1989	17	<10	35
158	Apple Creek near Menoken, N. Dak.	10	2007	32	<10	48
159	Missouri River near Schmidt, N. Dak.	23	1975–1979	23	<10	84
161	Coal Bank Creek near Havelock, N. Dak.	2	1974–1977	<10	<10	<10
164	Cannonball River near Raleigh, N. Dak.	61	1996–2007	39	<10	885
169	Cedar Creek near Raleigh, N. Dak.	53	1996–2007	31	<10	701
170	Cannonball River at Breien, N. Dak.	63	1996–2007	35	<10	4,500
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	4	1974–1977	125	60	260
175	James River near Manfred, N. Dak.	34	1985–1998	<10	<10	44
176	James River near Grace City, N. Dak.	99	1985–2007	13	<10	96
177	James River above Arrowwood Lake near Kensal, N. Dak.	169	1985–2008	16	<10	206
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	8	1986–1989	11	<10	81
179	James River near Pingree, N. Dak.	109	1984–2008	28	<10	576
180	Pipestem Creek near Pingree, N. Dak.	9	1998–1999	26	<10	59
182	James River at Jamestown, N. Dak.	159	1984–2007	17	<10	73
183	James River at Lamoure, N. Dak.	150	1984–2007	42	<10	514
184	Bear Creek near Oakes, N. Dak.	9	1998–1999	18	<10	39
185	James River at Oakes, N. Dak.	78	1984–1995	43	<10	367
186	James River at N. Dak./S. Dak. State line	9	1998–1999	62	12	207
Suspended-sediment concentration, in mg/L						
5	Red River of the North below Wahpeton, N. Dak.	21	1997–1999	49	4	125
6	Red River of the North at Hickson, N. Dak.	102	1975–2003	72	3	379
10	Wild Rice River near Abercrombie, N. Dak.	62	1975–1994	42	4	540
11	Red River of the North at Fargo, N. Dak.	62	1975–2008	115	4	21,400
12	Red River of North below Fargo, N. Dak.	56	1973–1977	43	4	436
14	Red River of the North near Harwood, N. Dak.	21	1997–1999	164	7	310
18	Sheyenne River near Warwick, N. Dak.	2	2001	58	21	95
24	Starkweather Coulee near Webster, N. Dak.	2	2001	200	6	394
34	Sheyenne River below Baldhill Dam, N. Dak.	2	2001	17	17	17
36	Sheyenne River at Lisbon, N. Dak.	42	1977–1995	102	8	730
37	Sheyenne River near Kindred, N. Dak.	113	1975–2001	74	10	2,850
44	Maple River near Mapleton, N. Dak.	1	1975	120	120	120

Table 1–4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[μ S/cm, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Suspended-sediment concentration, in mg/L—Continued						
46	Sheyenne River at Harwood, N. Dak.	21	1997–1999	225	10	810
52	Red River of the North at Halstad, Minn.	135	1976–2001	76	6	730
53	Beaver Creek near Finley, N. Dak.	101	1971–1996	24	<1	633
55	Goose River at Hillsboro, N. Dak.	10	1994–2008	28	9	610
56	Red River of the North at Grand Forks, N. Dak.	29	1993–2008	125	6	1,110
57	Turtle River at Turtle River State Park near Arvilla, N. Dak.	68	1993–2000	15	<1	981
58	Turtle River at Manvel, N. Dak.	24	1980–2008	34	6	106
59	Red River of the North at Oslo, Minn.	54	1973–1977	76	5	1,060
62	Forest River near Minto, N. Dak.	21	1974–2008	38	4	158
65	Middle Branch Park River near Edinburg, N. Dak.	14	1978–1980	192	6	1,340
66	Cart Creek at Mountain, N. Dak.	9	1978–1979	574	138	2,920
67	Park River at Grafton, N. Dak.	8	2007–2008	14	4	31
72	Pembina River near Vang, N. Dak.	91	1970–1979	210	4	6,760
73	Little South Pembina River near Walhalla, N. Dak.	115	1970–1995	122	3	8,460
74	Pembina River at Walhalla, N. Dak.	249	1970–1995	681	4	19,900
75	Pembina River at Neche, N. Dak.	8	2007–2008	44	4	1,210
76	Tongue River at Akra, N. Dak.	16	2003–2004	42	9	813
78	Red River of the North at Pembina, N. Dak., site 2	54	1994–2008	190	8	1,243
79	Red River of the North at Emerson, Manitoba	123	1978–2001	115	6	911
81	West Branch Short Creek near Columbus, N. Dak.	22	1978–1981	22	3	70
82	Souris River near Sherwood, N. Dak.	64	1974–1981	23	4	1,400
83	Souris River near Foxholm, N. Dak.	90	1972–1980	13	2	80
87	Souris River near Verendrye, N. Dak.	93	1976–1986	16	4	1,150
88	Wintering River near Karlsruhe, N. Dak.	28	1977–1980	8	3	20
89	Souris River near Bantry, N. Dak.	139	1985–2000	26	2	746
90	Willow Creek near Willow City, N. Dak.	134	1986–2000	12	2	399
91	Stone Creek near Kramer, N. Dak.	132	1986–2000	14	2	310
92	Deep River near Upham, N. Dak.	19	1989–2000	12	4	92
95	Cut Bank Creek at Upham, N. Dak.	16	1999–2000	7	2	167
96	Deep River below Cut Bank Creek near Upham, N. Dak.	102	1986–1989	11	<1	100
97	Boundary Creek near Landa, N. Dak.	134	1986–2000	16	<1	76
98	Souris River near Westhope, N. Dak.	250	1974–1994	21	3	1,045
100	Missouri River near Williston, N. Dak.	68	1975–1982	178	16	6,740
102	Stony Creek near Williston, N. Dak.	39	1977–1981	78	16	1,370
104	Beaver Creek near Ray, N. Dak.	51	1977–1982	32	4	180
106	Bear Den Creek near Mandaree, N. Dak.	177	1971–1995	104	8	11,300
111	Deep Creek near Amidon, N. Dak.	53	1977–1982	71	9	978
113	Beaver Creek near Trotters, N. Dak.	56	1977–1981	80	14	2,560
114	Little Missouri River near Watford City, N. Dak.	126	1971–1994	1,028	27	40,400

Table 1-4. Summary statistics for field measurements, total suspended solids, and suspended sediment at selected sites in North Dakota from 1970 through 2008.—Continued[$\mu\text{S/cm}$, microsiemens per centimeter; deg. C, degrees Celsius; --, not available; mg/L, milligrams per liter; <, less than]

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Suspended-sediment concentration, in mg/L—Continued						
115	Missouri River at Garrison Dam, N. Dak.	67	1974–2007	2	<1	11
116	Knife River at Manning, N. Dak.	50	1977–1982	62	11	173
117	Stray Creek near Manning, N. Dak.	22	1978–1981	31	3	1,030
118	Knife River at Marshall, N. Dak.	46	1977–1981	89	23	1,510
119	Elm Creek near Golden Valley, N. Dak.	16	1977–1981	78	15	864
121	Coyote Creek near Zap, N. Dak.	55	1977–1983	48	6	638
122	Brush Creek near Beulah, N. Dak.	90	1974–1988	25	2	388
123	Spring Creek below Lake Ilo near Dunn Center, N. Dak.	58	1977–2008	41	8	185
124	Spring Creek near Halliday, N. Dak.	55	1977–1981	53	14	618
125	Spring Creek at Zap, N. Dak.	81	1975–2008	39	4	872
127	Knife River at Hazen, N. Dak.	132	1974–1993	66	8	3,780
128	Antelope Creek above Hazen, N. Dak.	35	1977–1982	28	3	406
129	West Branch Antelope Creek No. 4 near Zap, N. Dak.	196	1977–1982	29	3	325
130	West Branch Antelope Creek near Hazen, N. Dak.	17	1978–1983	60	10	1,120
131	Coal Creek near Stanton, N. Dak.	34	1977–1981	47	6	894
132	Alderin Creek near Fort Clark, N. Dak.	40	1977–1982	159	9	6,100
133	Coal Lake Coulee near Hensler, N. Dak.	18	1978–1982	35	5	887
134	Buffalo Creek near Washburn, N. Dak.	42	1978–1983	68	<1	824
137	Square Butte Creek near Hannover, N. Dak.	29	1977–1981	17	3	425
138	Square Butte Creek above Nelson Lake near Center, N. Dak.	57	1977–1981	44	6	2,140
139	Hagel Creek near Center, N. Dak.	43	1977–1982	29	4	1,440
142	Missouri River at Bismarck, N. Dak.	456	1972–2001	97	11	892
143	South Branch Heart River near South Heart, N. Dak.	20	1979–1982	179	15	18,000
144	North Creek near South Heart, N. Dak.	18	1978–1981	68	11	355
145	Heart River near South Heart, N. Dak.	58	1977–1982	125	19	1,250
147	Green River near New Hradec, N. Dak.	49	1977–1982	34	9	222
156	Heart River near Mandan, N. Dak.	120	1972–1993	42	4	2,690
158	Apple Creek near Menoken, N. Dak.	20	1979–1981	16	3	53
159	Missouri River near Schmidt, N. Dak.	6	1975–1976	146	26	352
160	Cannonball River at New England, N. Dak.	42	1978–1981	58	19	1,560
161	Coal Bank Creek near Havelock, N. Dak.	74	1975–1982	22	3	481
162	Cannonball River at Regent, N. Dak.	51	1977–1981	67	6	770
167	Timber Creek near Bentley, N. Dak.	54	1977–1981	44	10	572
170	Cannonball River at Breien, N. Dak.	139	1972–1992	90	6	9,100
174	Buffalo Creek Tributary near Gascoyne, N. Dak.	75	1974–1987	63	2	1,200
175	James River near Manfred, N. Dak.	32	1985–1995	11	<1	92
176	James River near Grace City, N. Dak.	54	1985–1995	11	2	243
177	James River above Arrowwood Lake near Kensal, N. Dak.	155	1985–2008	30	2	288
178	Kelly Creek below Niccum Reservoir near Bordulac, N. Dak.	10	1986–1989	8	3	24

Site identification number (table 1)	Site name	Number of samples	Period of record	Median	Minimum	Maximum
Suspended-sediment concentration, in mg/L—Continued						
179	James River near Pingree, N. Dak.	107	1984–2008	32	2	784
182	James River at Jamestown, N. Dak.	79	1985–1995	39	8	154
183	James River at Lamoure, N. Dak.	136	1976–1995	65	3	402
185	James River at Oakes, N. Dak.	61	1985–1995	89	2	544

Appendix 2. Weighted regression methods for relating flow and concentration differences

Figure 2–1. Weighted linear regression model for mean relative differences in streamflow and the logarithm of mean relative differences in sulfate concentration.

Figure 2–2. Partially weighted residuals from the weighted regression model for sulfate and sample size used to compute mean relative streamflow and concentration differences. SD is the standard deviation of the partially weighted residuals as a function of sample size

Figure 2–3. Partially weighted residuals from the weighted regression model for sulfate and mean relative streamflow differences. SD is the standard deviation of the partially weighted residuals as a function of the mean absolute difference between downstream and upstream flow

Figure 2–4. Weighted linear regression model for mean relative differences in streamflow and the logarithm of mean relative differences in sulfate concentration, standardized to a sample size of $n=40$.

In this appendix, the methods used to determine the percentile lines in figures 31 and 32 are described. Consider sulfate first (fig. 31). Let X be the mean absolute difference between the downstream and upstream flow, as a percent of downstream flow, and let Y be the mean absolute difference between the downstream and upstream sulfate concentration, as a percent of downstream concentration. It was first noted by examining graphs of X and $\log(Y)$ that X was linearly related to $\log(Y)$ (base-10 logarithm). This is shown in figure 2–1, where the vertical axis is in log units. The regression line was obtained from a weighted simple linear regression model,

$$\text{Log}(Y) = \alpha + \beta X + \omega(X,n) e \tag{1}$$

where

- α is the intercept;
- β is the slope;
- $\omega(X,n)$ is a weight that depends on X and n ;
- n is the sample size (the number of pairs of values used to compute the mean); and
- e is the error, assumed to be normally distributed with mean zero and constant variance.

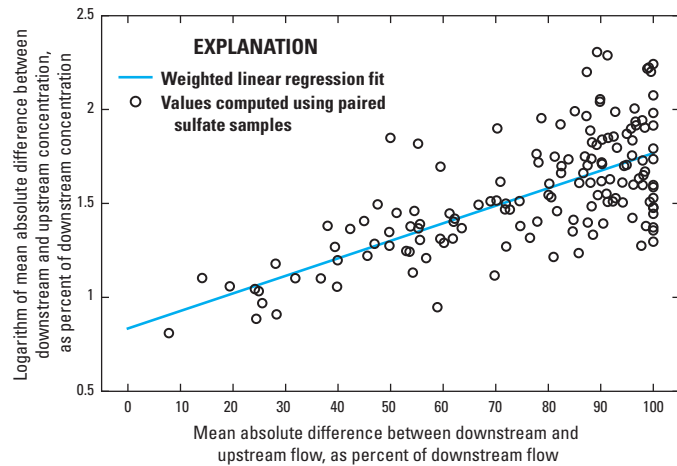


Figure 2–1. Weighted linear regression model for mean relative differences in streamflow and the logarithm of mean relative differences in sulfate concentration.

The weights were determined through trial and error, to make the residual variance as close to a constant (with respect to X and n) as possible. The weight function is given by:

$$\omega(X,n) = [0.32+8/n]^{1/2} [1+(X-50)/100] \tag{2}$$

The weights decrease as the sample size increases (smaller error variance for larger sample size) and increase as X increases. The relation between the partially weighted residuals (PWR) and sample size:

$$\text{PWR}(n) = \omega(X,n) e/[1+(X-50)/100] = [0.32+8/n]^{1/2} e \tag{3}$$

is shown in figure 2–2. The points in this figure show a scatterplot of the square root of n and $\text{PWR}(n)$ and the lines are plus and minus 2 standard deviations (2SD), where $\text{SD}=[0.32+8/n]^{1/2} \text{sterr}$, which are approximate 95-percent limits on the partial residuals assuming e is normally distributed and sterr is the standard error of the regression (the estimate of the standard deviation of the errors from the regression model, in this case $\text{sterr} = 0.196$). Although the errors are somewhat positively skewed, the weights provide a good representation of the decrease in variance as the sample size increases. The relation between the partially weighted residuals and X ,

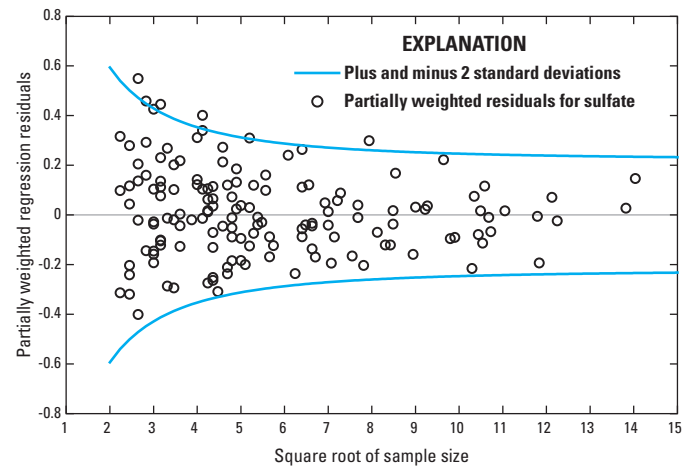


Figure 2–2. Partially weighted residuals from the weighted regression model for sulfate and sample size used to compute mean relative streamflow and concentration differences. SD is the standard deviation of the partially weighted residuals as a function of sample size

$$\text{PWR}(X) = \omega(X,n) e/[0.32+8/n]^{1/2} = [1+(X-50)/100] e \tag{4}$$

is shown in figure 2–3. The points in this figure show a scatterplot of X and $\text{PWR}(X)$ and the lines are plus and minus 2SD, where $\text{SD}=[1+(X-50)/100] \text{sterr}$, which are approximate 95-percent limits on the partial residuals assuming e is normally distributed. Again, although the errors are somewhat positively skewed, the weights provide a good representation of the increase in variance as X increases.

Next, the errors were adjusted to remove the effects of variable sample sizes. A reference sample size of $n=40$ was chosen (for example, 8 samples per year over 5 years or 4 samples per year over 10 years). The adjusted errors are:

$$[e^*|_{n=40}] = [0.32+8/40]^{1/2} e/[0.32+8/n]^{1/2} \tag{5}$$

and the final fitted adjusted regression model is:

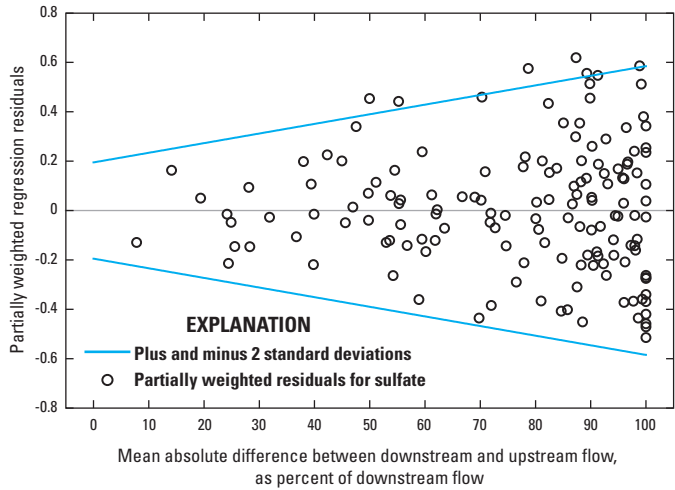


Figure 2-3. Partially weighted residuals from the weighted regression model for sulfate and mean relative streamflow differences. SD is the standard deviation of the partially weighted residuals as a function of the mean absolute difference between downstream and upstream flow

$$\text{Log}(Y) = 0.83 + 0.0093X + [1+(X-50)/100] [e^*|n=40] \quad (6)$$

where the estimated standard deviation of $[e^*|n=40]$ is 0.196. The adjusted regression model is illustrated in figure 2-4. The 50th percentile is just the fitted regression line and the 90th percentile is:

$$\begin{aligned} \text{90th pct } [\text{Log}(Y)] &= 0.83 + 0.0093X + 1.28 \\ & [1+(X-50)/100] 0.196 \end{aligned} \quad (7)$$

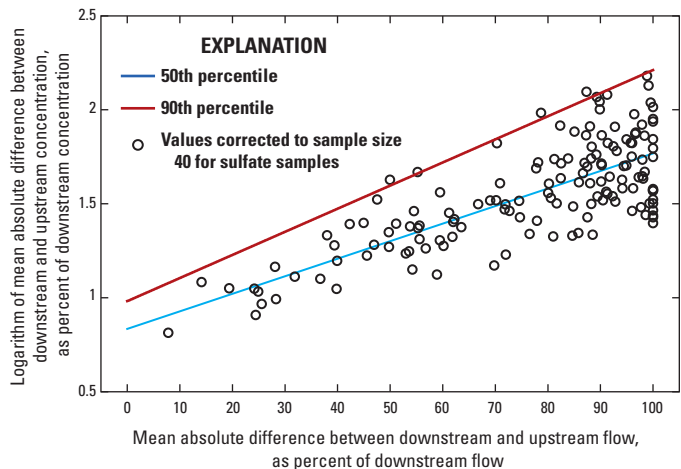


Figure 2-4. Weighted linear regression model for mean relative differences in streamflow and the logarithm of mean relative differences in sulfate concentration, standardized to a sample size of $n=40$.

where 1.28 is the 90th percentile of a standard normal distribution. Figure 31 is simply figure 2-4 with the values expressed in arithmetic rather than log-transformed scale.

The same procedure used for sulfate was used to perform a weighted regression analysis for total phosphorus, but with different weights. The weight function for total phosphorus was:

$$\omega(X,n) = [0.016+8/n]^{1/2} [1+(X-50)/100] \quad (8)$$

the adjusted errors for phosphorus were:

$$[e^*|n=40] = [0.016+8/40]^{1/2} e/[0.016+8/n]^{1/2} \quad (9)$$

and the final fitted adjusted regression model was:

$$\text{Log}(Y) = 1.43 + 0.0034X + [1+(X-50)/100] [e^*|n=40] \quad (10)$$

and the estimated standard deviation of $[e^*|n=40]$ was 0.161. Figure 32 was obtained using this regression model and reversing the transformed resulting percentiles in a similar manner to sulfate.

Appendix 3. Water quality data used in this report

Appendix3.xlsx contains the four data tables listed below and is available for download at:
<http://pubs.usgs.gov/sir/2012/5216/downloads/appendix3.xlsx>

Table 3–1. Major ion constituent data at selected sites in North Dakota from 1970 through 2008.

Table 3–2. Nutrient constituent data at selected sites in North Dakota from 1970 through 2008.

Table 3–3 Trace metal constituent data at selected sites in North Dakota from 1970 through 2008.

Table 3–4. Field measurement, total suspended solids, and suspended-sediment data at selected sites in North Dakota from 1970 through 2008.

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