Quality of Streams in the Red River of the North Basin, Minnesota, North Dakota, and South Dakota

By Lan H. Tornes

In cooperation with the Bureau of Reclamation

Scientific Investigations Report _____

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Conversion Factors and Datum

Multiply	By	To obtain
	Length	
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

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

°F = (1.8 x °C) + 32

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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Executive Summary

This report was prepared to address requirements of the Dakota Water Resources Act of 2000 that directed the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), to prepare a report on the comprehensive water-quality and -quantity needs of the Red River Valley. Reclamation enlisted the help of the U.S. Geological Survey to address those needs.

The Red River of the North Basin is a mostly agricultural region with crops that include small grains, corn, soybeans, sugar beets, sunflowers, and hay. It drains large portions of western Minnesota and eastern North Dakota. The river flows north from the United States into Canada and empties into Lake Winnipeg in Manitoba, Canada.

The major metropolitan areas in the United States part of the basin include Fargo, N. Dak., and Moorhead, Minn., and Grand Forks, N. Dak. and East Grand Forks, Minn.; located along the main stem of the Red River. These growing communities and several smaller communities located throughout the basin add to the draw on water resources.

Considerable water-quality data have been collected for a variety of purposes from streams in the Red River of the North Basin by several agencies. The U.S. Geological Survey has collected the longest-term and most consistent data from streams in the basin. USGS data are interpreted for this report.

The most downstream site considered for this report is the Red River of the North at Emerson, Manitoba. Less than a mile north of the United States-Canadian border, it integrates flow from most tributary streams draining the United States, assimilates point and nonpoint inputs, and has a long period of record. Water-quality data collected from other sites along the main stem of the river, and from eastern and western tributary streams, also were evaluated. This report is a review that is intended to identify measured concentrations that may affect the potability of the water supply and the maintenance of healthy aquatic ecosystems.

The general quality of the waters in the Red River Basin is suitable for intended uses as described in several referenced reports. Occasional exceedances of criteria or standards are identified based on the data interpreted. Most of the measured exceedances were brief, and many occurred before present-day wastewater-treatment methods were enacted. Concentrations of major ions, including sulfate and specific conductance, have approached and occasionally exceeded water-quality standards or criteria and may continue to do so. These exceedances likely are to be expected because of baseflow that is sustained from ground-water discharge from several aquifers, some of which are known to contain high concentrations of dissolved salts that contain sulfate and other ions.

These data provide a good baseline of water-quality conditions, but detections of many trace elements, including lead and mercury, may have been the result of contamination. Although these measurements are maintained in the USGS database and likely will cause concern, more recent studies (Brigham and others, 2002; Sando and others, 2003) have shown that concentrations of selected trace elements generally are low.

Abstract

This report summarizes water-quality data from streams draining the Red River of the North Basin, which is a mostly agricultural region. It primarily has crops including small grains, corn, soybeans, sugar beets, sunflowers, and hay. The Red River drains large portions of western Minnesota and eastern North Dakota. It flows north from the United States into Canada and empties into Lake Winnipeg in Manitoba, Canada.

The general quality of the waters in the Red River Basin is suitable for intended uses. Occasional exceedances of criteria or standards were brief, and many occurred before present-day wastewater-treatment methods were enacted. Concentrations of major ions, including sulfate and specific conductance, have approached and occasionally exceeded water-quality standards or criteria and may continue to do so. These exceedances likely are to be expected because of baseflow that is sustained from ground-water discharge from several aquifers, some of which are known to contain high concentrations of dissolved salts that contain sulfate and other ions.

These data provide a good baseline of water-quality conditions, but detections of many trace elements, including lead and mercury, may have been the result of contamination during collection and processing until methods were refined. The detections recorded in databases likely will cause concern although more recent reports show that concentrations of selected trace elements in the Red River Basin generally are low.

Introduction

The Red River of the North (hereinafter referred to as the Red River) is a large watershed that encompasses about 36,000 square miles in the northern United States. It is largely agricultural with crops that include small grains, corn, soybeans, sugar beets, sunflowers, and hay. Figure 1 shows that the Red River drains large parts of western Minnesota and eastern North Dakota and a small part of South Dakota. The river flows north from the United States into Canada and empties into Lake Winnipeg in Manitoba, Canada.

Figure 1 near here.

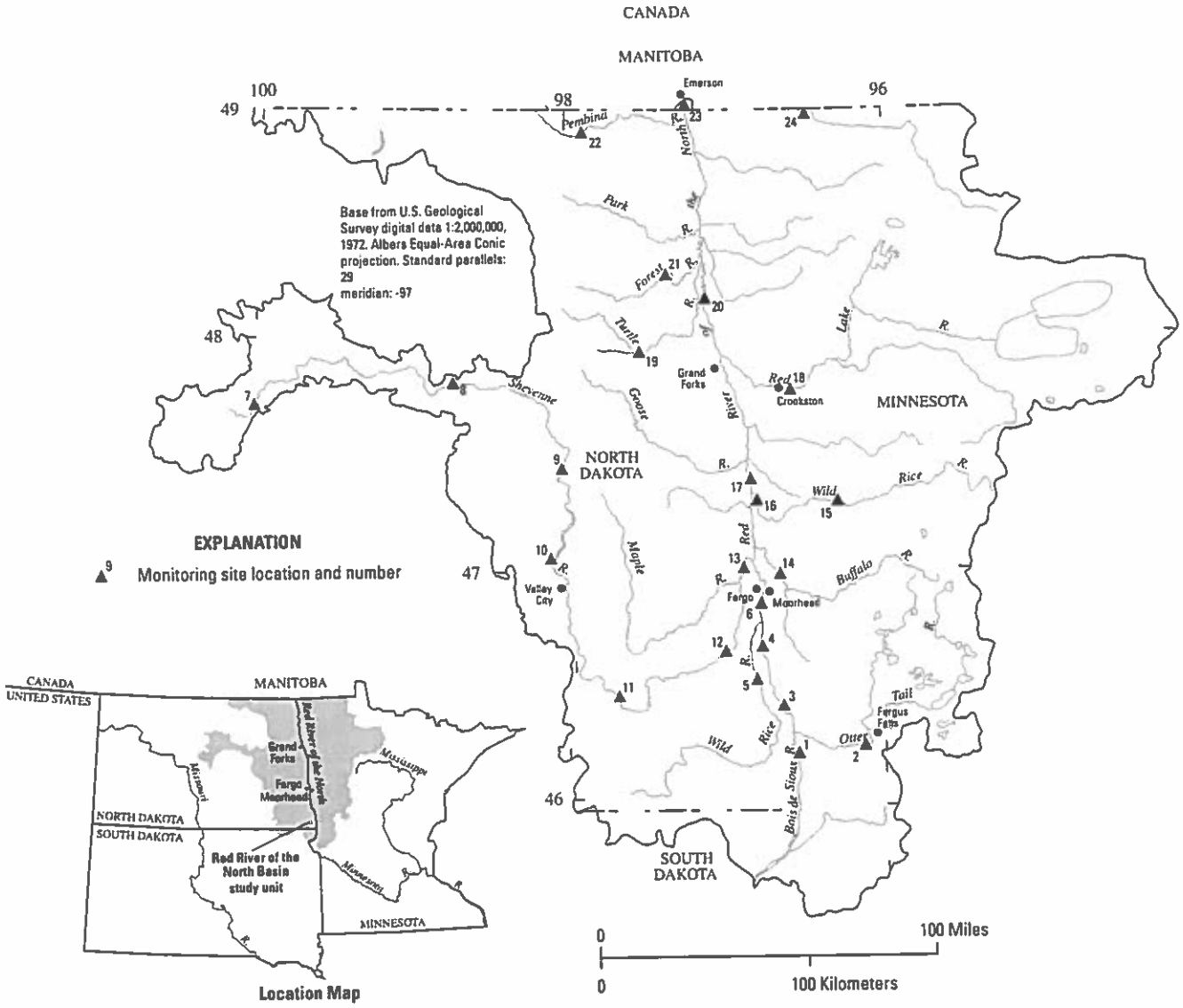

Figure 1. Location of

The Red River frequently floods during snowmelt runoff because snow and river ice melt from south to north causing the river to back up behind ice jams. The Red River Valley actually is a relatively flat lake plain formed about 8,000 years ago under glacial Lake Agassiz. This created streams that generally have very slow velocities and carry considerable sediment eroded from the clays and silts of the lake plain. There are a number of communities along the streams in the watershed, and farmsteads situated throughout the basin. The major metropolitan areas in the United States part of the basin include Fargo, N. Dak., and Moorhead, Minn., and Grand Forks, N. Dak., and East Grand Forks, Minn. These rapidly growing communities are located along the banks of the main stem of the Red River and are adding to the strain on water resources. There are several smaller communities located throughout the basin, generally along tributaries to the Red River.

The major source of sustainable potable water supply for most of these communities is the Red River and it tributaries, and these resources may not be sufficient in the future during dry years because of growing populations. The Red River has been described as having two water-supply issues--too much and too little, describing the problems associated with spring flooding followed by dry conditions in the summer when there is minimal runoff.

Considerable water-quality data have been collected from streams in the Red River watershed by a variety of agencies. Data have been collected for ambient monitoring, regulatory and enforcement purposes, and to better understand special issues. The longest-term records have been collected by the U.S. Geological Survey as part of the high/low flow sampling program performed in cooperation with the North Dakota State Water Commission, Hydrologic Benchmark Network (HBN), and National Stream Quality Accounting Network (NASQAN). These programs started in 1971, 1967, and 1974, respectively, and use standard data-collection techniques that make the data comparable. Other USGS studies collected data using techniques that make those data comparable with the NASQAN program. The USGS National Water Quality Assessment (NAWQA) Program collected comprehensive data on major-ion, nutrient, and pesticide concentrations, but excluded sampling for most trace elements and microbiological indicators.

The Dakota Water Resources Act of 2000 directed the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), to prepare a report on the comprehensive water-quality and -quantity needs of the Red River Valley and options for meeting those needs. The needs are defined as municipal, rural, and industrial supplies; water quality; aquatic environment; recreation; and water conservation measures. Reclamation enlisted the help of the USGS to address the needs for water-quality information.

Purpose and Scope

This report presents analysis and interpretation of existing water-quality data from the Red River watershed. Reclamation is evaluating the water quantity and quality to determine whether existing supplies are adequate to meet future needs.

The data used in this report were almost exclusively collected by the USGS. Although useful data from a variety of local, State, tribal, and other Federal agencies are available and may be incorporated, quality assuring those data and determining their comparability because of different collection and analytical methods is beyond the scope of this report. Many agencies collect samples to assess a defined problem or document an impacted resource, using a variety of sampling and analytical methods. The USGS generally has collected water data using a clearly defined set of protocols that are used nationwide, with the intent of describing the ambient condition of the resource. This provides reasonable assurance that those data are comparable from site to site and among different geographic and political regions.

Methods

This report evaluated USGS data collected primarily from 1976 (earlier data may be included but their reliability is less certain) through the year 2000 that were retrieved from a USGS Internet-based water-resources data server called NWIS-Web. These data are available to anyone that has access to the Internet. Because the data available through NWIS-Web may be somewhat limited and may not be current, data collected from selected sites on the main stem of the Red River (including Wahpeton, N. Dak. and Emerson, Man.) were compared to internally-available USGS data. No notable differences were found. Funding for data-collection activity within the basin by the HBN, NASQAN, and NAWQA programs has been discontinued. The only long-term data-collection program currently active in the Red River Basin is the high/low sampling program that is conducted by the USGS in cooperation with the North Dakota State Water Commission (Douglas G. Emerson, U.S. Geological Survey, oral commun., 2004). Selected sites throughout the State are sampled for this program--once during high flow (generally snowmelt runoff) and once during low flow (baseflow, generally when ground-water discharge is the source of streamflow).

Figure 2 shows the distribution of samples collected at various sites sampled by the USGS but does not indicate the type of samples (nutrients, major ions, trace elements, pesticides, etc.) that were collected and analyzed. It is evident that some sites were sampled sporadically or briefly, and their sampling periods may overlap or complement other nearby sites on the same river. The sites listed in table 1 and shown in figure 1 have the data that are considered the most indicative of water quality in the basin. Data from other nearby sites will be considered in the interpretation because they may provide important supplementary information, and their inclusion will be noted.

Figure 2 near here.

It is important to understand that because nonconcurrent data are interpreted for this report, the data collected from each of the sites may not be comparable. Although care has been taken to ensure that the data are comparable, subtle differences may result from changes over time in land use and land cover, changes in sampling methodology, and changes in analytical methods. These potential differences will be noted where possible.

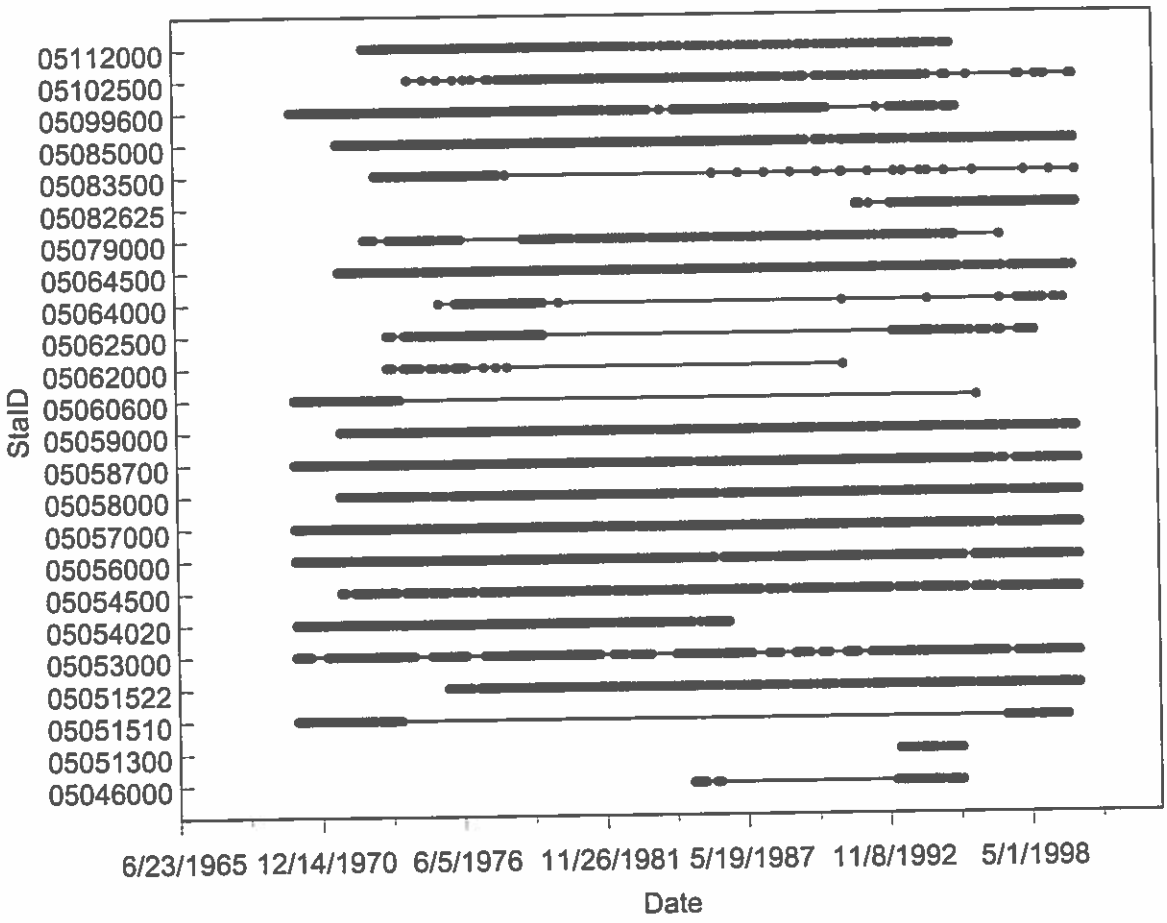

Figure 2. Distribution of sample-collection for sites evaluated in the report.

Table 1. Representative stream sites used for analysis of water quality (listed in downstream order).

Map site identifier (figure 1)	U.S. Geological Survey site identifier	Site name	Latitude	Longitude
1	05051300	Bois de Sioux River near Doran, Minn.	46°09'08"	96°34'44"
2	05046000	Otter Tail River below Orwell Dam near Fergus	46°12'35"	96°11'05"
3	05051510	Red River of the North below Wahpeton, N. Dak.	46°22'30"	96°39'25"
4	05051522	Red River of the North at Hickson, N. Dak.	46°39'35"	96°47'44"
5	05053000	Wild Rice River near Abercrombie, N. Dak.	46°28'05"	96°47'00"
6	05054020	Red River of the North below Fargo, N. Dak.	46°55'50"	96°47'05"
7	05054500	Sheyenne River above Harvey, N. Dak.	47°42'10"	99°56'55"
8	05056000	Sheyenne River near Warwick, N. Dak.	47°48'20"	98°42'57"
9	05057000	Sheyenne River near Cooperstown, N. Dak.	47°25'58"	98°01'38"
10	05058000	Sheyenne River below Baldhill Dam, N. Dak.	47°01'50"	98°05'50"
11	05058700	Sheyenne River at Lisbon, N. Dak.	46°26'49"	97°40'44"
12	05059000	Sheyenne River near Kindred, N. Dak.	46°37'54"	97°00'01"
13	05060600	Sheyenne River near Harwood, N. Dak.	47°00'05"	96°53'40"
14	05062000	Buffalo River near Dilworth, Minn.	46°57'40"	96°39'40"
15	05062500	Wild Rice River at Twin Valley, Minn.	47°16'00"	96°14'40"
16	05064000	Wild Rice River at Hendrum, Minn.	47°16'05"	96°47'50"
17	05064500	Red River of the North at Halstad, Minn.	47°21'10"	96°50'50"
18	05079000	Red Lake River at Crookston, Minn.	47°46'32"	96°36'33"
19	05082625	Turtle River at Turtle River State Park near	47°56'18"	97°30'00"
20	05083500	Red River of the North at Oslo, Minn.	48°11'35"	97°08'25"
21	05085000	Forest River at Minto, N. Dak.	48°16'10"	97°22'10"
22	05099600	Pembina River at Walhalla, N. Dak.	48°54'50"	97°55'00"
23	05102500	Red River of the North at Emerson, Manitoba	49°00'30"	97°12'40"
24	05112000	Roseau River below South Dakota 51 near Caribou	48°58'54"	96°27'46"

The focus for the data collected for the NAWQA program (February 1993 through September 2002) was different than for other (NASQAN, HBM, and high/low flow) data-collection programs. NAWQA sampling was intended to provide a comprehensive view of water-quality issues related to land-use practices in this highly agricultural region but did not directly address water-supply or drinking-water quality concerns. Some sites were selected that may or may not have been sampled previously. Also, some of the constituents measured were different than were measured for previous programs.

During the late 1980s, some problems with sample-collection methodology were identified (D. Rickert, written commun.) that caused contamination of some trace-metal samples that had been collected by the USGS at many network sites, including the HBN and NASQAN. Cadmium, copper, lead, mercury, and other results all have been questioned. As these data are interpreted in this report, these problems will be noted as a possible contamination issue and not the result of an actual environmental occurrence. This suggests that these data are not cause for concern.

The NAWQA program, which incorporated many of the HBN and NASQAN sites, generally and intentionally did not sample for most metals that had been identified as potentially the result of contamination because of previous sampling practices. Only a few metals that are considered less subject to contamination, including iron and manganese, were sampled by NAWQA. Unfortunately, when the NAWQA program discontinued sampling the Red River Basin, funding for the NASQAN sites also was discontinued.

Water-Quality Criteria

Because this report includes data collected from multiple states and provinces--Minnesota, North Dakota, and Manitoba--and multiple countries--Canada and the United States, multiple guidelines or criteria are, or may be, applicable. Generally, the most stringent guidelines or criteria within the United States are established by the USEPA with states following USEPA guidelines or criteria. However, states have the option to enhance these guidelines or criteria resulting in challenges from other organizations that suggest the newly established guidelines or criteria are too strict or inadequate. This results in state guidelines, standards, or criteria that often are preliminary or otherwise tenuous. They also may be different across state boundaries such that a North Dakota tributary stream meets standards that would fail Minnesota standards and vice versa. These generally will be cited in this report, but the Federal (United States and Canadian) guidelines, standards, criteria, etc., will take precedent.

The Canadian and provincial governments generally have more guidelines or criteria that are designed to protect aquatic life than Federal and State governments. Often, these Canadian guidelines and criteria are stricter than those on the United States side of the border. These guidelines or criteria take precedent in this report to assess whether the water sampled meets guidelines or criteria established by either national entity. This should provide a better level of confidence that the streams meet the needs of all stakeholders.

Likewise, when more than one criterion exists for any water-quality constituent measured, the strictest criteria will be cited. In many cases, the constituents and measurements may exceed standards for drinking water, but these are easily treated and removed by conventional methods. Sedimentation and filtration, processes that also remove many hydrophobic nutrients and organic compounds, are examples of conventional treatment methods. There may be cases where more treatment is necessary, which could include reverse osmosis and carbon filtration.

Results

Red River Main Stem

Emerson

The most downstream site in the Red River Basin considered for this report is the Red River at Emerson, Manitoba. It is less than a mile across the international border in Canada, encompasses most of the water flowing north from the United States into Canada, and has a long period of record. As an international station, it also has been sampled and monitored by both the United States and Canadian governments providing considerable quality assurance of the data collected.

Because Emerson is the most downstream site, it integrates flow from all the tributary streams draining the United States except the Roseau River. The Roseau River annually adds nearly 10 percent more water to what the Red River carries at Emerson (USGS water-resources data reports, published annually). The Red River at Emerson also assimilates all the point and nonpoint inputs to the system, including industrial and wastewater discharges and agricultural runoff. The stream water at Emerson also may incorporate and reduce extreme concentrations from tributaries because other sources are likely to dilute and reduce those extremes. The Red River at Emerson is important because of its implication for international transport of streamwater. Other influences (point sources, tributaries, etc.) will be considered in relation to what was measured at this long-term sampling site.

Physical Characteristics and General Chemistry

Dissolved oxygen is one of the more critical factors for the maintenance of healthy aquatic ecosystems. In well-mixed and minimally-polluted rivers, the dissolved-oxygen concentration is near equilibrium with the atmosphere (near saturation) and ranges between about 8 and 15 mg/L, depending on temperature and barometric pressure. Dissolved-oxygen concentrations typically ranged from 7.9 mg/L (the 25^{th} percentile) to 11.6 mg/L (the 75^{th} percentile) with a median of 9.8 mg/L. The minimum value of 1.3 mg/L was measured during August 1993 and was accompanied by other measurements below the USEPA (1986) minimum dissolved-oxygen criteria of 3 mg/L. Streamflow during this period was unusually high, exceeding 30,000 ft^3/s (Tornes and others, 1997), suggesting that runoff washed considerable oxygen-demanding substances into the rivers. Oxygen-demanding substances include materials that consume oxygen as microorganisms decompose organic carbon and other materials associated with runoff and point-source inputs. Except for this period late in the summer of 1993, the dissolved-oxygen concentrations were always greater than the USEPA criteria of 3 mg/L and the Canadian guidelines of 5.5 mg/L. The maximum value of 18.2 mg/L measured in December 1980 appears to be an outlier because all other concentrations measured were 15.6 mg/L or lower.

The pH measured in the Red River at Emerson ranged from 7.2 to 8.9 standard units with a median of 8.1 standard units. This is well within the range of 6.5 to 9.0 standard units established for the protection of aquatic life under Canadian guidelines.

Water temperatures ranged from around zero to 29.0 degrees Celsius. These values were well within the range of zero degrees Celsius to 30 degrees Celsius recommended by the USEPA (1986) for the protection of the fish species commonly found in the Red River including Carp (*Cyprinus carpio*) and Channel Catfish (*Ictalurus punctatus*). See Goldstein (1995) for more information about the distribution of fish communities in streams of the Red River Basin.

Dissolved-solids concentrations at the Red River at Emerson ranged from 245 mg/L to 1,100 mg/L with a median of 438 mg/L. These relatively high concentrations (mostly dissolved salts and silica) probably originate from western tributaries because they have lower precipitation and runoff and more opportunities for salts in lakes and reservoirs to become more concentrated as a result of evaporation. Ground water discharging from western aquifers also tends to carry higher concentrations of dissolved solids. The USEPA has established a drinking-water guideline, also called a secondary standard or SMCL, for dissolved solids of 500 mg/L (http://www.epa.gov/safewater/mcl.html, accessed December 23, 2003).

The suspended-sediment data discussed in this report more accurately represent the suspended, mostly mineral, particles carried by the stream. These are not the same results as suspended-solids samples and concentrations. Suspended-solids samples often are collected by various agencies for compliance monitoring using grab or 'dip' techniques prescribed for samples of wastewater. Suspended-sediment samples are the type most frequently collected by the USGS using methods designed to collect a representative sample of stream water using depth- and flow-integrating techniques and analytical methods that incorporate the entire contents of the sample.

Suspended sediment transported by streams leads to sedimentation of pools, lakes, and reservoirs; and reduced clarity. It also is known to be associated with the transport of various contaminants including trace elements, hydrophobic organic compounds, and phosphorus. Stoner and others (1997) summarize the results of sampling recently-deposited bottom sediments during 1992 and show that concentrations of trace elements and hydrophobic organic compounds in the Red River Basin are consistent with those found at other sites around the United States and are not known to cause a threat to human health or the health of aquatic ecosystems. Brigham and others (1998) provide a more detailed discussion of what was found in bottom sediments. Based on a discussion in Tornes and Brigham (1994), the Red River at Emerson had the highest median concentration of suspended sediment, 108 mg/L, of any site evaluated along the Red River. Much of this can be attributed to the Pembina River, which joins the Red River only a few miles upstream and had the largest yield (1,010 pounds per square mile per day) of suspended sediment of streams in the basin evaluated by Tornes and others (1997).

Water chemistry at Emerson, as in most streams in the basin, had a predominance of calcium and magnesium cations, with bicarbonate as the predominant anion; median concentrations were 63, 30, and 255 mg/L, respectively. However, sodium, chloride, and sulfate also were strongly evident in the water with median concentrations of 34, 35, and 94 mg/L, respectively.

The maximum concentrations of chloride and sulfate were 240 and 230 mg/L, respectively. These values approached, but did not exceed, the SMCL established by the USEPA (http://www.epa.gov/safewater/mcl.html, accessed December 23, 2003).

Hardness often is cited by USEPA standards, criteria, and guidelines as a factor affecting the toxicity of metals to aquatic organisms. The hardness at Emerson, calculated from the calcium and magnesium concentrations, had a median value of 280 mg/L as calcium carbonate and was as high as 496 mg/L. Many of the criteria that are provided by the USEPA (http://www.epa.gov/waterscience/criteria/aqlife.html, accessed May 5, 2004) use a hardness value of 100 mg/L, which generally is less than the hardness encountered at Emerson. However, these criteria provide a numeric value from which to contrast values that were measured in Red River samples without requiring calculations for each measurement.

Because increased nutrient concentrations in streams may enhance plant growth, they also may adversely affect aquatic habitat and the potability of the water supply. Nutrient concentrations in the Red River at Emerson generally were low when compared to other smaller streams that drain agricultural areas. This may be a result of the integrating effect of this stream system at Emerson. Median total ammonia plus organic nitrogen concentrations were 1.2 mg/L with most of that (about 1 mg/L) in the dissolved state. Nitrate nitrogen had a median concentration of 0.34 mg/L with a maximum of 5.8 mg/L, which is well below the drinking-water standard of 10.0 mg/L. The median ammonia concentration was 0.08 mg/L with a maximum of 2.3 mg/L recorded in 1981. Based on criteria that are still under development by the USEPA (http://www.epa.gov/waterscience/standards/ammonia/99update.pdf, accessed December 31, 2003), it is unclear what organisms would have been adversely affected by this concentration under the circumstances that this concentration occurred. Since more stringent water-quality standards have been enacted under the Clean Water Act of 1972 and amended in 1977 (http://www.epa.gov/region5/water/cwa.htm, accessed June 18, 2004) and other regulations, concentrations have been much lower. The data collected at Emerson as part of the NAWQA program had a maximum ammonia concentration of 0.37 mg/L.

Trace elements had routinely been analyzed in samples collected from Emerson and other sites in the basin for the NASQAN program. However, much of that sampling was discontinued starting in the early 1990s because of concerns about sample contamination. The only trace elements that continued to be routinely sampled were iron and manganese that generally are considered nontoxic micronutrients. Trace-element data collected before they were discontinued will be discussed with the caveat that the results may be adversely affected by contamination. Mercury and other trace-element data have been collected more recently (Brigham and others, 1999; Sando and others, 2003) and further suggest that previously collected data may have been biased.

The trace elements considered potentially harmful generally were below established standards. The maximum total arsenic concentration (9 µg/L) was below the 10 µg/L USEPA drinking-water standard that is scheduled to take effect in January 2006. This value and a few others did exceed the 5 µg/L Canadian criteria for aquatic life protection (http://www.ec.gc.ca/ceqg-rcqe/English/ceqg/water/default.cfm, accessed December 23, 2003) but were far below the 150 µg/L USEPA aquatic life criteria. The maximum concentrations of both total and dissolved barium were almost an order of magnitude lower than the 2-mg/L USEPA drinking-water standard and well below any other standard that was reviewed. Beryllium concentrations were at or below detection, which is nearly an order of magnitude below the 4-µg/LUSEPA drinking-water standard (http://www.epa.gov/safewater/mcl.html, accessed December 23, 2003). Cadmium concentrations also generally were below detection and, when detected, were below established water-quality standards. The highest chromium concentration reported was 30 µg/L, which is well below the total chromium criterion continuous concentrations (CCC) established by the USEPA; however, chromium detections could be a result of contamination during sample collection and processing, and the valence was not determined. The maximum total copper concentration of 310 µg/L likely is the result of sample contamination because it was accompanied by a dissolved concentration of only 8 µg/L, suggesting that most of the copper was particulate. The highest dissolved copper concentration of 17 µg/L is nearly three orders of magnitude below the 1.3-mg/L USEPA drinking-water standard. Iron concentrations varied widely during the sampling period, ranging as high as 640 µg/L for dissolved and 12,000 µg/L for total; the 640 µg/L in April 1991 was the only value that exceeded the 300-µg/L Canadian criteria for protection of aquatic life. Dissolved lead was below detection in more than 75 percent of the samples collected and was 11 µg/L or less when it was detected. The USEPA action level for removal of lead from drinking water is 15 µg/L and the Canadian criteria for aquatic life is 1-7 µg/L. Sporadic detections of total lead as high as 66 µg/L while it was sampled until 1983 could be real but also could be the result of contamination before its widespread use was restricted. Figure 3 shows that dissolved lead concentrations were variable until sampling was discontinued in 1991. No trends are apparent in the data shown in figure 3.

Figure 3 near here.

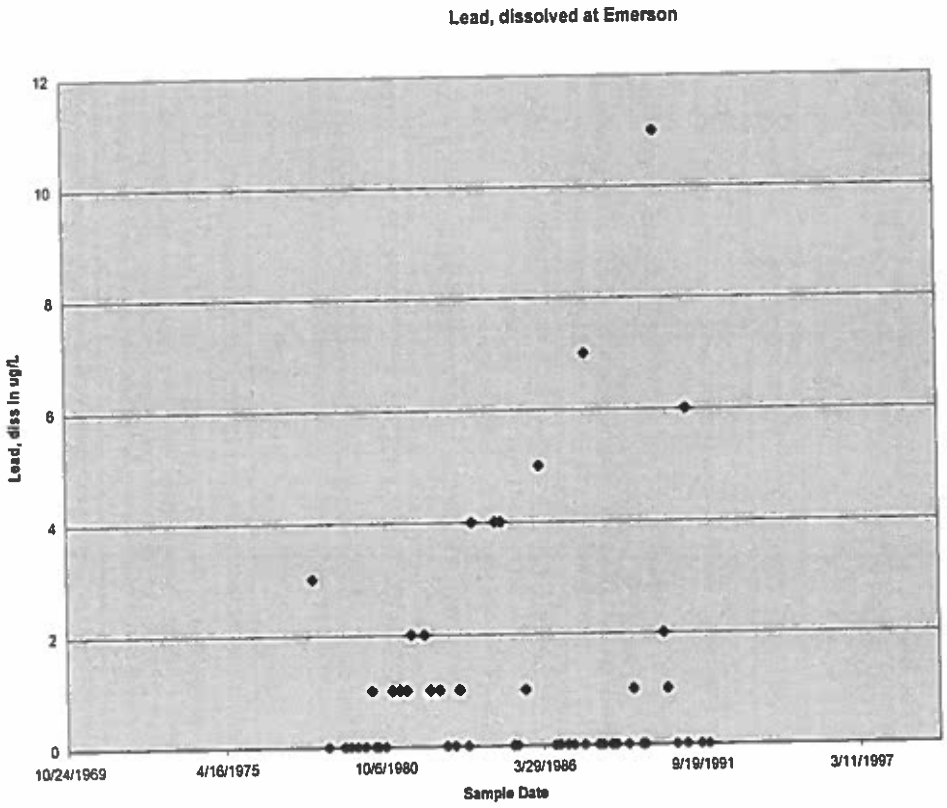

Figure 3. Dissolved lead concentrations measured in samples from the Red River of the North at Emerson, Manitoba.

Dissolved and total mercury also were sampled at Emerson as part of the NASQAN program until 1992 when these measurements were discontinued because of concerns about sample contamination. Concentrations of dissolved mercury ranged from zero (which by today's conventions would be reported as less than the reporting limit established for that method) to 0.5 µg/L. Total mercury ranged from zero to 1.4 µg/L. At the reporting level established for this analysis and the analytical method used, mercury probably would not have been detected. Total and dissolved mercury and methylmercury have recently been sampled using more refined techniques in various parts of the watershed (Brigham and others, 1999; Sando and others, 2003), and concentrations typically were below 10 nanograms per liter and generally were much less.

The previously straightforward sampling and analysis for total and dissolved mercury in water has recently become complicated by a developing understanding of how mercury behaves in the environment. Concentrations reported from recent studies are far below those considered for this report but still are subject to biogeochemical processes that change the chemical behavior of mercury in the environment. These processes result in important activity that is not evident in the data considered for this report.

Red River Main-Stem Sites Upstream from Emerson

Other sites along the Red River upstream from Emerson also were sampled for various purposes including NASQAN and NAWQA. Water quality at Emerson generally was within the various applicable guidelines. Because waters sampled at that site are an integration of the varied inputs upstream, violations might result at more upstream sites that were not evident at Emerson. Sampling sites along the main stem of the Red River considered for this evaluation include Wahpeton, Hickson, Fargo, Halstad, and Oslo. Other assorted sites also were evaluated.

Being further south and carrying a smaller volume of water, many of the upstream sampling sites showed occasional minor violations of aquatic-life criteria for water temperatures in excess of 30 degrees Celsius and pH values greater than 9.0 standard units. Dissolved oxygen was as low as 0.6 mg/L during the 1970s with scattered occurrences below 3.0 mg/L as far downstream as Halstad. Improvements in water quality resulting from the Clean Water Act of 1972 and amended in 1977 apparently resulted in improved dissolved-oxygen concentrations with fewer violations of criteria and standards. Exceptions occurred during July 1993 at Halstad when increased flows apparently washed oxygen-demanding substances into the stream. These low dissolved-oxygen concentrations were measured on two occasions when samples were collected, but no other exceedances were measured.

Measurements of pH rarely exceeded 9.0 standard units at sites sampled along the Red River. A series of measurements at Halstad during September 27, 1984, exceeded the 9.0-standard unit criteria and likely were part of a special study intended to evaluate stresses imposed upon the river. As these occurred during a short time span and were not widespread, it may be assumed that these will rarely be encountered along the river.

A number of constituents measured at the Red River sites near Fargo exceeded water-quality criteria or standards. The sulfate concentration of 267 mg/L was slightly more than the 250-mg/L standard but occurred in 1958, about 45 years ago. Other exceedances including copper, cadmium, lead, and selenium occurred before the early 1970s and could be related to pollution or other sampling artifacts.

Large concentrations of cadmium were measured in samples collected from the Red River at Halstad in1983 and 1988. Concentrations of 26 and 45 µg/L, respectively, were found in the NWIS data base. These concentrations far exceed the Canadian freshwater aquatic life criteria of 0.017 µg/L and the USEPA aquatic life criteria of 0.25 µg/L. It is not certain what caused these detections because no other constituents measured indicate a potential source of contamination.

Mercury also was occasionally detected at some sites along the Red River, at concentrations up to 6.9 µg/L, but the source or cause of that detection is uncertain. Because no other trace elements or other indicators were evident, it is assumed that these values are an artifact of sample collection, processing, handling, or analysis. The discussion of mercury detections at the sampling site on the Red River at Emerson (above) and other caveats cast doubt on the reliability of this detection.

Sheyenne River

The Sheyenne River is the longest tributary to the Red River. In spite of its large drainage area, it carries proportionately little water because runoff from this part of the Red River Basin is so small compared to other tributaries, especially eastern streams. This evaluation of the quality of the Sheyenne River combines data from a number of sites that were sampled starting from near the headwaters where it likely dries up occasionally to near the mouth where it joins the Red River.

Generally, the physical and chemical data indicate that the water is suitable for most uses. Water temperatures were consistently below about 30 degrees Celsius. pH values rarely exceeded 9.0 standard units and generally were only slightly alkaline. Dissolved-oxygen concentrations were above 3.0 mg/L at all sites except the most upstream site near Harvey, N. Dak., and usually were above 6.0 mg/L. The low dissolved-oxygen concentrations at Harvey occurred during the early 1990s or earlier, most often when streamflows were very low. This suggests that the stream was not able to assimilate the load of internally- or externally-derived oxygen-demanding substances.

The chemical quality of the Sheyenne River is relatively constant along its path, carrying a mixture of calcium, sodium, sulfate, and bicarbonate ions. At many of the sites, the sulfate concentration exceeded the USEPA drinking-water standard of 250 mg/L. The median sulfate concentration exceeded the standard in as many as one-fourth of the samples collected from the most upstream sites but was well below the drinking-water standard at all sites downstream. Similarly, the sodium concentrations generally were well below 100 mg/L but approached or exceeded 500 mg/L in a few samples from sites near Harvey, Cooperstown, and Lisbon.

Trace-element concentrations including chromium, nickel, zinc, mercury, and lead were detected sporadically and often with decreasing frequency and lowering concentrations over time. This would suggest better controls on wastewater discharges but also could result from improved sample-collection and -processing techniques reducing unintended contamination. Trace elements that were more commonly detected included copper, nickel, and arsenic with median concentrations that typically were 4 to 5 µg/L. This concentration of arsenic is well below the 10-µg/L USEPA drinking-water standard that is scheduled to take effect in 2006.

Lake Ashtabula is a major reservoir along the Sheyenne River that is used for recreation, water supply, and flood control. The data most pertinent to this study were collected below Baldhill Dam near the outlet of the reservoir during 1959 through 2002. Specific-conductance measurements collected as part of that monitoring are shown in figure 4. The figure suggests that there is a gradual increase in specific conductance over time although that trend has not been tested to determine its statistical significance.

Figure 4 near here.

All constituents measured at the site below Lake Ashtabula were well within any criteria used for this report. Dissolved-oxygen concentrations were consistently 6.0 mg/L or higher. The median sulfate concentration was 120 mg/L. Median arsenic and selenium concentrations were 4 and 1 µg/L, respectively, which is well below the 150- and 5-µg/L criteria established by the USEPA.

Western Tributaries

The other western tributaries to the Red River drain areas having relatively high evaporation and low runoff (Stoner and others, 1998). During baseflow, these streams are sustained mostly by ground-water discharge that generally has high concentrations of dissolved solids. This has the potential to introduce high concentrations of salts and trace elements during low-flow conditions that may be considered harmful to aquatic ecosystems and human health.

Many of the western tributaries had median conductances that were greater than 1,000 µS/cm. Much of the salts that comprise those conductances include sodium and calcium, with sulfate concentrations that typically exceeded the 250-mg/L USEPA drinking-water criteria. The median sulfate concentrations in the Wild Rice, Maple, and Goose Rivers typically exceeded the USEPA drinking-water standard. However, sulfate concentrations were considerably less in streams that were farther north so that the maximum concentration measured in the Red River was below or far below the water-quality standard.

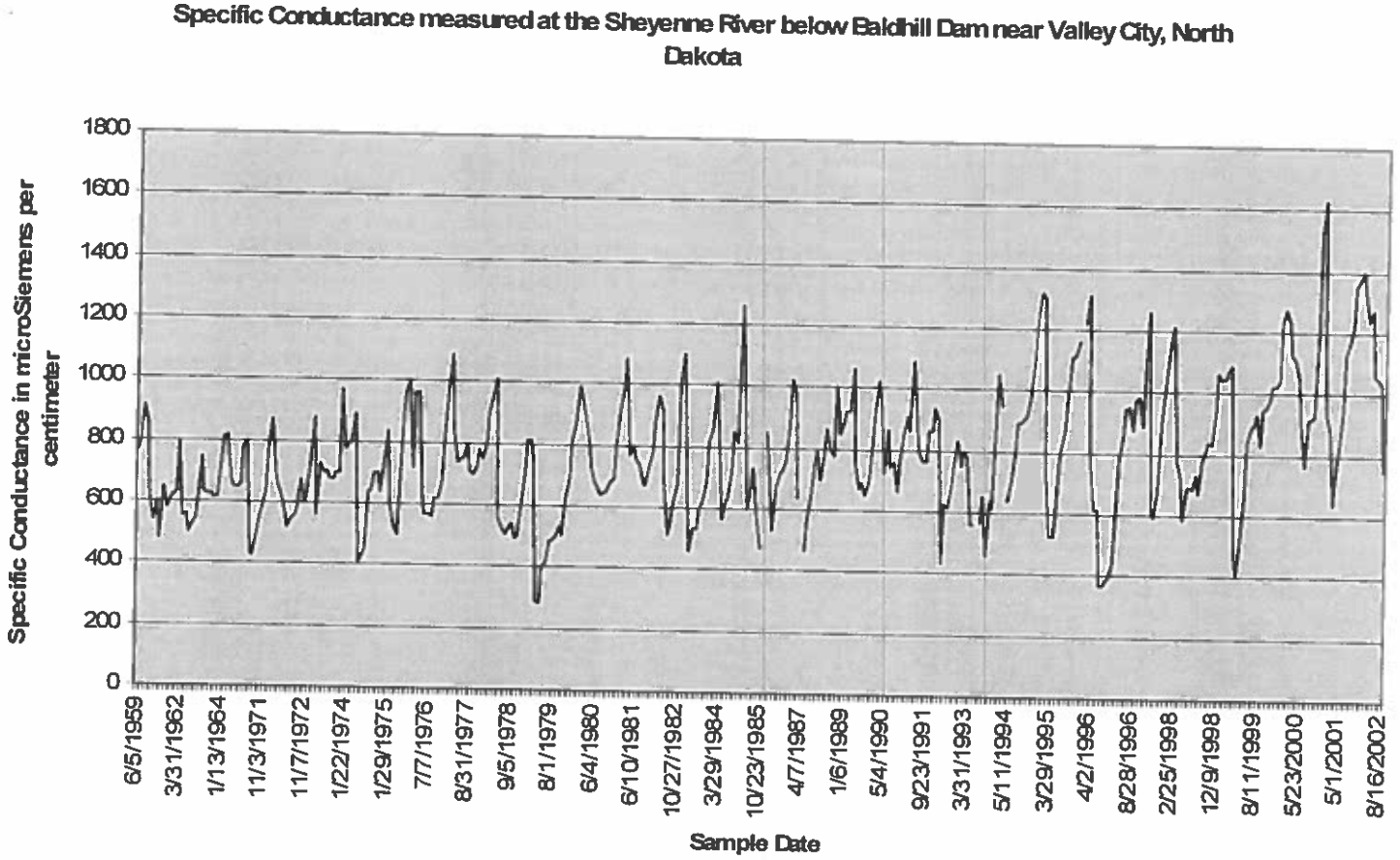

Figure 4. Specific conductance measured at the Sheyenne River below Baldhill Dam near Valley City, North Dakota.

Median arsenic concentrations of 6 µg/L or less were well below the USEPA drinking-water standard that will be lowered to 10 µg/L in 2006. The Wild Rice, Maple, and Goose Rivers typically had median arsenic concentrations that were greater than 3 µg/L, whereas streams further north typically had median concentrations that were near or below 3 µg/L. These occurrences probably are indicative of leaching from parent materials including rocks and soils.

Other trace elements were detected, but at low concentrations. Copper, nickel, zinc, and strontium were commonly found at low concentrations in southern western tributaries and probably are indicative of leaching from parent materials including rocks and soils. Occasional, apparently random, detections of lead, mercury, and selenium probably are a result of sample contamination or other factors that are unrelated to source-water inputs. Detectable concentrations have been less frequent recently as sample-collection, processing, and analytical techniques have improved.

Eastern Tributaries

The eastern tributaries to the Red River drain areas having relatively high runoff and low evaporation compared to western tributaries (Stoner and others, 1993). The Bois de Sioux River is included with the eastern tributaries because it forms part of the boundary between the States of Minnesota and North Dakota and could be considered the 'headwaters' of the Red River.

The eastern tributaries had median conductances that were less than 1,000 µS/cm, except in the Bois de Sioux where they were greater than 1,000 µS/cm in nearly half of the samples. Sulfate concentrations in the Bois de Sioux also exceeded USEPA drinking-water quality criteria with a median of 350 mg/L. All other measurements in the Bois de Sioux showed that the water quality was within established drinking-water quality criteria.

Eastern tributaries had greater runoff that generally provided a dilution effect for other inputs. The Ottertail River, which drains considerable upland lakes and streams in west-central Minnesota, had dissolved-oxygen concentrations above 3.5 mg/L, generally with low nutrient concentrations. The data reviewed for the Ottertail River showed no exceedances of any water-quality criteria.

The Ottertail River had sulfate concentrations at or below 32 mg/L. However, the Buffalo River, which mostly drains the Red River Lake Plain and empties into the Red River more than 50 linear (not river) miles north of the Ottertail River, had sulfate concentrations as high as 230 mg/L. These differences may be related to the location of sampling sites which were further down in the watershed where sulfate concentrations from source waters, including ground water, may be higher than in more upland areas.

This geographic difference in sulfate concentration was not evident along the Wild Rice River in Minnesota where samples were collected from an upstream site at Twin Valley and a site about 30 miles downstream at Hendrum, which is near the Red River. Both sites had similar distributions of sulfate concentrations (although the median concentration at Hendrum was higher) and both had maximum values of 85 mg/L. However, during February 1977, the dissolved-oxygen concentration at Hendrum was less than about 1 mg/L during low flow while the dissolved-oxygen concentration at Twin Valley never dropped below 3.1 mg/L. Other potential contaminants measured in the Wild Rice River included arsenic, which was 7 µg/L or less, and nitrate nitrogen, which was 2.5 mg/L or less. Both were well below any drinking-water standards or criteria.

The Red Lake River adds considerable flow to the Red River, so much that the towns at the confluence are called Grand Forks, N. Dak., and East Grand Forks, Minn. The water sampled at Crookston, Minn., carried no constituent concentrations that would be considered harmful. Conductance was 730 µS/cm or less, nitrates were 2.4 mg/L or less, and sulfate was 125 mg/L or less. Trace elements also occurred in very low concentrations or were below detection, with arsenic found at 7 µg/L or less.

The only other eastern tributary to the Red River that was routinely sampled was the Roseau River. However, because that river joins the Red River well across the border in Canada, it was not included in this analysis.

Other Related Data

Hydrophyllic (water-soluble) pesticides were collected from selected stream sites in the Red River Basin as part of the NAWQA study. Results of those samplings are presented in Tornes and Brigham (1995), Tornes and others (1997), and Stoner and others (1998). Concentrations of pesticides detected were below or far below water-quality standards and criteria. Although most of the pesticides that were detected were related to domestic and agricultural use, many did not have water-quality criteria established. The data had a high enough resolution to provide information about seasonal variability and responses to hydrologic influences. For example, pesticides that typically are applied early in the growing season, such as atrazine, were evident in runoff following application. Pesticides applied during late summer and early fall, such as triallate, generally were detected in late fall or early spring runoff. Other pesticides such as prometon that are applied more generally, such as on transportation rights of way, were detected randomly.

Hydrophobic compounds including chlorinated pesticides and high molecular weight organic compounds were sampled from bottom sediments at selected stream sites in the Red River Basin also as part of the NAWQA study. Results of those samplings are presented in Brigham and others (1998), Goldstein (1995) (which included a discussion of concentrations in fish tissue), and Stoner and others (1998). In summary, concentrations of the compounds detected were below or far below sediment-quality standards and criteria, few of which exist for the United States waters. These samples usually were collected only once, so temporal variability cannot be assessed. However, the spatial coverage of the samples provides some indication about their distribution in the Red River Basin. The reader should refer to those reports for a more detailed description of what was found and the significance to the environment.

A large suite of trace elements were sampled from bottom sediments at selected stream sites in the Red River Basin also as part of the NAWQA study. Results of those samplings are presented in Brigham and others (1998), Goldstein (1995) (which included a discussion of concentrations in fish tissue), and Stoner and others (1998). In summary, concentrations of trace elements detected were below or far below sediment-quality standards and criteria, few of which exist for the United States waters. These samples usually were collected only once, so temporal variability cannot be assessed. However, the spatial coverage of the samples provides some indication about their distribution in the Red River Basin. The reader should refer to those reports for a more detailed description of what was found and the significance to the environment.

Summary and Conclusions

The quality of water in the Red River has rarely exceeded criteria or standards. Most of the measured violations were brief, and many occurred before present-day wastewater-treatment methods were enacted. Concentrations of major ions, including sulfate and specific conductance, may continue to approach drinking-water criteria during periods of reduced flow. These occurrences likely are to be expected because baseflow, which generally is sustained by ground-water discharge, often contains high concentrations of dissolved salts that contain sulfate and other ions.

These data provide a good benchmark from which to establish a baseline of water-quality conditions. However, they are somewhat limited because many of the trace elements detected, including lead and mercury, that might be important to describe water-quality conditions may have been the result of contamination. Although suspect, these data are difficult to dismiss as being irrelevant to the interpretation. The detections likely will cause concern until more recent data, which are being collected for subsequent studies of mercury and other trace elements using more refined methods, further confirm that trace-element concentrations generally are low.

Our understanding of how chemicals behave in the environment and ultimately affect human and environmental health continues to evolve. Measurements of arsenic, mercury, and numerous organic compounds need to be put into perspective to understand how they interact with the environment including human and ecosystem health. Evaluating the importance of these ongoing studies to the quality of the stream water in the Red River Basin generally was beyond the scope of this report.

Most routine long-term monitoring in the Red River Basin supported by national programs, including the NASQAN and NAWQA programs, has been discontinued. However, other important ongoing programs, including the high- and low-flow water-quality monitoring program operated by the USGS in cooperation with the North Dakota State Water Commission (Douglas G. Emerson, U.S. Geological Survey, oral commun., 2004), and discrete measurements of conductance and temperature during routine streamflow measurements continue to provide useful water-quality data.

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Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Wahpeton, N. Dak. (Period of record: October 5, 1971, to August 11, 2000; Number of dates: 320)								
Temperature, water (degrees Celsius)	0	0.5	7.3	18.9	30.0	310	1	?
Discharge (ft3/s)	1.7	242	499	1,130	10,800	313	?	?
Specific conductance (µS/cm at 25 degrees Celsius	123	450	520	604	1,050	304	?	?
Oxygen, dissolved (mg/L)	13	13	13.1	13.3	13.6	4	0	?
pH, field	7.2	7.8	8.1	8.3	8.8	58	0	?
Calcium, dissolved (mg/L as Ca)	27	38	45	53	70	55	?	?
Magnesium, dissolved (mg/L as Mg)	10	28	30	33	51	55	?	?
Sodium, dissolved (mg/L as Na)	5	11	13	16	33	55	0	?
Potassium, dissolved (mg/L as K)	1.7	3.9	5.0	6.3	15.0	55	?	?
Chloride, dissolved (mg/L as Cl)	1.7	7.1	11.0	13.0	22.0	55	0	?
Sulfate, dissolved (mg/L as SO_4)	15	32	60	94	230	55	0	?
Arsenic, dissolved (µg/L as As)	1	2	3	5	7	38	0	0
Barium, dissolved (µg/L as Ba)	76	?	?	?	76	1	0	0
Boron, dissolved (µg/L as B)	30	50	60	125	1600	44	7	6
Cadmium, dissolved (µg/L as Cd)	<1	?	?	?	<1	1	0	1
Chromium, dissolved (µg/L as Cr)	<5	?	?	?	<5	1	0	1
Copper, dissolved (µg/L as Cu)	<10	?	?	?	<10	1	0	1
Lead, dissolved (µg/L as Pb)	<1	<1	<1	1	3	38	0	23
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.1	.1	1.0	38	1	13
Nickel, dissolved (µg/L as Ni)	<10	?	?	?	<10	1	0	1

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Wahpeton, N. Dak.–Continued (Period of record: October 5, 1971, to August 11, 2000; Number of dates: 320)								
Selenium, dissolved (µg/L as Se)	<1	<1	<1	<1	2	38	0	24
Silver, dissolved (µg/L as Ag)	<1	?	?	?	<1	1	0	1
Zinc, dissolved (µg/L as Zn)	8	?	?	?	8	1	0	0
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	177	252	293	344	601	55	?	?
Solids, sum, dissolved (mg/L)	189	229	262	297	337	18	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Hickson, N. Dak. (Period of record: November 3, 1975, to August 15, 2000; Number of dates: 282)								
Temperature, water (degrees Celsius)	-1	0.8	9.0	20.0	32.0	273	1	?
Discharge (ft^3/s)	2.9	267	586.5	1580	14,100	280	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	47	480	541	612	1590	272	?	?
Oxygen, dissolved (mg/L)	.6	7.2	9.2	11.6	18.6	83	1	?
pH, field	7.2	8.0	8.2	8.4	9.4	116	0	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	0	1	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	254	254	254	254	254	1	?	?
Calcium, dissolved (mg/L as Ca)	21	43	50	58	140	118	?	?
Magnesium, dissolved (mg/L as Mg)	10	29	33	37	110	118	?	?
Sodium, dissolved (mg/L as Na)	7	11	15	19	92	118	0	?
Potassium, dissolved (mg/L as K)	1.3	4.6	5.5	6.6	24.0	118	?	?
Chloride, dissolved (mg/L as Cl)	1.3	7.8	10.0	13.3	44.0	117	0	?
Sulfate, dissolved (mg/L as SO_4)	5	35	64	110	340	118	2	?
Arsenic, dissolved (µg/L as As)	1	3	3	4	6	34	0	0
Barium, dissolved (µg/L as Ba)	40	80	<100	<100	200	10	0	5
Boron, dissolved (µg/L as B)	<10	60	80	110	530	85	0	4
Cadmium, dissolved (µg/L as Cd)	<1	<2	<2	<2	3	9	0	7
Chromium, dissolved (µg/L as Cr)	<1	<1	<1	<1	30	10	0	9
Copper, dissolved (µg/L as Cu)	2	2	4	5	15	10	0	2
Lead, dissolved (µg/L as Pb)	<1	<1	<1	3	7	33	0	20
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.2	11	34	1	23

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Hickson, N. Dak.–Continued (Period of record: November 3, 1975, to August 15, 2000; Number of dates: 282)								
Nickel, dissolved (µg/L as Ni)	2	2	2	5	11	10	0	1
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	1	34	0	26
Silver, dissolved (µg/L as Ag)	<1	<1	<1	<1	<1	5	0	5
Zinc, dissolved (µg/L as Zn)	<3	10	<20	<20	140	10	0	7
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	168	288	329	391	1180	95	?	?
Solids, sum, dissolved (mg/L)	224	282	326	384	1150	55	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Fargo, N. Dak. (Period of record: May 16, 1949, to September 8, 2000; Number of dates: 791)								
Temperature, water (degrees Celsius)	0	1.0	8.5	20.0	32.0	414	2	?
Discharge (ft^3/s)	9.1	213	511	1460	25,200	791	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	180	465	526	608	1400	769	?	?
Oxygen, dissolved (mg/L)	6.6	6.6	9.85	13.15	13.3	4	0	?
pH, field	0	7.6	7.8	8.0	8.8	531	3	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	0	1	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	303	303	303	303	303	1	?	?
Calcium, dissolved (mg/L as Ca)	21	41	46	52	82	272	?	?
Magnesium, dissolved (mg/L as Mg)	8	29	32	36	52	272	?	?
Sodium, dissolved (mg/L as Na)	5	11	14	19	43	506	237	?
Potassium, dissolved (mg/L as K)	1.7	4.6	5.3	6.3	18.0	239	?	?
Chloride, dissolved (mg/L as Cl)	.2	4.9	6.3	8.0	39.0	235	0	?
Sulfate, dissolved (mg/L as SO_4)	13	39	60	100	267	441	1	?
Arsenic, dissolved (µg/L as As)	1	2	3	5	13	42	0	4
Barium, dissolved (µg/L as Ba)	76	<100	<100	<100	600	9	0	7
Boron, dissolved (µg/L as B)	<20	70	81	100	590	230	0	2
Cadmium, dissolved (µg/L as Cd)	<1	1	<2	<2	<2	10	0	3
Chromium, dissolved (µg/L as Cr)	<5	<5	<5	<5	<5	9	0	9
Copper, dissolved (µg/L as Cu)	4	7	<10	18	32	10	4	1
Lead, dissolved (µg/L as Pb)	<1	<1	1	<2	6	42	1	21
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.1	.4	.7	37	0	16

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Fargo, N. Dak.–Continued (Period of record: May 16, 1949, to September 8, 2000; Number of dates: 791)								
Nickel, dissolved (µg/L as Ni)	5	7	9	<10	<10	10	0	5
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	14	41	4	21
Silver, dissolved (µg/L as Ag)	<1	<1	<1	<1	4	8	0	6
Zinc, dissolved (µg/L as Zn)	9	10	18	20	30	10	0	2
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	134	282	317	375	650	493	?	?
Solids, sum, dissolved (mg/L)	130	268	299	362	609	205	?	?

Notes: Copper, dissolved (µg/L as Cu)--last exceeded in 1973; selenium, dissolved (µg/L as Se)--last exceeded in 1973.

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North below Fargo, N. Dak. (Period of record: July 16, 1969, to September 13, 1994; Number of dates: 190)								
Temperature, water (degrees Celsius)	0	0.3	9.0	19.5	28.0	183	0	?
Discharge (ft^3/s)	2	164	340	723	17,300	183	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	290	500	557	638	1140	182	?	?
Oxygen, dissolved (mg/L)	1.4	6.85	9.2	11	16.1	118	8	?
pH, field	7.2	7.8	8.1	8.2	8.9	180	0	?
Calcium, dissolved (mg/L as Ca)	30	43	48	54	98	169	?	?
Magnesium, dissolved (mg/L as Mg)	11	30	33	36	70	169	?	?
Sodium, dissolved (mg/L as Na)	7	15	20	24	110	149	4	?
Potassium, dissolved (mg/L as K)	3.7	5.3	6.2	7.7	20.0	139	?	?
Chloride, dissolved (mg/L as Cl)	4.4	8.7	11.0	14.3	96.0	168	0	?
Sulfate, dissolved (mg/L as SO4)	19	49	69	100	330	180	1	?
Arsenic, dissolved (µg/L as As)	<1	2	4	5	10	47	0	4
Barium, dissolved (µg/L as Ba)	30	80	<100	100	230	20	0	3
Boron, dissolved (µg/L as B)	40	70	85	110	421	90	0	0
Cadmium, dissolved (µg/L as Cd)	<1	1	<2	<2	26	48	1	38
Chromium, dissolved (µg/L as Cr)	<10	<20	<20	<20	<20	49	0	46
Copper, dissolved (µg/L as Cu)	<2	4	5	9	140	47	3	5
Lead, dissolved (µg/L as Pb)	<1	<2	<2	4	15	47	1	25
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.3	<.5	8.0	42	2	29
Nickel, dissolved (µg/L as Ni)	<1	2	4	7	43	27	0	2
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	135	44	4	24

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North below Fargo, N. Dak.–Continued (Period of record: July 16, 1969, to September 13, 1994; Number of dates: 190)								
Silver, dissolved (µg/L as Ag)	<1	<1	<1	1	2	13	0	7
Zinc, dissolved (µg/L as Zn)	<3	10	<20	25	194	48	0	13
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	183	308	356	414	769	180	?	?
Solids, sum, dissolved (mg/L)	170	294	334	384	741	106	?	?

Note: Trace elements last exceeded their respective standards in the 1970's (mercury in 1979).

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Halstad, N. Dak. (Period of record: July 8, 1961, to September 8, 2000; Number of dates: 536)								
Temperature, water (degrees Celsius)	0	0.5	8.7	18.4	28.0	517	0	?
Discharge (ft^3/s)	23	619	1,450	6,000	69,200	405	?	?
Turbidity (JTU)	7	8	12	34	90	4	1	?
Turbidity (NTU)	1	7	28	73	480	112	58	?
Specific conductance (µS/cm at 25 degrees Celsius)	245	569.75	658	748	1650	512	?	?
Oxygen, dissolved (mg/L)	1.9	7.5	8.3	10.8	16.2	269	7	?
pH, field	5.9	7.8	8.1	8.3	9.3	279	36	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	6	23	44	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	122	233	268	327	433	43	?	?
Calcium, diss. (mg/L as Ca)	28	52	60	69	96	165	?	?
Magnesium, dissolved (mg/L as Mg)	12	29	33	39	58	165	?	?
Sodium, dissolved (mg/L as Na)	8	22	30	38	77	165	0	?
Potassium, dissolved (mg/L as K)	3.9	6.3	7.1	8.3	18.0	165		?
Chloride, dissolved (mg/L as Cl)	4	12	16	22	52	165	0	?
Sulfate, dissolved (mg/L as SO_4)	36	80	110	130	240	165	0	?
Arsenic, dissolved (µg/L as As)	<1	3	4	5	11	64	0	1
Barium, dissolved (µg/L as Ba)	48	64	80	<100	200	65	0	5
Boron, dissolved (µg/L as B)	<20	<20	110	125	290	23	0	6
Cadmium, dissolved (µg/L as Cd)	<1	<1	<1	<1	45	51	2	42
Chromium, dissolved (µg/L as Cr)	<1	<1	<1	<10	<10	54	0	51
Copper, dissolved (µg/L as Cu)	1	2	3	5	22	54	1	3

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Halstad, N. Dak.–Continued (Period of record: July 8, 1961, to September 8, 2000; Number of dates: 536)								
Lead, dissolved (µg/L as Pb)	<1	<1	<2	4	190	60	1	38
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.1	6.9	63	17	44
Nickel, dissolved (µg/L as Ni)	<1	2	3	5	25	57	0	3
Selenium, dissolved (µg/L as Se)	<1	<1	<1	<1	1	75	0	55
Silver, dissolved (µg/L as Ag)	<1	<1	<1	<1	2	65	0	54
Zinc, dissolved (µg/L as Zn)	<3	7	10	20	190	54	0	6
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	176	367	425	484	695	165	?	?
Solids, sum, dissolved (mg/L)	170	336	393	471	631	74	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Grand Forks, N. Dak. (Period of record: June 22, 1949, to September 26, 2000; Number of dates: 927)								
Temperature, water (degrees Celsius)	0	1.0	8.0	18.0	28.0	556	0	?
Discharge (ft^3/s)	1.9	1,190	2,400	7,730	106,000	924	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	200	460	531	600	1040	894	?	?
Oxygen, dissolved (mg/L)	3.9	7.7	9.9	11.1	14.5	31	1	?
pH, field	7.0	7.5	7.7	7.9	8.7	532	0	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	8	25	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	140	216	253	264	373	25	?	?
Calcium, dissolved (mg/L as Ca)	30	49	55	62	150	286	?	?
Magnesium, dissolved (mg/L as Mg)	6	22	25	30	110	285	?	?
Sodium, dissolved (mg/L as Na)	3	14	17	20	43	535	251	?
Potassium, dissolved (mg/L as K)	.8	4.3	5.2	6.2	60.0	255		?
Chloride, dissolved (mg/L as Cl)	.5	7.0	9.1	12.0	34.0	255	0	?
Sulfate, dissolved (mg/L as SO_4)	18	51	70	95	200	468	0	?
Arsenic, dissolved (µg/L as As)	<1	2	3	4	13	46	0	5
Barium, dissolved (µg/L as Ba)	82	<100	<100	<100	300	12	0	10
Boron, dissolved (µg/L as B)	<10	60	80	100	760	212	1	13
Cadmium, dissolved (µg/L as Cd)	<1	<2	<2	<2	7	18	1	16
Chromium, dissolved (µg/L as Cr)	<5	<5	<5	<5	<5	21	0	21
Copper, dissolved (µg/L as Cu)	3	13	<20	<20	20	23	1	15
Lead, dissolved (µg/L as Pb)	<1	<1	<1	<1	5	53	0	21
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.1	.2	1.4	40	1	20

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Grand Forks, N. Dak.–Continued (Period of record: June 22, 1949, to September 26, 2000; Number of dates: 927)								
Nickel, dissolved (µg/L as Ni)	<1	1	10	10	13	21	0	6
Selenium, dissolved (µg/L as Se)	<1	<1	<1	2	23	46	6	28
Silver, dissolved (µg/L as Ag)	<1	<2	<2	2	5	11	0	6
Zinc, dissolved (µg/L as Zn)	10	<20	<20	20	46	23	0	13
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	158	303	336	385	570	513	?	?
Solids, sum, dissolved (mg/L)	170	271	311	359	1890	186	?	?

Note: Selenium, dissolved (µg/L as Se)--last exceeded in 1973.

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Drayton, N. Dak. (Period of record: October 12, 1971, to August 29, 2001; Number of dates: 416)								
Temperature, water (degrees Celsius)	-2	0.5	9.0	18.0	28.5	407	0	?
Discharge (ft^3/s)	111	1,430	3,350	14,625	92,900	416	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	275	520	620	746	2010	386	?	?
Oxygen, dissolved (mg/L)	10.5	10.9	11.2	11.6	11.9	2	0	?
pH, field	7.1	7.8	8.1	8.3	8.7	59	0	?
Nitrogen, nitrate, dissolved (mg/L as N)	.2	.2	.5	1.2	3.6	14	5	0
Phosphorus, dissolved (mg/L as P)	0	0	.1	.1	.2	12	6	0
Calcium, dissolved (mg/L as Ca)	29	49	56	66	98	59	?	?
Magnesium, dissolved (mg/L as Mg)	3	21	26	32	56	59	?	?
Sodium, dissolved (mg/L as Na)	7	22	30	44	130	59	0	?
Potassium, dissolved (mg/L as K)	3	5	7	8	12	59	?	?
Chloride, dissolved (mg/L as Cl)	5	20	30	51	160	59	7	?
Sulfate, dissolved (mg/L as SO_4)	35	65	87	115	220	59	0	?
Arsenic, dissolved (µg/L as As)	1	3	3	5	8	41	0	2
Barium, dissolved (µg/L as Ba)	86	?	?	?	86	1	0	0
Boron, dissolved (µg/L as B)	30	70	90	150	1100	45	1	3
Cadmium, dissolved (µg/L as Cd)	<1	?	?	?	<1	1	0	1
Chromium, dissolved (µg/L as Cr)	<5	?	?	?	<5	1	0	1
Copper, dissolved (µg/L as Cu)	<10	?	?	?	<10	1	0	1
Fecal coliform, 0.7 m-MF (colonies per 100 milliliters)	<2	?	?	?	<2	1	0	1

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Drayton, N. Dak.–Continued (Period of record: October 12, 1971, to August 29, 2001; Number of dates: 416)								
Lead, dissolved (µg/L as Pb)	<1	<1	<1	<2	10	41	0	30
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.2	.6	41	0	30
Nickel, dissolved (µg/L as Ni)	<10	?	?	?	<10	1	0	1
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	3	41	0	31
Silver, dissolved (µg/L as Ag)	1	?	?	?	1	1	0	0
Zinc, dissolved (µg/L as Zn)	9	?	?	?	9	1	0	0
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	179	328	389	472	932	59	?	?
Solids, sum, dissolved (mg/L)	169	246	339	415	564	18	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Pembina, N. Dak. (Period of record: July 15, 1969, to August 30, 2000; Number of dates: 102)								
Temperature, water (degrees Celsius)	0	5.1	13.4	19.5	25.0	96	0	?
Discharge (ft^3/s)	887	2,100	5,120	9,780	91,700	69	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	310	583	667	794	1060	97	?	?
Oxygen, dissolved (mg/L)	4.6	7.8	9.3	10.3	13.9	90	1	?
pH, field	6.5	8.0	8.2	8.3	8.7	96	2	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	2	11	45	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	122	211	243	260	312	45	?	?
Calcium, dissolved (mg/L as Ca)	32	54	62	69	140	63	?	?
Magnesium, dissolved (mg/L as Mg)	13	24	29	34	96	63	?	?
Sodium, dissolved (mg/L as Na)	8	22	29	37	52	65	1	?
Chloride, dissolved (mg/L as Cl)	5	17	22	30	62	64	0	0
Sulfate, dissolved (mg/L as SO_4)	39	73	94	120	220	73	0	0
Arseni,c dissolved (µg/L as As)	<1	<1	1	6	8	12	0	3
Barium, dissolved (µg/L as Ba)	<100	<100	<100	<100	<100	4	0	4
Boron, dissolved (µg/L as B)	51	70	110	120	160	9	0	0
Cadmium, dissolved (µg/L as Cd)	<1	<1	<1	<1	1	12	0	9
Copper, dissolved (µg/L as Cu)	<2	4	7	20	48	12	4	1
Lead, dissolved (µg/L as Pb)	<2	<2	<2	2	7	12	0	8
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.2	.4	2.0	8	1	2
Nickel, dissolved (µg/L as Ni)	<1	<1	1	2	11	12	0	5
Selenium, dissolved (µg/L as Se)	<1	1	5	8	21	9	5	1

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Pembina, N. Dak.–Continued (Period of record: July 15, 1969, to August 30, 2000; Number of dates: 102)								
Silver,dissolved (µg/L as Ag)	<1	<1	<1	1	5	12	0	6
Zinc, dissolved (µg/L as Zn)	<10	10	13	25	140	11	0	2
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	203	361	411	463	661	74	?	?

Note: All metals data are from 1969-72.

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Emerson, Manitoba (Period of record: _____; Number of dates: ___)								
Temperature, water (degrees Celsius)	0	0.5	7.5	18.5	29.0	172	?	?
Discharge (ft^3/s)	170	1,143	2,165	5,238	62,800	158	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	76	589	690	809	1,810	171	?	?
Oxygen, dissolved (mg/L)	1.3	7.9	9.8	11.6	18.2	150	6	?
pH, field	7.2	7.8	8.1	8.4	8.9	158	0	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	1	22	50	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	136	222	255	304	398	50	?	?
Alkalinity, dissolved (mg/L as $CaCO_3$)	112	182	215	250	326	50	?	?
Calcium, dissolved (mg/L as Ca)	36	58	63	69	110	144	?	?
Magnesium, dissolved (mg/L as Mg)	16	26	30	34	54	144	?	?
Sodium, dissolved (mg/L as Na)	8	28	34	50	190	144	0	?
Potassium, dissolved (mg/L as K)	3.8	5.5	6.7	8.2	17.0	144	?	?
Chloride, dissolved (mg/L as Cl)	10	25	35	61	240	145	0	?
Sulfate, dissolved (mg/L as SO_4)	6	70	94	120	230	145	0	?
Aluminum, dissolved (µg/L as Al)	<10	<10	20	30	420	43	2	11
Arsenic, dissolved (µg/L as As)	<1	2	3	4	11	53	0	3
Barium, dissolved (µg/L as Ba)	31	59	70	<100	240	64	0	6
Boron, dissolved (µg/L as B)	130	138	145	153	160	2	0	0
Cadmium, dissolved (µg/L as Cd)	<1	<1	<1	<1	3	53	0	48
Copper, dissolved (µg/L as Cu)	<1	2	4	7	17	53	0	4
Iron, dissolved (µg/L as Fe)	<3	<10	20	30	640	93	1	24

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red River of the North at Emerson, Manitoba–Continued (Period of record: _____; Number of dates: ___)								
Lead, dissolved (µg/L as Pb)	<1	1	<2	<5	11	50	0	29
Manganese, dissolved (µg/L as Mn)	<1	4	10	26	85	93	3	5
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.1	.5	50	8	26
Nickel, dissolved (µg/L as Ni)	<1	2	3	5	12	57	0	5
Selenium, dissolved (µg/L as Se)	.5	<1	<1	<1	1	65	0	46
Silver, dissolved (µg/L as Ag)	<1	<1	<1	<1	2	64	2	52
Zinc, dissolved (µg/L as Zn)	<3	6	13	21	60	53	0	8
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	245	375	438	503	1100	145	?	?
Solids, sum, dissolved (mg/L)	243	338	381	453	1060	53	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River above Harvey, N. Dak. (Period of record: _____; Number of dates:___)								
Temperature, water (degrees Celsius)	0	0.5	7	17	28.5	289	0	?
Discharge (ft^3/s)	.16	1.6	5.1	30.25	500	268	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	50	932.5	1280	1,475	2300	286	?	?
Oxygen, dissolved (mg/L)	0	6.65	8.75	10.475	16.6	70	13	?
pH, field	7.4	7.975	8.2	8.5	9.2	176	36	?
Calcium, dissolved (mg/L as Ca)	13	28	33	42	140	181	0	?
Magnesium, dissolved (mg/L as Mg)	3.2	15	22	36	69	181	?	?
Sodium, dissolved (mg/L as Na)	20	180	250	300	480	181	170	?
Potassium, dissolved (mg/L as K)	4.2	6.275	7.9	11	20	180	?	?
Chloride, dissolved (mg/L as Cl)	2.2	14	17	21	54	181	0	?
Sulfate, dissolved (mg/L as SO_4)	37	170	210	250	560	181	4	?
Arsenic, dissolved (µg/L as As)	1	2	3	4	8	53	0	0
Barium, dissolved(µg/L as Ba)	20	43	55	75	400	45	0	5
Boron, dissolved (µg/L as B)	10	530	730	860	1200	172	77	2
Cadmium, dissolved (µg/L as Cd)	<1	<1	<1	<1	<3	46	0	43
Chromium, dissolved (µg/L as Cr)	<1	<1	1	<10	10	45	0	33
Copper, dissolved (µg/L as Cu)	<1	1	1	2	<10	46	0	13
Lead, dissolved (µg/L as Pb)	<1	<1	<1	2	<5	53	0	39
Mercury, dissolved (µg/L as Hg)	<.10	<.10	<.10	.2	.8	52	0	29
Nickel, dissolved (µg/L as Ni)	<1	1	2	3	<10	45	0	10
Selenium, dissolved (µg/L as Se)	<1	<1	<1	<1	1	53	0	51

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River above Harvey, N. Dak.–Continued (Period of record: _____; Number of dates:___)								
Zinc, dissolved (µg/L as Zn)	<3	<3	5	10	130	46	1	19
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	152	804	921	1020	1590	181	?	?
Solids, sum, dissolved (mg/L)	140	791	927	1010	1570	73	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River near Warwick, N. Dak. (Period of record: January 8, 1951, to August 30, 2000; Number of dates: 716)								
Temperature, water (degrees Celsius)	0	1	7.4	17.05	30	344	1	?
Discharge (ft^3/s)	.1	6	20	97	3160	290	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	210	575	734	930	1680	703	?	?
Oxygen, dissolved (mg/L)	2.1	5.175	5.9	8.05	11.4	8	2	?
pH, field	6.7	7.6	7.9	8.2	9.2	535	13	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	313	332	384	437	461	4	?	?
Calcium, dissolved (mg/L as Ca)	16	42	50	60	110	282	0	?
Magnesium, dissolved (mg/L as Mg)	6.9	21	29	34	54	282	?	?
Sodium, dissolved (mg/L as Na)	10	41	68	100	230	537	389	?
Potassium, dissolved (mg/L as K)	1.8	6.1	7.8	9.6	17	276	?	?
Chloride, dissolved (mg/L as Cl)	.6	8.2	12	17	37	249	0	?
Sulfate, dissolved (mg/L as SO_4)	28	60.5	88	126	240	279	0	?
Arsenic, dissolved (µg/L as As)	<1	2	5	8	13	58	0	2
Barium, dissolved(µg/L as Ba)	30	<100	<100	<100	200	22	0	16
Boron, dissolved (µg/L as B)	<10	90	140	190	390	179	0	4
Cadmium, dissolved (µg/L as Cd)	<2	<2	<2	<2	3	22	0	19
Chromium, dissolved (µg/L as Cr)	<20	<20	<20	<20	<20	22	0	22
Copper, dissolved (µg/L as Cu)	<2	2	4	11	27	22	1	9
Lead, dissolved (µg/L as Pb)	<1	<1	1	<2	16	56	3	25
Mercury, dissolved (µg/L as Hg)	.01	<.1	.1	<.5	6.5	53	4	25
Nickel, dissolved (µg/L as Ni)	<2	<2	2	5	12	23	0	9

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River near Warwick, N. Dak.–Continued (Period of record: January 8, 1951, to August 30, 2000; Number of dates: 716)								
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	23	58	9	41
Silver, dissolved (µg/L as Ag)	<1	<1	<1	<1	4	16	0	15
Zinc, dissolved (µg/L as Zn)	2	<3	10	<20	40	22	0	11
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	150	362	468	598	1010	532	?	?
Solids, sum, dissolved (mg/L)	139	323	427	564	768	110	?	?

Notes: Selenium, dissolved (µg/L as Se)--last exceeded in 1973; mercury, dissolved (µg/L as Hg)--last exceeded in 1979.

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River near Cooperstown, N. Dak. (Period of record: October 11, 1959, to September 7, 2000; Number of dates: 585)								
Temperature, water (degrees Celsius)	0	0.5	7.4	16.5	27.8	462	0	?
Discharge (ft^3/s)	.02	14	57	313	5290	327	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	213	710	906	1,010	1,880	573	?	?
Oxygen, diss. (mg/L)	3	7	8.4	10.1	13.5	77	9	?
pH, field	6.5	7.7	8	8.2	8.7	380	7	?
Calcium, dissolved (mg/L as Ca)	19	56	66	78	154	340	?	?
Magnesium, dissolved (mg/L as Mg)	6.5	27	32.5	37	72	340	?	?
Sodium, dissolved (mg/L as Na)	10	63	83	99	920	373	120	?
Potassium, dissolved (mg/L as K)	2.3	7.7	8.5	9.6	28	354	?	?
Chloride, dissolved (mg/L as Cl)	.1	12	16	19	39	317	0	?
Sulfate, dissolved (mg/L as SO_4)	21	120	140	170	360	322	0	?
Arsenic, dissolved (µg/L as As)	<1	2	4	6	12	55	0	5
Barium, dissolved(µg/L as Ba)	10	<100	<100	<100	200	22	0	18
Boron, dissolved (µg/L as B)	30	130	180	210	890	298	1	1
Cadmium, dissolved (µg/L as Cd)	1	<2	<2	<2	2	22	0	19
Chromium, dissolved (µg/L as Cr)	<20	<20	<20	<20	<20	22	0	22
Copper, dissolved (µg/L as Cu)	<2	3	6	11	34	21	3	4
Lead, dissolved (µg/L as Pb)	<1	<1	1	<2	200	54	4	35
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.1	.3	.9	52	0	25
Nickel, dissolved (µg/L as Ni)	<1	<1	4	9	18	22	0	6
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	18	55	6	38

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River near Cooperstown, N. Dak.–Continued (Period of record: October 11, 1959, to September 7, 2000; Number of dates: 585)								
Silver, dissolved (µg/L as Ag)	<2	<2	<2	<2	4	13	0	12
Zinc, dissolved (µg/L as Zn)	4	18	<20	20	400	22	1	8
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	143	499	596	667	1240	370	?	?
Solids, sum, dissolved (mg/L)	129	494	591	653	1230	265	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River below Baldhill Dam, N. Dak. (Period of record: June 5, 1959, to September 7, 2000; Number of dates: 369)								
Temperature, water (degrees Celsius)	0	3.0	7.0	18.5	26.2	334	0	?
Discharge (ft^3/s)	.05	21.5	79	235	5510	283	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	285	620	740	890	1320	364	?	?
Oxygen, dissolved (mg/L)	6.0	9.6	10.8	12.5	14.6	39	0	?
pH, field	6.9	7.7	8.1	8.5	9.1	124	28	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	170	217	267	371	453	10	?	?
Calcium, dissolved (mg/L as Ca)	22	40	47	54	76	114	?	?
Magnesium, dissolved (mg/L as Mg)	2	23	26	32	48	114	?	?
Sodium, dissolved (mg/L as Na)	20	51	65	77	120	114	4	?
Potassium, dissolved (mg/L as K)	1.8	9.0	9.8	11.0	16	114	?	?
Chloride, dissolved (mg/L as Cl)	5	11	13	17	26	124	0	?
Sulfate, dissolved (mg/L as SO_4)	48	94	120	149	240	114	0	?
Arsenic, dissolved (µg/L as As)	1	4	4	5	10	33	0	0
Boron, dissolved (µg/L as B)	40	120	140	170	310	104	0	3
Lead, dissolved (µg/L as Pb)	<1	<1	<1	<1	2	32	0	25
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.1	.2	<1.0	33	0	14
Selenium, dissolved (µg/L as Se)	<1	<1	<1	<1	2	33	0	25
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	196	379	448	524	764	114	?	?
Solids, sum, dissolved (mg/L)	176	352	407	470	713	81	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River at Valley City, N. Dak. (Period of record: November 3, 1971 to June 20, 2000; Number of dates: 99)								
Temperature, water (degrees Celsius)	0	1.8	4.0	16.3	26.0	95	0	?
Discharge (ft^3/s)	11	46	171	1420	5200	69	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	235	610	705	830	1300	95	?	?
Oxygen, dissolved (mg/L)	7.3	7.3	7.3	7.3	7.3	1	0	?
pH, field	7.6	7.8	8.0	8.3	8.7	30	4	?
Calcium, dissolved (mg/L as Ca)	30	43	50	56	79	28	?	?
Magnesium, dissolved (mg/L as Mg)	16	25	29	36	48	28	?	?
Sodium, dissolved (mg/L as Na)	24	52	64	76	100	28	1	?
Potassium, dissolved (mg/L as K)	6.4	8.3	10.0	12.0	15.0	28	?	?
Chloride, dissolved (mg/L as Cl)	5.1	12.0	15.0	19.3	24.0	28	0	?
Sulfate, dissolved (mg/L as SO_4)	81	120	130	163	260	28	0	?
Arsenic, dissolved (µg/L as As)	1	2	3	5	9	18	0	0
Boron, dissolved (µg/L as B)	<10	95	145	175	290	21	0	3
Lead, dissolved (µg/L as Pb)	<1	<1	<1	<1	1	18	0	15
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.1	.2	.8	18	0	6
Selenium, dissolved (µg/L as Se)	<1	<1	<1	<1	2	18	0	16
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	278	392	484	554	734	28	?	?
Solids, sum, dissolved (mg/L)	297	390	444	477	524	11	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River at Lisbon, N. Dak. (Period of record: August 2, 1956, to August 9, 2000; Number of dates: 765)								
Temperature, water (degrees Celsius)	0	1.0	7.0	19.1	28.5	392	0	?
Discharge (ft^3/s)	1.1	37	128	518	5230	319	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	110	686	832	988	5220	758	?	?
Oxygen, dissolved (mg/L)	6.0	8.2	10.4	12.0	14.7	57	0	?
pH, field	6.7	7.6	7.8	8.1	9.0	610	8	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	169	239	301	328	448	24	?	?
Calcium, dissolved (mg/L as Ca)	30	51	60	69	130	368	?	?
Magnesium, dissolved (mg/L as Mg)	9	25	29	35	53	368	?	?
Sodium, dissolved (mg/L as Na)	13	59	76	91	560	616	328	?
Potassium, dissolved (mg/L as K)	4.9	9.7	11.0	12.0	22.0	384	?	?
Chloride, dissolved (mg/L as Cl)	8	20	26	38	110	335	0	?
Sulfate, dissolved (mg/L as SO_4)	39	128	159	200	447	549	0	?
Arsenic, dissolved (µg/L as As)	1	2	4	6	20	45	0	5
Barium, dissolved(µg/L as Ba)	70	<100	<100	<100	400	22	0	20
Boron, dissolved (µg/L as B)	20	150	200	240	400	303	0	0
Cadmium, dissolved (µg/L as Cd)	<2	<2	<2	<2	3	19	0	16
Chromium, dissolved (µg/L as Cr)	<20	<20	<20	<20	<20	22	0	22
Copper, dissolved (µg/L as Cu)	<1	5	4	12	38	22	3	5
Lead, dissolved (µg/L as Pb)	<1	<1	<1	1	40	40	3	28
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.1	<.5	1.6	39	1	23
Nickel, dissolved (µg/L as Ni)	<1	3	6	7	23	20	0	2

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River at Lisbon, N. Dak.–Continued (Period of record: August 2, 1956, to August 9, 2000; Number of dates: 765)								
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	14	43	4	26
Silver, dissolved (µg/L as Ag)	<1	<1	<1	<1	2	13	0	11
Zinc, dissolved (µg/L as Zn)	7	<20	<20	20	140	24	0	10
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	185	450	541	644	1000	600	?	?
Solids, sum, dissolved (mg/L)	198	451	539	650	1040	201	?	?

Note: Lead, dissolved (µg/L as Pb)--last exceeded in 1976.

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River near Kindred, N. Dak. (Period of record: October 13, 1971, to August 7, 2000; Number of dates: 531)								
Temperature, water (degrees Celsius)	-1.0	1.0	9.0	18.2	28.0	525	0	?
Discharge (ft^3/s)	18	60	140	555	5600	374	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	180	679	765	900	1420	514	?	?
Oxygen, dissolved (mg/L)	4.0	7.7	9.1	11.5	16.1	310	3	?
pH, field	6.9	8.0	8.2	8.4	8.8	295	13	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	171	277	319	341	436	47	?	?
Calcium, dissolved (mg/L as Ca)	28	64	75	83	110	224	0	?
Magnesium, dissolved (mg/L as Mg)	11	26	29	33	54	224	?	?
Sodium, dissolved (mg/L as Na)	10	54	64	76	110	224	7	?
Potassium, dissolved (mg/L as K)	3.8	8.0	8.9	10.0	15.0	223	?	?
Chloride, dissolved (mg/L as Cl)	5.7	20.0	26.5	35.0	74.0	224	0	?
Sulfate, dissolved (mg/L as SO_4)	50	130	150	170	310	224	0	?
Arsenic, dissolved (µg/L as As)	1	3	4	5	12	67	0	0
Barium, dissolved(µg/L as Ba)	12	75	<100	110	300	69	0	11
Boron, dissolved (µg/L as B)	70	110	170	220	20000	31	4	0
Cadmium, dissolved (µg/L as Cd)	<1	<1	<1	1	27	53	0	45
Chromium, dissolved (µg/L as Cr)	<1	<1	1	10	10	57	0	49
Copper, dissolved (µg/L as Cu)	<1	2	2	4	28	57	2	5
Lead, dissolved (µg/L as Pb)	<1	<1	1	4	350	61	0	39
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.1	20	73	6	44
Nickel, dissolved (µg/L as Ni)	1	4	5	6	31	57	0	0

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River near Kindred, N. Dak.--Continued (Period of record: October 13, 1971, to August 7, 2000; Number of dates: 531)								
Selenium, dissolved (µg/L as Se)	<1	<1	<1	<1	1	79	0	68
Silver, dissolved (µg/L as Ag)	<1	<1	<1	<1	<1	69	0	69
Zinc, dissolved (µg/L as Zn)	<3	4	9	20	100	57	0	10
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	200	478	539	600	832	227	?	?
Solids, sum, dissolved (mg/L)	189	447	519	589	777	128	?	?

Note: Mercury, dissolved (µg/L as Hg)--all exceedences in 1979.

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River at West Fargo, N. Dak. (Period of record: September 16, 1969, to August 8, 2000; Number of dates: 329)								
Temperature, water (degrees Celsius)	-1.0	0.5	8.0	19.0	27.5	320	0	?
Discharge (ft^3/s)	5.3	64	164	484	3840	283	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	237	673	833	950	1700	323	?	?
Oxygen, dissolved (mg/L)	6.7	6.7	6.7	6.7	6.7	1	0	?
pH, field	6.7	7.7	8.0	8.2	8.6	62	1	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	320	320	320	320	320	1	?	?
Calcium, dissolved (mg/L as Ca)	24	53	70	84	110	60	0	?
Magnesium, dissolved (mg/L as Mg)	13	21	27	30	55	60	?	?
Sodium, dissolved (mg/L as Na)	23	46	61	71	95	60	5	?
Potassium, dissolved (mg/L as K)	3.3	7.3	8.2	9.9	14.0	60	?	?
Chloride, dissolved (mg/L as Cl)	8	19	27	36	57	60	0	?
Sulfate, dissolved (mg/L as SO_4)	9	108	140	170	310	60	0	?
Arsenic, dissolved (µg/L as As)	1	3	5	6	10	28	0	0
Barium, dissolved(µg/L as Ba)	90	?	?	?	90	1	0	0
Boron, dissolved (µg/L as B)	<20	85	120	195	5400	54	3	6
Cadmium, dissolved (µg/L as Cd)	<1	?	?	?	<1	1	0	1
Chromium, dissolved (µg/L as Cr)	<5	?	?	?	<5	1	0	1
Copper, dissolved (µg/L as Cu)	<10	?	?	?	<10	1	0	1
Lead, dissolved (µg/L as Pb)	<1	<1	<1	<1	4	29	0	23
Mercury, dissolved (µg/L as Hg)	<.1	<.1	.1	.2	.4	28	0	11
Nickel, dissolved (µg/L as Ni)	<10	?	?	?	<10	1	0	1

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Sheyenne River at West Fargo, N. Dak.–Continued (Period of record: September 16, 1969, to August 8, 2000; Number of dates: 329)								
Selenium, dissolved (µg/L as Se)	<1	<1	<1	<1	2	28	0	25
Silver, dissolved (µg/L as Ag)	<1	?	?	?	<1	1	0	1
Nickel, dissolved (µg/L as Ni)	7	?	?	?	7	1	0	0
Selenium, dissolved (µg/L as Se)	222	413	505	576	820	60	?	?
Silver, dissolved (µg/L as Ag)	219	379	534	574	650	31	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Wild Rice River near Abercrombie, N. Dak. (Period of record: June 20, 1966, to August 8, 2001; Number of dates: ___)								
Temperature, water (degrees Celsius)	-1	0.5	8.5	19.5	29.5	349	2	?
Discharge (ft^3/s)	.01	2.8	25	227	9,260	458	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	125	763	1,180	1,620	3,430	438	?	?
Oxygen, dissolved (mg/L)	4.8	5.3	5.7	6.2	6.6	2	1	?
pH, field	6.8	7.7	7.9	8.1	8.6	272	0	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	55	260	380	460	980	209	?	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	45	198	?	?
Nitrogen nitrate, dissolved (mg/L as N)	<.01	.04	.13	.29	1.90	163	16	15
Phosphorus, total (mg/L as P)	.18	.19	.20	.20	.21	2	2	?
Phosphorus, dissolved (mg/L as P)	.01	.19	.27	.42	2.00	111	104	?
Calcium, dissolved (mg/L as Ca)	13	72	100	130	290	256	?	?
Magnesium, dissolved (mg/L as Mg)	4.5	35	56	74	150	256	?	?
Sodium, dissolved (mg/L as Na)	5.3	60	100	157	420	281	26	?
Potassium, dissolved (mg/L as K)	1.9	12	15	17	47	263	?	?
Chloride, dissolved (mg/L as Cl)	2.3	23	39	62	180	227	0	?
Sulfate, dissolved (mg/L as SO_4)	11	210	360	500	1,200	243	167	?
Arsenic, dissolved (µg/L as As)	<1	4	6	10	18	56	0	2
Barium, dissolved(µg/L as Ba)	40	<100	<100	<100	170	19	0	16
Boron, dissolved (µg/L as B)	30	190	290	400	840	213	1	0
Cadmium, dissolved (µg/L as Cd)	<2	<2	<2	<2	18	19	1	16
Chromium, dissolved (µg/L as Cr)	<2	<2	<20	<20	<20	19	0	19

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Wild Rice River near Abercrombie, N. Dak.–Continued (Period of record: June 20, 1966, to August 8, 2001; Number of dates: ___)								
Copper, dissolved (µg/L as Cu)	3	5	8	11	36	19	1	3
Lead, dissolved (µg/L as Pb)	<1	<1	1	<2	480	56	0	39
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.4	2.4	53	1	39
Nickel, dissolved (µg/L as Ni)	<1	3	5	8	15	18	0	2
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	13	56	5	35
Silver, dissolved (µg/L as Ag)	<2	<2	<2	<2	<2	8	0	8
Zinc, dissolved (µg/L as Zn)	<2	14	20	21	73	19	0	5
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	83	586	918	1,230	2,840	280	?	?
Solids, sum, dissolved (mg/L)	159	566	893	1,238	2,660	174	?	?

Note: Selenium, dissolved (µg/L as Se)--last exceeded standard in 1978.

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Maple River near Mapleton, N. Dak. (Period of record: October 6, 1971, to May 8, 2001; Number of dates: ___)								
Temperature, water (degrees Celsius)	0	0.5	6.8	19.0	27.5	88	0	?
Discharge (ft^3/s)	.1	11	106	906	11,600	93	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	240	600	1,060	1,440	2,620	90	?	?
pH, field	6.5	7.9	8.0	8.1	8.6	15	0	?
Nitrogen nitrate, dissolved (mg/L as N)	.2	.2	.5	1.0	2.3	16	2	0
Bicarbonate, dissolved, field (mg/L as HCO_3)	200	278	290	325	400	8	?	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	0	8	?	?
Calcium, dissolved (mg/L as Ca)	40	94	110	110	140	12	?	?
Magnesium, dissolved (mg/L as Mg)	18	45	55	63	77	12	?	?
Sodium, dissolved (mg/L as Na)	19	61	80	120	130	12	0	?
Potassium, dissolved (mg/L as K)	9	10	12	12	16	12	?	?
Chloride, dissolved (mg/L as Cl)	15	36	51	84	99	12	0	?
Sulfate, dissolved (mg/L as SO_4)	100	290	365	425	480	12	10	?
Arsenic, dissolved (µg/L as As)	3	4	6	9	12	4	0	0
Boron, dissolved (µg/L as B)	<20	30	120	300	1,000	8	1	1
Lead, dissolved (µg/L as Pb)	<1	?	<1	?	<1	4	0	4
Selenium, dissolved (µg/L as Se)	<1	?	<1	?	1	4	0	3
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	326	720	859	1,055	1,130	12	?	?
Solids, sum, dissolved (mg/L)	648	815	928	1,028	1,110	8	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Goose River at Hillsboro, N. Dak. (Period of record: September 15, 1969, to August 13, 2001; Number of dates: 346)								
Temperature, water (degrees Celsius)	0	0.5	6.0	18.5	27.5	340	0	?
Discharge (ft^3/s)	0	5	24	220	8,000	346	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	204	945	1,330	1,643	3,400	332	?	?
Oxygen, dissolved (mg/L)	4.1	8.1	9.8	10.2	10.4	4	1	?
pH, field	7.2	7.7	7.9	8.1	8.5	97	0	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	110	160	270	360	460	22	?	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	22	22	?	?
Nitrogen nitrate, dissolved (mg/L as N)	<.01	.2	.6	1.1	2.9	83	24	4
Phosphorus, total (mg/L as P)	.003	.033	.183	.392	.914	22	14	0
Phosphorus, dissolved (mg/L as P)	.09	?	.24	?	.39	2	1	0
Calcium, dissolved (mg/L as Ca)	32	82	120	150	230	97	?	?
Magnesium, dissolved (mg/L as Mg)	10	36	58	71	98	97	?	?
Sodium, dissolved (mg/L as Na)	9	54	84	120	330	97	0	?
Potassium, dissolved (mg/L as K)	3	9	10	12	20	97	?	?
Chloride, dissolved (mg/L as Cl)	5	24	49	89	310	97	9	?
Sulfate, dissolved (mg/L as SO_4)	49	240	400	480	800	97	32	?
Arsenic, dissolved (µg/L as As)	1	3	4	7	19	38	0	0
Boron, dissolved (µg/L as B)	<10	70	205	310	1100	81	4	5
Lead, dissolved (µg/L as Pb)	<1	<1	<1	1	3	38	0	29
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	4	38	0	21

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Goose River at Hillsboro, N. Dak.--Continued (Period of record: September 15, 1969, to August 13, 2001; Number of dates: 346)								
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	184	662	977	1,140	2190	97	?	?
Solids, sum, dissolved (mg/L)	208	892	1020	1,240	2060	59	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Turtle River at Turtle River State Park near Arvilla, N. Dak. (Period of record: October 11, 1991, to September 27, 2001; Number of dates: 170)								
Temperature, water (degrees Celsius)	0	0.9	10.0	18.0	26.0	164	0	?
Discharge (ft^3/s)	2.7	11	17	113	12,200	119	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	283	795	913	1,020	1,530	169	?	?
Oxygen, dissolved (mg/L)	6	9	10	12	19	96	0	?
pH, field	7.0	7.9	8.1	8.3	8.6	108	0	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	14	73	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	110	266	308	339	408	73	?	?
Nitrogen nitrate, dissolved (mg/L as N)	.1	.2	.4	.7	2.6	81	10	11
Phosphorus, total (mg/L as P)	0	.1	.1	.2	1.3	84	40	1
Calcium, dissolved (mg/L as Ca)	25	85	99	110	130	85	?	?
Magnesium, dissolved (mg/L as Mg)	7	31	36	41	60	85	?	?
Sodium, dissolved (mg/L as Na)	11	33	46	62	130	85	0	?
Potassium, dissolved (mg/L as K)	4.2	5.3	5.9	7.1	11.0	85	?	?
Chloride, dissolved (mg/L as Cl)	7	20	23	29	160	85	0	?
Sulfate, dissolved (mg/L as SO_4)	48	167	198	250	490	85	21	?
Arsenic, dissolved (µg/L as As)	3	3	3	4	8	4	0	0
Boron, dissolved (µg/L as B)	30	30	30	30	30	1	0	0
Lead, dissolved (µg/L as Pb)	<1	<1	<1	2	2	4	0	2
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	<.1	<.1	4	0	4
Selenium, dissolved (µg/L as Se)	<1	3	3	3	3	4	0	1
Lindane, dissolved (µg/L)	<.004	<.004	<.004	<.004	.009	34	0	33

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Turtle River at Turtle River State Park near Arvilla, N. Dak.–Continued (Period of record: October 11, 1991, to September 27, 2001; Number of dates: 170)								
Dieldrin, dissolved (µg/L)	<.001	<.001	<.001	<.001	<.001	34	0	34
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	165	548	617	714	1,150	85	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Forest River at Minto, N. Dak. (Period of record: October 6, 1971, to September 10, 2001; Number of dates: 308)								
Temperature, water (degrees Celsius)	0	0.5	6.5	17.5	27.0	302	0	?
Discharge (ft^3/s)	.03	5	14	58	6,210	302	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	240	672	804	940	2,120	294	?	?
Oxygen, dissolved (mg/L)	1.8	5.4	8.8	10.5	12.4	12	3	?
pH, field	7.1	7.7	8.0	8.2	8.8	100	0	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	93	270	295	330	690	54	?	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	12	54	?	?
Nitrogen nitrate, dissolved (mg/L as N)	.1	.2	.6	.9	2.7	39	6	0
Calcium, dissolved (mg/L as Ca)	32	70	78	88	180	95	?	?
Magnesium, dissolved (mg/L as Mg)	7	29	34	37	140	95	?	?
Sodium, dissolved (mg/L as Na)	6	32	39	49	170	95	0	?
Potassium, dissolved (mg/L as K)	3.6	5.3	6.8	8.1	62.0	95	?	?
Chloride, dissolved (mg/L as Cl)	1	18	24	38	270	95	1	?
Sulfate, dissolved (mg/L as SO_4)	36	120	140	180	290	95	4	?
Arsenic, dissolved (µg/L as As)	<1	2	3	5	20	41	0	2
Boron, dissolved (µg/L as B)	<20	50	80	190	500	80	0	8
Lead, dissolved (µg/L as Pb)	<1	<1	<1	1	2	41	0	31
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	4	41	0	21
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	171	444	511	582	1,370	95	?	?
Solids, sum, dissolved (mg/L)	152	441	491	548	1,370	55	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Forest River at Minto, N. Dak.–Continued (Period of record: October 6, 1971, to September 10, 2001; Number of dates: 308)								
Fecal coliform, MFC MF (colonies per 100 milliliters)	<1	<1	6	58	230	10	1	3

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Park River at Grafton, N. Dak. (Period of record: September 22, 1969, to August 28, 2001; Number of dates: 297)								
Temperature, water (degrees Celsius)	0	0.5	7.0	18.0	28.0	292	0	?
Discharge (ft^3/s)	0	1	8	113	8,460	293	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	289	750	1,110	1,335	2,500	283	?	?
Oxygen, dissolved (mg/L)	12.2	?	?	?	12.2	1	0	?
pH, field	6.3	7.7	7.9	8.1	8.7	85	1	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	93	210	260	320	440	45	?	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	6	45	?	?
Nitrogen nitrate, dissolved (mg/L as N)	<.01	.23	.45	.80	2.90	36	7	2
Phosphorus, dissolved (mg/L as P)	0	.1	.3	.4	.8	13	10	0
Calcium, dissolved (mg/L as Ca)	31	58	75	96	130	84	?	?
Magnesium, dissolved (mg/L as Mg)	8	20	33	41	68	84	?	?
Sodium, dissolved (mg/L as Na)	12	46	97	129	370	84	11	?
Potassium, dissolved (mg/L as K)	3.8	7.4	8.6	11.0	16.0	84	?	?
Chloride, dissolved (mg/L as Cl)	6	31	81	131	410	84	3	?
Sulfate, dissolved (mg/L as SO_4)	53	130	210	270	420	84	26	?
Arsenic, dissolved (µg/L as As)	<1	2	4	6	12	39	0	1
Boron, dissolved (µg/L as B)	<20	50	165	300	830	71	1	10
Lead, dissolved (µg/L as Pb)	<1	<1	<1	1	2	39	0	29
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.2	1.0	39	1	27
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	4	39	0	24

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Park River at Grafton, N. Dak.–Continued (Period of record: September 22, 1969, to August 28, 2001; Number of dates: 297)								
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	83	425	709	845	1450	84	?	?
Solids, sum, dissolved (mg/L)	193	529	749	819	1220	46	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Tongue River at Akra, N. Dak. (Period of record: October 14, 1971, to August 8, 2001; Number of dates: 270)								
Temperature, water (degrees Celsius)	0	2.5	9.0	18.5	28.5	265	0	?
Discharge (ft^3/s)	.02	2.6	7.1	27	663	269	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	235	510	570	650	1,490	252	?	?
Oxygen, dissolved (mg/L)	6.5	8.2	9.8	10.7	13.2	8	0	?
pH, field	6.4	7.8	8.0	8.3	8.8	86	1	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	97	200	230	308	380	34	?	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	6	34	?	?
Nitrogen nitrate, dissolved (mg/L as N)	<.01	.23	.29	.56	2.30	30	4	2
Calcium, dissolved (mg/L as Ca)	28	55	63	71	98	82	?	?
Magnesium, dissolved (mg/L as Mg)	7	16	20	22	35	82	?	?
Sodium, dissolved (mg/L as Na)	11	22	26	29	37	82	0	?
Potassium, dissolved (mg/L as K)	3	5	6	7	12	82	?	?
Chloride, dissolved (mg/L as Cl)	2	8	10	11	40	82	0	?
Sulfate, dissolved (mg/L as SO_4)	6	72	87	97	140	82	0	?
Arsenic, dissolved (µg/L as As)	<1	2	3	7	12	39	0	1
Boron, dissolved (µg/L as B)	<20	30	80	100	350	68	0	13
Lead, dissolved (µg/L as Pb)	<1	<1	1	1	6	39	0	23
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	<.1	2.4	39	1	32
Selenium, dissolved (µg/L as Se)	<1	<1	<1	1	3	39	0	22
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	172	315	360	407	515	81	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Tongue River at Akra, N. Dak.–Continued (Period of record: October 14, 1971, to August 8, 2001; Number of dates: 270)								
Solids, sum, dissolved (mg/L)	177	312	339	380	463	44	?	?
Fecal coliform, 0.7 m-MF (colonies per 100 milliliters)	<1	6	10	33	720	8	1	1

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Pembina River at Neche, N. Dak. (Period of record: October 13, 1971, to August 9, 2001; Number of dates: 334)								
Temperature, water (degrees Celsius)	0	0.5	7.8	17.5	28.0	328	0	?
Discharge (ft^3/s)	.04	21.0	112.0	837	19,000	334	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	250	583	825	942	1,700	294	?	?
Oxygen, dissolved (mg/L)	12.4	?	?	?	12.4	1	0	?
pH, field	6.5	7.8	8.1	8.3	8.7	55	1	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	110	150	210	320	340	17	?	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	13	17	?	?
Nitrogen nitrate, dissolved (mg/L as N)	.02	.22	.23	.64	1.70	20	3	0
Calcium, dissolved (mg/L as Ca)	26	46	70	87	140	57	?	?
Magnesium, dissolved (mg/L as Mg)	8	18	29	36	53	57	?	?
Sodium, dissolved (mg/L as Na)	19	28	42	49	59	57	0	?
Potassium, dissolved (mg/L as K)	3.2	6.6	8.3	10.0	13.0	57	?	?
Chloride, dissolved (mg/L as Cl)	3	8	14	18	34	57	0	?
Sulfate, dissolved (mg/L as SO_4)	56	110	160	190	250	57	0	?
Arsenic, dissolved (µg/L as As)	<1	2	3	5	12	38	0	2
Boron, dissolved (µg/L as B)	<20	60	90	150	550	44	0	4
Lead, dissolved (µg/L as Pb)	<1	<1	<1	<2	3	39	0	28
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.2	.8	39	0	28
Selenium, dissolved (µg/L as Se)	<1	<1	1	2	4	39	0	13
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	194	363	514	583	763	57	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Pembina River at Neche, N. Dak.–Continued (Period of record: October 13, 1971, to August 9, 2001; Number of dates: 334)								
Solids, sum, dissolved (mg/L)	215	321	470	569	596	18	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Bois de Sioux River near Doran, N. Dak. (Period of record: March 27, 1993, to August 24, 1995; Number of dates: 26)								
Temperature, water (degrees Celsius)	0	1.1	12.3	20.0	24.0	26	0	?
Discharge (ft^3/s)	2.7	64	501	1,408	3,420	26	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	384	743	985	1,340	2,270	25	12	?
Oxygen, dissolved (mg/L)	2.8	5.6	8.8	11.7	13.4	23	3	?
pH, field	6.8	7.8	7.9	8.2	8.9	25	3	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	29	25	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	79	161	222	317	666	25	7	?
Calcium, dissolved (mg/L as Ca)	32	77	95	130	220	25	?	?
Magnesium, dissolved (mg/L as Mg)	16	41	63	93	140	25	?	?
Sodium, dissolved (mg/L as Na)	15	25	42	60	100	25	0	?
Potassium, dissolved (mg/L as K)	6	8	10	15	25	24	?	?
Chloride, dissolved (mg/L as Cl)	7	11	17	19	40	25	0	?
Sulfate, dissolved (mg/L as SO_4)	85	233	350	563	790	26	8	?
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	250	535	760	1,108	1,860	26	?	?
Alachlor, dissolved (µg/L)	<.002	?	<.002	?	.12	3	0	2
Atrazine, dissolved (µg/L)	.12	?	.21	?	.23	3	0	0
Chlorpyrifos, dissolved (µg/L)	<.004	?	<.004	?	<.004	3	0	3
Dieldrin, dissolved (µg/L)	<.001	?	<.001	?	<.001	3	0	3
Lindane, dissolved (µg/L)	<.004	?	<.004	?	<.004	3	0	3
Parathion, dissolved (µg/L)	<.004	?	<.004	?	<.004	3	0	3

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Otter Tail River below Orwell Dam near Fergus Falls, Minn. (Period of record: October 12, 1960, to August 24, 1995; Number of dates: 47)								
Temperature, water (degrees Celsius)	0	5.1	14.8	20.1	24.5	40	0	
Discharge (ft^3/s)	85	446	687	907	1,220	47	?	
Specific conductance (µS/cm at 25 degrees Celsius)	367	399	418	441	505	47	0	
Oxygen, dissolved (mg/L)	3.5	8.3	9.4	12.2	15.4	38	2	
pH, field	7.2	8.0	8.2	8.4	8.8	46	5	
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	5.3	17.0	24	?	
Bicarbonate, dissolved, field (mg/L as HCO_3)	193	221	228	244	271	24	0	
Calcium, dissolved (mg/L as Ca)	32	37	39	41	47	39	?	
Magnesium, dissolved (mg/L as Mg)	25	27	28	29	35	39	?	
Sodium, dissolved (mg/L as Na)	6.5	7.9	8.3	9.2	11.0	39	0	
Potassium, dissolved (mg/L as K)	1.8	3.8	4.1	4.6	5.8	38	?	
Chloride, dissolved (mg/L as Cl)	2.7	6.9	8.9	10.0	14.0	42	0	
Sulfate, dissolved (mg/L as SO_4)	9.3	12.3	16.0	20.0	32.0	42	0	
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	225	243	252	266	299	41	?	

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Buffalo River near Dilworth, N. Dak. (Period of record: April 10, 1962, to March 12, 1991; Number of dates: 217)								
Temperature, water (degrees Celsius)	0	7.5	10.5	15.3	26.0	207	0	?
Discharge (ft^3/s)	.36	143	255	536	5,180	217	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	260	570	620	750	1,100	117	1	?
Oxygen, dissolved (mg/L)	6.1	6.1	6.1	6.1	6.1	1	0	?
pH, field	7.0	7.7	7.9	8.1	8.4	11	0	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	0	1	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	427	427	427	427	427	1	1	?
Hardness, total (mg/L as $CaC0_3$)	120	328	415	428	600	10	8	?
Calcium, dissolved (mg/L as Ca)	28	73	89	95	143	11	?	?
Magnesium, dissolved (mg/L as Mg)	11	40	44	50	59	11	?	?
Sodium, dissolved (mg/L as Na)	4.5	15.0	18.0	20.5	27.0	11	0	?
Potassium, dissolved (mg/L as K)	4.6	5.8	6.3	6.7	7.4	11	?	?
Chloride, dissolved (mg/L as Cl)	0	3.6	6.4	7.5	15.0	11	0	?
Sulfate, dissolved (mg/L as SO_4)	36	95	122	146	230	11	0	?
Barium, dissolved(µg/L as Ba)	61	?	?	?	61	1	0	0
Beryllium, dissolved (µg/L as Be)	<.5	?	?	?	<.5	1	0	1
Cadmium, dissolved (µg/L as Cd)	<10	?	?	?	<10	1	?	1
Chromium, dissolved (µg/L as Cr)	<5	?	?	?	<5	1	0	1
Cobalt, dissolved (µg/L as Co)	<30	?	?	?	<30	1	0	1
Copper, dissolved (µg/L as Cu)	<10	?	?	?	<10	1	0	1
Lead, dissolved (µg/L as Pb)	10	?	?	?	10	1	?	0

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Buffalo River near Dilworth, N. Dak.–Continued (Period of record: April 10, 1962, to March 12, 1991; Number of dates: 217)								
Nickel, dissolved (µg/L as Ni)	<10	?	?	?	<10	1	0	1
Silver, dissolved (µg/L as Ag)	1	?	?	?	1	1	0	0
Zinc, dissolved (µg/L as Zn)	16	?	?	?	16	1	?	0
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	168	432	534	556	736	11	?	?
Solids, sum, dissolved (mg/L)	156	465	510	548	658	5	?	?

Notes: Standards used are the same as for the Red River main stem; all major-ion data are rom the 1960's and 1970's; all heavy metals data are from 1991; no hardness data to calculate hardness dependent standards.

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Wild Rice River at Hendrum, Minn. (Period of record: October 1, 1962, to September 14, 2000; Number of dates: 305)								
Temperature, water (degrees Celsius)	0	1.8	16.0	22.0	28.0	276	0	?
Discharge (ft^3/s)	.09	36	80	464	9,010	175	?	?
Specific conductance (µS/cm at 25 degrees Celsius)	239	480	540	595	2,150	163	4	?
Oxygen, dissolved (mg/L)	.8	6.3	7.4	9.8	13.4	261	18	?
pH, field	5.8	7.9	8.2	8.4	9.4	270	3	?
Carbonate, dissolved, field (mg/L as CO_3)	0	0	0	0	0	1	?	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	471	471	471	471	471	1	1	?
Carbon, organic, dissolved (mg/L AS C)	14	14	14	14	14	1	?	?
Hardness, total (mg/L as $CaC0_3$)	260	260	290	320	490	5	5	?
Calcium, dissolved (mg/L as Ca)	42	58	66	82	93	7	?	?
Magnesium, dissolved (mg/L as Mg)	16	28	31	37	63	7	?	?
Sodium, dissolved (mg/L as Na)	5.2	9.0	10.0	19.0	31.0	7	0	?
Potassium, dissolved (mg/L as K)	3.7	4.2	4.5	4.7	6.5	7	?	?
Chloride, dissolved (mg/L as Cl)	0	3.4	4.2	5.8	31.0	118	0	?
Sulfate, dissolved (mg/L as SO_4)	28	39	48	52	85	8	0	?
Barium, dissolved(µg/L as Ba)	98	?	?	?	98	1	0	0
Beryllium, dissolved (µg/L as Be)	<.5	?	?	?	<.5	1	0	1
Cadmium, dissolved (µg/L as Cd)	<1	?	?	?	<1	1	0	1
Chromium, dissolved (µg/L as Cr)	<5	?	?	?	<5	1	0	1
Cobalt, dissolved (µg/L as Co)	<3	?	?	?	<3	1	0	1
Copper, dissolved (µg/L as Cu)	<10	?	?	?	<10	1	0	1

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Wild Rice River at Hendrum, Minn.–Continued (Period of record: October 1, 1962, to September 14, 2000; Number of dates: 305)								
Nickel, dissolved (µg/L as Ni)	<10	?	?	?	<10	1	0	1
Zinc, dissolved (µg/L as Zn)	23	?	?	?	23	1	0	0
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	250	312	355	424	621	7	?	?
Solids, sum, dissolved (mg/L)	301	322	342	363	383	2	?	?

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red Lake River at Crookston, Minn. (Period of record: April 11, 1962, to September 11, 2000; Number of dates: 178)								
Temperature, water (degrees Celsius)	0	0.5	6.5	17.6	28.5	164	0	?
Discharge (ft^3/s)	6	499	980	1,680	20,200	176	?	?
Turbidity (NTU)	.6	3.0	4.7	11.8	95.0	98	10	?
Specific conductance (µS/cm at 25 degrees Celsius)	195	358	395	452	730	171	0	?
Oxygen, dissolved (mg/L)	5.7	8.4	10.2	12.3	14.1	115	0	?
pH, field	6.9	7.8	8.1	8.3	8.7	163	14	?
Bicarbonate, dissolved, field (mg/L as HCO_3)	102	207	222	242	372	65	5	?
Hardness, total (mg/L as $CaCO_3$)	100	185	210	237	391	169	24	?
Calcium, dissolved (mg/L as Ca)	25	46	52	57	94	169	?	?
Magnesium, dissolved (mg/L as Mg)	8	16	19	22	38	169	?	?
Sodium, dissolved (mg/L as Na)	2.3	4.3	5.1	6.6	15.0	170	0	?
Potassium, dissolved (mg/L as K)	<.10	2.7	3.3	4.1	9.8	171	?	?
Chloride, dissolved (mg/L as Cl)	.1	3.0	3.9	5.7	12.0	169	0	?
Sulfate, dissolved (mg/L as SO_4)	7	18	32	50	125	171	?	?
Aluminum, dissolved (µg/L as Al)	<10	<10	<10	10	60	47	0	28
Arsenic, dissolved (µg/L as As)	<1	1	2	3	6	52	15	4
Barium, dissolved (µg/L as Ba)	38	50	58	65	100	65	0	5
Beryllium, dissolved (µg/L as Be)	<.5	<.5	<.5	<.5	2.1	37	0	34
Boron, dissolved (µg/L as B)	<20	40	50	70	310	50	?	4
Cadmium, dissolved (µg/L as Cd)	<1	<1	<1	<1	4	54	2	45
Chromium, dissolved (µg/L as Cr)	<1	<1	1	10	30	52	0	31

Constituent	Minimum	25th percentile	Median	75th percentile	Maximum	Number of observations	Number greater than standard	Number less than D.L.
Red Lake River at Crookston, Minn.–Continued (Period of record: April 11, 1962, to September 11, 2000; Number of dates: 178)								
Cobalt, dissolved (µg/L as Co)	<1	2	<3	<3	3	66	1	55
Copper, dissolved (µg/L as Cu)	<1	1	2	3	16	54	0	13
Iron, dissolved (µg/L as Fe)	<10	10	20	40	220	102	0	9
Lead, dissolved (µg/L as Pb)	<1	1	<2	<5	5	54	0	28
Manganese, dissolved (µg/L as Mn)	2	8	13	23	79	102	6	11
Mercury, dissolved (µg/L as Hg)	<.1	<.1	<.1	.1	2.0	49	14	35
Nickel, dissolved (µg/L as Ni)	<1	<1	1	2	7	61	0	18
Selenium, dissolved (µg/L as Se)	<1	<1	<1	<1	10	64	1	61
Silver, dissolved (µg/L as Ag)	<1	<1	<1	<1	3	65	1	63
Zinc, dissolved (µg/L as Zn)	<3	5	12	18	90	54	0	9
Solids, residue on evaporation at 180 degrees Celsius, dissolved (mg/L)	68	188	207	235	326	65	?	?
Solids, sum, dissolved (mg/L)	145	230	263	300	463	171	?	?
Alachlor, dissolved (µg/L)	<.002	?	?	?	<.002	5	0	5
Chlorpyrifos, dissolved (µg/L)	<.004	?	?	?	<.004	5	0	5
Dieldrin, dissolved (µg/L)	<.001	?	?	?	<.001	5	0	5
Lindane, dissolved (µg/L)	<.004	?	?	?	<.004	5	0	5
Parathion, dissolved (µg/L)	<.004	?	?	?	<.004	5	0	5
Fecal coliform, 0.7 m-MF (colonies per 100 milliliters)	2	16	49	205	7,400	96	3	?

5/19/2004

RED RIVER BASIN
ASSESSMENT OF STREAM WATER QUALITY
Based on the 2004 MN 305(b) Report to Congress of the United States

National Hydrography Dataset (NHD) Assessment Reach ID	Impaired Waters List	Category	River Reach	Location	NHD Length (Miles)	USES:			Indicators of Impairment:														Ecoregion Data:			
						Aquatic Consumption	Aquatic Life	Aquatic Recreation	Fish	Oxygen Depletion	Turbidity	Un-ionized Ammonia	Metals	Chloride	pH	Invertebrates	Bacteria	Mercury FCA	PCB FCA	Mercury Water Column	PCB Water Column		TOTAL PHOSPHORUS	NITRITE/NITRATE	OXYGEN DEMAND (BOD)	SUSPENDED SOLIDS
Bois De Sioux River																										
09020101-501	Y	5A	BOIS DE SIOUX RIVER	Rabbit R to Otter Tail R	15.31	NA	NS	NA	NS	PS		FS		FS	FS								EN			
09020101-502	Y	5A	RABBIT RIVER	Wilkin Cty Line to Boise de Sioux R	22.66	NA	NS	NA	NS	PS	NS	FS			FS								EN	EN		
Mustinka River																										
09020102-501	Y	5C	TWELVEMILE CREEK	West Br Twelvemile Cr to Mustinka R	18.96	NA	NS	NA	NS																	
09020102-503	Y	5C	MUSTINKA RIVER	Unnamed Cr to Lk Traverse	8.28	NA	NS	NA		FS	NS	FS			FS								EN	EN		
09020102-518	Y	5C	MUSTINKA RIVER	Grant/Traverse Co Line to Fivemile Cr	4.76	NA	NS	NA		FS	NS	FS			FS								EN	EN		
Otter Tail River																										
09020103-502	Y	5A	OTTER TAIL RIVER	Breckenridge Lk to Bois de Sioux R	8.20	NA	NS	NA		FS	NS	FS		FS	FS								OK	EN	OK	EN
09020103-503	N	2	OTTER TAIL RIVER	Pelican R to Dayton Hollow Reservoir	2.50	NA	FS	NA		FS	FS	FS		FS	FS								OK	OK	OK	EN
09020103-504	Y	5A	OTTER TAIL RIVER	JD 2 to Breckenridge Lk	19.04	NA	NS	NA	NS	FS	NS	FS			FS								OK	EN		
09020103-506	N	2	OTTER TAIL RIVER	Orwell Dam to JD 2	7.61	NA	FS	NA		FS		FS		FS	FS								OK	OK		
09020103-521	N	2	OTTER TAIL RIVER	Pine Lk to Rush Lk	11.71	NA	FS	NA				FS			FS											
09020103-526	N	3A	TOAD RIVER	Little Toad Lk to T138 R38W S30 southwest corner	8.51	NA	NA	NA																		

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National Hydrography Dataset (NHD) Assessment Reach ID	Impaired Waters List	Category	River Reach	Location	NHD Length (Miles)	USES:			Indicators of Impairment:													Ecoregion Data:			
						Aquatic Consumption	Aquatic Life	Aquatic Recreation	Fish	Oxygen Depletion	Turbidity	Un-ionized Ammonia	Metals	Chloride	pH	Invertebrates	Bacteria	Mercury FCA	PCB FCA	Mercury Water Column	PCB Water Column	TOTAL PHOSPHORUS	NITRITE/NITRATE	OXYGEN DEMAND (BOD)	SUSPENDED SOLIDS
Otter Tail River - cont'd																									
09020103-532	Y	5C	OTTER TAIL RIVER	Rice Lk to Mud Lk	10.9	NA	PS	NA		PS		FS		FS	FS										
09020103-535	N	2	OTTER TAIL RIVER	Little Pine Lk to Pine Lk	1.01	NA	FS	NA				FS			FS										
09020103-542	N	2	TOAD RIVER	T138 R38W S31northwest corner to Pine Lk	9.74	NA	FS	NA		FS		FS			FS										
Red River of the North (Headwaters)																									
09020104-501	Y	5C	WHISKEY CREEK	Headwaters to Red R	20.36	NA	NS	NA		FS	NS	FS			FS							EN	EN		
09020104-502	Y	5A	RED RIVER	Fargo/Moorhead dam A to Sheyenne R (ND)	21.24	NS	NA	NA										NS	NS						
09020104-503	Y	5A	RED RIVER	Breckenridge dam to Whiskey Cr	25.00	NS	NS	FS	FS	FS	NS	FS		FS	FS		FS	NS	NS			OK	EN	EN	EN
09020104-504	Y	5A	RED RIVER	Fargo/Moorhead dam 1 to dam A	3.11	NS	NS	PS		FS	NS	FS		FS	FS		PS	NS	NS			EN	EN	EN	EN
09020104-505	Y	5A	RED RIVER	Whiskey Cr to Comstock dam 3	39.65	NS	NA	NA										NS	NS						
09020104-506	Y	5A	RED RIVER	Otter Tail R to Breckenridge dam	2.34	NS	NA	NA										NS	NS						
09020104-507	Y	5A	RED RIVER	Fargo/Moorhead dam 2 to dam 1	5.92	NS	NA	NA										NS	NS						
09020104-508	Y	5A	RED RIVER	Wild Rice R(ND) to Dam 2	12.33	NS	NA	NA										NS	NS						
09020104-509	Y	5A	RED RIVER	Dam 3 (Comstock) to Wolverton Cr	5.90	NS	NA	NA										NS	NS						

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RED RIVER BASIN
ASSESSMENT OF STREAM WATER QUALITY
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National Hydrography Dataset (NHD) Assessment Reach ID	Impaired Waters List	Category	River Reach	Location	NHD Length (Miles)	USES:			Indicators of Impairment:													Ecoregion Data:			
						Aquatic Consumption	Aquatic Life	Aquatic Recreation	Fish	Oxygen Depletion	Turbidity	Un-ionized Ammonia	Metals	Chloride	pH	Invertebrates	Bacteria	Mercury FCA	PCB FCA	Mercury Water Column	PCB Water Column	TOTAL PHOSPHORUS	NITRITE/NITRATE	OXYGEN DEMAND (BOD)	SUSPENDED SOLIDS
Red River of the North (Headwaters) cont'd.																									
09020104-510	Y	5A	RED RIVER	Wolverton Cr to Wild Rice R (ND)	6.76	NS	NA	NA										NS	NS						
09020104-511	Y	5A	RED RIVER	Sheyenne R (ND) to Buffalo R	10.40	NS	NA	NA										NS	NS						
Buffalo River																									
09020106-501	Y	5C	BUFFALO RIVER	S Br Buffalo R to Red R	45.07	NA	FS	NA	FS																
09020106-502	Y	5C	STONY CREEK	Hay Cr to South Br Buffalo R	12.83	NA	NA	NA																	
09020106-503	N	3A	BUFFALO RIVER, SOUTH BRANCH	Stony Cr to Buffalo R	16.28	NA	NA	NA																	
09020106-504	N	3A	BUFFALO RIVER, SOUTH BRANCH	Whiskey Cr to Stony Cr	10.40	NA	NA	NA																	
09020106-505	Y	5C	BUFFALO RIVER, SOUTH BRANCH	Deerhorn Cr to Whiskey Cr	16.58	NA	NS	NA	NS																
09020106-506	N	2	BUFFALO RIVER	Headwaters to South Br Buffalo R	69.49	NA	FS	NA	FS																
09020106-509	N	3A	WHISKEY CREEK	T137 R47W S13 east line to South Br Buffalo R	5.91	NA	NA	NA																	
09020106-519	N	2	HAY CREEK	Unnamed Cr to Spring Cr	9.12	NA	FS	NA	FS																
Red River of the North (Hillsboro) - Marsh River																									
09020107-501	Y	5A	RED RIVER	Buffalo R to Elm R (ND)	29.39	NS	NS	NA		FS	NS	FS		FS	FS			NS	NS			EN	EN	EN	EN
09020107-502	Y	5A	RED RIVER	Wild Rice R to Goose R (ND)	22.77	NS	FS	NA				FS		FS	FS			NS	NS						
09020107-503	N	2	MARSH RIVER	Headwaters to Red R	51.07	NA	FS	NA	FS																
09020107-504	Y	5A	RED RIVER	Elm R (ND) to Wild Rice R	6.70	NS	NA	NA										NS	NS						
09020107-505	Y	5A	RED RIVER	Goose R (ND) to Marsh R	0.88	NS	FS	NA	FS									NS	NS						

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RED RIVER BASIN
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National Hydrography Dataset (NHD) Assessment Reach ID	Impaired Waters List	Category	River Reach	Location	NHD Length (Miles)	USES:			Indicators of Impairment:												Ecoregion Data:			
						Aquatic Consumption	Aquatic Life	Aquatic Recreation	Fish	Oxygen Depletion	Turbidity	Un-ionized Ammonia	Metals	Chloride	pH	Invertebrates	Bacteria	Mercury FCA	PCB FCA	Mercury Water Column	PCB Water Column	TOTAL PHOSPHORUS	NITRITE/NITRATE	OXYGEN DEMAND (BOD)	SUSPENDED SOLIDS
Wild Rice River																								
09020108-501	N	2	WILD RICE RIVER	South Br Wild Rice R to Red R	30.58	NA	FS	NA	FS	FS					FS									
09020108-502	N	2	WILD RICE RIVER, SOUTH BRANCH	Otto Lk to Wild Rice R	56.80	NA	FS	NA	FS															
09020108-503	N	2	WILD RICE RIVER	Marsh Cr to South Br Wild Rice R	44.58	NA	FS	NA	FS	FS		FS		FS	FS							OK			
Red River of the North (Sand Hill River)																								
09020301-501	Y	5A	RED RIVER	Cole Cr (ND) to Red Lake R	8.01	NS	NS	NA		FS	NS	FS		FS	FS			NS	NS			EN	EN	EN	EN
09020301-502	Y	5A	RED RIVER	Buffalo Coulee to Cole Cr (ND)	20.39	NS	NA	NA										NS	NS						
09020301-503	Y	5A	RED RIVER	Grand Forks dam to English Coulee	1.68	NS	NA	NA										NS	NS						
09020301-504	Y	5A	RED RIVER	Red Lk R to Grand Forks dam	2.14	NS	FS	NA		FS		FS		FS	FS			NS	NS						
09020301-506	Y	5A	RED RIVER	Marsh R to Sandhill Cr	21.22	NS	NA	NA										NS	NS						
09020301-507	Y	5A	RED RIVER	Sandhill R to Buffalo Coulee	10.66	NS	NA	NA										NS	NS						
Red Lake River																								
09020303-501	Y	5A	RED LAKE RIVER	Burnham Cr to Unnamed Cr	30.52	NS	NS	NA		FS	NS	FS		FS	FS			NS				OK	EN		EN
09020303-502	Y	5C	RED LAKE RIVER	Black R to Gentilly R	9.98	NS	NA	NA										NS							
09020303-503	Y	5A	RED LAKE RIVER	Unnamed Cr to Red R	1.88	NS	NS	NA		FS	NS	FS		FS	FS			NS				OK	EN	OK	EN
09020303-504	Y	5C	RED LAKE RIVER	Unnamed Cr to Clearwater R	21.22	NS	FS	NA	FS									NS							

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National Hydrography Dataset (NHD) Assessment Reach ID	Impaired Waters List	Category	River Reach	Location	NHD Length (Miles)	USES:			Indicators of Impairment:													Ecoregion Data:			
						Aquatic Consumption	Aquatic Life	Aquatic Recreation	Fish	Oxygen Depletion	Turbidity	Un-ionized Ammonia	Metals	Chloride	pH	Invertebrates	Bacteria	Mercury FCA	PCB FCA	Mercury Water Column	PCB Water Column	TOTAL PHOSPHORUS	NITRITE/NITRATE	OXYGEN DEMAND (BOD)	SUSPENDED SOLIDS
Red Lake River - cont'd																									
09020303-506	Y	5C	RED LAKE RIVER	Crookston dam to Burnham Cr	20.54	NS	FS	NA		FS		FS		FS	FS			NS							
09020303-507	N	2	BLACK RIVER	Headwaters to Red Lake R	34.53	NA	FS	NA	FS																
09020303-508	Y	5C	RED LAKE RIVER	Headwaters to Thief R	66.05	NS	NA	NA										NS							
09020303-509	Y	5C	RED LAKE RIVER	Thief R to Thief River Falls dam	0.83	NS	NA	NA										NS							
09020303-510	Y	5C	RED LAKE RIVER	Clearwater R to Cyr Cr	9.42	NS	NA	NA										NS							
09020303-511	Y	5C	RED LAKE RIVER	Cyr Cr to Black R	4.83	NS	NA	NA										NS							
09020303-512	Y	5C	RED LAKE RIVER	Gentilly R to Crookston dam	16.17	NS	NA	NA										NS							
09020303-513	Y	5C	RED LAKE RIVER	Thief River Falls dam to Unnamed Cr	13.87	NS	NA	NA										NS							
Clearwater River																									
09020305-501	Y	5C	CLEARWATER RIVER	Lower Badger Cr to Red Lake R	7.19	NS	FS	NA	FS	FS		FS			FS			NS				OK			EN
09020305-502	N	2	LOWER BADGER CREEK	CD 14 to Clearwater R	11.90	NA	FS	NA	FS																
09020305-504	N	2	POPLAR RIVER	Highway 59 to Lost R	10.34	NA	FS	NA	FS																
09020305-505	N	3A	LOST RIVER	Hill R to Poplar R	2.44	NA	NA	NA																	
09020305-507	Y	5C	LOST RIVER	Anderson Lk to Hill R	40.02	NA	FS	NA	FS						FS										
09020305-508	Y	5C	COUNTY DITCH 57	Unnamed Ditch to Clearwater R	0.37	NA	NA	NA																	
09020305-509	Y	5C	WALKER BROOK	Walker Bk Lk to Clearwater R	4.82	NA	NA	NA																	
09020305-510	Y	5A	CLEARWATER RIVER	Ruffy Bk to Lost R	58.24	NS	FS	NA		FS		FS			FS			NS				OK			EN

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						Aquatic Consumption	Aquatic Life	Aquatic Recreation	Fish	Oxygen Depletion	Turbidity	Un-ionized Ammonia	Metals	Chloride	pH	Invertebrates	Bacteria	Mercury FCA	PCB FCA	Mercury Water Column	PCB Water Column	TOTAL PHOSPHORUS	NITRITE/NITRATE	OXYGEN DEMAND (BOD)	SUSPENDED SOLIDS
Clearwater River - cont'd																								
09020305-511	Y	5C	CLEARWATER RIVER	Lost R to Beau Gerlot Cr	11.63	NS	NA	NA										NS						
09020305-512	N	3A	LOST RIVER	Pine Lk to Anderson Lk	8.43	NA	NA	NA																
09020305-513	N	3A	RUFFY BROOK	Headwaters to Clearwater R	20.95	NA	NA	NA																
09020305-514	Y	5C	CLEARWATER RIVER	Clearwater Lk to Ruffy Bk	16.74	NS	FS	NA		FS		FS			FS			NS				OK			OK
09020305-516	Y	5A	CLEARWATER RIVER	T148 R35W S31 west line to Clearwater Lk	17.60	NS	FS	PS				FS			FS		PS	NS				OK			OK
09020305-517	Y	5C	CLEARWATER RIVER	Headwaters to Thief Lk T148 R36W S36 east line	29.48	NS	NA	FS									FS	NS				EN			OK
09020305-518	Y	5C	POPLAR RIVER	Spring Lk to Highway 59	34.82	NA	NA	NA																
09020305-519	Y	5C	Clearwater River	Beau Gerlot Cr to Lower Badger Cr	1.63	NS	NA	NA										NS						
09020305-539	N	2	Hill River	Hill River Lk to Lost R	28.06	NA	FS	NA	FS															
Red River of the North (Grand Marais Creek)																								
09020306-501	Y	5A	RED RIVER	Grand Marais Cr to N Marais R (ND)	41.97	NS	NA	NA										NS	NS					
09020306-502	Y	5A	RED RIVER	English Coulee to Grand Marais Cr	6.95	NS	NA	NA										NS	NS					
09020306-503	Y	5A	RED RIVER	North Marais R (ND) to Forest R (ND)	3.70	NS	NA	NA										NS	NS					
09020306-504	Y	5A	RED RIVER	Forest R (ND) to Snake R	13.52	NS	NA	NA										NS	NS					
09020306-505	Y	5A	RED RIVER	Snake R to Park R (ND)	8.11	NS	NA	NA										NS	NS					
09020306-506	N	3A	GRAND MARAIS CREEK	Unnamed Cr to Red R	5.48	NA	NA	NA																

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						Aquatic Consumption	Aquatic Life	Aquatic Recreation	Fish	Oxygen Depletion	Turbidity	Un-Ionized Ammonia	Metals	Chloride	pH	Invertebrates	Bacteria	Mercury FCA	PCB FCA	Mercury Water Column	PCB Water Column	TOTAL PHOSPHORUS	NITRITE/NITRATE	OXYGEN DEMAND (BOD)	SUSPENDED SOLIDS
Snake River (Red River of the North)																									
09020309-501	Y	5A	SNAKE RIVER	Middle R to Red R	9.11	NA	NS	NA		PS	NS	FS		FS	FS							EN	EN		EN
09020309-503	Y	5A	SNAKE RIVER	CD 7 to CD 3	15.37	NA	NS	NA	NS	PS		FS		FS	FS							EN			
09020309-504	Y	5C	SNAKE RIVER	S Br Snake R to CD 7	22.85	NA	NS	NA	NS																
09020309-505	N	2	MIDDLE RIVER	Headwaters to Snake R	88.93	NA	FS	NA	FS																
09020309-506	N	2	SNAKE RIVER	Headwaters to South Br Snake R	29.16	NA	FS	NA	FS																
Red River of the North (Tamarac River)																									
09020311-501	Y	5A	RED RIVER	Pembina R (ND) to Canadian Border	2.91	NS	FS	NA		FS				FS	FS			NS	NS						
09020311-502	Y	5A	RED RIVER	Tamarac R to Drayton dam	16.51	NS	NA	NA										NS	NS						
09020311-503	Y	5C	TAMARAC RIVER	Florian Park Reservoir to Stephen dam	33.20	NA	NS	NA	NS																
09020311-504	Y	5A	RED RIVER	Two R to Pembina R (ND)	17.52	NS	NA	NA										NS	NS						
09020311-506	Y	5A	RED RIVER	Unnamed Cr to Two R	16.51	NS	NA	NA										NS	NS						
09020311-507	Y	5A	RED RIVER	Park R (ND) to Tamarac R	2.97	NS	NA	NA										NS	NS						
09020311-508	Y	5A	RED RIVER	Drayton Dam to Unnamed Cr	12.28	NS	NA	NA										NS	NS						
Two Rivers																									
09020312-501	N	2	TWO RIVER	M Br Two Rivers to N Br Two Rivers	20.59	NA	FS	NA		FS		FS		FS	FS							OK	EN		OK
09020312-502	N	2	TWO RIVER, SOUTH BRANCH	Lk Bronson to Middle Br Two River	32.96	NA	FS	NA	FS																
09020312-503	Y	5C	TWO RIVER, MIDDLE BRANCH	Headwaters to South Br Two R	27.03	NA	NS	NA	NS																

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						Aquatic Consumption	Aquatic Life	Aquatic Recreation	Fish	Oxygen Depletion	Turbidity	Un-ionized Ammonia	Metals	Chloride	pH	Invertebrates	Bacteria	Mercury FCA	PCB FCA	Mercury Water Column	PCB Water Column	TOTAL PHOSPHORUS	NITRITE/NITRATE	OXYGEN DEMAND (BOD)	SUSPENDED SOLIDS
Two Rivers - cont'd																									
09020312-504	Y	5C	TWO RIVER, NORTH BRANCH	Headwaters to Little Joe R	39.31	NA	NS	NA	NS																
09020312-506	Y	5C	TWO RIVER, SOUTH BRANCH	Unnamed Ditch to Lateral Ditch #2	24.89	NA	NS	NA	NS																
Roseau River																									
09020314-501	Y	5A	ROSEAU RIVER	Hay Cr to Canada Border	49.53	NS	NS	NA		NS		FS		FS	FS			NS				EN			
09020314-502	Y	5C	ROSEAU RIVER	South Fk Roseau R to Hay Cr	9.15	NS	NA	NA										NS							
09020314-504	Y	5C	ROSEAU RIVER	Headwaters to S Fk Roseau R	53.45	NS	NA	NA										NS							
				-End of Basin-																					

Full Support (FS); Partial Support (PS); Not Supporting (NS); Not Assessed (NA); Exceeds Ecoregion Norms (EN)

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020101-001-S_00	Bois De Sioux River from the ND-SD border downstream to its confluence with the Rabbit River	12.77 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	2
					Biological Indicators	2
ND-09020101-002-S_00	Bois De Sioux River from its confluence with the Rabbit River downstream to its confluence with the Ottertail River	15.03 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	2
					Biological Indicators	2
ND-09020104-001-S_00	Red River of the North from its confluence with the Ottertail River downstream to its confluence with Whiskey Creek	26.81 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	2
			Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020104-002-S_00	Red River of the North From its confluence with Whiskey Creek downstream to its confluence with the Wild Rice River	51.64 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	2
			Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020104-003-S_00	Red River of the North from its confluence with the Wild Rice River downstream to the 12th Ave bridge in Fargo, ND (just upstream from the Moorhead, MN waste water discharge)	21 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
			Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020104-004-S_00	Red River of the North from the 12th Ave N bridge in Fargo, ND downstream to its confluence with the Sheyenne River	20.09 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Ammonia	1
					BOD, carbonaceous	1
					Oxygen, Dissolved	1
			Recreation	Not Supporting	Total Fecal Coliform	1
			Fish Consumption	Not Supporting	Methyl-mercury	3

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020104-005-S_00	Red River of the North from its confluence with the Sheyenne River downstream to its confluence with the Buffalo River	10.45 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
			Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020105-001-L_00	Lake Elsie	260.5 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	2
					Turbidity	2
ND-09020105-001-S_00	Wild Rice River from its confluence with the Colfax watershed downstream to its confluence with the Red River of the North	38.01 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	1
					Biological Indicators	1
			Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
ND-09020105-002-L_00	Mooreton Pond	36.8 acres	Fish and Other Aquatic Biota	Not Supporting	Total Dissolved Solids	1
					Turbidity	1
ND-09020105-003-S_00	Wild Rice River from its confluence with a tributary NE of Great Bend, ND downstream to its confluence with the Colfax watershed	51.8 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	1
					Organic Enrichment/ Oxygen, Dissolved	1
ND-09020105-005-S_00	Antelope Creek downstream to its confluence with the Wild Rice River	40.09 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	1
					Temperature, water	1
ND-09020105-009-S_00	Wild Rice River from Elk Creek downstream to its confluence with a tributary NE of Great Bend, ND	52.31 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	1
					Organic Enrichment/ Oxygen, Dissolved	1
			Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020105-012-S_00	Wild Rice River from its confluence with Shortfoot Creek downstream to its confluence with Elk Creek	44.78 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	1
			Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
ND-09020105-016-S_00	Shortfoot Creek from its confluence with the Wild Rice River upstream to the ND-SD border, including tributaries	16.16 miles	Recreation	Not Supporting	Total Fecal Coliform	1
ND-09020105-017-S_00	Unnamed tributaries to the Wild Rice River (ND-09020105-015-S), including Crooked Creek	16.17 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
ND-09020105-018-S_00	Wild Rice River from its confluence with the Silver Lake diversion downstream to Lake Tewaukon	18.82 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
ND-09020105-019-S_00	Wild Rice River upstream from its confluence with Wild Rice Creek, including tributaries	57.06 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	1
			Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
ND-09020105-020-S_00	Wild Rice Creek from its confluence with the Wild Rice River upstream to the ND-SD border, including tributaries	118.17 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
ND-09020105-022-S_00	Wild Rice River from its confluence with Wild Rice Creek downstream to its confluence with the Silver Lake diversion	5.54 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020107-001-S_00	Red River of the North from its confluence with the Buffalo River downstream to its confluence with the Elm River	29.4 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020107-014-S_00	Red River of the North from its confluence with the Elm River downstream to its confluence with the Marsh River	29.83 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020107-008-S_00	Elm River from dam NW of Galesburg, ND downstream to dam NE of Galesburg	20.49 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	2
					Biological Indicators	2
ND-09020107-011-S_00	North Branch Elm River downstream to its confluence with the Elm River	33.4 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	2
					Biological Indicators	2
ND-09020109-001-S_00	Goose River from a tributary upstream from Hillsboro, ND downstream to its confluence with the Red River of the North	27.68 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	2
ND-09020109-002-L_00	South Golden Lake	323.5 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	2
					Oxygen, Dissolved	2
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020109-007-S_00	North Branch Goose River downstream to its confluence with the Goose River	37.12 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020109-011-S_00	Goose River from its confluence with Beaver Creek downstream to its confluence with the South Branch Goose River	19.38 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	2
ND-09020109-027-S_00	Beaver Creek downstream to the Golden Lake Diversion channel	37.01 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	2
ND-09020109-034-S_00	Little Goose River from Little Goose River National Wildlife Refuge downstream to the Goose River	28.64 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	2
ND-09020201-006-L_00	Devils Lake	125000 acres	Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
			Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020202-001-L_00	Warsing Dam.	53.4 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	2
					Sedimentation/Siltation	2
					Oxygen, Dissolved	2
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020202-002-L_00	Balta Dam	108 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	2
					Oxygen, Dissolved	2
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020202-004-S_00	Sheyenne River from its confluence with Big Coulee downstream to its confluence with the Warsing Dam watershed (ND-09020202-003-S)	40.37 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2
ND-09020202-006-S_00	Sheyenne River from Harvey Dam downstream to its confluence with Big Coulee	35.06 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Biological Indicators	2
ND-09020202-008-S_00	North Fork Sheyenne River upstream from its confluence with the Sheyenne River, excluding the Trappers Coulee and Buffalo Coulee watersheds	52.66 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020202-012-S_00	Sheyenne River from Coal Mine/Sheyenne Lakes downstream to Harvey Dam	6.19 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2
			Recreation	Fully Supporting but Threatened	Total Fecal Coliform	2
ND-09020203-001-L_00	Lake Ashtabula	5430 acres	Recreation	Not Supporting	Nutrients/Eutrophication	2
ND-09020203-002-S_00	Baldhill Creek from tributary watershed (ND-09020203-005-S) downstream to Lake Ashtabula	30.21 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
ND-09020203-004-L_00	Red Willow Lake	130 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	2
					Oxygen, Dissolved	2
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020203-004-S_00	Silver Creek, including Gunderson Creek and all tributaries	38.51 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	2
ND-09020203-007-L_00	McVille Dam	33.4 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	2
					Sedimentation/Siltation	2
					Oxygen, Dissolved	2
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020203-008-L_00	Tolna Dam	152 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	2
					Sedimentation/Siltation	2
					Oxygen, Dissolved	2
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020203-008-S_00	Unnamed tributary watershed to Baldhill Creek (ND-09020203-007-S)	16.07 miles	Recreation	Not Supporting	Total Fecal Coliform	1

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020203-012-S_00	Pickerel Lake Creek, including tributaries	28.04 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	1
			Recreation	Not Supporting	Total Fecal Coliform	1
ND-09020203-013-S_00	Unnamed tributary watershed to the Sheyenne River (ND-09020203-001-S)	33.92 miles	Recreation	Not Supporting	Total Fecal Coliform	1
ND-09020204-003-L_00	Brewer Lake	128 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	1
					Oxygen, Dissolved	1
					Sedimentation/Siltation	1
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	1
ND-09020204-003-S_00	Sheyenne River from its confluence with the Maple River downstream to its confluence with the Red River of the North	18.51 miles	Recreation	Not Supporting	Total Fecal Coliform	2
ND-09020204-004-S_00	Rush River from its confluence with an unnamed tributary watershed (ND-09020204-011-S) downstream to its confluence with the Sheyenne River	17.44 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	1
					Organic Enrichment	1
					Biological Indicators	1
ND-09020204-005-L_00	Dead Colt Creek Dam	124 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	1
					Oxygen, Dissolved	1
					Sedimentation/Siltation	1
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	1
ND-09020204-007-S_00	Rush River downstream to unnamed tributary watershed (ND-09020204-011-S)	40.92 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	1
					Organic Enrichment	1
					Biological Indicators	1

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020204-015-S_00	Sheyenne River from its confluence with tributary watershed (ND-09020204-016-S) downstream to tribuary (ND-09020204-014-S)	27.68 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	2
					Biological Indicators	2
ND-09020204-017-S_00	Sheyenne River from unnamed tributary (ND-09020204-018-S) downstream to unnamed tributary watershed (ND-09020204-016-S)	56.72 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	2
					Biological Indicators	2
ND-09020204-022-S_00	Sheyenne River from tributary near Lisbon (ND-09020204-0024-S) downstream to its confluence with Dead Colt Creek(ND-09020204-021-S)	11.37 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	1
ND-09020204-023-S_00	Tiber Coulee, including tributaries	32.33 miles	Recreation	Fully Supporting but Threatened	Total Fecal Coliform	2
ND-09020204-025-S_00	Sheyenne River from its confluence with a tributary near highway 46 (ND-09020204-025-S) downstream to its confluence with a tributary near Lisbon (ND-09020204-024-S)	46.06 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2
					Sedimentation/Siltation	2
ND-09020204-027-S_00	Sheyenne River from its confluence with a tributary watershed below Valley City (ND-09020204-028-S) downstream to its confluence with a tributary near Highway 46 (ND-09020204-026-S)	33.59 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	1
					Biological Indicators	1

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020204-034-S_00	Sheyenne River from its confluence with a tributary above Valley City, near railroad bridge (ND-09020204-038-S) downstream to its confluence with a tributary below Valley City (ND-09020204-028-S)	13.18 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	1
					Biological Indicators	1
ND-09020204-040-S_00	Sheyenne River from Lake Ashtabula downstream to its confluence with a tributary above Valley City, near railroad bridge (ND-09020204-038-S)	4.13 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	1
					Biological Indicators	1
ND-09020205-001-S_00	Maple River from its confluence with Buffalo Creek downstream to its confluence with the Sheyenne River	27.02 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2
			Recreation	Fully Supporting but Threatened	Total Fecal Coliform	2
ND-09020205-010-S_00	Maple River from its confluence with tributary near Leonard (ND-09020205-011-S) downstream to its confluence with Buffalo Creek	13.96 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2
ND-09020301-001-S_00	Red River of the North from its confluence with the Marsh River downstream to its confluence with Sandhill Creek	21.26 miles	Fish Consumption	Not Supporting	Methyl-mercury	3

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020301-002-S_00	English Coulee from its confluence with a tributary upstream from Grand Forks, ND downstream to its confluence with the Red River of the North (lower reach)	5.53 miles	Fish and Other Aquatic Biota	Not Supporting	Nutrients	2
					Sedimentation/Siltation	2
					Total Dissolved Solids	2
					Organic Enrichment	2
			Recreation	Not Supporting	Total Fecal Coliform	2
					Nutrients	2
					Sedimentation/Siltation	2
ND-09020301-007-S_00	Red River of the North from its confluence with the Sand Hill River downstream to its confluence with Cole Creek	31.13 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020301-010-S_00	Red River of the North from its confluence with Cole Creek downstream to its confluence with the Red Lake River	8.06 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020301-014-S_00	Red River of the North from its confluence with the Red Lake River downstream to its confluence with English Coulee	4.02 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020306-001-S_00	Red River of the North from its confluence with English Coulee downstream to its confluence with Grand Marais Creek	8.65 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020306-003-S_00	Red River of the North from its confluence with Grand Marais Creek downstream to its confluence with the Turtle River	12.62 miles	Fish Consumption	Not Supporting	Methyl-mercury	3

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020306-004-S_00	Red River of the North from its confluence with the Turtle River downstream to its confluence with the Forest River	31.94 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020306-005-S_00	Red River of the North from its confluence with the Forest River downstream to its confluence with the Park River	22.02 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020307-001-S_00	Turtle River from its confluence with Salt Water Coulee downstream to its confluence with the Red River of the North	30.36 miles	Fish and Other Aquatic Biota	Not Supporting	Cadmium	2
					Sedimentation/Siltation	2
					Selenium	2
					Total Dissolved Solids	2
ND-09020307-006-S_00	Turtle River from its confluence with Kelly Slough downstream to its confluence with Salt Water Coulee	0.65 miles	Fish and Other Aquatic Biota	Not Supporting	Cadmium	2
					Sedimentation/Siltation	2
					Selenium	2
					Total Dissolved Solids	2
ND-09020307-016-S_00	Kelly Slough from the control structure at Kelly Slough National Wildlife Refuge downstream to its confluence with the Turtle River	2.69 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2
ND-09020308-001-L_00	Fordville Dam	197 acres	Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020308-001-S_00	Forest River from Lake Ardoch downstream to its confluence with the Red River of the North	16.17 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2
					Sedimentation/Siltation	2
					Total Dissolved Solids	2

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020308-002-L_00	Whitman Dam	143 acres	Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020308-003-L_00	Matejcek Dam	130 acres	Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020310-001-L_00	Homme Dam	194 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	2
					Sedimentation/Siltation	2
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2
ND-09020310-001-S_00	Park River from its confluence with Salt Lake outlet (ND-09020310-009-S) downstream to its confluence with the Red River of the North	15.06 miles	Fish and Other Aquatic Biota	Not Supporting	Biological Indicators	2
					Sedimentation/Siltation	2
					Total Dissolved Solids	2
					Organic Enrichment	2
ND-09020310-010-S_00	Park River from its confluence with a tributary east of Grafton, ND (ND-09020310-012-S) downstream to its confluence with the outlet from Salt Lake (ND-09020310-009-S)	14.68 miles	Fish and Other Aquatic Biota	Not Supporting	Sedimentation/Siltation	2
					Total Dissolved Solids	2
					Organic Enrichment	2
ND-09020310-013-S_00	Park River from the confluence of the South Branch Park River and the Middle Branch Park River downstream to its confluence with a tributary east of Grafton, ND (ND-09020310-012-S)	6.83 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	2
					Total Dissolved Solids	2
					Organic Enrichment	2

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020311-001-S_00	Red River of the North from its confluence with the Park River downstream to its confluence with a small tributary north of Drayton, ND	19.02 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020311-003-S_00	Red River of the North from its confluence with a small tributary north of Drayton, ND downstream to its confluence with Two River	30.3 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020311-005-S_00	Red River of the North from its confluence with Two River downstream to its confluence with the Pembina River	17.99 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020311-007-S_00	Red River of the North from its confluence with the Pembina River downstream to the US-Canada border	3.0 miles	Fish Consumption	Not Supporting	Methyl-mercury	3
ND-09020313-002-L_00	Renwick Dam	220 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	1
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	1
ND-09020313-006-S_00	Tongue River from its confluence with a tributary NE of Cavalier, ND downstream to its confluence with Big Slough	22.54 miles	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Sedimentation/Siltation	1
ND-09020313-007-L_00	Lake Upsilon	414 acres	Fish and Other Aquatic Biota	Fully Supporting but Threatened	Nutrients/Eutrophication	2
					Sedimentation/Siltation	2
					Oxygen, Dissolved	2
			Recreation	Fully Supporting but Threatened	Nutrients/Eutrophication	2

Table VI-2. 2004 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota (cont.)

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority[1]
ND-09020313-011-L_00	Armourdale Dam	79.8 acres	Fish and Other Aquatic Biota	Not Supporting	Nutrients/Eutrophication	1
					Oxygen, Dissolved	1
					Sedimentation/Siltation	1
			Recreation	Not Supporting	Nutrients/Eutrophication	1
ND-09020313-021-S_00	Pembina River from its confluence with a tributary west of Neche, ND downstream to its confluence with the Tongue River	32.72 miles	Recreation	Fully Supporting, but Threatened	Total Fecal Coliform	2

[1] Priority 1 are those AUs which are scheduled for TMDL development in the next two years. Priority 2 are those AUs which are scheduled for TMDL development in the next 10 y AUs listed as priority 3 are listed as impaired for fish consumption due to methyl-mercury. These AUs are a low priority for the state due to complexities related to the fate and tran: methyl-mercury and due to the interstate and international nature of atmospheric mercury sources. It is the department's recommendation that EPA take the lead in developing merc TMDLs.