


Contract Report 2003-06

Sediment and Water Quality Monitoring for the Vermilion River and Little Vermilion River Watersheds

by
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Prepared for the
**Conservation 2000
Vermilion River Ecosystem Partnership**

April 2003



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A Division of the Illinois Department of Natural Resources

Sediment and Water Quality Monitoring for the Vermilion River and Little Vermilion River Watersheds

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Abstract

The Vermilion River and Little Vermilion River watersheds lie in seven counties in east-central Illinois and west-central Indiana. The drainage areas of the Vermilion River and Little Vermilion River at their confluences with the Wabash River are 1434 and 244 square miles, respectively. The Vermilion River meets the Wabash River at river mile 257.4 and has three tributaries: North Fork, Middle Fork, and Salt Fork. The Little Vermilion River is a direct tributary of the Wabash River at river mile 247.8. Lake Vermilion, a 660-acre impounded reservoir located on the North Fork Vermilion River, is the main municipal drinking water supply for the City of Danville, Illinois. The Little Vermilion River is the main tributary for the 63-acre Georgetown Reservoir, the municipal drinking water supply for the community of Georgetown, Illinois. Approximately 88 percent of the watersheds for both rivers are in agricultural production with approximately 5 percent in forest/woodlands and wetlands.

The Illinois State Water Survey (ISWS) conducted a two-year watershed monitoring study of the Vermilion River and Little Vermilion River watersheds for the Vermilion River Ecosystem Partnership–Conservation 2000 Ecosystem Program. The purpose was to assist the partnership by establishing a baseline of hydrologic and water quality data to provide a better understanding of the cumulative impacts of future best management practices implemented in the watersheds.

The ISWS established a streamgaging station on the Little Vermilion River near Sidell and monitored the hydrology, sediment, and nitrate-nitrogen (nitrate-N) there and at three U.S. Geological Survey (USGS) streamgaging sites in the Vermilion River watershed (Middle Fork Vermilion River above Oakwood, North Fork Vermilion River near Bismarck, and Vermilion River near Danville). Annual sediment loads for the three Vermilion River watershed stations were approximately three times higher than loads at the Little Vermilion station. The Middle Fork station had the highest sediment loads among the three Vermilion River stations for both project years. The North Fork station had the highest annual nitrate-N load for both monitoring years. In general, annual sediment and nitrate-N loads were lower during the first monitoring year, due to below average spring season runoff. Sampling for three pesticides (atrazine, alachlor, and metolachlor) was done on a weekly basis from June to October 2002. Atrazine was the only pesticide detected during this period. The highest level sampled was 20.93 micrograms per liter ($\mu\text{g/L}$) and, and all others were below 2.65 $\mu\text{g/L}$.

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Sediment and Water Quality for the Vermilion River and Little Vermilion River Watersheds

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Introduction

The Vermilion River and Little Vermilion River watersheds lie in seven counties in east-central Illinois and west-central Indiana (figure 1). The Vermilion River is composed of three major tributaries (North Fork, Middle Fork, and Salt Fork). Lake Vermilion, a 660-acre impounded reservoir located on the North Fork Vermilion River, is the main municipal drinking water supply for the City of Danville, Illinois. The Middle Fork Vermilion River is the only designated National Wild and Scenic River in the State of Illinois. The Little Vermilion River is the main tributary for the 63-acre Georgetown Reservoir, which is impounded for a municipal drinking water for the community of Georgetown, Illinois. Approximately 88 percent of the study area is in agricultural production with approximately 5 percent in forest/woodlands (mostly concentrated on the steeper slopes of the Middle Fork, Salt Fork, and North Fork) and wetlands (IDNR, 1999a). The drainage areas of the Vermilion River and Little Vermilion River at their confluence with the Wabash River are 1434 and 244 square miles (mi²), respectively. It should be noted, that the Little Vermilion River is not a tributary to the Vermilion River.

The Illinois Department of Natural Resources (IDNR) Conservation 2000 Vermilion River Ecosystem Partnership is a group of public and private members interested in improving the ecosystem in the Vermilion River and Little Vermilion River watersheds. To better understand the cumulative impacts of future best management practices (BMPs) implemented in the watersheds, the partnership wanted to establish a 2-year baseline hydrologic and water quality dataset. Since this dataset documents stream conditions for a narrow period of time, the range of values collected is limited by the climatic variability experienced during the 2-year study period. Therefore, any post-BMP project study efforts will need to take this into account when comparing data with these pre-BMP project study results. The Illinois State Water Survey (ISWS) received a grant through the Vermilion River Ecosystem Partnership for Conservation 2000 Ecosystem Program funds to conduct a two-year monitoring study of the two watersheds.

This technical report is the product of that two-year hydrologic and water quality monitoring study. The report is organized into three sections: Introduction, Background, and Hydrologic and Water Quality Monitoring. The background discusses the physical characteristics of the watershed. The hydrologic and water quality monitoring section is subdivided into two sections. Hydrologic monitoring discusses the hydrologic data collection methods and results of the streamflow data collection over the two years (2000–2002). The water quality monitoring section is further subdivided into three

sections: a) sediment monitoring: data collection of suspended sediment samples for the two-year study period; b) nitrate-nitrogen (nitrate-N) monitoring: collection of nitrate-N samples for the two-year study period; and c) pesticide monitoring: sample collection of pesticide samples during summer 2002.

Acknowledgments

The Vermilion River Ecosystem Partnership was the principal sponsor of this project. The author gratefully acknowledges support of Kevin Green, Chairman, and several Vermilion County Soil & Water Conservation District staff. This project was funded by the IDNR Conservation 2000 Ecosystem Program and administered by Paula Martel, whose cooperation and assistance throughout the project are greatly appreciated. The author also would like to express appreciation to Phillip Morgan, District Director, Danville Sanitary District, for access to plant property for sample collection from the Vermilion River throughout this project.

The author wishes to acknowledge the significant contributions of the following ISWS project staff toward the completion of this report. Kevin Rennels, field technician, showed extreme dedication to collecting the best possible data. Stacy Curtis managed the data under the skilled guidance of Amy Russell and Bianca Rios. Several ISWS staff also provided project or report assistance in various capacities: Bill Bogner, Sandy Jones, Jim Slowikowski, and Joshua Stevens. Erin Bauer produced all the maps used in this report, and her assistance and skills are gratefully acknowledged. The commitment of all these staff toward the successful completion of all ISWS projects always is appreciated.

The author gratefully acknowledges the laboratory analyses performed by the following ISWS chemists and technicians: Loretta M. Skowron, Sofia Lazovsky, RuthAnn Nichols, Lauren F. Sievers, Daniel L. Webb, and Yi Han. Patti Hill and Becky Howard prepared the report, which was edited by Eva Kingston. Linda Hascall provided guidance and expert advice on all illustrations. This report was reviewed by several ISWS staff, and their helpful comments are truly appreciated.



Figure 1. Location of the Vermilion River and Little Vermilion River watersheds and precipitation and monitoring stations

Background

The Vermilion River and Little Vermilion watersheds are contained within an Illinois Department of Natural Resources (IDNR) Critical Trends Assessment Program (CTAP) Assessment Area. This designation has resulted in a four-volume report (IDNR, 1999 a–d) on the geology, water resources, living resources, socio-economic profile, environmental quality, and archaeological resources for the area. These volumes are available from the IDNR Clearinghouse at (217) 782-7498 or by email: clearing@dnrmail.state.il.us. The following sections briefly summarize selected discussions located in that CTAP report. The reader is encouraged to check those volumes for more detail or topics not covered here.

Throughout this report, the Vermilion River and Little Vermilion River will be generally referred to as the “Vermilion River” unless a specific issue unique to each watershed requires them to be discussed separately.

Watershed Physical Characteristics

The Vermilion River and Little Vermilion River watersheds lie in two states in seven counties (Illinois: Champaign, Ford, Iroquois, Livingston, and Vermilion Counties; Indiana: Benton, and Warren Counties). Both rivers are tributaries to the Wabash River, which itself is a tributary to the Ohio River. Figure 1 shows the watersheds with subbasins, various municipalities, and county/state borders.

The climate in these watersheds is typically continental with changeable weather and a wide range of temperatures. The 30-year average annual precipitation (1971–2000) ranges from 36.8 inches near Hoopeston (north) to 41.0 inches at Urbana (west) and 41.0 inches at Danville (southeast). “The wettest year of record since 1889 at Urbana was 1993 (58.54 inches), the year of the great flood along the Mississippi River and its tributaries. The driest year was 1894 (23.95 inches)” (IDNR, 1999b).

Figure 2 shows that “the Vermilion River Assessment Area is located within the physiographic region of the Bloomington Ridged Plain, a division of the Till Plains section of the Central Lowland Physiographic Province (Leighton et al., 1948). The topography of this region is characterized by wide stretches of nearly flat to gently rolling till plains, crossed by low, broad, and poorly-developed end moraines. The till plains and moraines are features that were formed under the influence of the most recent, Wisconsin Episode of glaciation, with the tills being a crushed mixture of bedrock and sediment deposited as the glaciers retreated from the landscape” (IDNR, 1999b). “The moraine ridges generally trend northwest to southeast, then continue to loop around to the east. The Rantoul Moraine trends northeast-southwest; the Urbana Moraine trends nearly north-south, but ultimately its trend turns eastward and generally parallels the east-west part of the loop of other moraines” (IDNR, 1999a).

Figure 3 shows 16 soil associations within the study areas. The dominant associations are Varna–Elliott–Ashkum (24%), Catlin–Flanagan–Drummer (22%),

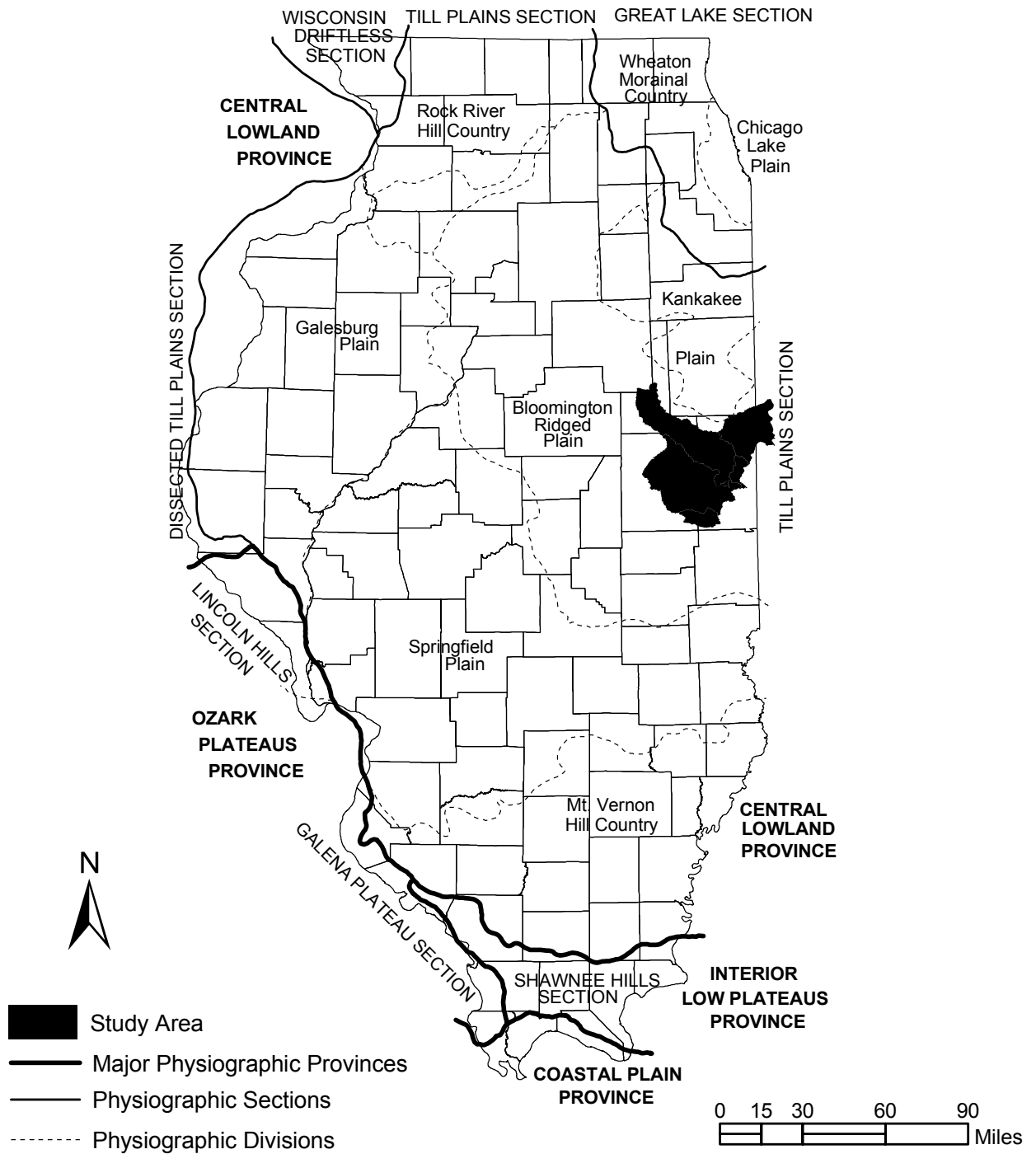
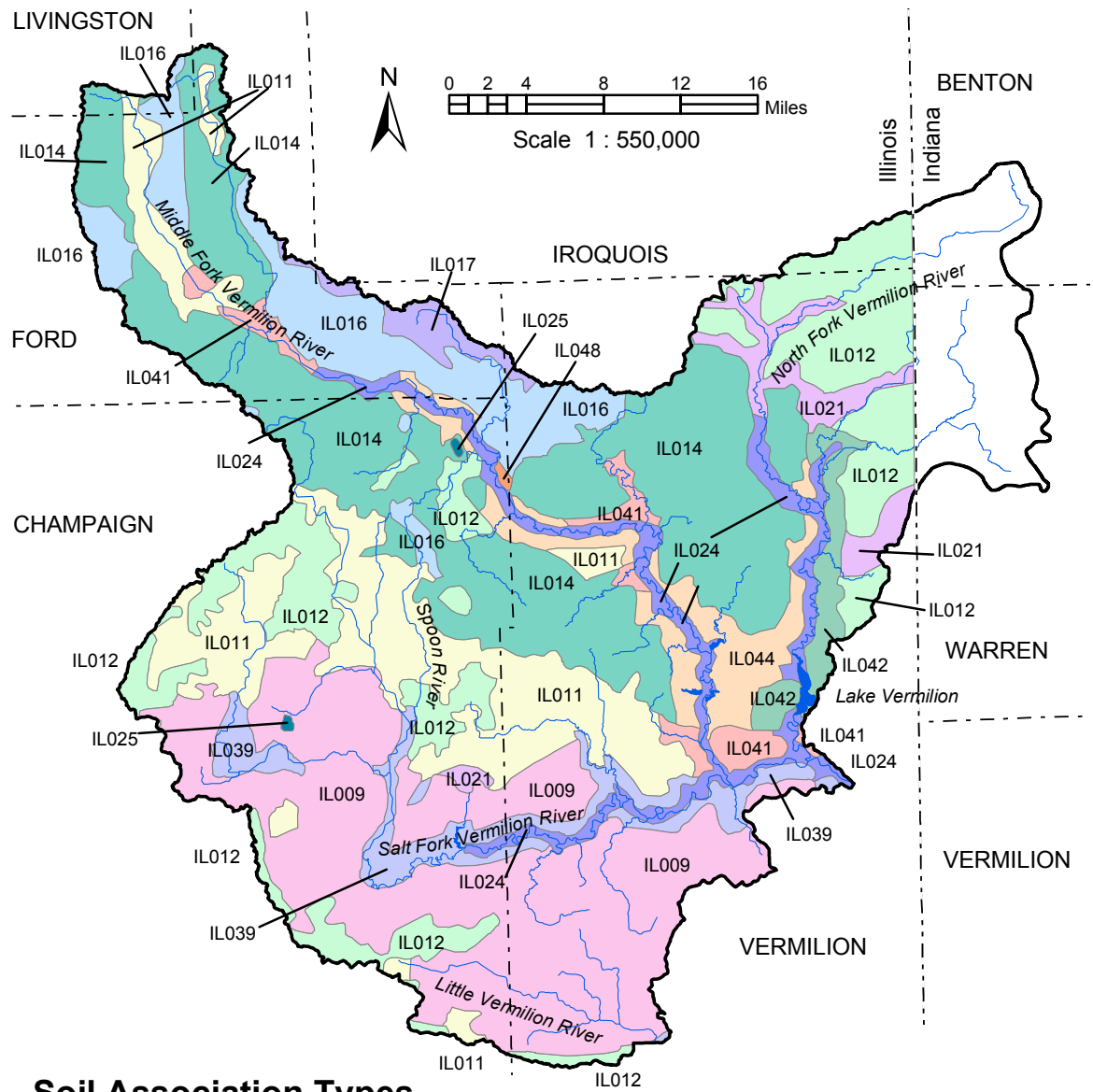


Figure 2. Location of study area in the physiographic divisions in Illinois



Soil Association Types

- IL009 : Catlin-Flanagan-Drummer
- IL011 : Plano-Proctor-Worthen
- IL012 : Saybrook-Dana-Drummer
- IL014 : Varna-Elliott-Ashkum
- IL016 : Swygert-Bryce-Mokena
- IL017 : Clarence-Rowe
- IL021 : Jasper-LaHogue-Selma
- IL024 : Lawson-Sawmill-Darwin
- IL025 : Houghton-Palms-Muskego
- IL039 : Birkbeck-Sabina-Sunbury
- IL041 : St. Charles-Camden-Drury
- IL042 : Dodge-Russell-Miami
- IL044 : Morley-Blount-Beecher
- IL048 : Casco-Fox-Ockley

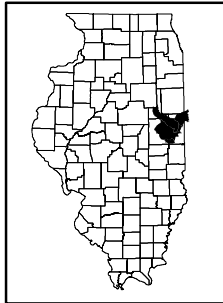


Figure 3. Map of soil associations in study area (ISGS, 1984)

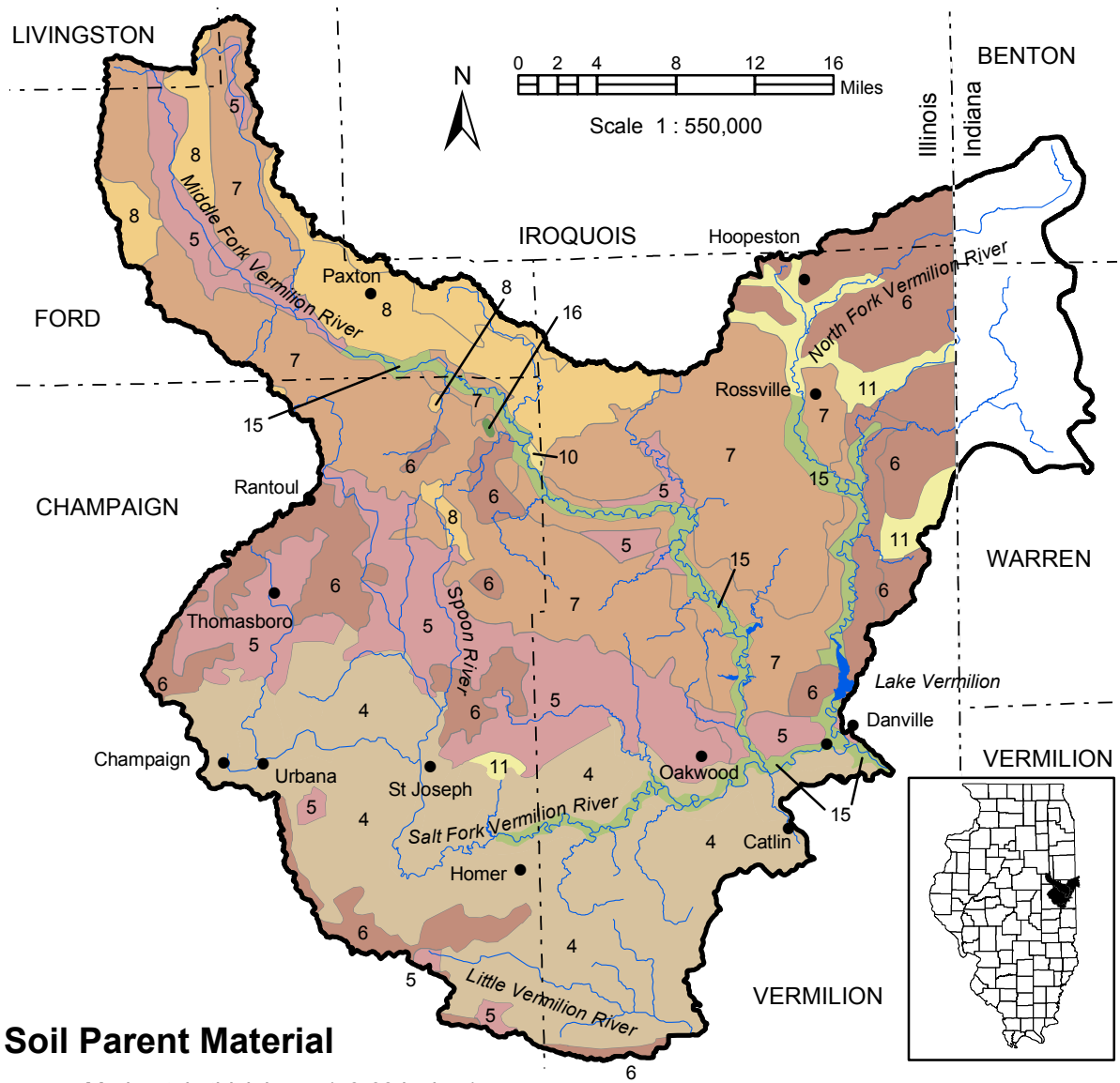


Figure 4. Location of type and thickness of soil parent material in study area

Plano–Proctor–Worthen (13%), Saybrook–Dana–Drummer (13%), and Swygert–Bryce–Mokena (7%). The soils generally can be divided into three major soil areas closely associated with the distribution of the parent material (figure 4). The extent of each soil area is roughly associated with the major tributary watersheds in the study area. The first soil area is in the north-central and northwest portion of the study area in the Middle Fork watershed. The main soil associations in this area are Varna–Elliott–Ashkum and Swygert–Bryce–Mokena. These soils are somewhat poorly to moderately well drained with medium to very high surface runoffs and slopes ranging from 0 to 20 percent. They formed on thin loess deposits in clay till, silty clay, loam till, and lacustrine sediments in the undissected parts of the Wisconsin Till plain.

The North Fork watershed roughly outlines the extent of the second soil area, which is comprised of the Saybrook–Dana–Drummer, Jasper–LaHogue–Selma, and Dodge–Russell–Miami soil associations. Except for the Jasper–LaHogue–Selma group, the soils are considered well drained with low to high surface runoff and slopes that range from 0 to 25 percent. These soils formed on thin loess (10–40 inches) or other silty material. The Jasper–LaHogue–Selma soils are characterized by low slopes (0–5%), somewhat poor drainage, and low to medium runoff. They were formed on outwash plains and stream terraces of loam and sandy stratified material.

The third soil area covers almost the entire southern portion of the study area, essentially the Salt Fork and Little Vermilion River watersheds. The Catlin–Flanagan–Drummer and Plano–Proctor–Worthen soil associations dominate this area. They are typically characterized as soils found in outwash plains and stream terraces and are predominantly poorly drained with low to negligible runoff. However, the Plano–Proctor–Worthen association, located in the upland areas of the Salt Fork with slope gradients up to 15 percent, is well drained, and has moderate surface runoff. All these soils formed in thick (>60 inches) loess or other silty textured material.

Since the late 1800s and early 1900s, the drainage of the Vermilion River watershed has been dominated by the channelization of streams into networks of drainage ditches and extensive artificial drainage tiles from the western portion of the watershed (Champaign County). An estimated “65 percent of Champaign County is underlain by drainage tiles to improve drainage” (L. Wendt, personal communication, June 1996). This improved drainage made the land available for high-yield agricultural production in the watershed.

Stream slope is an indicator of erosion and stream velocity. Figure 5 shows the stream profiles for the Vermilion River, Little Vermilion River, and selected tributaries. Each tributary is plotted relative to other tributaries, and the two major reservoirs in the area (Lake Vermilion and Georgetown Reservoir) also are shown. Slope data were retrieved from the Illinois Streams Information System (ISIS), Version 3.0, in February 1999. Table 1 shows the overall slope of the Vermilion River to be 0.063 percent. The tributary with the greatest slope, 0.214 percent, is the Spoon River in the Upper Salt Fork watershed. The next greatest slope is 0.078 percent on the North Fork. The least slope is 0.055 percent on the Little Vermilion River.

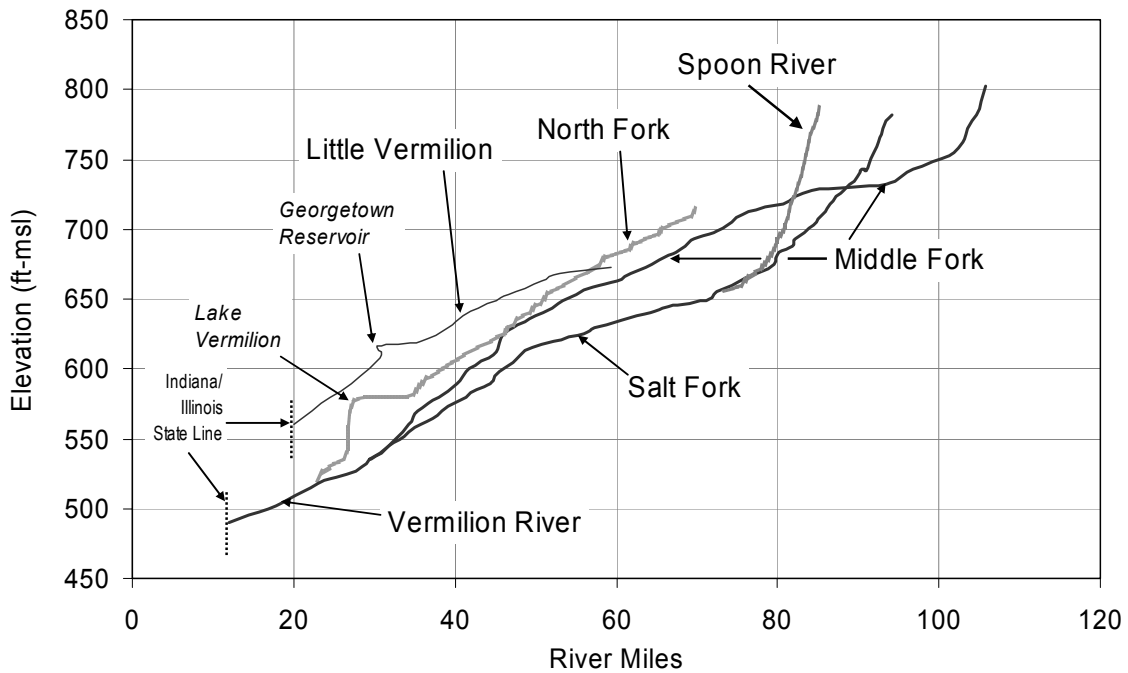


Figure 5. Stream profiles of the Vermilion River, Little Vermilion River, and selected tributaries

Table 1. Mean Stream Slope of the Vermilion River, Little Vermilion River, and Selected Tributaries

<i>Location</i>	<i>Mean slope (%)</i>
Vermilion River	0.063
North Fork	0.078
North Fork above Lake Vermilion	0.071
Middle Fork	0.066
Salt Fork	0.072
Spoon River	0.214
Little Vermilion River	0.055
Little Vermilion above Georgetown Reservoir	0.043

The major land cover of the Vermilion River watershed area is agricultural land (88.8%) with forest/woodland, urban/built up wetland, and lakes/streams and barren land comprising 4.3, 4.5, 0.9, and 1.5 percent, respectively (IDNR, 1999a). Approximately 76 percent is cropland. Agricultural crops covered 80 percent of the region in 1995, and only slightly more than 72 percent in 1925 (figure 6).

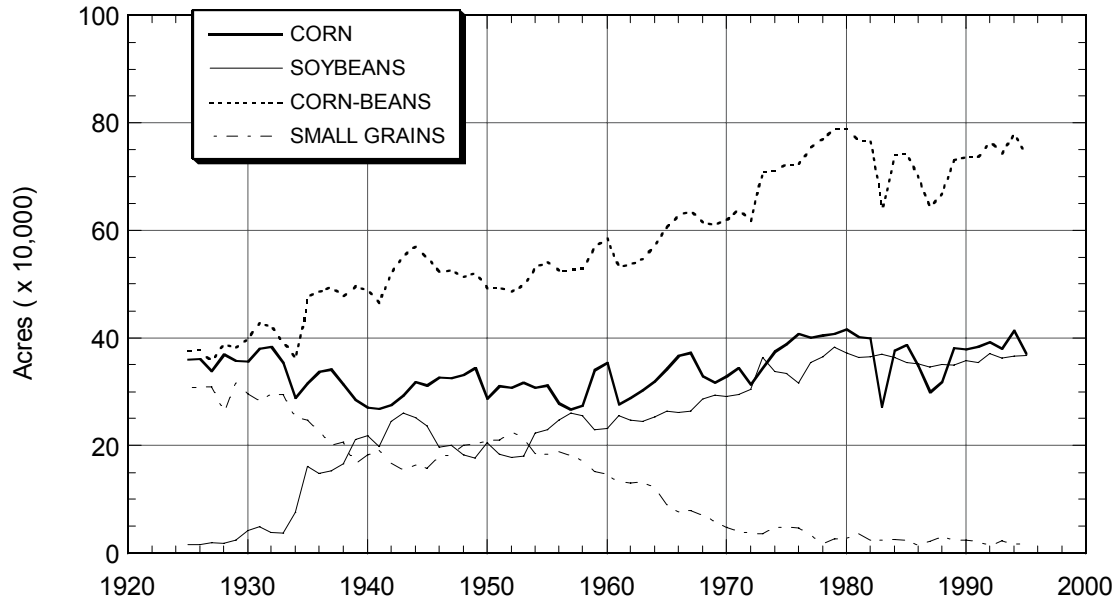


Figure 6. Acreages of selected crops in the Vermilion River assessment area based on Illinois Agricultural Statistics data

The dominant crops in 1925 were corn (360,838 acres) and small grains (308,503 acres), whereas the dominant crops in 1995 were corn (372,035 acres) and soybeans (368,330 acres). Corn acreage has averaged 340,066 acres from 1925–1995. Soybean acreage increased from 15,921 acres in 1925 to 368,330 acres in 1995. The increase in soybean acreage mirrors a decrease in small grain acreage during the same period of record. Small grains decreased from 308,503 acres in 1925 to 18,759 acres in 1995. Corn and soybeans were planted on equal areas, accounting for 98 percent of the crop acreage in the area in 1995, whereas corn and small grains dominated the crop acreage (97%) in 1925 (IDNR, 1999b).

Hydrologic and Water Quality Monitoring

A watershed monitoring network was established to provide streamflow, suspended sediment, and nitrate-N data for the Vermilion River and Little Vermilion River watersheds to establish a baseline dataset to document progress of future watershed management practices. The network was composed of four sampling stations located in Vermilion County, Illinois. The ISWS installed streamgaging and automatic sampling equipment on the Little Vermilion River near Sidell. Stage was recorded continuously at this station, and discharge measurements were made periodically. Suspended sediment and nitrate-N samples were collected weekly, and efforts were made to sample during storm events. The other three stations were located at U.S. Geological Survey (USGS) streamgaging sites in the Vermilion River watershed. Water levels were noted weekly, and mean daily streamflow data were retrieved from the USGS. Water samples were collected manually and analyzed for suspended sediment and nitrate-N. Table 2 shows the hydrologic station number, name, location, and drainage area.

**Table 2. Streamflow and Stage Monitoring Stations
in the Vermilion River and Little Vermilion River Watersheds**

<i>ISWS station number</i>	<i>Location</i>	<i>Drainage area</i>	
		<i>(mi²)</i>	<i>(acres)</i>
701	Little Vermilion River County @ County Road 300N, Vermilion	69.6	44,500
702	Middle Fork Vermilion River, USGS Station #03336645, above Oakwood	440.8	282,118
703	North Fork Vermilion River, USGS Station #03338780 near Bismarck, Vermilion County	264.0	168,934
704	Vermilion River, USGS Station #03339000 near Danville, Vermilion County	1274.7	815,360

Hydrologic Monitoring

The monitoring of hydrologic data required the collection of continuous streamflow records for the entire study period (April 2000–March 2002) as well as precipitation records. This was necessary to establish the contribution of suspended sediment and nitrate-N from each watershed that has a monitoring station. The methods and procedures used to collect hydrologic data at each monitoring station are discussed in the following sections.

Precipitation

Precipitation data for selected locations around the study area were retrieved from the Midwestern Regional Climate Center database, which is operated by the ISWS. Figure 1 shows the locations of the six precipitation stations selected from within and around the Vermilion watershed: Rantoul, Hoopeston, Danville, Danville Plant, Sidell, and Urbana.

Figure 7 presents the monthly precipitation totals for all stations. Figure 7a presents data during the first project year (April 2000–March 2001), and figure 7b presents second-year data (April 2001–March 2002). During the first project year, the lowest monthly precipitation was at Rantoul in March 2001 (0.57 inches), and the highest monthly precipitation was at Danville in June 2000 (7.16 inches). During January and March 2001, precipitation at all stations totaled an inch or less. May and June 2000 were the only months with precipitation greater than 4 inches at all stations. The highest precipitation amount recorded for the second project year, as well as for the two-year study period, was 8.88 inches in October 2001 at Hoopeston. The lowest precipitation amount, 1.09 inches, was at the Urbana station. Precipitation at all stations exceeded one inch for the entire year (figure 7b). October 2001 was the only month in which all stations exceeded 4 inches of precipitation; however, precipitation for four of the six stations also exceeded 4 inches in July 2001.

Table 3 shows the annual precipitation and the 30-year means for the six stations. During the first project year, precipitation at all stations was below to much below normal, ranging in values from 0.85 to 7.59 inches below normal and averaging 4.91 inches below normal. In contrast, precipitation the second project year at three stations was somewhat below normal (Rantoul, Sidell, and Urbana with deficits of 0.75, 1.39, and 1.89 inches, respectively), and three stations were much above normal (Hoopeston, Danville, and Danville Plant with 9.43, 3.84, and 4.38 inches, respectively). The average annual precipitation for all stations was 2.27 inches above normal. The first project year was much drier than the second.

Stream Stage

The “stage” of a stream is the measurement of the water surface of a stream from an arbitrary datum. The stage record is collected continuously and makes it possible to determine the volume of water carried by a stream past a gaging station. Through the application of a stage discharge rating curve, the continuous stage is converted to streamflow.

The gaging station installed on the Little Vermilion River near Sidell for this project was outfitted with identical equipment and programs to those at other ISWS gaging stations. The mean daily stage values at this station appear in appendix A. The following detailed description of the equipment was adapted from Demissie et al. (2001):

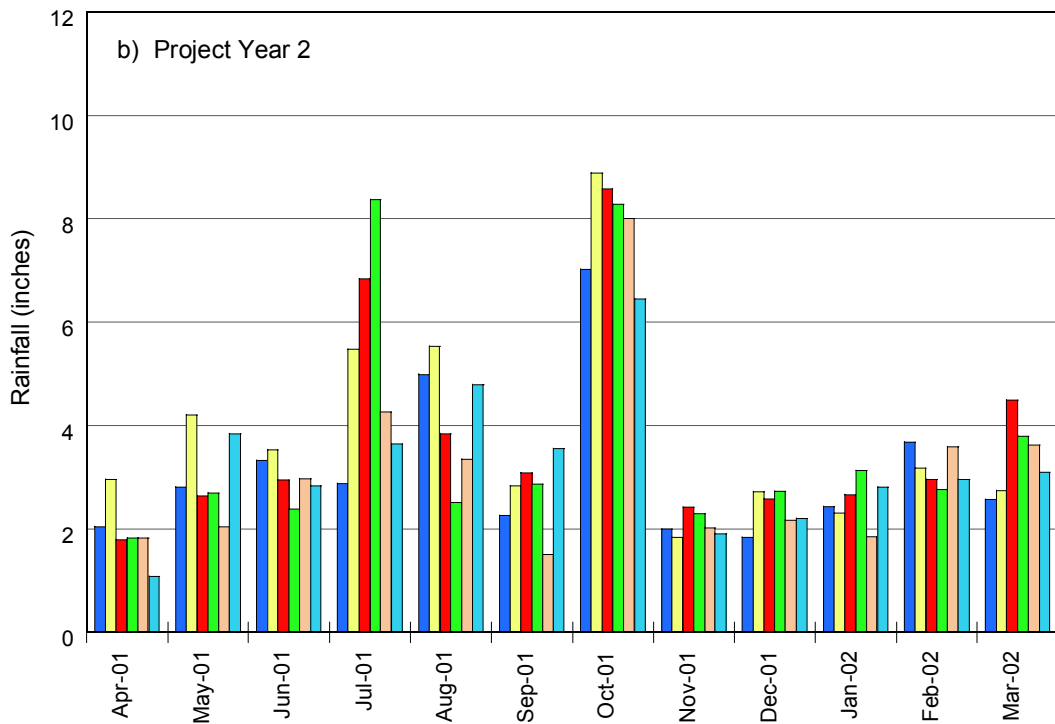
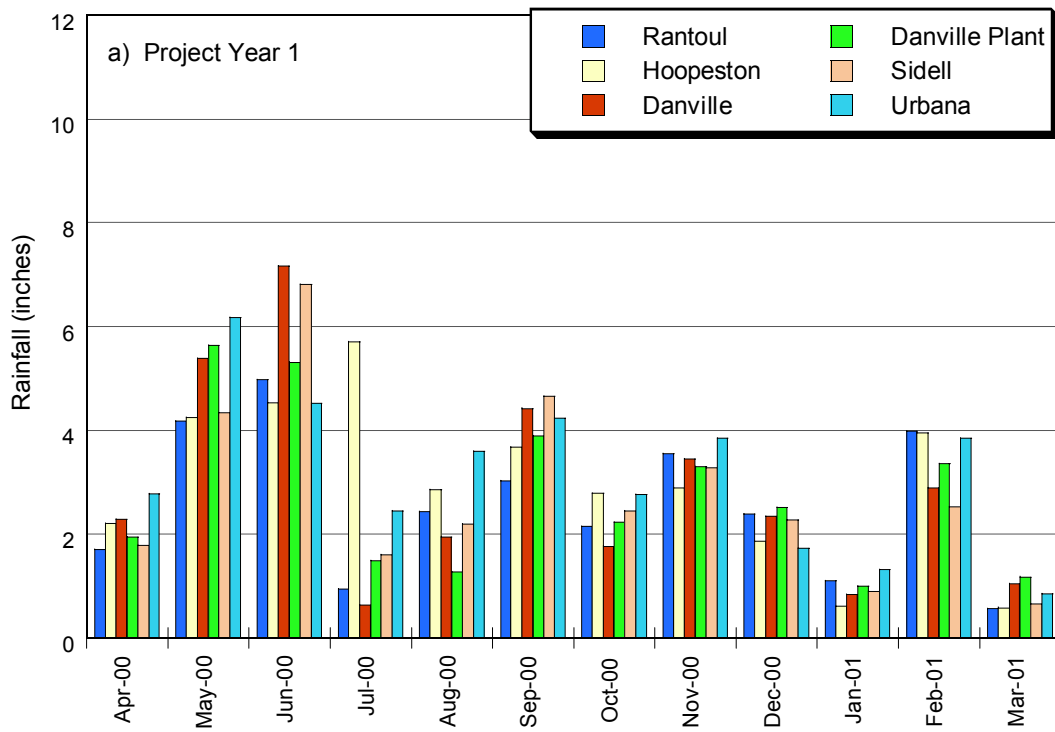


Figure 7. Monthly precipitation, April 2000–March 2002

**Table 3. Annual and 30-year (1971–2000)
Mean Precipitation (inches) for Selected Stations**

<i>Project year</i>	<i>Rantoul</i>	<i>Hoopeston</i>	<i>Danville</i>	<i>Danville plant</i>	<i>Sidell</i>	<i>Urbana</i>
1	31.00	35.91	34.20	33.11	33.45	38.1
2	37.84	46.19	44.80	43.63	37.20	39.17
<i>30-Year mean</i>	38.59	36.76	40.96	39.25	38.59	41.05

Monitoring Equipment. The stage was determined using an H-310 pressure transducer. This vented, SDI-12 pressure transducer is capable of primary record accuracies of 0.01foot, as determined by the USGS. The H-310 is vented to the atmosphere so that all pressure measurements are equilibrated to the current atmospheric pressure, and only the water pressure is determined. The transducer is located in a housing of ISWS design, made of 2-inch steel pipe mounted on a 5-foot galvanized steel post driven into the streambed until there is approximately 6 inches of exposure above the streambed (figure 8).

The Campbell Scientific CR10X is a sophisticated data logger/controller capable of receiving the SDI-12 protocol from the pressure transducer, recording the data, and, using data within a set of programmed logic sequences, controls external peripherals, such as the automated pump sampler described below. The CR10X records the data but also writes the data to an additional storage module (SM192). This redundancy was added in an effort to minimize the chance of lost data and to facilitate the download of data during inclement weather or periods of high flow where time is at a premium. The CR10X records stage and water temperature every 15 minutes. Also included in each 15-minute reading is an output of the pump sampler status as to whether a sample was taken and which condition or flags were set high to initiate a sample.

The daily and storm event samples are collected using an automated pump sampler, model 6700 manufactured by ISCO Inc., Lincoln, Nebraska. The 6700 uses a peristaltic pump that eliminates any contact between the pump mechanism and the sample being collected. The model 6700 has 24 bottles of 1000 ml capacity and was programmed to collect 750 ml samples.

Every ISWS monitoring site has two shelters. One shelter houses the dry air system for the H-310, 12-volt gel-cell power supply, and the CR10X and SM192, both of which are contained in a NEMA 4X fiberglass enclosure. Figure 9 shows the CR10X and storage module within the shelter. The second enclosure at each site is a 55-gallon steel drum that houses the ISCO 6700 sampler and is located over the thalweg of the channel.

In addition to the equipment located at the site, each gage was supplied with a second battery, SM192, and ISCO 6700 sample tray. This allowed the field technician to simply cycle the components in and out of a station during routine field visits and provided uninterrupted data collection.



Figure 8. Pressure transducer installed in channel



(a)



(b)

**Figure 9. Typical instrumentation located at the Little Vermilion station:
(a) streamgage data logger, and (b) ISCO automatic pump sampler**

Station Site Descriptions. The following is a detailed description of the station locations, data and/or equipment used, and period of record. Figure 10 shows several views of each station.

Little Vermilion River near Sidell, IL (Station 701). The Little Vermilion River station was the only site installed by the ISWS. The station was installed on March 21, 2000, and stage record collection was initiated at that time. Sediment sampling and nitrate-N was initiated on March 09, 2000. The gage was located on the bridge at the intersection of Vermilion County Road 300 N and the Little Vermilion River, approximately 0.75 miles east of Sidell, Illinois. The shelter housing and ISCO pump sampler were located on the downstream bridge rail. The pressure transducer was located on the downstream side of the furthest downstream bridge pier near the left descending bank.

Middle Fork Vermilion River above Oakwood, IL (Station 702). The USGS station 03336645 is located within the boundaries of Kickapoo State Park 150 feet upstream from the bridge at the intersection of the Middle Fork Vermilion River and Kickapoo State Park Road. The site is a mile upstream from Interstate Highway 74 bridge and 2 miles northeast of Oakwood, Illinois, on the right descending bank. The station has a period of record from October 1978 to present. The gage datum is 544.42 feet above mean sea level (ft-msl), as determined by the IDNR, Office of Water Resources.

North Fork Vermilion River near Bismarck, IL (Station 703). The USGS station 03338780 is located near the bridge at the intersection of Vermilion County Road 2750 N. The site is 1.8 miles west of Bismarck, Illinois, 1.9 miles downstream from the Panther Creek confluence, and 6.6 miles downstream from the confluence of the Middle Branch of the North Fork Vermilion River. The gage datum is 594 ft-msl. This elevation was taken from a topographic map. The period of record is from June 1970 to September 1973 (low-flow partial record station) and from October 1988 to present.

Vermilion River near Danville, IL (Station 704). The USGS station 03339000 is located near the bridge at the Danville sewage-treatment plant. The gage is on the right descending bank 1.7 miles upstream from Stoney Creek, 2.2 miles southeast of Danville. The gage datum is 503.03 ft-msl. The U.S. Army Corps of Engineers leveled the datum. The period of record encompasses October 1914 to September 1921 and June 1928 to present.

Streamflow

Streamflow data are generated from the 15-minute stage record at a gaging station. The stage data are converted to discharge (streamflow) by applying a stage-discharge rating curve. The calibration is developed by taking several detailed field measurements of the streamflow at known stages. The procedure was used at the ISWS station 701 on the Little Vermilion River near Sidell.

Methods used in this study for determining stream discharge followed established USGS procedures as outlined by Rantz (1982a, 1982b). All discharge measurements for this project were made using standard USGS Price AA current meters. For shallow low-flow conditions, a

USGS pygmy current meter was substituted. Both mechanical meters are equipped with a vertical axis rotor or bucket wheel with six stainless steel cups. Water velocity is determined by counting the number of revolutions of the rotor during a measured time interval of at least 40 seconds.

Stream discharge is determined by measuring the mean velocity at approximately 20–25 verticals along a stream cross section. Each vertical represents the velocity of a flow area (substation), which is defined as the sum of half the distance between verticals by the water depth at the vertical. At each vertical the velocity is sampled at 20 and 80 percent of the total depth (for total depths ≥ 2.5 feet) or at 60 percent of the total depth (for total depths < 2.5 feet). The average of the 20 and 80 measurements or the single 60 percent measurement is assumed to be the mean velocity for that subsection. Each subsection discharge is calculated by multiplying the average velocity by the flow area, and then the sum of all the subsections equals the total discharge of the stream cross section. Every discharge is then plotted against the corresponding stage at which the discharge measurement occurred. After sufficient measurements have been collected, a curve is developed to express the relationship between stage and discharge. Using this stage-discharge curve, the stage data files are then converted to discharge. The discharge data can then be used to develop nitrate-N and sediment load data.

Streamflow Data. The period of record for this study was April 2000–March 2002 and is referred to as Project Year 1 (April 2000–March 2001) and Project Year 2 (April 2001–March 2002). Streamflow was computed, as described above for Little Vermilion River (701). The stage-discharge rating curve and the mean daily discharge data for the station are shown (appendices B and C). The remaining stations (Middle Fork 702, North Fork 703, and Vermilion River 704) are USGS sites (see table 2); therefore, mean daily discharge records were retrieved for these stations from the USGS–Illinois District (USGS, 2002a and b).

Figures 11 and 12 present monthly discharge data for all four stations by project year, April 2000–March 2001 and April 2001–March 2002, respectively. It should be noted that Little Vermilion is the only station from this study that monitors the Little Vermilion River watershed. The three other stations monitor the Vermilion River watershed (Middle Fork, North Fork, and Vermilion River). Vermilion River shows the highest discharge for every month (figures 11 and 12). This is because the watershed area being monitored is an order of magnitude larger than the two upstream stations (Middle Fork and North Fork). Little Vermilion consistently shows the lowest monthly discharge because it has the smallest watershed area being monitored (69.6 mi^2). As can be seen in figure 11, higher discharges occurred during April–June 2000, and February and March 2001. Some of the lowest discharges for the entire study period occurred during August–October 2000 (Project Year 1). February 2001 was the month with the highest discharges for Project Year 1. Figure 12 shows that monthly discharge values were generally higher during Project Year 2. Discharges were moderate during April–June 2001, lower for July–September 2001, increased during fall months (October–November 2001), and stayed generally the same for the remainder of the project year. Discharges were highest in October 2001, February 2002, and March 2002 were the highest discharge months.



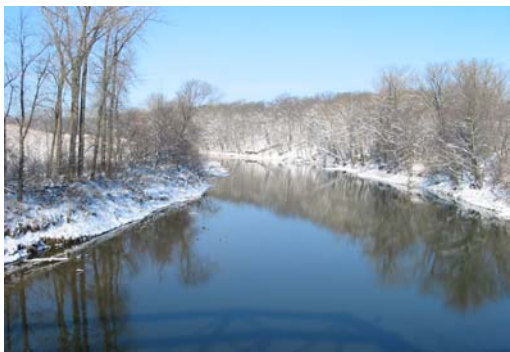
Station 701: Little Vermilion River near Sidell



Station 702: Middle Fork Vermilion River in Kickapoo Park above Oakwood



Station 703: North Fork Vermilion River Near Bismarck



Station 704: Vermilion River near Danville

Figure 10. Upstream (left) and downstream (right) views of stations in the study

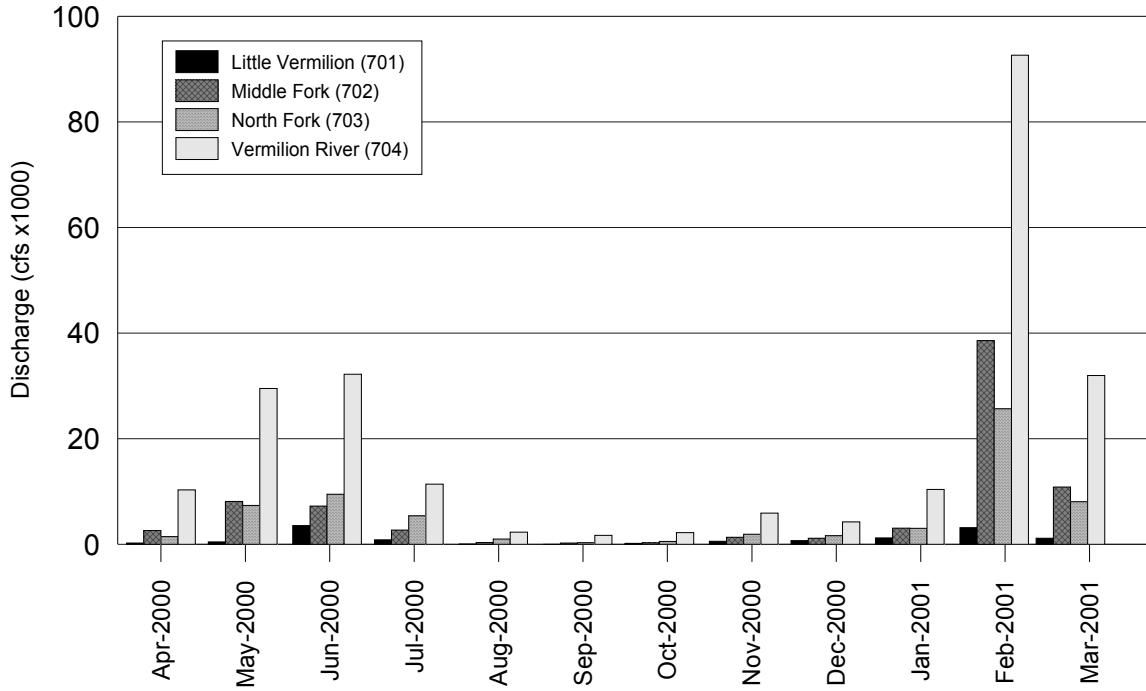


Figure 11. Monthly discharge for Vermilion stations, April 2000–March 2001

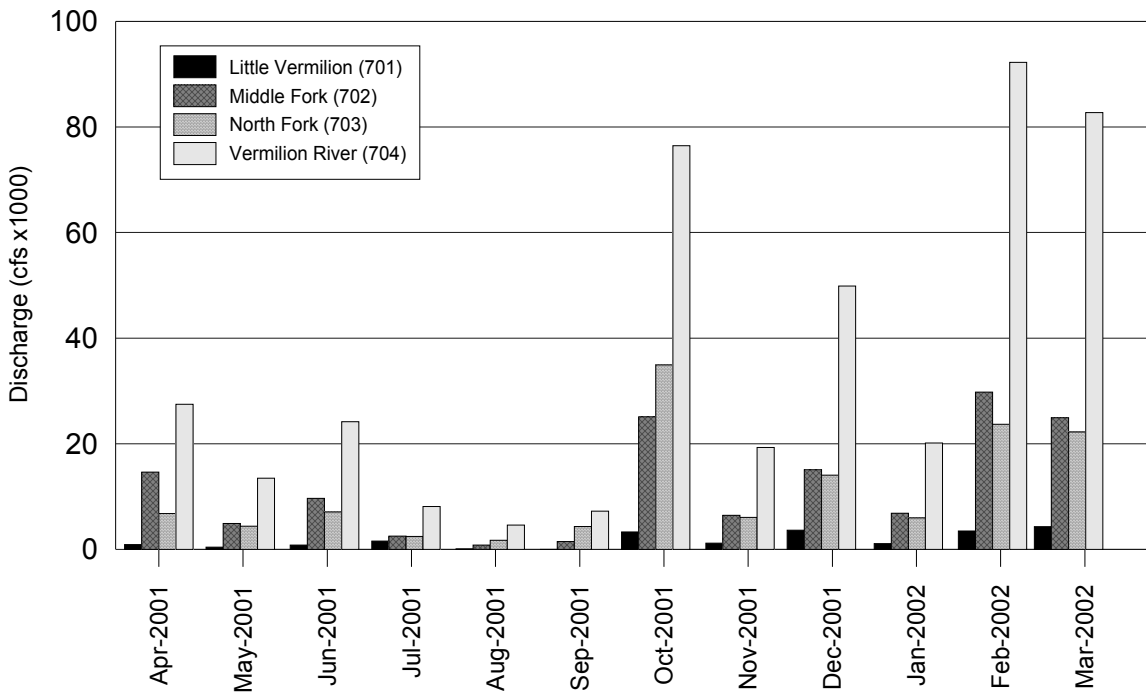


Figure 12. Monthly discharge for Vermilion stations, April 2001–March 2002

For the purpose of comparing streamflow to rainfall, discharge was converted to inches per unit watershed area. This was calculated by dividing the monthly discharge by the drainage area upstream of the streamgaging station (table 2) and is referred to as “runoff”. This also normalizes streamflow per unit watershed area, which allows the comparison of streamflow between stations. Figures 13 and 14 show the runoff in inches for all stations during Project Years 1 and 2, respectively. Runoff varies between stations due to the spatial variability of rainfall patterns throughout the watersheds. Figure 13 shows the highest monthly runoff for the Little Vermilion, 1.89 inches in June 2000, and the lowest runoff, 0.01 inches in September 2000. In the Vermilion River watershed, 3.62 inches was the highest monthly runoff in February 2001 at North Fork. Middle Fork had the lowest monthly runoff (0.02 inches) in September 2000. February 2001 was the only month where the runoff exceeded an inch at all four stations and exceeded 2 inches for the three Vermilion River watershed stations. Figure 14 shows December 2001 with the highest runoff (1.95 inches) for the Little Vermilion and September 2001 as the lowest monthly runoff (0.01 inches). North Fork had the highest monthly runoff (4.92 inches) in October 2001 during Project Year 2. The lowest runoff occurred in August 2001 (0.07 inches) at Middle Fork. Monthly runoff exceeded an inch at all four stations in four months in Project Year 2 (October–December 2001 and February–March 2002). Runoff exceeded 2 inches for three months (October 2001, February 2002, and March 2002) for all three Vermilion River watershed stations. The difference in the number of months exceeding one and two inches between the two project years can be explained by the precipitation. Precipitation during Project Year 1 was much below the 30-year means, in contrast with Project Year 2 when precipitation was near or slightly above the means (see table 3).

Table 4 presents the annual runoff in inches for all stations for the two project years (April–March) and the mean annual runoff (water years: October–September) for the USGS period of record for the three Vermilion River watershed stations. These three stations were much below their long-term mean during the first project year and near or above the mean during the second project year.

Table 4. Mean Annual Runoff for Vermilion River Watershed Stations

<i>Station</i>	<i>Annual runoff (inches)</i>		<i>USGS period of record (water year)</i>	<i>Mean annual runoff (inches)</i>
	<i>Project year 1</i>	<i>Project year 2</i>		
#701 Little Vermilion	6.37	11.06	--	--
#702 Middle Fork (USGS 03336645)	6.45	12.00	1979-2001	12.56
#703 North Fork (USGS 03338780)	9.27	18.80	1989-2001	15.43
#704 Vermilion River (USGS 03339000)	6.85	12.42	1915-2001	10.64

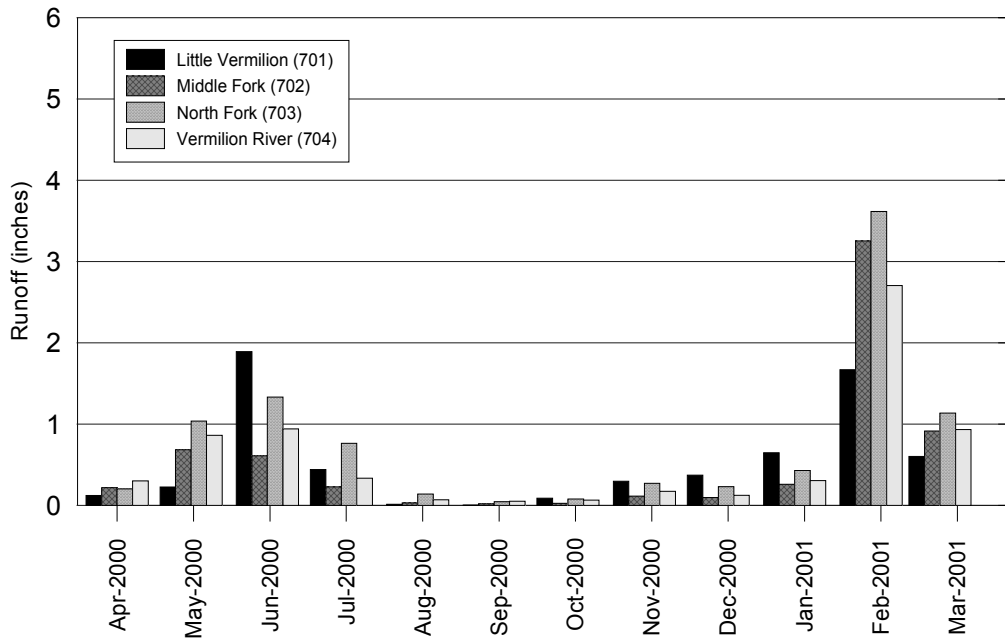


Figure 13. Monthly runoff for Vermilion stations, April 2000–March 2001

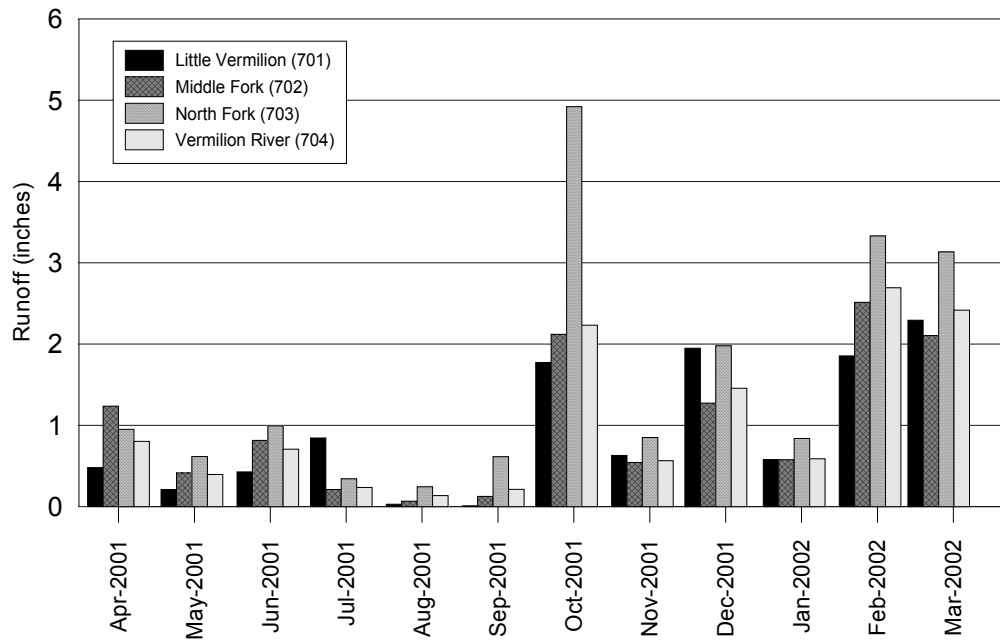


Figure 14. Monthly runoff for Vermilion stations, April 2001–March 2002

Water Quality Monitoring

Sediment

Suspended sediment samples for the project were collected either manually or by automated pump sampler. The suspended sediment sampling methods used in this study followed established USGS procedures as outlined by Edwards and Glysson (1999) and FISP (1952). The manual sampling method used depth-integrating samplers for all but the shallowest conditions. The second method used to collect suspended sediment samples was the ISCO automated pump sampler. The programming of the CR10X data logger controlled the ISCO sampling schedule. This program allowed automated sampling during high-flow events and was triggered by changes in stage over time. Manual suspended sediment samples were taken at all four stations during weekly station visits and during storms when possible. Little Vermilion was the only station at which an automated pump sampler was installed.

Sediment Concentration. Suspended sediment concentration data for all stations are tabulated (appendix D). Figures 15 and 16 are plots of the sediment concentrations with the streamflow at Little Vermilion for Project Years 1 and 2, respectively. Sediment concentration data for the remaining three stations are shown in appendix D. As can be seen in figure 15 and discussed in the “Streamflow Data” section, there were few significant streamflow events during Project Year 1. Sediment concentrations also remained low during the long periods of low discharge. The highest concentration, 208 mg/L, occurred in June 2000. In contrast, figure 16 shows more streamflow activity in Project Year 2 with the highest concentration, 709 mg/L, occurring in July 2001.

During October 2000–January 2001, it was observed that suspended sediment concentrations at Little Vermilion became slightly elevated to levels not consistent with low streamflow. Further inspection of the hourly discharge and sediment concentration data during this period revealed daily cycles of flow during October 2000 (figure 17). This can be indicative of artificial pumping into the river. The figure also shows several “spikes” of flow that are not associated with rainfall events. Many of the “spike” flows from November 2000–January 2001 started their rise in the early morning hours, usually between 2:00 and 4:00 a.m., peaked around the noon hour of the day, and returned to original levels in the mid-afternoon. For the most part, these cyclic or spiked flows did not appear in Project Year 2. It is unknown whether the slightly elevated suspended sediment concentrations are due to new sediment being introduced from these artificial discharges or a re-suspension of channel-bottom sediments due to increased flow at any discharge point(s). Because the cyclic or spike flows did not appear in Project Year 2, no effort was made to locate any discharge point(s) due to the difficulty in finding a nonflowing source.

Sediment Load. Load calculations are used to compare the relative contribution of sediment from different areas being monitored over time. The product of discharge and sediment concentration values from each station are used to calculate loads, and is converted to tons by

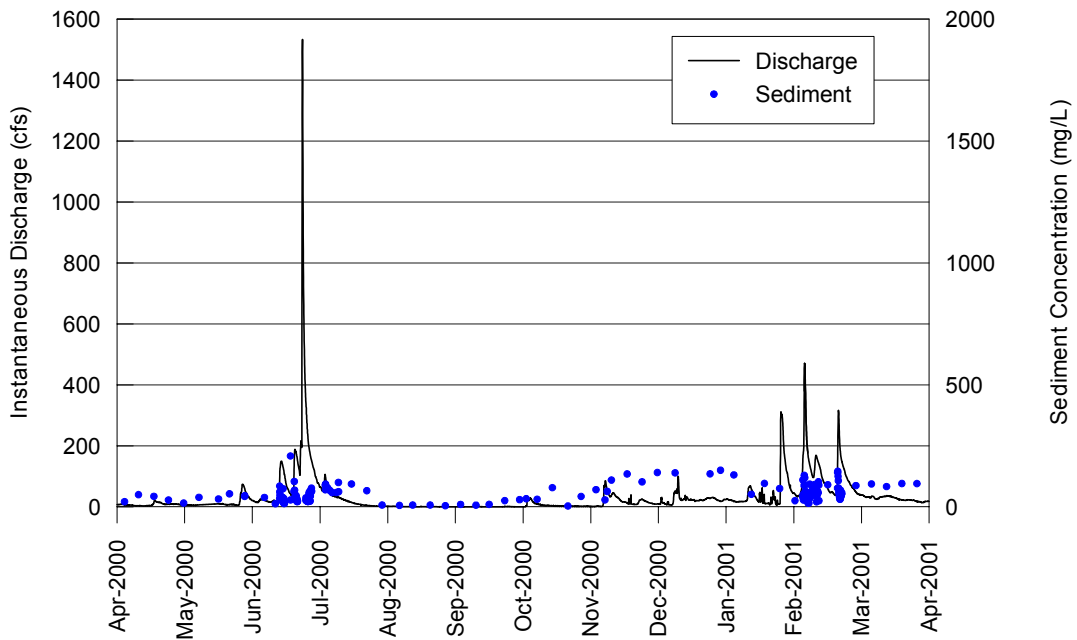


Figure 15. Suspended sediment concentrations at Little Vermilion (Station 701), April 2000–March 2001

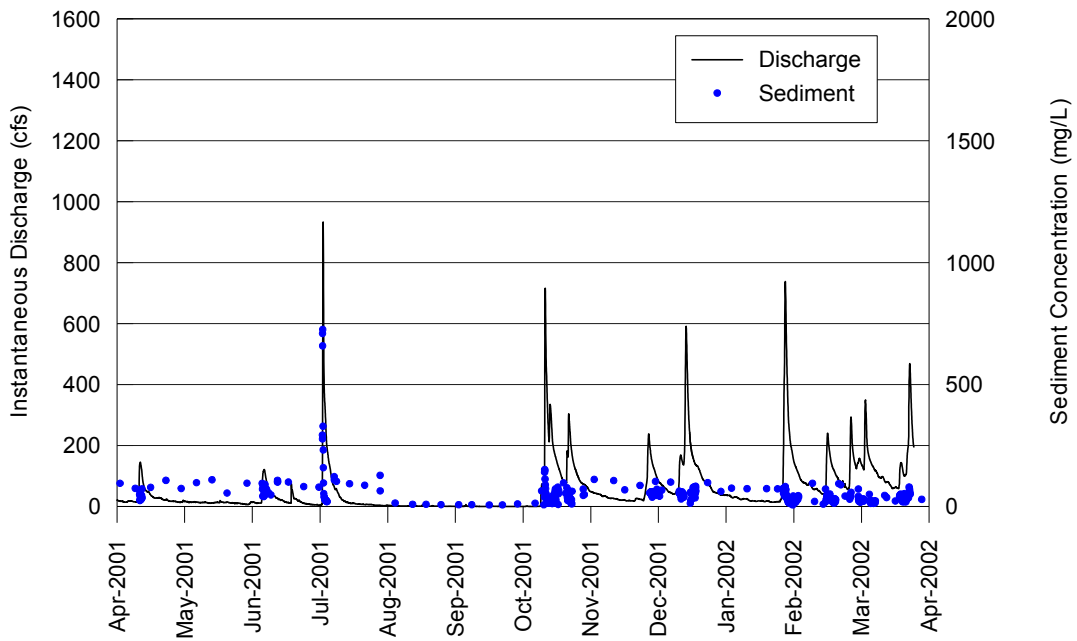


Figure 16. Suspended sediment concentrations at Little Vermilion (Station 701), April 2001–March 2002

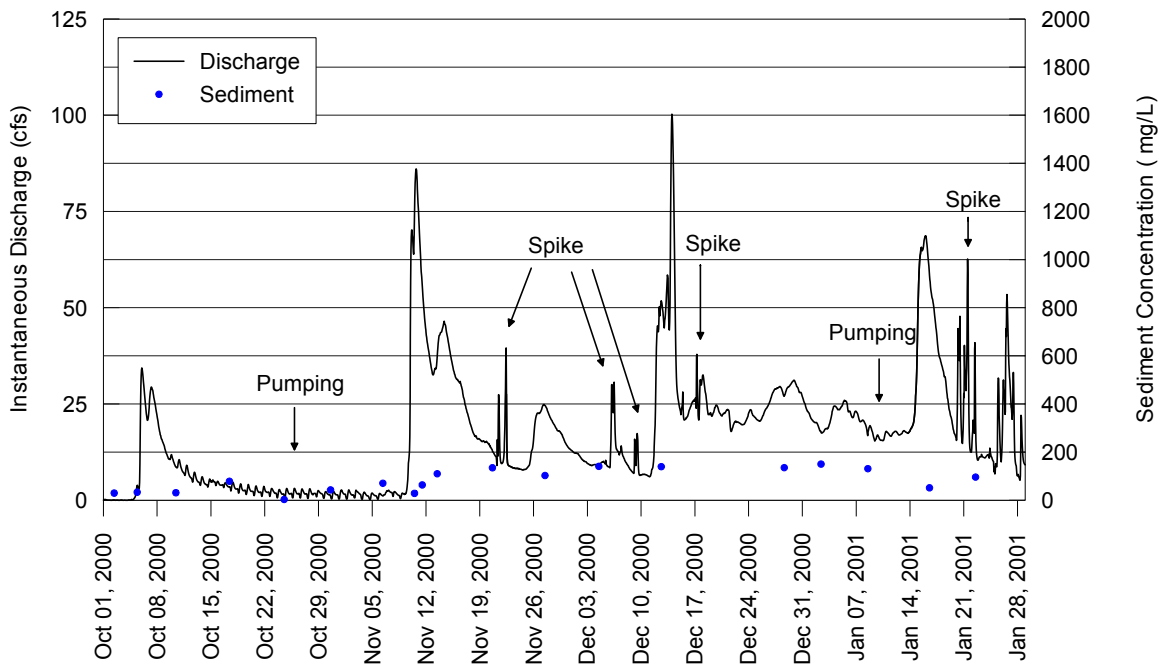


Figure 17. Hourly discharge at Little Vermilion River (Station 701), October 2000–January 2001

using the appropriate conversion factors, over a certain period of time. The monthly sediment load calculation results for all four stations are summarized (tables 5 and 6). Table 5 presents sediment load in tons, and table 6 normalizes the loads using the drainage area above the monitoring station to determine the relative contribution of sediment and is presented as tons per 10 acres. Both tables present the annual totals for each project year. As can be seen in table 5, the relative tons of sediment contributed annually by each watershed are a reflection of the drainage area being monitored.

Figures 18 and 19 present the monthly sediment load in tons per 10 acres for each project year. Several observations can be made from figure 18. The highest load, 1.65 tons per 10 acres, was at Middle Fork in February 2001. All stations were at their lowest (at or nearly zero) load during April 2000 and August–October 2000. During Project Year 1, there are only three times when the sediment load exceeds 0.2 tons per 10 acres. This was in February 2001 at Middle Fork, North Fork, and Vermilion River. This was also the only month when the sediment load exceeded one ton per 10 acres. In contrast, figure 19 shows many months when stations exceeded 0.2 tons per 10 acres (April, October, and December 2001, January–March 2002) during Project Year 2. However, none of the stations exceeded one ton per 10 acres the entire second project year. The highest sediment load, 0.88 tons per 10 acres, was in February 2002 at Middle Fork. Sediment loads at all stations were at or near zero during August and September 2001. A general observation for the entire study period is Little Vermilion rarely exceeded the monthly loads of the three Vermilion River watershed stations, which could be due

**Table 5. Monthly and Annual Suspended Sediment Loads (tons)
at Four Monitoring Stations, Vermilion River and Little Vermilion River Watersheds**

		<i>Station</i>			
		<i>Little Vermilion River (701)</i>	<i>Middle Fork (702)</i>	<i>North Fork (703)</i>	<i>Vermilion River near Danville (704)</i>
Project Year 1					
2000	April	20	116	63	430
	May	46	3,506	2,583	14,988
	Jun	693	1,376	1,970	6,682
	Jul	166	426	1,876	1,065
	Aug	0	25	93	96
	Sept	0	21	13	201
	Oct	17	55	34	81
	Nov	143	158	313	250
	Dec	259	397	555	409
2001	Jan	260	1,315	1,076	4,844
	Feb	518	46,501	22,041	91,019
	Mar	261	2,886	1,790	6,080
Project Year 2					
2001	April	173	7,828	2,280	6,968
	May	91	647	949	568
	Jun	168	3,688	2,388	4,517
	Jul	491	382	530	893
	Aug	2	160	975	656
	Sept	0	325	1,310	807
	Oct	449	15,542	13,158	32,343
	Nov	262	1,644	1,712	2,621
	Dec	659	5,655	3,638	11,214
2002	Jan	197	11,116	4,414	12,478
	Feb	397	24,686	7,720	57,526
	Mar	478	13,766	4,284	27,275
Total					
(Project Year 1)		2,382	56,783	32,408	126,146
(Project Year 2)		3,367	85,439	43,358	157,865
Drainage area (acres)		44,544	282,112	168,960	815,808

**Table 6. Monthly and Annual Suspended Sediment Loads (tons per 10 acres)
at Four Monitoring Stations, Vermilion River and Little Vermilion River Watersheds**

		<i>Station</i>			
		<i>Little Vermilion River (701)</i>	<i>Middle Fork (702)</i>	<i>North Fork (703)</i>	<i>Vermilion River near Danville (704)</i>
Project Year 1					
2000	April	0.00	0.00	0.00	0.01
	May	0.01	0.12	0.15	0.18
	Jun	0.16	0.05	0.12	0.08
	Jul	0.04	0.02	0.11	0.01
	Aug	0.00	0.00	0.01	0.00
	Sept	0.00	0.00	0.00	0.00
	Oct	0.00	0.00	0.00	0.00
	Nov	0.03	0.01	0.02	0.00
	Dec	0.06	0.01	0.03	0.01
2001	Jan	0.06	0.05	0.06	0.06
	Feb	0.12	1.65	1.30	1.12
	Mar	0.06	0.10	0.11	0.07
Project Year 2					
2000	April	0.04	0.28	0.13	0.09
	May	0.02	0.02	0.06	0.01
	Jun	0.04	0.13	0.14	0.06
	Jul	0.11	0.01	0.03	0.01
	Aug	0.00	0.01	0.06	0.01
	Sept	0.00	0.01	0.08	0.01
	Oct	0.10	0.55	0.78	0.40
	Nov	0.06	0.06	0.10	0.03
	Dec	0.15	0.20	0.22	0.14
2001	Jan	0.04	0.39	0.26	0.15
	Feb	0.09	0.88	0.46	0.71
	Mar	0.11	0.49	0.25	0.33
Total					
(Project Year 1)	(tons/10 acre)	0.54	2.01	1.92	1.55
(Project Year 2)	(tons/10 acre)	0.76	3.03	2.57	1.94
<i>2-year mean</i>		0.65	2.52	2.24	1.74
PY01	(tons/acre)	0.05	0.20	0.19	0.16
PY02	(tons/acre)	0.08	0.30	0.26	0.19
Drainage Area (acres)		44,544	282,112	168,960	815,808

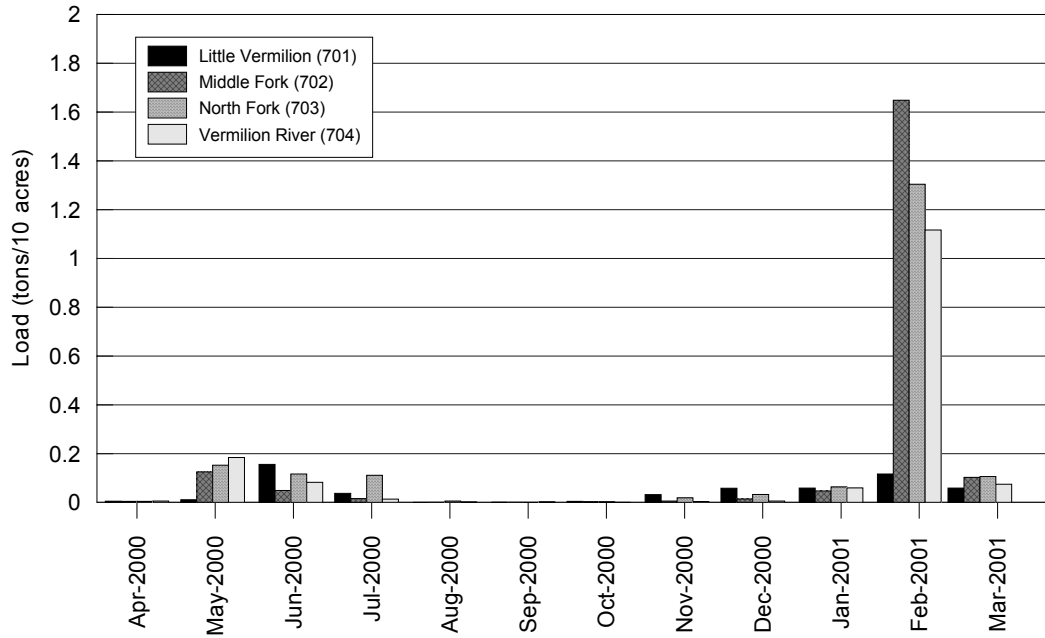


Figure 18. Monthly sediment load for Vermilion stations, April 2000–March 2001

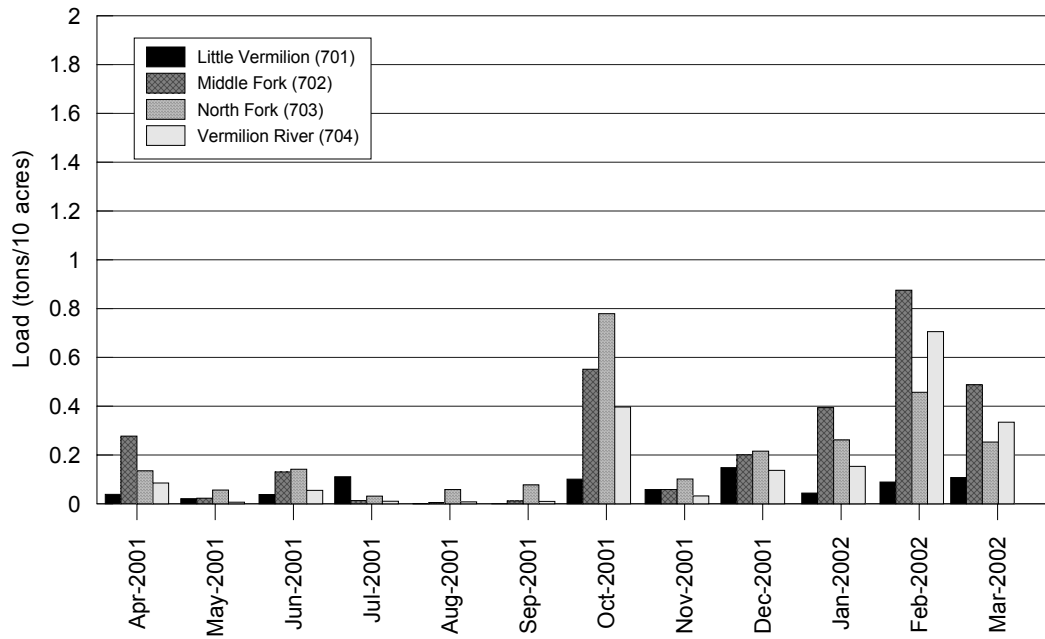


Figure 19. Monthly sediment load for Vermilion stations, April 2001–March 2001

to the spatial variability of storms. Sediment loads at Middle Fork or North Fork were usually higher than those at the Vermilion River station, except in May 2000.

During Project Year 1, the ISWS was conducting an Illinois Environmental Protection Agency (IEPA) Phase I Diagnostic Study of Lake Vermilion, an impounded reservoir on the North Fork Vermilion River and downstream of the North Fork Vermilion River station near Bismarck (Station 703). That study reports a mean annual sedimentation rate to Lake Vermilion from 1963–1976 and 1976–1998 as 0.28 tons per acre (Bogner, personal communication, December 2000). Table 6 also shows the annual sediment loads for each station in tons per acre. The load at North Fork for Project Years 1 and 2 was 0.19 and 0.26 tons per acre, respectively. Additional calculations were made to estimate annual sediment load contributed by the watershed area between North Fork station and the Lake Vermilion spillway (32.7 mi²) to more accurately compare the two loading rates.

The Vermilion River station monitors a drainage area of 1274 mi². The two upstream stations, Middle Fork and North Fork, monitor 55.3 percent of that area. This leaves nearly 45 percent that could have an average annual sediment load estimated based on the three other monitoring stations. Nearly all of this unmonitored area is in the Salt Fork Vermilion River watershed. The average annual sediment load is estimated by summing the sediment load from the two main watersheds (Middle Fork and North Fork) and subtracting that total from the total at the downstream Vermilion River station. Middle Fork monitors a drainage area of 440.8 mi², which is most of the 444.4 mi² total watershed area as measured at the confluence with the Salt Fork. The drainage area not monitored between the gaged site and the confluence is estimated by assuming that the load measured at the gage is the same for the ungaged area and then applying a drainage area ratio to the gage value. However, in the case of the North Fork watershed, it is necessary to take into consideration the effect Lake Vermilion has on altering the overall sediment contribution from North Fork station. The current sediment trap efficiency of Lake Vermilion is estimated to be 74 percent; therefore, the contribution of sediment from the North Fork Vermilion River at the spillway is much reduced (Bogner, personal communication, December 2002). With this information, the drainage areas between the North Fork station and the Lake Vermilion spillway, as well as the area from the spillway to the confluence with the Vermilion River, can now be estimated just as for the Middle Fork. After performing the calculations, as described above, the estimated average annual sediment load from the unmonitored area (Salt Fork Vermilion River and local tributary watersheds between the confluence of the Salt Fork with the Vermilion River and Vermilion River station) is 1.77 tons per 10 acres. As can be seen in table 6, this is less than the means for the Middle Fork (2.52) and North Fork (2.24) stations but almost the same as that for the Vermilion River station (1.74). It should be noted that this estimate is based on data collected over two years at the three Vermilion River watershed stations. These years had low and normal runoff and therefore should be considered a low sediment load estimation. Estimates could improve with additional data for several more years. The Salt Fork watershed is somewhat similar to the Little Vermilion watershed in terms of soils, slope, and land use. Therefore, an estimated average sediment load could be considered somewhere between the loads at the Vermilion River watershed stations and the Little Vermilion station.

Nitrate-N

Nitrate-N samples were collected at all four stations from April 2000–March 2002. These samples were collected manually and using an ISCO automated sampler. Nitrate-N concentration data for all stations are shown (appendix E). As described in the “Sediment” section above, manual samples were collected primarily by depth-integrated samples except when streamflow conditions were such that there was not enough depth. In those cases, a surface grab sample was taken. Water samples were prepared in the field by filtering the sample through a 0.45 micron paper filter into a 60 mg/L polyethylene (HDPE) bottle, stored at 4 degrees C, and transported to the ISWS laboratory for analysis. Weekly samples were collected unless the stream was either pooled or ice-covered, and extra efforts were made to visit the sites more often during storm events. The ISCO sampler at Little Vermilion was used for several storms during Project Year 2. Samples were retrieved from the ISCO sampler immediately after the storms for timely analysis at the laboratory.

Nitrate-N Concentration. Figures 20 and 21 present the nitrate-N concentrations at all stations for Project Years 1 and 2, respectively. Table 7 shows the maximum, minimum, and mean nitrate-N concentrations at all stations for the study period. As can be seen in both figures, the nitrate-N concentrations have an annual cycle. Concentrations are highest during the spring months, decrease to near zero during the summer, rise again through the fall, and then remain relatively steady through the winter. Figure 20 shows the highest nitrate-N concentration, 18.26 mg/L, in May 2000 at North Fork with the next highest concentration, 17.22 mg/L, in the same month at Middle Fork. The lowest concentrations occurred from mid-August through mid-October at all stations and ranged from 0.06 to below 3.00 mg/L. Throughout April–July 2000, concentrations at no particular station were consistently higher or lower than those at another. However, from October 2000–April 2001, Little Vermilion had the highest nitrate-N concentrations of all the stations. This observation is supported by table 7, which shows Little Vermilion with the highest mean annual nitrate-N concentration, 9.17 mg/L, during Project Year 1. During Project Year 2 (figure 21) the highest nitrate-N concentration, 20.74 mg/L, occurred at Middle Fork in June 2001. All stations had minimum nitrate-N levels below 1.0 mg/L during August 2001. Project Year 2 exhibited the same pattern as in Project Year 1: nitrate-N concentrations highest in the spring months, very low levels during August and September 2001, increases during the fall, and slight increases or remain steady through the winter. Little Vermilion had the highest concentrations of all the stations by almost 5 mg/L from mid-October 2001– March 2002, as well as the highest mean annual concentration for Project Year 2. The nitrate-N concentration values for the other three stations were very similar during the same time period.

Nitrate-N Load. As with sediment loads, load calculations for nitrate-N are used to compare the relative contribution of nitrate-N from different areas being monitored over time. Nitrate-N concentrations are used for regulatory purposes but are not sufficient to determine the relative contribution of nitrate-N from different areas over time. Using discharge and concentration data, nitrate-N loads are calculated as the product of nitrate-N concentration and discharge and converted to pounds of nitrate-N over a certain period of time. Loads then were

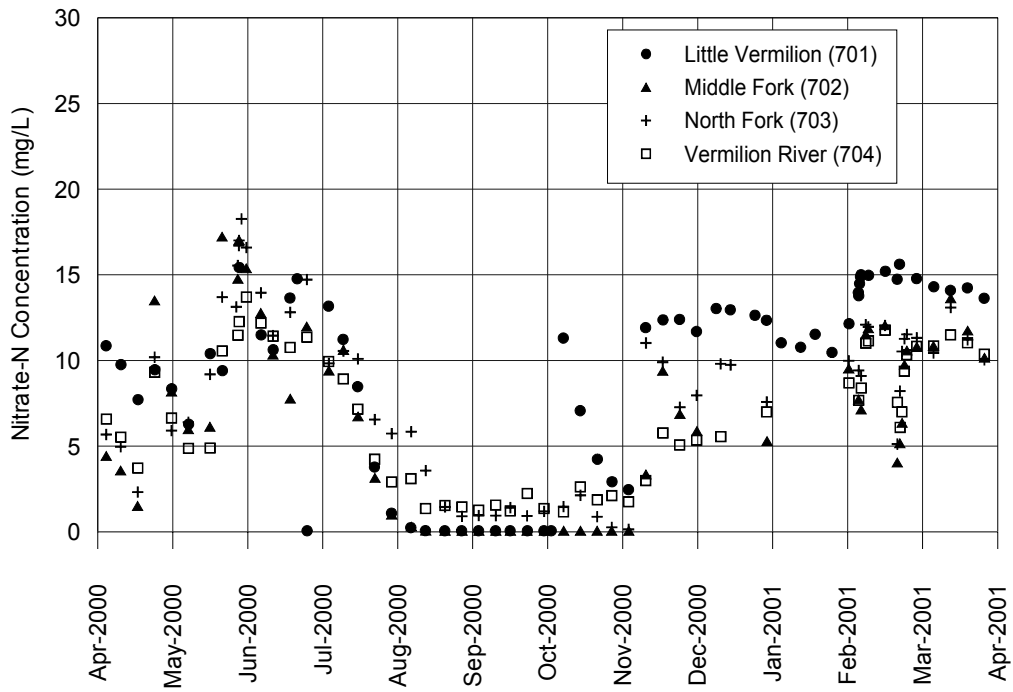


Figure 20. Nitrate-N at all stations, April 2000–March 2001

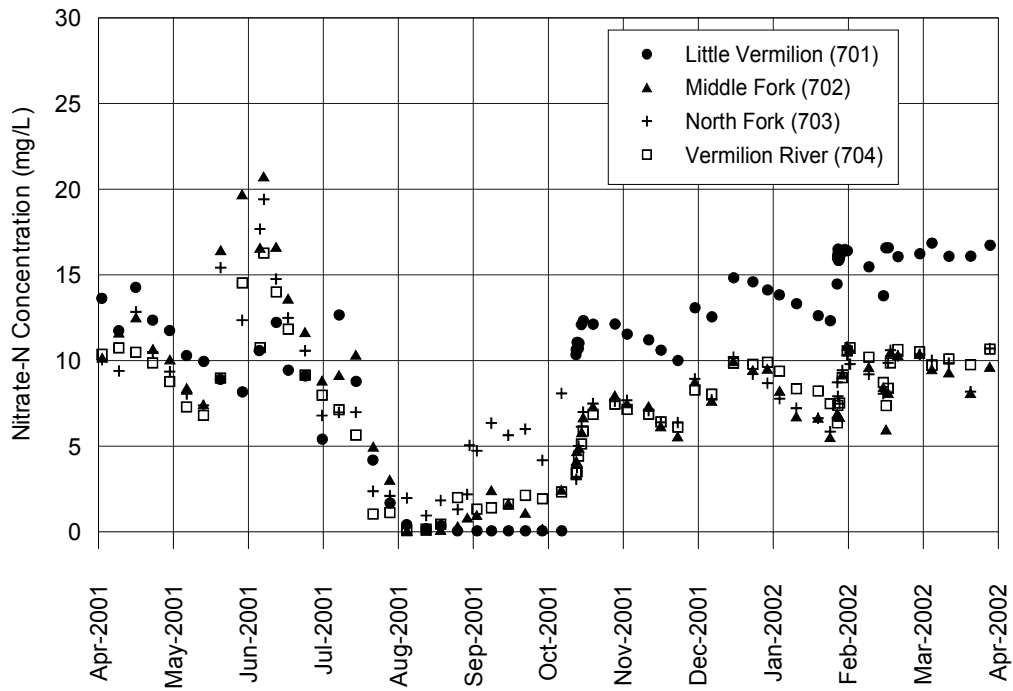


Figure 21. Nitrate-N at all stations, April 2001–March 2002

Table 7. Maximum, Minimum, and Mean Nitrate-N Concentrations at All Stations during Study Period

Station	Nitrate-N concentration (mg/L)					
	Project Year 1			Project Year 2		
	Max.	Min.	Mean	Max.	Min.	Mean
701	15.62	0.06	9.17	16.85	0.06	10.97
702	17.22	0.06	6.60	20.74	0.06	7.80
703	18.26	0.14	8.37	19.41	0.95	7.94
704	13.70	1.16	6.69	16.27	0.07	7.32

normalized per unit area (acres) to determine the relative contribution of nitrate-N from the watersheds above the monitoring stations. The monthly nitrate-N load calculation results for all four stations are summarized (tables 8 and 9). Table 8 presents nitrate-N load in pounds (lb), and table 9 normalizes the loads per unit area as pounds per acre (lb/acre). Both tables present the annual totals for each project year. As can be seen in table 8, the relative load of nitrate-N contributed annually by each gaged area is a reflection of the drainage area being monitored. As mentioned above, this was the same pattern for the sediment loads in tons. Little Vermilion has the smallest drainage area (69.6 mi²), with North Fork (264.0 mi²) and Middle Fork (440.8 mi²) the next largest, and Vermilion River is by far the largest (1274.7 mi²).

Figures 22 and 23 are illustrations of the data presented in table 9. The highest nitrate-N load during Project Year 1 (figure 22) was 8.17 lb/acre at North Fork during February 2001. All stations were at or near zero loads for August–October 2000. Only four months of the year had at least one station exceed 2 lb/acre, two months exceed 4 lb/acre, and one month exceeds 6 lb/acre. Figure 23 shows the highest nitrate-N load, 8.48 lb/acre, at Little Vermilion during March 2002 of Project Year 2. August 2001 had nitrate-N loads at or near zero for all stations. Loads exceed 2 lb/acre in six months of the year, 4 lb/acre in four months, and 6 lb/acre in four months.

As shown in table 9, annual nitrate-N loads were generally lower in Project Year 1 than in Project Year 2. Also, North Fork had slightly higher loads than Little Vermilion, but loads at both stations were higher than Middle Fork and Vermilion River, which had very similar annual load values.

Table 8. Monthly and Annual Nitrate-N Loads (lb) at Four Monitoring Stations, Vermilion River and Little Vermilion River Watersheds

		<i>Station</i>			
		<i>Little Vermilion River (701)</i>	<i>Middle Fork (702)</i>	<i>North Fork (703)</i>	<i>Vermilion River near Danville (704)</i>
Project Year 1					
2000	April	11,706	80,443	44,578	348,991
	May	22,655	504,321	510,360	1,344,428
	Jun	193,015	454,443	709,153	2,063,742
	Jul	33,447	89,993	249,337	408,231
	Aug	13	224	15,846	23,145
	Sept	2	76	1,785	14,543
	Oct	3,775	98	3,512	21,698
	Nov	29,289	35,690	73,044	123,926
	Dec	47,202	36,324	80,635	124,268
2001	Jan	73,296	88,044	124,276	393,120
	Feb	243,754	1,772,203	1,380,889	4,432,467
	Mar	87,194	672,629	500,646	1,880,007
Project Year 2					
2000	April	61,667	869,352	379,727	1,487,851
	May	19,678	344,538	254,598	683,048
	Jun	44,304	824,875	569,941	1,616,529
	Jul	55,679	97,824	66,137	200,119
	Aug	75	1,189	15,261	16,581
	Sept	5	12,156	130,232	63,224
	Oct	168,630	664,004	1,096,227	1,876,844
	Nov	68,601	230,174	224,153	690,534
	Dec	270,295	727,313	682,592	2,418,396
2001	Jan	85,982	265,106	242,273	886,327
	Feb	298,691	1,451,061	1,188,913	4,627,745
	Mar	377,245	1,253,686	1,151,985	4,472,601
Total					
(Project Year 1)		745,349	3,734,487	3,694,061	11,178,565
(Project Year 2)		1,450,851	6,741,276	6,002,039	19,039,799
Drainage area (acres)		44,544	282,112	168,960	815,808

Table 9. Monthly and Annual Nitrate-N Loads (lb/acre) at Four Monitoring Stations, Vermilion River and Little Vermilion River Watersheds

		<i>Station</i>			
		<i>Little Vermilion River (701)</i>	<i>Middle Fork (702)</i>	<i>North Fork (703)</i>	<i>Vermilion River near Danville (704)</i>
Project Year 1					
2000	April	0.26	0.29	0.26	0.43
	May	0.51	1.79	3.02	1.65
	Jun	4.34	1.61	4.20	2.53
	Jul	0.75	0.32	1.48	0.50
	Aug	0.00	0.00	0.09	0.03
	Sept	0.00	0.00	0.01	0.02
	Oct	0.08	0.00	0.02	0.03
	Nov	0.66	0.13	0.43	0.15
	Dec	1.06	0.13	0.48	0.15
2001	Jan	1.65	0.31	0.74	0.48
	Feb	5.48	6.28	8.17	5.44
	Mar	1.96	2.39	2.96	2.31
Project Year 2					
2000	April	1.39	3.08	2.25	1.82
	May	0.44	1.22	1.51	0.84
	Jun	1.00	2.93	3.37	1.98
	Jul	1.25	0.35	0.39	0.25
	Aug	0.00	0.00	0.09	0.02
	Sept	0.00	0.04	0.77	0.08
	Oct	3.79	2.35	6.49	2.30
	Nov	1.54	0.82	1.33	0.85
	Dec	6.07	2.58	4.04	2.97
2001	Jan	1.93	0.94	1.43	1.09
	Feb	6.71	5.15	7.03	5.68
	Mar	8.48	4.45	6.82	5.49
Total					
(Project Year 1)		17	13	22	14
(Project Year 2)		33	24	36	23
<i>2-year mean</i>		25	19	29	19
Drainage area (acres)		44,544	282,112	168,960	815,808

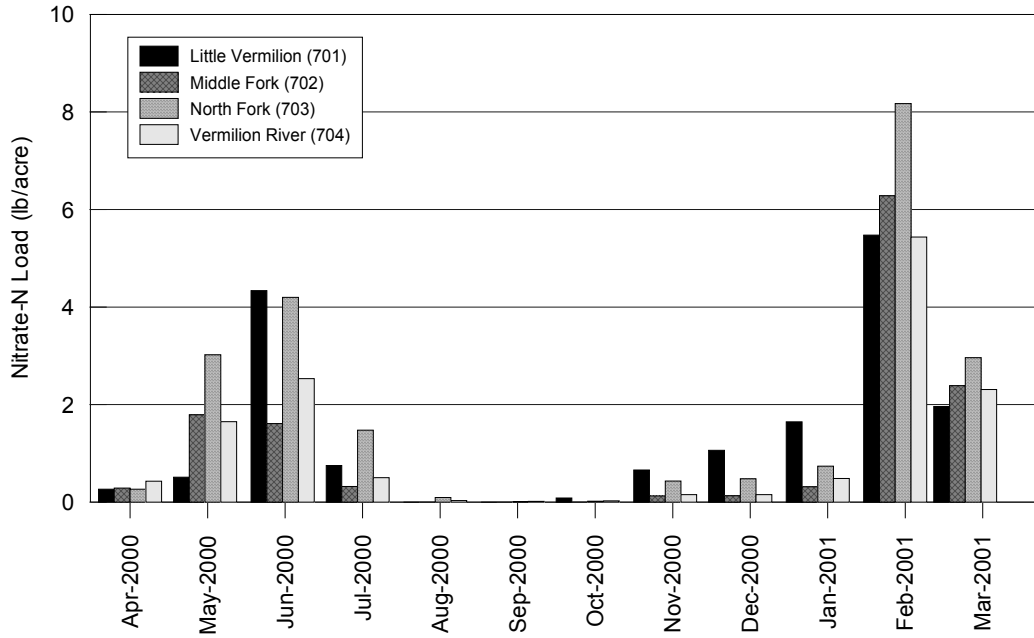


Figure 22. Monthly nitrate-N load for all stations, April 2000–March 2001

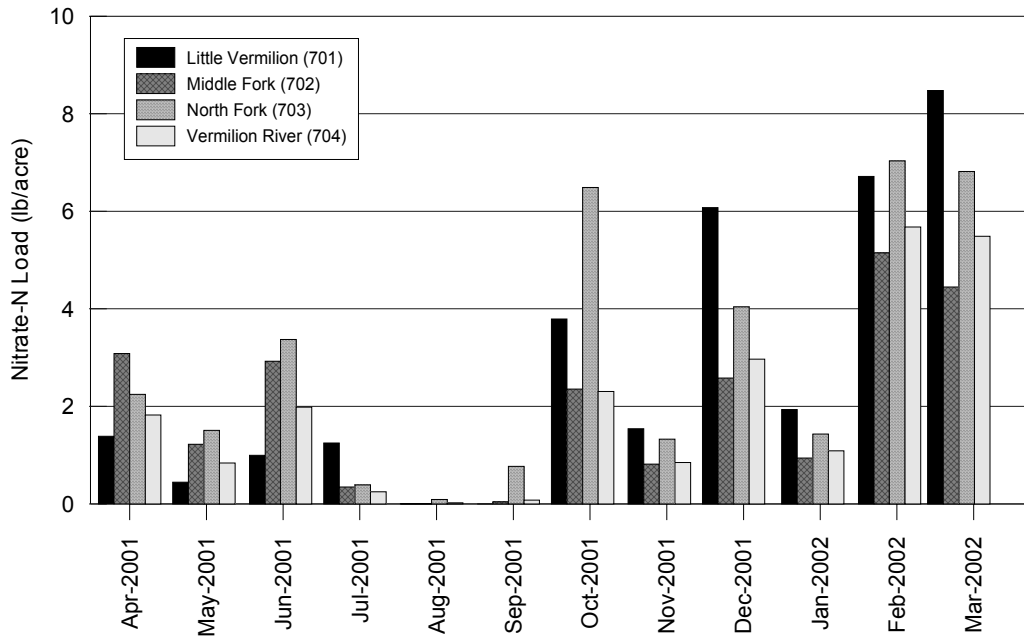


Figure 23. Monthly nitrate-N load for all stations, April 2001–March 2002

Pesticides

Samples were collected from June 2002–mid-October 2002 for pesticide concentration at Little Vermilion. These samples were analyzed for atrazine, alachlor, and metolachlor (see figure 24 and appendix F). Pesticide samples were collected in triplicate in one-liter amber glass bottles and stored on ice and away from light before delivery. Samples were extracted with methylene chloride, followed by concentration and solvent exchange with methyl t-butyl ether. Extracts were analyzed using a Varian 3400 gas chromatograph, with a J&W DB-5 column and a thermionic specific (nitrogen-phosphorous) detector.

Figure 24 presents the pesticide concentration with the stage record at Little Vermilion. The highest concentration for atrazine was 20.93 $\mu\text{g/L}$ in June 2002. All other atrazine concentrations were below 2.65 $\mu\text{g/L}$. Alachlor concentrations never exceeded the minimum detection limit of 0.23 $\mu\text{g/L}$. Metolachlor concentrations exceeded the minimum detection limit (MDL) of 0.24 $\mu\text{g/L}$ in June and July 2002 (1.31 $\mu\text{g/L}$ and 0.72 $\mu\text{g/L}$, respectively). Figure 24 reflects the same daily cycles of flow discussed above and presented in figure 17.

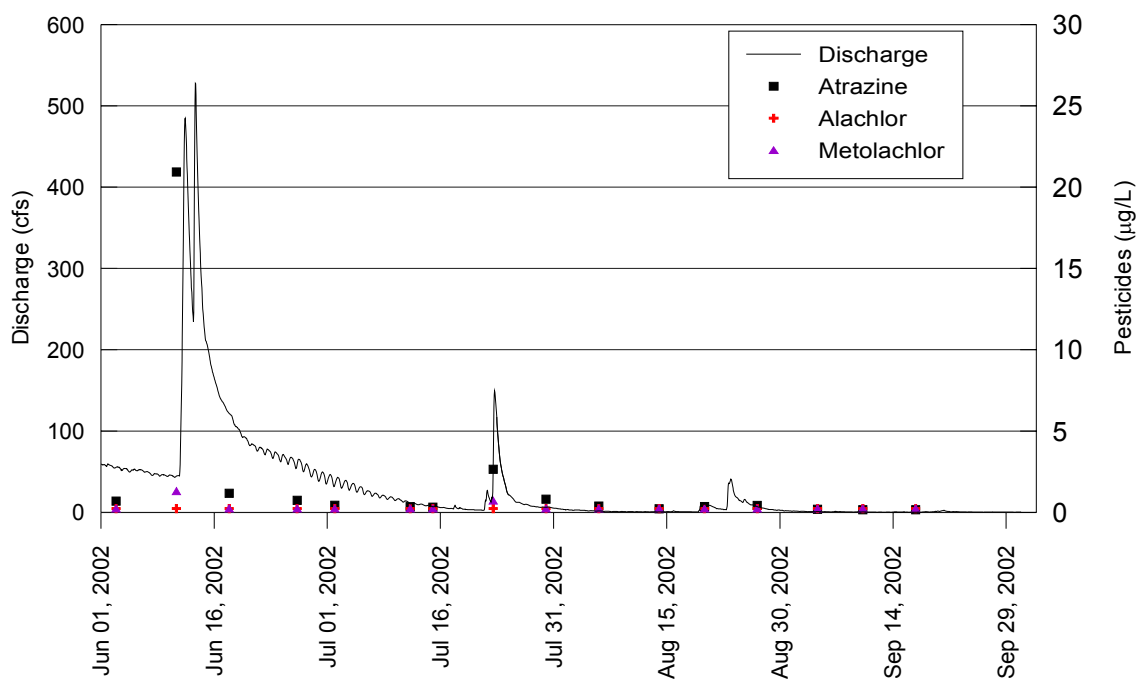


Figure 24. Pesticides at Little Vermilion River (Station 701), June 2002-September 2002

Summary

The Illinois State Water Survey (ISWS) conducted a two-year watershed monitoring study of the Vermilion River and Little Vermilion River watersheds for the Vermilion River Ecosystem Partnership for Conservation 2000 Ecosystem Program. The purpose of the study was to assist the partnership by establishing a baseline of hydrologic and water quality data to better understand the cumulative impacts of future best management practices implemented in the watersheds. The ISWS established a streamgaging station on the Little Vermilion River near Sidell (ISWS Station 701) and monitored hydrology, sediment, and nitrate-N at this and three USGS streamgaging sites (ISWS 702/USGS #03336645, Middle Fork Vermilion River above Oakwood; ISWS 703/USGS Station #03338780 North Fork Vermilion River near Bismarck; and ISWS 704/USGS Station #03339000 Vermilion River near Danville). The study period was April 2000–March 2002. A summary of the data collected and some observations follows:

- A comparison of the measured annual runoff for each station and the long-term mean annual runoff at the three USGS stations shows very low runoff during the first project year (April 2000–March 2001) and approximately normal runoff the second project year (April 2001–March 2002). North Fork had the highest runoff and Little Vermilion had the lowest runoff both project years.
- Annual sediment loads were lower during Project Year 1 than Project Year 2, averaging 1.51 and 2.08 tons per 10 acres, respectively. Annual sediment loads for the Vermilion River (stations 702, 703, and 704) were found to be approximately three times higher than loads at Little Vermilion (station 701).
- Annual sediment loads at North Fork, which is upstream of Lake Vermilion, agree with the long-term average annual load calculated.
- The estimated average annual sediment load from the Salt Fork Vermilion River watershed and local tributary watersheds of the Vermilion River between the confluence of the Salt Fork with the Vermilion River and the Vermilion River station is 1.77 tons per 10 acres. This is considered a low estimate because it was based on the average runoff of two years of data, one of which was extremely low.
- Little Vermilion had the highest mean annual nitrate-N concentrations of all the stations. However, due to higher runoff, North Fork had the highest annual nitrate-N load for both monitoring years. In general, annual nitrate-N loads were lower during Project Year 1 than Project Year 2, averaging 16 and 29 lb/acre, respectively.
- The hydrologic and sediment record indicates that artificial discharges were occurring in the Little Vermilion River above station 701 (October 2000–January 2001).
- Atrazine was the only pesticide with levels higher than 2.65 µg/L. Alachlor was never detected above 0.23 µg/L (the minimum detection limit), and metoachlor was detected twice above the 0.24 MDL.

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Appendix A. Mean Daily Stage

Table A1. Mean Daily Stage (feet), Little Vermilion River Station (701), April 2000–March 2001

<i>DAY</i>	<i>APR</i>	<i>MAY</i>	<i>JUN</i>	<i>JUL</i>	<i>AUG</i>	<i>SEP</i>	<i>OCT</i>	<i>NOV</i>	<i>DEC</i>	<i>JAN</i>	<i>FEB</i>	<i>MAR</i>
1	85.00	84.97	85.44	86.38	84.74	84.47	84.49	84.68	85.16	85.38	86.83	86.42
2	85.03	84.98	85.35	86.19	84.73	84.46	84.46	84.69	85.11	85.32	86.40	86.28
3	85.03	84.95	85.26	86.05	84.71	84.46	84.46	84.68	85.07	85.37	86.05	86.13
4	84.98	84.93	85.24	85.94	84.70	84.46	84.49	84.64	85.07	85.45	85.85	86.02
5	84.94	84.91	85.42	86.42	84.71	84.45	84.92	84.65	85.07	85.48	85.78	85.87
6	84.96	84.91	85.45	86.11	84.71	84.45	85.50	84.69	85.35	85.42	85.66	85.78
7	84.94	84.93	85.41	85.89	84.68	84.45	85.51	84.73	85.15	85.39	85.70	85.74
8	84.88	84.96	85.34	85.75	84.64	84.44	85.30	84.67	85.04	85.34	86.06	85.73
9	84.83	84.98	85.28	85.68	84.61	84.45	85.14	84.91	85.09	85.28	88.04	85.65
10	84.82	85.00	85.26	85.63	84.59	84.53	85.08	86.22	84.97	85.27	88.72	85.61
11	84.84	85.01	85.33	85.59	84.57	84.52	85.02	86.00	85.12	85.30	87.49	85.61
12	84.81	85.02	85.34	85.53	84.55	84.61	84.95	85.70	85.87	85.30	86.89	85.62
13	84.79	85.04	85.27	85.46	84.54	84.57	84.90	85.72	85.99	85.31	86.54	85.63
14	84.83	85.05	86.13	85.41	84.53	84.57	84.87	85.81	85.90	85.43	86.81	85.50
15	84.85	85.07	87.07	85.35	84.52	84.52	84.88	85.67	85.42	86.07	87.31	85.50
16	84.85	85.08	86.67	85.28	84.50	84.48	84.85	85.57	85.46	86.04	87.00	85.60
17	85.05	85.09	86.22	85.22	84.51	84.46	84.83	85.41	85.53	85.80	86.64	85.63
18	85.35	85.08	85.97	85.16	84.62	84.45	84.80	85.29	85.51	85.61	86.35	85.65
19	85.25	85.08	85.78	85.11	84.56	84.44	84.77	85.25	85.44	85.37	86.23	85.67
20	85.23	85.02	85.71	85.06	84.53	84.43	84.76	85.20	85.42	85.49	86.06	85.67
21	85.16	84.99	87.35	85.02	84.52	84.44	84.74	85.18	85.39	85.55	85.88	85.65
22	85.06	85.00	87.27	84.97	84.53	84.45	84.73	85.22	85.37	85.29	85.88	85.60
23	85.03	85.02	86.77	84.92	84.61	84.46	84.72	85.04	85.37	85.13	85.77	85.56
24	85.05	85.01	89.01	84.89	84.58	84.51	84.71	85.02	85.42	85.13	85.83	85.51
25	85.06	84.95	90.74	84.85	84.54	84.61	84.71	85.10	85.39	85.21	88.17	85.45
26	85.07	84.93	88.88	84.82	84.53	84.61	84.71	85.39	85.47	85.64	87.47	85.43
27	85.06	85.53	88.05	84.79	84.53	84.64	84.70	85.45	85.55	85.33	86.95	85.40
28	85.06	86.14	87.45	84.77	84.53	84.58	84.70	85.37	85.54	85.09	86.63	85.40
29	85.02	86.02	87.01	84.74	84.53	84.54	84.69	85.30	85.58	85.60		85.43
30	84.96	85.77	86.65	84.74	84.51	84.51	84.67	85.21	85.55	88.53		85.41
31		85.58		84.79	84.49		84.67		85.46	87.70		85.40
MAX	85.35	86.14	90.74	86.42	84.74	84.64	85.51	86.22	85.99	88.53	88.72	86.42
MIN	84.79	84.91	85.24	84.74	84.49	84.43	84.46	84.64	84.97	85.09	85.66	85.40
AVG	84.99	85.13	86.40	85.37	84.59	84.50	84.83	85.22	85.38	85.60	86.61	85.66

Table A2. Mean Daily Stage (feet), Little Vermilion River Station (701), April 2001–March 2002

<i>DAY</i>	<i>APR</i>	<i>MAY</i>	<i>JUN</i>	<i>JUL</i>	<i>AUG</i>	<i>SEP</i>	<i>OCT</i>	<i>NOV</i>	<i>DEC</i>	<i>JAN</i>	<i>FEB</i>	<i>MAR</i>
1	85.36	85.31	85.21	84.93	84.78	84.60	84.50	86.17	87.48	85.79	90.03	86.02
2	85.31	85.29	85.22	84.87	84.81	84.58	84.50	86.07	86.92	85.73	88.64	86.59
3	85.29	85.24	85.15	84.91	84.83	84.57	84.49	85.92	86.63	85.72	87.93	88.21
4	85.23	85.22	85.14	89.39	84.79	84.56	84.48	85.87	86.42	85.70	87.38	87.31
5	85.24	85.22	85.14	88.51	84.75	84.55	84.59	85.83	86.28	85.69	86.96	86.87
6	85.31	85.24	85.83	87.52	84.73	84.55	84.55	85.80	86.18	85.69	86.71	87.09
7	85.32	85.23	86.66	86.85	84.72	84.71	84.52	85.76	86.10	85.59	86.52	87.13
8	85.27	85.19	86.31	86.36	84.71	84.64	84.52	85.73	86.01	85.57	86.35	86.87
9	85.25	85.18	86.00	86.10	84.70	84.61	84.51	85.64	85.90	85.60	86.27	87.84
10	85.27	85.20	85.82	85.98	84.70	84.60	84.54	85.66	85.84	85.53	86.24	88.04
11	86.75	85.20	85.70	85.76	84.68	84.56	84.57	85.58	85.78	85.45	86.19	87.32
12	86.58	85.16	85.60	85.53	84.67	84.54	85.87	85.52	85.78	85.46	86.23	87.03
13	86.09	85.13	85.51	85.38	84.70	84.53	86.36	85.51	85.92	85.47	86.05	86.83
14	85.92	85.14	85.43	85.29	84.75	84.52	89.75	85.50	86.52	85.47	85.99	86.67
15	85.86	85.18	85.40	85.21	84.73	84.52	88.38	85.48	87.28	85.38	86.00	86.54
16	85.71	85.20	85.30	85.15	84.68	84.52	88.56	85.44	87.10	85.33	85.93	86.45
17	85.60	85.20	85.22	85.11	84.66	84.52	88.03	85.39	89.38	85.33	85.82	86.47
18	85.53	85.28	85.18	85.12	84.70	84.56	87.46	85.39	89.01	85.30	85.77	86.36
19	85.54	85.21	85.35	85.05	84.74	84.65	87.08	85.40	88.05	85.32	86.09	86.29
20	85.54	85.19	85.83	85.03	84.69	84.58	86.76	85.34	87.44	85.33	87.95	86.26
21	85.49	85.23	85.49	85.01	84.67	84.56	86.51	85.36	87.08	85.34	87.49	86.13
22	85.41	85.17	85.40	84.99	84.64	84.54	86.34	85.34	86.91	85.28	86.95	86.04
23	85.43	85.16	85.33	84.95	84.74	84.53	86.31	85.33	86.77	85.31	86.68	86.08
24	85.35	85.13	85.21	84.98	84.66	84.51	87.69	85.43	86.56	85.30	86.51	86.05
25	85.31	85.11	85.13	84.96	84.66	84.52	88.19	85.50	86.39	85.23	86.38	86.53
26	85.30	85.11	85.07	84.96	84.65	84.51	87.42	85.46	86.30	85.23	86.28	86.92
27	85.30	85.10	85.02	84.90	84.63	84.51	86.90	85.42	86.23	85.24	86.16	86.55
28	85.25	85.05	84.99	84.86	84.62	84.51	86.61	85.55	86.14	85.26	86.12	86.71
29	85.22	85.01	84.96	84.87	84.60	84.51	86.42	86.20	85.98	85.30		88.18
30	85.23	84.98	84.93	84.84	84.59	84.51	86.29	87.86	85.86	85.61		89.10
31		85.02		84.79	84.61		86.22		85.83	88.51		88.10
MAX	86.75	85.31	86.66	89.39	84.83	84.71	89.75	87.86	89.38	88.51	90.03	89.10
MIN	85.22	84.98	84.93	84.79	84.59	84.51	84.48	85.33	85.78	85.23	85.77	86.02
AVG	85.51	85.17	85.42	85.55	84.70	84.56	86.22	85.68	86.65	85.55	86.70	86.92

Appendix B. Discharge Rating Curve

Appendix C. Mean Daily Discharge

Table C1. Mean Daily Discharge (cfs) Little Vermilion River Station (701), April 2000–March 2001

<i>DAY</i>	<i>APR</i>	<i>MAY</i>	<i>JUN</i>	<i>JUL</i>	<i>AUG</i>	<i>SEP</i>	<i>OCT</i>	<i>NOV</i>	<i>DEC</i>	<i>JAN</i>	<i>FEB</i>	<i>MAR</i>
1	7.5	6.59	23.25	88.01	2.27	0.05	0.1	1.6	12.26	20.6	128.36	91.64
2	8.10	6.96	19.31	72.03	2.03	0.03	0.04	1.60	10.41	18.15	90.80	79.21
3	8.16	6.28	15.79	60.56	1.79	0.04	0.04	1.49	9.21	20.12	60.44	67.03
4	6.82	5.71	15.13	52.71	1.64	0.03	0.11	1.15	9.45	23.96	46.44	58.67
5	5.90	5.36	22.48	92.58	1.76	0.02	7.96	1.16	9.28	24.99	42.01	48.09
6	6.30	5.17	23.90	65.81	1.81	0.02	26.18	1.60	20.10	22.42	34.78	42.09
7	5.95	5.77	21.80	49.15	1.42	0.02	26.67	2.05	11.92	21.24	36.89	39.57
8	4.69	6.37	19.08	40.07	1.03	0.02	17.17	1.39	8.42	18.92	62.87	38.55
9	3.65	6.92	16.42	35.87	0.80	0.02	11.62	7.23	10.34	16.59	253.35	34.03
10	3.52	7.28	15.54	32.83	0.62	0.32	9.50	74.05	6.58	16.25	332.30	31.88
11	3.90	7.66	18.67	31.09	0.49	0.21	7.86	57.36	11.75	17.21	175.37	31.67
12	3.24	8.05	18.92	27.74	0.36	0.89	6.24	37.27	47.51	17.41	132.68	32.38
13	3.03	8.44	16.06	24.47	0.31	0.49	5.09	38.23	57.19	17.70	103.33	32.93
14	3.62	8.85	75.83	21.86	0.27	0.46	4.43	44.11	53.42	23.37	125.00	26.16
15	4.12	9.26	145.04	19.19	0.21	0.20	4.69	35.13	22.61	62.60	162.30	26.36
16	4.00	9.69	115.06	16.53	0.14	0.07	4.02	29.70	24.29	60.23	140.47	31.24
17	8.91	9.77	74.73	14.06	0.18	0.04	3.66	22.03	28.03	43.19	112.46	32.86
18	19.55	9.54	54.64	12.03	0.89	0.02	3.10	16.70	26.76	31.78	85.34	33.97
19	15.46	9.76	41.95	10.40	0.40	0.02	2.73	15.32	23.29	20.25	75.03	35.15
20	14.44	7.84	37.80	8.94	0.26	0.01	2.49	13.47	22.59	26.68	61.20	35.45
21	12.06	7.08	164.77	7.87	0.21	0.02	2.26	13.07	21.19	30.64	48.48	33.98
22	9.11	7.30	159.42	6.62	0.25	0.03	2.15	15.23	20.14	17.51	48.14	31.38
23	8.24	7.88	123.31	5.55	0.80	0.04	1.95	8.39	20.33	11.25	41.38	29.24
24	8.61	7.55	480.64	4.77	0.52	0.18	1.83	8.01	22.39	11.09	45.24	26.48
25	9.10	6.26	802.92	4.08	0.30	0.93	1.85	10.37	21.08	14.93	252.03	23.84
26	9.31	5.75	357.79	3.43	0.26	0.75	1.85	21.32	24.60	34.52	174.43	22.69
27	9.03	29.70	227.64	2.99	0.24	1.02	1.79	24.01	28.66	19.62	137.15	21.50
28	8.91	68.05	172.37	2.61	0.26	0.56	1.71	20.36	28.36	10.32	112.02	21.65
29	7.97	58.61	141.25	2.27	0.24	0.32	1.66	17.43	30.18	45.06		22.80
30	6.47	41.19	113.95	2.26	0.16	0.19	1.44	13.99	28.96	295.86		22.16
31		30.46		3.03	0.11		1.46		24.29	195.45		21.40
TOTAL	229.67	421.10	3535.46	821.41	22.03	7.02	163.65	554.82	695.59	1209.91	3120.29	1126.05
MAX	19.55	68.05	802.92	92.58	2.27	1.02	26.67	74.05	57.19	295.86	332.30	91.64
MIN	3.03	5.17	15.13	2.26	0.11	0.01	0.04	1.15	6.58	10.32	34.78	21.40
AVG	7.66	13.58	117.85	26.50	0.71	0.23	5.28	18.49	22.44	39.03	111.44	36.32
INCHES	0.12	0.23	1.89	0.44	0.01	0.00	0.09	0.30	0.37	0.65	1.67	0.60

Table C2. Mean Daily Discharge (cfs), Little Vermilion River Station (701), April 2001–March 2002

<i>DAY</i>	<i>APR</i>	<i>MAY</i>	<i>JUN</i>	<i>JUL</i>	<i>AUG</i>	<i>SEP</i>	<i>OCT</i>	<i>NOV</i>	<i>DEC</i>	<i>JAN</i>	<i>FEB</i>	<i>MAR</i>
1	19.85	17.78	13.82	5.62	2.78	0.66	0.13	69.85	174.38	42.47	599.98	58.37
2	17.57	16.74	14.36	4.32	3.35	0.54	0.13	61.93	134.77	38.64	316.06	105.19
3	16.97	14.95	11.97	5.36	3.69	0.49	0.10	51.49	112.78	38.12	211.94	249.47
4	14.69	14.13	11.43	523.65	3.03	0.43	0.07	48.08	92.33	37.05	167.58	162.66
5	15.05	14.31	11.35	294.03	2.33	0.36	0.74	44.79	79.16	36.71	137.24	131.57
6	17.73	14.92	52.82	177.89	2.03	0.33	0.39	43.00	71.13	36.16	119.33	146.29
7	18.02	14.47	115.52	129.10	1.94	2.11	0.22	40.78	64.08	30.85	101.33	149.64
8	16.20	13.28	82.26	86.41	1.83	1.09	0.20	38.71	57.98	29.62	85.46	131.01
9	15.43	12.93	56.76	64.17	1.69	0.78	0.15	33.51	49.81	31.13	78.82	230.58
10	15.94	13.36	44.50	55.46	1.62	0.69	0.30	34.51	45.94	27.70	75.47	231.72
11	120.22	13.67	37.12	40.54	1.45	0.42	0.53	30.23	42.16	23.77	71.86	162.84
12	107.10	12.14	31.59	27.74	1.35	0.32	52.27	27.16	42.07	24.43	75.19	142.11
13	64.13	11.04	26.88	20.77	1.67	0.27	101.67	26.73	51.47	24.85	60.86	128.26
14	50.95	11.42	22.99	16.70	2.38	0.22	537.44	26.42	100.03	24.79	56.46	116.92
15	47.19	12.68	21.36	13.91	2.12	0.22	274.40	25.20	160.35	20.52	57.14	103.41
16	37.41	13.50	17.16	11.77	1.45	0.22	302.00	23.46	147.75	18.41	51.68	94.75
17	31.38	13.35	14.40	10.39	1.23	0.23	225.40	21.18	463.14	18.44	44.62	96.49
18	27.89	16.40	12.73	10.75	1.90	0.53	173.18	21.10	382.05	17.41	41.39	86.62
19	28.24	13.87	22.82	8.69	2.22	1.28	146.21	21.49	227.50	18.11	65.57	80.25
20	28.37	13.17	45.33	8.05	1.59	0.53	123.14	19.02	171.76	18.41	215.32	77.81
21	25.54	14.63	25.91	7.52	1.28	0.42	100.86	19.77	146.12	18.97	175.78	66.56
22	22.01	12.54	21.71	7.10	1.03	0.31	84.79	18.93	134.11	16.56	136.66	60.14
23	22.83	12.05	18.50	6.26	2.15	0.26	82.10	18.52	124.12	17.67	117.21	62.75
24	19.36	11.30	13.90	6.88	1.25	0.19	200.26	23.03	105.14	17.43	100.69	60.50
25	17.57	10.48	11.04	6.39	1.20	0.19	246.13	26.04	88.86	14.73	88.51	101.98
26	17.29	10.65	9.29	6.33	1.16	0.17	170.23	24.19	80.90	14.47	79.05	134.63
27	17.25	10.08	7.96	5.03	0.94	0.17	133.35	22.52	74.85	15.05	69.54	104.10
28	15.41	8.86	7.03	4.19	0.83	0.17	110.71	29.29	67.26	15.89	65.70	117.43
29	14.32	7.77	6.34	4.38	0.67	0.17	92.43	73.55	55.70	17.21		259.99
30	14.61	6.80	5.75	3.84	0.62	0.16	79.82	208.61	47.39	32.58		397.55
31		7.87		3.04	0.76		74.11		45.33	340.95		234.36
TOTAL	896.52	391.14	794.60	1576.28	53.54	13.93	3313.46	1173.09	3640.42	1079.10	3466.44	4285.95
MAX	120.22	17.78	115.52	523.65	3.69	2.11	537.44	208.61	463.14	340.95	599.98	397.55
MIN	14.32	6.80	5.75	3.04	0.62	0.16	0.07	18.52	42.07	14.47	41.39	58.37
AVG	29.88	12.62	26.49	50.85	1.73	0.46	106.89	39.10	117.43	34.81	123.80	138.26
INCHES	0.48	0.21	0.43	0.84	0.03	0.01	1.77	0.63	1.95	0.58	1.85	2.29

Appendix D. Instantaneous Suspended Sediment Concentrations

**Table D1. Suspended Sediment Concentrations (mg/L),
Little Vermilion River (Station 701), 03/29/00–04/04/02 Central Standard Time**

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
03/29/2000 14:02	38.79	GRAB
04/04/2000 10:52	21.00	GRAB
04/10/2000 19:42	49.77	GRAB
04/17/2000 21:00	43.02	GRAB
04/24/2000 13:30	28.00	GRAB
05/01/2000 12:59	15.31	GRAB
05/08/2000 12:43	38.91	GRAB
05/17/2000 11:31	32.15	GRAB
05/22/2000 12:06	53.31	DH-48
05/29/2000 10:56	42.55	DH-48
05/29/2000 12:00	45.89	ISCO
06/07/2000 12:40	38.42	DH-48
06/12/2000 12:18	12.69	DH-48
06/14/2000 11:45	33.75	ISCO
06/14/2000 12:00	85.13	ISCO
06/14/2000 13:00	61.31	ISCO
06/14/2000 16:00	47.67	ISCO
06/14/2000 19:00	47.54	ISCO
06/14/2000 22:00	41.24	ISCO
06/15/2000 01:00	38.33	ISCO
06/15/2000 04:00	37.30	ISCO
06/15/2000 07:00	31.19	ISCO
06/15/2000 10:00	38.43	ISCO
06/15/2000 12:00	24.46	ISCO
06/15/2000 13:00	38.19	ISCO
06/15/2000 16:00	37.72	ISCO
06/15/2000 19:00	25.19	ISCO
06/15/2000 22:00	38.20	ISCO
06/16/2000 01:00	74.35	ISCO
06/16/2000 04:00	21.80	ISCO
06/16/2000 07:00	17.36	ISCO
06/16/2000 10:00	33.67	ISCO
06/16/2000 12:00	15.66	ISCO
06/16/2000 13:00	13.43	ISCO
06/16/2000 16:00	14.72	ISCO
06/16/2000 19:00	19.92	ISCO
06/19/2000 10:16	208.53	DH-48
06/19/2000 12:00	28.32	ISCO
06/21/2000 01:30	62.85	ISCO
06/21/2000 04:30	103.95	ISCO
06/21/2000 07:30	68.17	ISCO
06/21/2000 10:30	39.74	ISCO
06/21/2000 12:00	33.50	ISCO
06/21/2000 13:30	29.83	ISCO
06/21/2000 16:30	29.18	ISCO
06/21/2000 19:30	31.40	ISCO
06/21/2000 22:30	33.37	ISCO
06/22/2000 01:30	45.91	ISCO
06/22/2000 04:30	28.90	ISCO
06/22/2000 07:30	27.89	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
06/22/2000 10:00	32.76	DH-59
06/22/2000 10:30	24.11	ISCO
06/22/2000 12:00	22.70	ISCO
06/22/2000 13:30	21.28	ISCO
06/22/2000 16:30	23.38	ISCO
06/26/2000 12:43	26.40	DH-59
06/26/2000 13:30	37.23	ISCO
06/26/2000 16:30	30.07	ISCO
06/26/2000 19:30	26.85	ISCO
06/26/2000 22:30	24.03	ISCO
06/27/2000 01:30	24.34	ISCO
06/27/2000 04:30	30.04	ISCO
06/27/2000 07:30	22.14	ISCO
06/27/2000 10:30	24.00	ISCO
06/27/2000 12:00	21.65	ISCO
06/27/2000 13:30	39.62	ISCO
06/27/2000 16:30	28.97	ISCO
06/27/2000 19:30	28.18	ISCO
06/27/2000 22:30	53.29	ISCO
06/28/2000 01:30	60.14	ISCO
06/28/2000 04:30	23.41	ISCO
06/28/2000 07:30	57.88	ISCO
06/28/2000 10:30	43.04	ISCO
06/28/2000 12:00	23.96	ISCO
06/28/2000 13:30	44.95	ISCO
06/28/2000 16:30	68.16	ISCO
06/28/2000 19:30	62.72	ISCO
06/28/2000 22:30	67.24	ISCO
06/29/2000 01:30	76.82	ISCO
06/29/2000 04:30	63.67	ISCO
07/05/2000 09:09	87.77	DH-59
07/05/2000 10:15	70.06	ISCO
07/05/2000 12:00	93.29	ISCO
07/05/2000 13:15	89.63	ISCO
07/06/2000 12:00	77.42	ISCO
07/07/2000 12:00	67.27	ISCO
07/08/2000 12:00	58.25	ISCO
07/10/2000 12:00	58.73	ISCO
07/11/2000 09:49	99.81	DH-48
07/11/2000 12:00	61.98	ISCO
07/17/2000 09:26	93.57	DH-48
07/24/2000 09:50	66.24	DH-48
07/31/2000 09:38	7.31	DH-48
08/08/2000 09:27	5.75	GRAB
08/14/2000 10:11	7.18	GRAB
08/22/2000 09:54	7.26	DH-48
08/29/2000 09:13	4.52	GRAB
09/05/2000 08:43	9.76	DH-48
09/12/2000 09:44	6.74	DH-48
09/18/2000 10:43	9.94	GRAB
09/25/2000 14:05	25.39	DH-48

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
10/02/2000 09:39	29.55	GRAB
10/05/2000 09:40	33.43	GRAB
10/10/2000 10:15	31.04	GRAB
10/17/2000 09:52	78.53	DH48
10/24/2000 12:42	3.46	GRAB
10/30/2000 13:42	42.67	GRAB
11/06/2000 09:12	70.32	GRAB
11/10/2000 11:59	28.59	ISCO
11/11/2000 11:59	63.32	ISCO
11/13/2000 10:53	109.81	DH-48
11/20/2000 15:38	134.77	DH-48
11/27/2000 11:48	102.44	DH-48
12/04/2000 11:48	140.66	DH-48
12/12/2000 14:59	139.34	DH-48
12/28/2000 15:16	135.19	DH-48
01/02/2001 10:11	150.14	DH-48
01/08/2001 12:26	130.94	DH-48
01/16/2001 12:55	51.41	DH-48
01/22/2001 13:04	95.86	DH-48
01/29/2001 11:59	75.08	DH-48
02/05/2001 12:39	25.16	DH-59
02/09/2001 01:00	42.41	ISCO
02/09/2001 04:00	110.20	ISCO
02/09/2001 07:00	39.67	ISCO
02/09/2001 09:35	52.17	DH-59
02/09/2001 10:00	28.11	ISCO
02/09/2001 12:00	42.39	ISCO
02/09/2001 16:00	88.10	ISCO
02/09/2001 19:00	129.26	ISCO
02/10/2001 01:00	119.02	ISCO
02/10/2001 04:00	89.67	ISCO
02/10/2001 07:00	64.15	ISCO
02/10/2001 11:59	56.90	DH-59
02/10/2001 12:00	55.53	ISCO
02/10/2001 12:18	56.3	EWI
02/10/2001 12:27	55.05	DH-59
02/10/2001 13:00	53.39	ISCO
02/10/2001 16:00	45.56	ISCO
02/10/2001 19:00	37.81	ISCO
02/10/2001 22:00	32.75	ISCO
02/11/2001 01:00	28.77	ISCO
02/11/2001 04:00	24.65	ISCO
02/11/2001 07:00	23.68	ISCO
02/11/2001 10:00	20.70	ISCO
02/11/2001 12:00	15.43	ISCO
02/11/2001 13:00	19.16	ISCO
02/11/2001 16:00	23.00	ISCO
02/11/2001 19:00	29.02	ISCO
02/11/2001 22:00	15.17	ISCO
02/12/2001 01:00	39.82	ISCO
02/12/2001 04:00	57.94	ISCO
02/12/2001 07:00	92.82	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
02/12/2001 10:00	52.88	ISCO
02/12/2001 12:00	36.75	ISCO
02/12/2001 13:00	42.57	ISCO
02/13/2001 15:02	74.91	DH-59
02/13/2001 15:09	80.1	EWI
02/13/2001 15:17	88.24	DH-59
02/14/2001 15:30	91.45	ISCO
02/14/2001 18:30	58.73	ISCO
02/14/2001 21:30	64.36	ISCO
02/15/2001 00:30	56.40	ISCO
02/15/2001 03:30	61.93	ISCO
02/15/2001 06:30	43.44	ISCO
02/15/2001 09:30	20.71	ISCO
02/15/2001 12:00	57.78	ISCO
02/15/2001 12:30	51.99	ISCO
02/15/2001 15:30	45.34	ISCO
02/15/2001 18:30	64.14	ISCO
02/15/2001 21:30	63.77	ISCO
02/16/2001 00:30	58.24	ISCO
02/16/2001 03:30	57.60	ISCO
02/16/2001 06:30	102.79	ISCO
02/16/2001 12:00	89.21	ISCO
02/16/2001 12:30	25.01	ISCO
02/20/2001 13:04	90.56	DH-59
02/25/2001 00:00	76.52	ISCO
02/25/2001 02:45	139.99	ISCO
02/25/2001 03:00	145.94	ISCO
02/25/2001 06:00	124.87	ISCO
02/25/2001 09:00	107.49	ISCO
02/25/2001 10:23	83.1	EWI
02/25/2001 12:00	77.13	ISCO
02/25/2001 15:00	59.50	ISCO
02/25/2001 18:00	51.39	ISCO
02/25/2001 21:00	42.59	ISCO
02/26/2001 00:00	36.00	ISCO
02/26/2001 03:00	30.93	ISCO
02/26/2001 06:00	31.43	ISCO
02/26/2001 09:00	35.15	ISCO
02/26/2001 10:02	67.77	DH-59
02/26/2001 10:09	52.9	EWI
02/26/2001 10:13	60.75	DH-59
02/26/2001 15:00	55.10	ISCO
02/26/2001 18:00	45.16	ISCO
02/26/2001 21:00	52.27	ISCO
02/27/2001 00:00	56.41	ISCO
03/05/2001 10:48	87.09	DH-48
03/12/2001 13:32	93.76	DH-59
03/19/2001 11:10	83.08	DH-48
03/26/2001 11:16	95.54	DH-59
04/02/2001 09:09	95.20	DH-59

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
04/09/2001 09:13	74.42	DH-59
04/11/2001 04:44	66.98	ISCO
04/11/2001 07:44	49.11	ISCO
04/11/2001 10:44	27.36	ISCO
04/11/2001 11:59	24.68	ISCO
04/11/2001 13:44	44.56	ISCO
04/11/2001 16:44	39.27	ISCO
04/11/2001 19:44	51.30	ISCO
04/11/2001 22:44	48.23	ISCO
04/12/2001 01:44	28.97	ISCO
04/12/2001 04:44	45.91	ISCO
04/12/2001 07:44	34.82	ISCO
04/12/2001 10:44	72.41	ISCO
04/12/2001 11:59	36.25	ISCO
04/16/2001 09:26	78.50	DH-48
04/23/2001 09:22	107.13	DH-48
04/30/2001 09:27	73.93	DH-48
05/07/2001 09:46	97.95	DH-48
05/14/2001 12:19	109.57	DH-48
05/21/2001 09:33	55.30	DH-48
05/30/2001 12:33	95.69	DH-59
06/06/2001 11:34	95.01	DH-59
06/06/2001 15:30	71.13	ISCO
06/06/2001 18:30	42.23	ISCO
06/06/2001 21:30	84.05	ISCO
06/07/2001 00:30	72.14	ISCO
06/07/2001 03:30	43.46	ISCO
06/07/2001 06:30	41.29	ISCO
06/07/2001 09:30	58.90	ISCO
06/07/2001 12:00	82.79	ISCO
06/07/2001 12:30	65.53	ISCO
06/07/2001 15:30	45.74	ISCO
06/07/2001 18:30	90.87	ISCO
06/07/2001 21:30	67.25	ISCO
06/08/2001 00:30	70.35	ISCO
06/08/2001 03:30	64.26	ISCO
06/08/2001 12:00	70.49	ISCO
06/09/2001 12:00	56.05	ISCO
06/10/2001 12:00	47.78	ISCO
06/13/2001 12:33	100.07	DH-59
06/13/2001 12:54	107.10	DH-59
06/13/2001 13:01	93.2	EWI
06/13/2001 13:09	101.95	DH-59
06/18/2001 11:36	100.24	DH-59
06/25/2001 12:34	81.88	GRAB
07/02/2001 12:28	79.58	DH-59
07/04/2001 01:45	292.87	ISCO
07/04/2001 02:15	277.27	ISCO
07/04/2001 03:15	709.47	ISCO
07/04/2001 04:00	658.91	ISCO
07/04/2001 05:15	726.14	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
07/04/2001 08:15	329.30	ISCO
07/04/2001 11:15	232.15	ISCO
07/04/2001 12:00	159.27	ISCO
07/04/2001 14:15	96.51	ISCO
07/04/2001 17:15	53.17	ISCO
07/04/2001 20:15	40.26	ISCO
07/04/2001 23:15	38.38	ISCO
07/05/2001 02:15	32.62	ISCO
07/05/2001 05:15	29.78	ISCO
07/05/2001 08:15	26.31	ISCO
07/05/2001 11:15	24.77	ISCO
07/05/2001 12:00	26.07	ISCO
07/05/2001 14:15	25.28	ISCO
07/05/2001 17:15	24.91	ISCO
07/05/2001 20:15	24.23	ISCO
07/05/2001 23:15	20.54	ISCO
07/06/2001 02:15	20.41	ISCO
07/06/2001 05:15	20.40	ISCO
07/09/2001 12:00	122.52	ISCO
07/09/2001 12:11	109.12	DH-59
07/10/2001 12:00	103.01	ISCO
07/16/2001 12:08	93.46	DH-59
07/23/2001 10:18	87.34	GRAB
07/30/2001 11:55	128.04	DH-59
07/30/2001 12:52	64.23	DH-59
08/06/2001 09:27	14.35	GRAB
08/14/2001 09:05	9.08	DH-59
08/20/2001 13:24	9.10	GRAB
08/27/2001 09:41	7.65	GRAB
09/04/2001 12:05	7.43	GRAB
09/10/2001 11:42	7.47	DH-59
09/18/2001 12:01	6.35	GRAB
09/24/2001 12:29	6.65	GRAB
10/01/2001 11:15	10.85	DH-59
10/09/2001 12:08	13.69	DH-59
10/12/2001 12:00	64.16	ISCO
10/13/2001 12:00	7.18	ISCO
10/13/2001 19:30	38.30	ISCO
10/13/2001 20:30	140.46	ISCO
10/13/2001 21:45	151.41	ISCO
10/13/2001 23:30	147.86	ISCO
10/14/2001 01:30	112.49	ISCO
10/14/2001 04:30	89.25	ISCO
10/14/2001 07:30	73.10	ISCO
10/14/2001 10:30	53.77	ISCO
10/14/2001 12:00	49.08	ISCO
10/14/2001 13:30	45.17	ISCO
10/14/2001 16:30	37.25	ISCO
10/14/2001 19:30	33.45	ISCO
10/14/2001 22:30	29.67	ISCO
10/15/2001 01:30	28.36	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
10/15/2001 04:30	23.54	ISCO
10/15/2001 07:30	22.63	ISCO
10/15/2001 10:18	15.65	DH-59
10/15/2001 10:30	17.77	ISCO
10/15/2001 12:00	17.79	ISCO
10/15/2001 13:30	15.12	DH-59
10/15/2001 13:30	15.36	ISCO
10/15/2001 13:40	15.92	DH-59
10/15/2001 13:48	14.8	EWI
10/15/2001 13:50	15.14	ISCO
10/15/2001 13:59	16.43	DH-59
10/15/2001 14:04	13.99	DH-59
10/15/2001 14:10	15.0	EWI
10/15/2001 14:15	16.10	DH-59
10/15/2001 16:30	14.55	ISCO
10/15/2001 19:30	13.77	ISCO
10/15/2001 20:24	13.98	GRAB
10/15/2001 22:30	14.01	ISCO
10/16/2001 01:30	17.57	ISCO
10/16/2001 04:30	21.27	ISCO
10/16/2001 07:30	25.17	ISCO
10/16/2001 09:17	25.00	DH-59
10/16/2001 10:30	23.94	ISCO
10/16/2001 12:00	23.02	ISCO
10/16/2001 13:30	22.16	ISCO
10/16/2001 14:01	19.58	DH-59
10/16/2001 14:24	18.6	EWI
10/16/2001 14:03	14.39	ISCO
10/16/2001 14:27	15.56	DH-59
10/16/2001 14:29	19.26	ISCO
10/16/2001 14:42	16.18	DH-59
10/16/2001 14:43	19.45	ISCO
10/16/2001 14:58	20.03	ISCO
10/16/2001 15:00	17.98	DH-59
10/16/2001 15:09	18.52	DH-59
10/16/2001 15:12	18.89	ISCO
10/16/2001 16:30	19.61	ISCO
10/16/2001 19:30	18.22	ISCO
10/16/2001 22:30	17.29	ISCO
10/17/2001 01:30	13.80	ISCO
10/17/2001 04:30	12.67	ISCO
10/17/2001 07:30	12.74	ISCO
10/17/2001 10:30	20.51	ISCO
10/17/2001 12:00	12.32	ISCO
10/17/2001 13:30	14.28	ISCO
10/17/2001 16:30	32.27	ISCO
10/17/2001 19:30	46.60	ISCO
10/17/2001 22:30	35.65	ISCO
10/18/2001 01:30	39.34	ISCO
10/18/2001 04:30	39.45	ISCO
10/18/2001 07:30	19.61	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
10/18/2001 10:30	15.74	ISCO
10/18/2001 10:54	37.06	DH-59
10/18/2001 12:00	29.86	ISCO
10/18/2001 13:30	55.24	ISCO
10/18/2001 15:21	14.89	DH-59
10/18/2001 16:30	63.60	ISCO
10/18/2001 19:30	72.07	ISCO
10/18/2001 22:30	16.96	ISCO
10/19/2001 01:30	26.90	ISCO
10/19/2001 04:30	50.71	ISCO
10/19/2001 07:30	62.77	ISCO
10/19/2001 10:30	55.25	ISCO
10/19/2001 12:00	67.33	ISCO
10/19/2001 13:30	64.74	ISCO
10/19/2001 16:30	69.11	ISCO
10/19/2001 19:30	67.73	ISCO
10/19/2001 22:30	79.53	ISCO
10/20/2001 01:30	8.33	ISCO
10/20/2001 04:30	51.89	ISCO
10/20/2001 07:30	65.34	ISCO
10/22/2001 12:26	97.37	DH-59
10/23/2001 12:00	54.08	ISCO
10/23/2001 22:45	55.87	ISCO
10/24/2001 01:45	76.75	ISCO
10/24/2001 04:45	57.91	ISCO
10/24/2001 07:45	36.38	ISCO
10/24/2001 10:45	27.23	ISCO
10/24/2001 12:00	24.35	ISCO
10/24/2001 16:45	40.46	ISCO
10/24/2001 19:45	64.95	ISCO
10/24/2001 22:45	59.63	ISCO
10/25/2001 01:45	48.36	ISCO
10/25/2001 04:45	38.43	ISCO
10/25/2001 07:45	31.30	ISCO
10/25/2001 10:45	25.61	ISCO
10/25/2001 12:00	22.10	ISCO
10/25/2001 13:45	20.94	ISCO
10/25/2001 16:45	19.94	ISCO
10/25/2001 19:45	32.71	ISCO
10/25/2001 22:45	12.84	ISCO
10/26/2001 01:45	14.85	ISCO
10/26/2001 04:45	27.34	ISCO
10/26/2001 07:45	10.35	ISCO
10/26/2001 10:45	62.57	ISCO
10/31/2001 12:42	71.51	DH-59
10/31/2001 13:15	45.60	ISCO
11/01/2001 01:20	49.05	ISCO
11/05/2001 13:44	111.02	DH-59
11/14/2001 11:44	106.38	DH-59
11/19/2001 13:34	68.38	DH-59
11/26/2001 13:04	86.62	DH-59

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
12/01/2001 00:30	56.01	ISCO
12/01/2001 03:30	57.07	ISCO
12/01/2001 06:30	54.07	ISCO
12/01/2001 09:30	56.53	ISCO
12/01/2001 12:00	60.27	ISCO
12/01/2001 12:30	54.71	ISCO
12/01/2001 15:30	60.14	ISCO
12/01/2001 18:30	46.44	ISCO
12/01/2001 21:30	48.89	ISCO
12/02/2001 00:30	60.46	ISCO
12/02/2001 03:30	38.51	ISCO
12/02/2001 06:30	59.20	ISCO
12/02/2001 09:30	56.87	ISCO
12/02/2001 12:00	61.17	ISCO
12/02/2001 12:30	50.42	ISCO
12/03/2001 14:43	103.05	DH-59
12/03/2001 15:30	45.53	ISCO
12/03/2001 18:30	60.59	ISCO
12/03/2001 21:30	53.29	ISCO
12/04/2001 00:30	54.06	ISCO
12/04/2001 03:30	62.93	ISCO
12/04/2001 06:30	70.82	ISCO
12/04/2001 12:00	52.89	ISCO
12/05/2001 12:00	42.47	ISCO
12/06/2001 12:00	67.00	ISCO
12/10/2001 13:52	100.06	DH-59
12/14/2001 12:00	55.04	ISCO
12/14/2001 12:45	63.32	ISCO
12/14/2001 15:45	54.65	ISCO
12/14/2001 18:45	56.72	ISCO
12/14/2001 21:45	50.42	ISCO
12/15/2001 00:45	47.66	ISCO
12/15/2001 03:45	43.80	ISCO
12/15/2001 06:45	45.18	ISCO
12/15/2001 09:45	31.10	ISCO
12/15/2001 12:00	43.59	ISCO
12/15/2001 12:45	53.78	ISCO
12/15/2001 15:45	53.51	ISCO
12/15/2001 18:45	60.49	ISCO
12/15/2001 21:45	49.76	ISCO
12/16/2001 00:45	49.05	ISCO
12/16/2001 03:45	50.86	ISCO
12/16/2001 06:45	53.86	ISCO
12/16/2001 09:45	37.71	ISCO
12/16/2001 12:00	49.95	ISCO
12/16/2001 12:45	42.19	ISCO
12/16/2001 15:45	40.71	ISCO
12/19/2001 13:58	13.53	DH-59
12/19/2001 15:45	58.85	ISCO
12/19/2001 18:45	25.82	ISCO
12/19/2001 21:45	55.51	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
12/20/2001 00:45	54.09	ISCO
12/20/2001 03:15	50.12	ISCO
12/20/2001 06:45	30.65	ISCO
12/20/2001 09:45	58.63	ISCO
12/20/2001 12:00	60.84	ISCO
12/20/2001 12:45	58.06	ISCO
12/20/2001 15:45	56.94	ISCO
12/20/2001 18:45	52.47	ISCO
12/20/2001 21:45	78.21	ISCO
12/21/2001 00:45	73.94	ISCO
12/21/2001 03:45	42.77	ISCO
12/21/2001 06:45	43.02	ISCO
12/21/2001 09:45	52.35	ISCO
12/21/2001 12:00	50.49	ISCO
12/21/2001 12:45	81.63	ISCO
12/21/2001 15:45	50.76	ISCO
12/21/2001 18:48	35.71	ISCO
12/21/2001 21:45	56.54	ISCO
12/22/2001 00:45	75.91	ISCO
12/22/2001 00:45	83.16	ISCO
12/22/2001 03:15	63.72	ISCO
12/27/2001 12:58	98.16	DH-59
01/02/2002 14:47	61.79	DH-59
01/07/2002 11:25	75.37	DH-59
01/14/2002 14:03	73.04	DH-59
01/23/2002 13:07	73.36	GRAB
01/28/2002 13:08	72.55	DH-59
01/31/2002 02:15	74.52	ISCO
01/31/2002 05:15	56.57	ISCO
01/31/2002 11:15	56.67	ISCO
01/31/2002 12:00	52.23	ISCO
01/31/2002 12:20	62.08	DH-59
01/31/2002 13:20	56.30	DH-59
01/31/2002 14:15	49.28	ISCO
01/31/2002 17:15	43.04	ISCO
01/31/2002 17:56	49.20	DH-59
01/31/2002 19:36	60.92	DH-59
01/31/2002 20:15	58.11	ISCO
01/31/2002 22:28	76.46	DH-59
01/31/2002 23:15	74.96	ISCO
01/31/2002 23:32	77.34	DH-76
02/01/2002 02:15	81.95	ISCO
02/01/2002 05:15	71.17	ISCO
02/01/2002 07:06	64.52	DH-76
02/01/2002 08:15	70.61	ISCO
02/01/2002 10:19	51.45	DH-76
02/01/2002 11:15	47.81	ISCO
02/01/2002 12:00	47.11	ISCO
02/01/2002 14:15	45.85	ISCO
02/01/2002 17:15	37.81	ISCO
02/01/2002 20:15	33.87	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
02/01/2002 23:15	31.00	ISCO
02/02/2002 02:15	29.26	ISCO
02/02/2002 08:15	24.58	ISCO
02/02/2002 11:15	18.13	ISCO
02/02/2002 12:00	17.36	ISCO
02/02/2002 13:27	19.81	DH-59
02/02/2002 14:15	17.93	ISCO
02/02/2002 17:15	17.13	ISCO
02/02/2002 20:15	15.26	ISCO
02/02/2002 23:15	14.68	ISCO
02/03/2002 02:15	13.64	ISCO
02/03/2002 05:15	13.70	ISCO
02/03/2002 08:15	17.52	ISCO
02/03/2002 11:15	12.31	ISCO
02/03/2002 14:15	11.28	ISCO
02/03/2002 17:15	12.13	ISCO
02/03/2002 20:15	23.84	ISCO
02/03/2002 23:15	21.02	ISCO
02/04/2002 02:15	26.33	ISCO
02/04/2002 05:15	27.00	ISCO
02/04/2002 11:15	29.11	ISCO
02/04/2002 12:00	25.07	ISCO
02/04/2002 13:57	6.44	DH-59
02/04/2002 14:00	35.09	ISCO
02/04/2002 17:00	43.37	ISCO
02/05/2002 11:00	36.14	ISCO
02/05/2002 12:00	21.65	ISCO
02/05/2002 14:00	30.00	ISCO
02/05/2002 17:00	29.43	ISCO
02/05/2002 20:00	17.16	ISCO
02/05/2002 23:00	27.67	ISCO
02/06/2002 02:00	21.47	ISCO
02/06/2002 05:00	34.59	ISCO
02/06/2002 08:00	33.25	ISCO
02/06/2002 11:00	30.24	ISCO
02/06/2002 12:00	34.47	ISCO
02/06/2002 14:00	31.03	ISCO
02/06/2002 17:00	42.44	ISCO
02/06/2002 20:00	28.99	ISCO
02/06/2002 23:00	40.86	ISCO
02/07/2002 02:00	44.45	ISCO
02/07/2002 05:00	38.83	ISCO
02/13/2002 12:54	95.35	DH-59
02/14/2002 12:00	20.72	ISCO
02/18/2002 12:00	9.80	ISCO
02/19/2002 12:00	18.79	ISCO
02/19/2002 12:48	71.56	DH-76
02/19/2002 19:30	28.67	ISCO
02/19/2002 22:30	31.26	ISCO
02/20/2002 01:30	38.31	ISCO
02/20/2002 04:30	47.87	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
02/20/2002 07:30	46.94	ISCO
02/20/2002 10:30	38.42	ISCO
02/20/2002 12:00	40.42	ISCO
02/20/2002 12:30	37.37	DH-59
02/20/2002 13:30	38.03	ISCO
02/20/2002 16:30	33.28	ISCO
02/20/2002 19:30	29.02	ISCO
02/20/2002 22:30	36.49	ISCO
02/21/2002 01:30	40.78	ISCO
02/21/2002 04:30	30.79	ISCO
02/21/2002 07:30	41.22	ISCO
02/21/2002 10:30	34.53	ISCO
02/21/2002 12:00	40.51	ISCO
02/21/2002 12:34	51.59	DH-76
02/21/2002 13:30	40.81	ISCO
02/21/2002 16:30	31.32	ISCO
02/21/2002 19:30	31.01	ISCO
02/21/2002 22:30	24.61	ISCO
02/22/2002 01:30	31.61	ISCO
02/22/2002 04:30	27.44	ISCO
02/22/2002 07:30	30.71	ISCO
02/22/2002 10:30	24.37	ISCO
02/22/2002 12:00	28.18	ISCO
02/22/2002 13:30	26.69	ISCO
02/22/2002 16:30	21.18	ISCO
02/22/2002 19:30	18.96	ISCO
02/22/2002 22:30	29.29	ISCO
02/23/2002 01:30	15.95	ISCO
02/23/2002 04:30	16.55	ISCO
02/23/2002 07:30	23.99	ISCO
02/23/2002 10:30	13.49	ISCO
02/23/2002 12:00	22.60	ISCO
02/23/2002 13:30	16.90	ISCO
02/23/2002 16:30	32.14	ISCO
02/23/2002 19:30	23.91	ISCO
02/23/2002 22:30	29.68	ISCO
02/24/2002 01:30	19.62	ISCO
02/24/2002 04:30	28.02	ISCO
02/25/2002 13:23	93.67	DH-76
02/26/2002 12:00	89.28	ISCO
02/28/2002 12:00	42.93	ISCO
03/02/2002 14:45	30.10	ISCO
03/02/2002 17:45	50.23	ISCO
03/02/2002 20:45	45.26	ISCO
03/02/2002 23:45	47.41	ISCO
03/03/2002 02:45	39.79	ISCO
03/03/2002 05:45	58.43	ISCO
03/06/2002 13:30	41.58	ISCO
03/06/2002 13:32	71.67	DH-59
03/06/2002 16:30	28.80	ISCO
03/06/2002 19:30	21.26	ISCO

Table D1. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
03/06/2002 22:30	24.57	ISCO
03/07/2002 01:30	23.96	ISCO
03/07/2002 04:30	31.59	ISCO
03/07/2002 07:30	18.83	ISCO
03/07/2002 10:30	17.90	ISCO
03/07/2002 12:00	26.75	ISCO
03/07/2002 13:30	19.62	ISCO
03/07/2002 16:30	21.07	ISCO
03/07/2002 19:30	19.69	ISCO
03/07/2002 22:30	25.69	ISCO
03/08/2002 01:30	23.14	ISCO
03/08/2002 04:30	21.68	ISCO
03/08/2002 07:30	28.31	ISCO
03/08/2002 10:30	27.68	ISCO
03/08/2002 12:00	27.73	ISCO
03/08/2002 13:30	23.13	ISCO
03/08/2002 16:30	23.47	ISCO
03/08/2002 19:30	31.53	ISCO
03/08/2002 22:30	22.43	ISCO
03/09/2002 01:30	27.34	ISCO
03/09/2002 03:30	23.84	ISCO
03/11/2002 14:16	50.14	DH-59
03/11/2002 16:45	24.38	ISCO
03/11/2002 19:45	21.37	ISCO
03/11/2002 22:45	25.56	ISCO
03/12/2002 01:45	23.17	ISCO
03/12/2002 04:45	12.74	ISCO
03/12/2002 07:45	21.19	ISCO
03/12/2002 10:45	22.48	ISCO
03/12/2002 12:00	17.54	ISCO
03/12/2002 13:45	16.04	ISCO
03/12/2002 16:45	18.05	ISCO
03/12/2002 19:45	21.67	ISCO
03/12/2002 22:45	18.31	ISCO
03/13/2002 01:45	17.57	ISCO
03/13/2002 04:45	16.53	ISCO
03/13/2002 07:45	16.93	ISCO
03/13/2002 10:45	14.66	ISCO
03/13/2002 12:00	12.84	ISCO
03/13/2002 13:45	13.39	ISCO
03/13/2002 16:45	19.60	ISCO
03/13/2002 19:45	20.15	ISCO
03/13/2002 23:45	22.79	ISCO
03/14/2002 01:45	18.92	ISCO
03/14/2002 04:45	14.53	ISCO
03/14/2002 07:45	23.29	ISCO
03/18/2002 14:50	45.63	DH-59
03/19/2002 12:00	36.95	ISCO
03/23/2002 12:00	22.65	ISCO
03/25/2002 10:45	38.38	ISCO
03/25/2002 12:00	45.17	ISCO

Table D1. (Concluded)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
03/25/2002 13:45	43.65	ISCO
03/25/2002 16:45	43.67	ISCO
03/25/2002 19:45	50.12	ISCO
03/25/2002 22:45	50.16	ISCO
03/26/2002 01:45	42.04	ISCO
03/26/2002 04:45	28.80	ISCO
03/26/2002 07:45	43.32	ISCO
03/26/2002 10:45	46.64	ISCO
03/26/2002 12:00	34.57	ISCO
03/26/2002 13:45	29.08	ISCO
03/26/2002 16:45	19.80	ISCO
03/26/2002 19:45	31.92	ISCO
03/26/2002 22:45	29.09	ISCO
03/27/2002 01:45	20.92	ISCO
03/27/2002 04:45	22.91	ISCO
03/27/2002 07:45	19.15	ISCO
03/27/2002 14:16	53.07	DH-59
03/27/2002 16:45	29.35	ISCO
03/27/2002 19:45	26.92	ISCO
03/27/2002 22:45	38.78	ISCO
03/28/2002 01:45	26.98	ISCO
03/28/2002 04:45	38.52	ISCO
03/28/2002 07:45	18.93	ISCO
03/28/2002 10:45	26.33	ISCO
03/28/2002 12:00	27.86	ISCO
03/28/2002 13:45	31.07	ISCO
03/28/2002 16:45	31.00	ISCO
03/28/2002 19:45	38.20	ISCO
03/28/2002 22:45	45.54	ISCO
03/29/2002 01:45	39.43	ISCO
03/29/2002 04:45	38.46	ISCO
03/29/2002 07:45	47.25	ISCO
03/29/2002 10:45	44.54	ISCO
03/29/2002 12:00	35.63	ISCO
03/29/2002 13:45	45.70	ISCO
03/29/2002 16:45	50.70	ISCO
03/29/2002 19:45	79.94	ISCO
03/29/2002 22:45	73.64	ISCO
03/30/2002 01:45	65.23	ISCO
03/30/2002 04:45	56.05	ISCO
03/30/2002 07:45	50.84	ISCO
04/04/2002 14:10	29.38	DH-59

Notes:

*GRAB: Weighted Bottle (dip sample in extreme low flow conditions)

DH-48, 59, or 76: Depth-integrated, single vertical

EWI: Equal Width Increment, mean concentration

ISCO: Point sample, peristaltic pump

**Table D2. Suspended Sediment Concentrations (mg/L), Middle Fork (Station 702),
03/09/00–04/04/02 Central Standard Time**

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
03/09/2000 11:15	6.08	GRAB
03/29/2000 10:21	16.79	GRAB
04/04/2000 12:02	3.09	GRAB
04/10/2000 11:17	51.35	GRAB
04/17/2000 12:15	15.81	GRAB
04/24/2000 11:59	16.02	GRAB
05/01/2000 10:31	3.15	GRAB
05/08/2000 10:11	35.66	GRAB
05/17/2000 08:43	7.99	DH-59
05/22/2000 09:10	469.23	DH-59
05/28/2000 20:51	257.48	DH-59
05/29/2000 08:41	191.74	DH-59
06/01/2000 09:11	65.60	DH-59
06/07/2000 09:57	11.96	DH-59
06/12/2000 09:31	21.17	DH-59
06/19/2000 14:16	49.06	DH-59
06/26/2000 09:18	97.44	DH-59
07/05/2000 12:45	78.82	DH-59
07/11/2000 13:37	14.90	DH-59
07/17/2000 13:15	70.44	DH-59
07/24/2000 13:17	46.98	DH-59
07/31/2000 13:19	53.46	DH-59
08/08/2000 13:38	11.54	DH-59
08/14/2000 13:44	29.25	GRAB
08/22/2000 13:33	16.29	GRAB
08/29/2000 13:21	28.41	GRAB
09/05/2000 11:41	7.54	GRAB
09/12/2000 13:30	18.69	DH-59
09/18/2000 13:52	58.86	GRAB
09/25/2000 10:17	32.17	DH-59
10/02/2000 13:47	63.53	DH-59
10/10/2000 13:21	61.22	DH-59
10/17/2000 13:19	73.10	DH-59
10/24/2000 09:27	75.68	DH-59
10/30/2000 10:19	70.10	DH-59
11/06/2000 12:06	92.72	GRAB
11/13/2000 14:38	14.12	DH-59
11/27/2000 15:14	76.69	GRAB
12/04/2000 14:51	140.95	DH-59
02/05/2001 10:06	34.35	DH-59
02/09/2001 11:35	616.76	DH-59
02/10/2001 12:00	529.98	DH-59
02/12/2001 10:06	161.55	DH-59
02/13/2001 11:34	63.20	DH-59
02/20/2001 09:48	18.77	DH-59
02/25/2001 11:30	859.30	DH-59
02/26/2001 13:08	702.40	DH-59
02/27/2001 11:35	712.76	DH-59
02/28/2001 11:15	337.30	DH-59
03/01/2001 11:16	1943.50	DH-59

Table D2. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
03/05/2001 13:50	34.57	DH-59
03/12/2001 10:53	53.81	DH-59
03/19/2001 14:32	66.16	DH-59
03/26/2001 14:19	82.62	DH-59
04/02/2001 13:05	36.75	DH-59
04/09/2001 09:54	246.32	DH-59
04/16/2001 12:40	43.12	DH-59
04/23/2001 12:02	66.02	DH-59
04/30/2001 12:52	78.39	DH-59
05/07/2001 12:31	82.70	DH-59
05/14/2001 09:09	80.98	DH-59
05/21/2001 12:36	26.30	DH-59
05/30/2001 09:23	36.15	DH-59
06/06/2001 12:44	111.66	DH-59
06/08/2001 07:00	170.42	DH-59
06/13/2001 09:12	92.86	DH-59
06/18/2001 08:52	104.99	DH-59
06/25/2001 09:33	74.61	DH-59
07/02/2001 09:19	75.94	DH-59
07/09/2001 09:07	65.85	DH-59
07/16/2001 08:54	13.72	DH-59
07/23/2001 13:03	46.63	DH-59
07/30/2001 09:59	87.35	DH-59
08/06/2001 12:42	37.83	DH-59
08/14/2001 11:57	52.02	GRAB
08/20/2001 10:31	84.61	DH-59
08/27/2001 12:31	61.31	DH-59
08/31/2001 10:48	142.31	DH-59
09/04/2001 09:21	36.91	DH-59
09/10/2001 09:01	117.61	DH-59
09/18/2001 09:28	18.01	DH-59
09/24/2001 10:01	43.78	DH-59
10/01/2001 12:15	53.78	DH-59
10/09/2001 09:31	66.02	DH-59
10/15/2001 12:42	156.00	GRAB
10/15/2001 18:24	175.62	DH-59
10/16/2001 12:58	169.57	DH-59
10/18/2001 08:37	163.50	DH-59
10/18/2001 17:33	153.07	DH-59
10/22/2001 09:46	24.25	DH-59
10/31/2001 10:03	41.51	DH-59
11/05/2001 11:03	92.94	DH-59
11/14/2001 09:43	121.35	DH-59
11/19/2001 10:44	85.56	DH-59
11/26/2001 10:34	69.03	DH-59
12/03/2001 11:39	21.64	DH-59
12/10/2001 11:19	96.31	DH-59
12/19/2001 11:15	96.70	DH-59
12/27/2001 10:43	132.53	DH-59
01/02/2002 12:03	147.63	DH-59
01/07/2002 13:48	73.76	DH-59

Table D2. (Concluded)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
01/14/2002 11:11	94.22	DH-59
01/23/2002 10:31	92.32	GRAB
01/28/2002 10:44	68.85	DH-59
01/31/2002 10:09	1546.48	DH-59
01/31/2002 17:08	1174.51	DH-59
02/01/2002 07:53	578.65	GRAB
02/02/2002 12:36	300.94	DH-59
02/04/2002 10:51	111.44	DH-59
02/05/2002 17:43	47.24	DH-59
02/13/2002 10:43	15.81	DH-59
02/19/2002 10:41	133.56	DH-59
02/20/2002 13:30	653.61	DH-59
02/21/2002 10:01	398.19	DH-59
02/22/2002 10:12	260.38	DH-76
02/25/2002 10:46	67.72	DH-76
03/06/2002 10:24	49.01	DH-76
03/11/2002 12:06	237.07	DH-59
03/18/2002 11:43	50.96	DH-59
03/27/2002 11:37	61.74	DH-59
04/04/2002 11:41	25.63	DH-59

Notes:

*GRAB: Weighted Bottle (dip sample in extreme low flow conditions)

DH-48, 59, or 76: Depth-integrated, single vertical

EWI: Equal Width Increment, mean concentration

ISCO: Point sample, peristaltic pump

Table D3. Suspended Sediment Concentrations (mg/L), North Fork Vermilion (Station 703), 03/09/00–04/04/02 Central Standard Time

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling Method*</i>
03/09/2000 11:59	16.14	GRAB
03/29/2000 11:00	11.97	GRAB
04/04/2000 12:42	6.92	GRAB
04/10/2000 11:50	31.82	GRAB
04/17/2000 12:54	20.08	GRAB
04/24/2000 12:31	12.51	GRAB
05/01/2000 11:01	10.74	GRAB
05/08/2000 10:46	12.02	GRAB
05/17/2000 09:29	30.52	DH-59
05/22/2000 09:56	29.75	DH-59
05/28/2000 21:36	158.34	DH-59
05/29/2000 09:11	114.22	DH-59
05/30/2000 09:40	80.98	DH-59
06/01/2000 09:54	66.27	DH-59
06/07/2000 10:43	21.97	DH-59
06/12/2000 10:18	31.82	DH-59
06/19/2000 13:19	67.35	DH-59
06/26/2000 10:02	92.43	DH-59
07/05/2000 12:06	301.97	DH-59
07/11/2000 12:58	144.33	DH-59
07/17/2000 12:54	117.36	DH-59
07/24/2000 12:26	101.45	DH-59
07/31/2000 12:24	32.35	DH-59
08/08/2000 12:46	31.75	DH-59
08/14/2000 13:06	74.11	GRAB
08/22/2000 12:54	10.78	GRAB
08/29/2000 12:45	11.48	GRAB
09/05/2000 10:58	14.53	GRAB
09/12/2000 12:42	18.67	DH-59
09/18/2000 13:13	11.49	GRAB
09/25/2000 10:56	17.62	DH-59
10/02/2000 12:56	9.73	DH-59
10/10/2000 12:48	4.05	DH-59
10/17/2000 12:40	55.85	DH-59
10/24/2000 10:33	22.06	DH-59
10/30/2000 11:27	16.36	DH-59
11/06/2000 11:12	94.83	GRAB
11/13/2000 14:01	17.52	DH-59
11/20/2000 13:15	104.54	GRAB
11/27/2000 14:37	72.61	GRAB
12/04/2000 14:13	144.57	DH-59
12/14/2000 11:47	132.36	GRAB
12/18/2000 14:03	115.55	DH-59
01/02/2001 13:19	111.26	DH-48
02/05/2001 10:46	20.60	DH-59
02/09/2001 12:20	292.23	DH-59
02/10/2001 12:50	256.19	DH-59
02/12/2001 10:39	47.72	DH-59
02/13/2001 12:09	37.07	DH-59
02/20/2001 10:23	42.72	DH-59

Table D3. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
02/25/2001 12:15	1680.57	DH-59
02/26/2001 14:05	295.03	DH-59
02/27/2001 11:06	186.73	DH-59
02/28/2001 10:41	105.65	DH-59
03/01/2001 10:41	68.13	DH-59
03/05/2001 13:15	40.49	DH-59
03/12/2001 11:26	118.56	DH-59
03/19/2001 13:51	104.50	DH-76
03/26/2001 13:39	81.71	DH-59
04/02/2001 12:29	74.11	DH-59
04/16/2001 12:06	67.21	DH-59
04/23/2001 11:26	94.87	DH-59
04/30/2001 12:18	82.71	DH-59
05/07/2001 11:54	38.89	DH-59
05/14/2001 09:46	74.21	DH-59
05/21/2001 11:48	81.72	DH-59
05/30/2001 09:53	66.47	DH-59
06/06/2001 13:30	212.54	DH-59
06/08/2001 09:39	120.09	DH-59
06/13/2001 09:45	122.08	DH-59
06/18/2001 09:20	115.93	DH-59
06/25/2001 10:13	123.93	DH-59
07/02/2001 10:01	90.52	DH-59
07/09/2001 09:44	72.09	DH-59
07/16/2001 09:40	108.56	DH-59
07/23/2001 12:47	68.73	DH-59
07/30/2001 10:55	58.15	DH-59
08/06/2001 11:53	42.93	DH-59
08/14/2001 11:22	28.75	GRAB
08/20/2001 11:06	44.26	DH-59
08/27/2001 11:58	24.97	GRAB
08/31/2001 10:19	402.34	DH-59
09/01/2001 09:51	111.70	DH-59
09/04/2001 10:03	31.55	DH-59
09/10/2001 10:01	121.81	DH-59
09/18/2001 10:15	82.15	DH-59
09/24/2001 10:38	68.94	DH-59
10/01/2001 12:55	101.54	DH-59
10/09/2001 10:24	86.47	DH-59
10/15/2001 12:10	45.58	GRAB
10/15/2001 18:55	48.24	DH-59
10/16/2001 12:15	68.62	DH-59
10/18/2001 09:05	49.72	DH-59
10/18/2001 17:04	52.56	DH-59
10/22/2001 10:22	37.80	DH-59
10/31/2001 10:44	97.38	DH-59
11/05/2001 11:39	106.22	DH-59
11/14/2001 10:11	112.73	DH-59
11/19/2001 11:14	101.43	DH-59
11/26/2001 11:05	96.95	DH-59
12/03/2001 12:13	57.02	DH-59

Table D3. (Concluded)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
12/10/2001 11:55	94.07	DH-59
12/19/2001 11:43	43.71	DH-59
12/27/2001 11:24	112.89	DH-59
01/02/2002 12:33	107.19	DH-59
01/07/2002 13:17	92.61	DH-59
01/14/2002 11:46	90.19	DH-59
01/23/2002 11:03	86.68	GRAB
01/28/2002 11:16	73.74	DH-59
01/31/2002 10:40	790.47	DH-59
01/31/2002 16:39	484.54	DH-59
02/01/2002 08:21	201.32	GRAB
02/02/2002 12:11	96.14	GRAB
02/04/2002 11:21	45.04	DH-59
02/05/2002 17:16	23.51	DH-59
02/13/2002 11:15	86.76	DH-59
02/19/2002 11:07	88.51	DH-59
02/20/2002 14:20	329.46	DH-59
02/21/2002 10:34	165.63	DH-76
02/22/2002 09:44	93.84	DH-76
02/25/2002 11:17	40.53	DH-76
03/06/2002 10:56	75.24	DH-59
03/11/2002 12:37	85.11	DH-59
03/18/2002 12:15	59.50	DH-59
03/27/2002 12:19	6.29	DH-59
04/04/2002 12:07	19.98	DH-59

Notes:

*GRAB: Weighted Bottle (dip sample in extreme low flow conditions)

DH-48, 59, or 76: Depth-integrated, single vertical

EWI: Equal Width Increment, mean concentration

ISCO: Point sample, peristaltic pump

Table D4. Suspended Sediment Concentrations (mg/L), Vermilion River near Danville (Station 704), 03/29/00–04/04/02 Central Standard Time

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
03/29/2000 12:15	8.07	GRAB
04/04/2000 13:56	8.33	GRAB
04/10/2000 12:35	7.98	GRAB
04/17/2000 13:47	24.70	GRAB
04/24/2000 13:21	15.59	GRAB
05/01/2000 11:51	8.89	GRAB
05/08/2000 11:46	11.99	GRAB
05/17/2000 10:30	16.14	GRAB
05/22/2000 10:43	37.71	GRAB
05/28/2000 22:20	300.16	DH-59
05/29/2000 10:04	218.81	DH-59
06/01/2000 11:05	71.70	DH-59
06/07/2000 11:38	33.66	DH-59
06/12/2000 11:07	22.52	DH-59
06/19/2000 11:54	33.35	DH-59
06/26/2000 11:02	92.08	DH-59
07/05/2000 11:11	29.64	DH-59
07/11/2000 11:55	43.69	DH-59
07/17/2000 11:43	20.09	DH-59
07/24/2000 11:09	11.14	DH-59
07/31/2000 11:24	14.64	DH-59
08/08/2000 11:01	14.65	DH-59
08/14/2000 12:03	15.54	GRAB
08/22/2000 11:29	15.48	GRAB
08/29/2000 11:21	18.18	GRAB
09/05/2000 10:10	16.73	GRAB
09/12/2000 11:24	48.35	DH-59
09/18/2000 12:01	14.17	GRAB
09/25/2000 12:24	78.34	DH-59
10/02/2000 11:24	19.45	DH-59
10/10/2000 11:42	10.69	DH-59
10/17/2000 11:35	13.26	DH-59
10/24/2000 11:33	12.18	DH-59
10/30/2000 12:22	11.76	DH-59
11/06/2000 10:03	11.76	GRAB
11/13/2000 12:38	16.87	DH-59
11/20/2000 14:07	14.78	GRAB
11/27/2000 12:49	11.52	DH-59
12/04/2000 13:20	59.75	DH-59
12/14/2000 13:04	17.86	GRAB
01/02/2001 11:53	66.73	GRAB
02/05/2001 11:40	24.73	DH-59
02/09/2001 13:30	264.24	DH-59
02/10/2001 14:08	475.42	DH-59
02/12/2001 11:28	145.24	DH-76
02/13/2001 13:37	59.17	DH-59
02/20/2001 11:36	23.65	DH-59
02/25/2001 13:20	1161.67	DH-59
02/26/2001 15:55	679.14	DH-59
02/27/2001 09:44	497.93	GRAB

Table D4. (Continued)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
02/28/2001 09:21	281.14	GRAB
03/01/2001 09:20	142.25	GRAB
03/05/2001 11:43	43.55	DH-59
03/12/2001 12:26	13.25	DH-59
03/19/2001 12:10	105.44	DH-59
03/26/2001 12:05	43.08	DH-59
04/02/2001 11:03	12.49	DH-59
04/09/2001 10:34	213.32	DH-59
04/16/2001 10:31	36.14	DH-59
04/23/2001 10:13	19.98	DH-59
04/30/2001 11:10	12.92	DH-59
05/07/2001 10:37	13.61	DH-59
05/14/2001 11:10	10.92	DH-59
05/21/2001 10:26	16.69	DH-59
05/30/2001 11:29	18.90	DH-59
06/06/2001 15:10	71.16	DH-59
06/08/2001 08:22	143.93	DH-59
06/13/2001 11:06	29.00	DH-59
06/18/2001 10:33	16.08	DH-59
06/25/2001 11:25	15.12	DH-59
07/02/2001 11:19	13.92	DH-59
07/09/2001 10:57	27.91	DH-59
07/16/2001 10:46	41.36	DH-59
07/23/2001 11:55	78.10	DH-59
08/06/2001 10:54	77.55	DH-59
08/14/2001 10:24	28.76	GRAB
08/20/2001 12:11	62.10	DH-59
08/27/2001 10:55	41.17	GRAB
09/04/2001 10:59	37.67	DH-59
09/10/2001 10:48	58.30	DH-59
09/18/2001 10:57	24.17	DH-59
09/24/2001 11:24	26.19	DH-59
10/01/2001 13:42	17.37	DH-59
10/09/2001 10:08	16.39	DH-59
10/15/2001 11:25	204.58	GRAB
10/15/2001 19:34	172.02	DH-59
10/16/2001 11:26	113.55	DH-59
10/18/2001 09:50	71.38	DH-59
10/18/2001 16:13	82.49	GRAB
10/22/2001 11:06	32.04	DH-59
10/31/2001 11:32	26.40	DH-59
11/05/2001 12:41	36.63	DH-59
11/14/2001 10:47	76.86	DH-59
11/19/2001 12:34	70.75	DH-59
11/26/2001 12:05	8.33	DH-59
12/03/2001 13:11	43.16	DH-59
12/10/2001 12:45	8.25	DH-59
12/19/2001 12:54	79.34	DH-59
12/27/2001 11:59	14.01	DH-59
01/02/2002 13:48	93.26	DH-59

Table D4. (Concluded)

<i>Date/Time</i>	<i>Concentration</i>	<i>Sampling method*</i>
01/07/2002 12:21	75.92	DH-59
01/14/2002 12:53	81.90	DH-59
01/23/2002 12:03	32.60	GRAB
01/28/2002 12:00	7.16	DH-59
01/31/2002 11:17	503.28	DH-59
01/31/2002 15:57	863.63	DH-59
02/01/2002 08:54	461.22	GRAB
02/02/2002 11:28	250.13	GRAB
02/04/2002 12:54	86.29	DH-59
02/05/2002 16:38	49.31	DH-59
02/13/2002 11:51	18.48	DH-59
02/19/2002 11:43	135.44	DH-59
02/20/2002 15:20	531.85	DH-59
02/21/2002 11:28	369.53	DH-76
02/22/2002 09:10	230.51	DH-76
02/25/2002 12:11	52.89	DH-76
03/06/2002 11:54	37.40	DH-59
03/11/2002 13:12	177.91	DH-59
03/18/2002 13:38	19.17	DH-59
03/27/2002 13:02	10.64	DH-59
04/04/2002 13:07	24.99	DH-59

Notes:

*GRAB: Weighted Bottle (dip sample in extreme low flow conditions)
DH-48, 59, or 76: Depth-integrated, single vertical
EWI: Equal Width Increment, mean concentration
ISCO: Point sample, peristaltic pump

Appendix E. Instantaneous Nitrate-N Concentrations

**Table E1. Nitrate-N Concentrations (mg/L), Little Vermilion River (Station 701),
03/29/00–04/04/02 Central Standard Time**

<i>Date/Time</i>	<i>Nitrate-N</i>
03/29/2000 14:01	11.58
04/04/2000 09:52	10.86
04/10/2000 13:40	9.76
04/17/2000 14:56*	7.71
04/24/2000 13:31*	9.46
05/01/2000 12:58	8.35
05/08/2000 12:42*	6.28
05/17/2000 11:30	10.40
05/22/2000 12:05	9.41
05/29/2000 10:55	15.42
06/07/2000 12:45	11.49
06/12/2000 12:17	10.63
06/19/2000 10:15	13.65
06/22/2000 10:00*	14.77
06/26/2000 12:42	<0.06
07/05/2000 09:08	13.17
07/11/2000 09:48	11.23
07/17/2000 09:25	8.47
07/24/2000 09:30	3.78
07/31/2000 09:37*	1.09
08/08/2000 09:27	0.24
08/14/2000 10:10	0.07
08/22/2000 09:53	<0.06
08/29/2000 09:12	<0.06
09/05/2000 08:42	<0.06
09/12/2000 09:43	<0.06
09/18/2000 10:42	<0.06
09/25/2000 14:04	<0.06
10/02/2000 09:38	<0.06
10/05/2000 09:40	<0.06
10/10/2000 10:14	11.31
10/17/2000 09:51	7.07
10/24/2000 12:41	4.24
10/30/2000 13:41	2.92
11/06/2000 09:11	2.46
11/13/2000 10:52	11.92
11/20/2000 15:37	12.37
11/27/2000 11:47	12.40
12/04/2000 11:47	11.69
12/12/2000 14:58	13.03
12/18/2000 11:51	12.96
12/28/2000 15:15	12.64
01/02/2001 10:09	12.34
01/08/2001 12:25	11.03
01/16/2001 12:56	10.77
01/22/2001 13:04	11.53
01/29/2001 11:59	10.47
02/05/2001 12:38	12.15
02/09/2001 09:34	13.96
02/09/2001 13:00*	13.78

Table E1. (Continued)

<i>Date/Time</i>	<i>Nitrate-N</i>
02/09/2001 22:00*	14.49
02/10/2001 07:00*	14.89
02/10/2001 11:59*	15.00
02/13/2001 14:48	14.97
02/20/2001 13:10	15.21
02/25/2001 10:35	14.74
02/26/2001 09:43	15.62
03/05/2001 10:47	14.78
03/12/2001 13:31	14.30
03/19/2001 11:08	14.09
03/26/2001 11:15	14.24
04/02/2001 09:09	13.63
04/09/2001 09:12	11.74
04/16/2001 09:27	14.27
04/23/2001 09:21	12.36
04/30/2001 09:27	11.75
05/07/2001 09:45	10.29
05/14/2001 12:18	9.95
05/21/2001 09:32	8.90
05/30/2001 12:32	8.17
06/06/2001 11:32	10.58
06/13/2001 12:33	12.23
06/18/2001 11:35	9.44
06/25/2001 12:34	9.10
07/02/2001 12:27	5.41
07/09/2001 12:10	12.66
07/16/2001 12:06	8.78
07/23/2001 10:18	4.19
07/30/2001 12:51	1.69
08/06/2001 09:27	0.42
08/14/2001 09:04	0.18
08/20/2001 13:24	0.37
08/27/2001 09:41	<0.06
09/04/2001 12:05	<0.06
09/10/2001 11:47	<0.06
09/17/2001 12:01	<0.06
09/24/2001 12:29	<0.06
10/01/2001 11:15	<0.06
10/09/2001 12:08	<0.06
10/15/2001 10:17	10.34
10/15/2001 13:31	10.61
10/15/2001 14:30	10.66
10/15/2001 20:24	11.06
10/16/2001 09:06	10.70
10/16/2001 15:10	11.02
10/17/2001 15:20	12.10
10/18/2001 10:53	12.33
10/22/2001 12:25	12.12
10/31/2001 12:44	12.13
11/05/2001 13:43	11.54
11/14/2001 11:36	11.21

Table E1. (Concluded)

<i>Date/Time</i>	<i>Nitrate-N</i>
11/19/2001 13:33	10.60
11/26/2001 13:03	10.00
12/03/2001 14:42	13.08
12/10/2001 13:51	12.55
12/19/2001 13:59	14.82
12/27/2001 12:58	14.59
01/02/2002 14:46	14.12
01/07/2002 11:24	13.83
01/14/2002 14:02	13.32
01/23/2002 13:08	12.62
01/28/2002 13:07	12.32
01/31/2002 08:15	14.47
01/31/2002 12:19	15.97
01/31/2002 13:19	16.10
01/31/2002 17:55*	16.50
01/31/2002 19:35*	16.30
01/31/2002 22:27*	15.85
01/31/2002 23:31*	15.84
02/01/2002 07:05*	15.96
02/01/2002 10:18*	16.06
02/02/2002 13:26*	16.34
02/03/2002 12:00	16.48
02/04/2002 13:56	16.40
02/13/2002 12:54	15.47
02/19/2002 12:51	13.78
02/20/2002 12:30	16.58
02/21/2002 12:33	16.58
02/25/2002 13:22	16.06
03/06/2002 13:31	16.23
03/11/2002 14:15	16.85
03/18/2002 14:45	16.08
03/27/2002 14:15	16.09
04/04/2002 14:09	16.73

Note:

*Holding time violation - sample not analyzed within 48 hours of collection

**Table E2. Nitrate-N Concentrations, (mg/L) Middle Fork (Station 702),
03/09/00–04/04/02 Central Standard Time**

<i>Date/Time</i>	<i>Nitrate-N</i>
03/09/2000 11:12*	3.68
03/29/2000 10:20	6.70
04/04/2000 11:00	4.42
04/10/2000 10:15	3.57
04/17/2000 11:18*	1.51
04/24/2000 10:58*	13.50
05/01/2000 10:30	8.18
05/08/2000 10:10*	5.99
05/17/2000 08:42	6.13
05/22/2000 09:09*	17.22
05/28/2000 20:50*	14.77
05/29/2000 08:40	17.03
06/01/2000 09:10*	15.38
06/07/2000 09:56	12.77
06/12/2000 09:30	10.33
06/19/2000 14:15	7.77
06/26/2000 09:17	11.98
07/05/2000 12:44	9.41
07/11/2000 13:36	10.61
07/17/2000 13:14	6.74
07/24/2000 13:16	3.15
07/31/2000 13:18*	0.99
08/08/2000 13:37	0.31
08/14/2000 13:44	0.07
08/22/2000 13:32	<0.06
08/29/2000 13:20	<0.06
09/05/2000 11:40	<0.06
09/12/2000 13:29	<0.06
09/18/2000 13:51	<0.06
09/25/2000 10:15	<0.06
10/02/2000 13:46	<0.06
10/10/2000 13:20	<0.06
10/17/2000 13:18	<0.06
10/24/2000 09:26	<0.06
10/30/2000 10:18	<0.06
11/06/2000 12:05	<0.06
11/13/2000 14:37	3.35
11/20/2000 12:32	9.39
11/27/2000 15:13	6.87
12/04/2000 14:50	5.88
01/02/2001 14:15	5.30
02/05/2001 10:05	9.53
02/09/2001 11:35	7.73
02/10/2001 12:00*	7.14
02/12/2001 10:05	11.52
02/13/2001 11:33	11.87
02/20/2001 09:47	12.06
02/25/2001 11:30	4.04
02/26/2001 13:08	5.17
02/27/2001 11:34	6.36

Table E2. (Continued)

<i>Date/Time</i>	<i>Nitrate-N</i>
02/28/2001 11:14	9.76
03/01/2001 11:15	10.58
03/05/2001 13:49	10.81
03/12/2001 10:52	10.85
03/19/2001 14:30	13.63
03/26/2001 14:18	11.74
04/02/2001 13:04	10.16
04/09/2001 09:55	11.62
04/16/2001 12:39	12.52
04/23/2001 12:01	10.67
04/30/2001 12:51	10.06
05/07/2001 12:30	8.40
05/14/2001 09:09	7.43
05/21/2001 12:35	16.44
05/30/2001 09:22*	19.70
06/06/2001 17:44*	16.57
06/08/2001 06:59*	20.74
06/13/2001 09:11	16.63
06/18/2001 08:51	13.61
06/25/2001 09:32	11.66
07/02/2001 09:18	8.83
07/09/2001 09:05	9.15
07/16/2001 08:52	10.34
07/23/2001 13:21	4.97
07/30/2001 09:57	3.04
08/06/2001 12:41	<0.06
08/14/2001 11:57	<0.06
08/20/2001 10:30	0.11
08/27/2001 12:30	0.32
08/31/2001 10:47	0.83
09/04/2001 09:20	0.98
09/10/2001 09:00	2.42
09/17/2001 09:27	1.66
09/24/2001 10:00	1.11
10/01/2001 12:15	0.17
10/09/2001 09:29	2.46
10/15/2001 12:40	4.14
10/15/2001 18:25	4.71
10/16/2001 12:58	4.89
10/17/2001 17:32	5.81
10/18/2001 08:36	6.67
10/22/2001 09:44	7.31
10/31/2001 10:03	7.97
11/05/2001 11:02	7.50
11/14/2001 09:42	7.33
11/19/2001 10:43	6.16
11/26/2001 10:33	5.56
12/03/2001 11:39	8.77
12/10/2001 11:13	7.65
12/19/2001 11:14	9.96
12/27/2001 10:44	9.44

Table E2. (Concluded)

<i>Date/Time</i>	<i>Nitrate-N</i>
01/02/2002 12:02	9.52
01/07/2002 13:46	8.23
01/14/2002 11:10	6.74
01/23/2002 10:30	6.66
01/28/2002 10:43	5.53
01/31/2002 10:07	6.91
01/31/2002 17:07	6.77
02/01/2002 07:52	6.71
02/02/2002 12:35	9.18
02/04/2002 10:50	10.85
02/05/2002 17:42	10.68
02/13/2002 10:42	9.61
02/19/2002 10:40	8.45
02/20/2002 13:30	5.97
02/21/2002 10:00	8.11
02/22/2002 10:11	10.50
02/25/2002 10:45	10.31
03/06/2002 10:29	10.38
03/11/2002 12:05	9.49
03/18/2002 11:42	9.30
03/27/2002 11:37	8.09
04/04/2002 11:40	9.63

Note:

*Holding time violation - sample not analyzed within 48 hours of collection

**Table E3. Nitrate-N Concentrations (mg/L), North Fork Vermilion (Station 703),
03/09/00–04/04/02 Central Standard Time**

<i>Date/Time</i>	<i>Nitrate-N</i>
03/09/2000 11:57*	4.61
03/29/2000 11:00	8.27
04/04/2000 11:40	5.68
04/10/2000 10:52	4.96
04/17/2000 11:52*	2.32
04/24/2000 11:30*	10.19
05/01/2000 11:00	5.91
05/08/2000 10:45*	6.39
05/17/2000 09:28	9.19
05/22/2000 09:55	13.70
05/28/2000 06:15	13.13
05/28/2000 21:35*	15.54
05/29/2000 07:40	16.70
05/29/2000 09:10	17.00
05/30/2000 09:40	18.26
06/01/2000 09:53*	16.59
06/07/2000 10:42	13.95
06/12/2000 10:17	11.45
06/19/2000 13:18	12.81
06/26/2000 10:01	14.72
07/05/2000 12:05	9.83
07/11/2000 12:57	10.55
07/17/2000 12:53	10.09
07/24/2000 12:25	6.55
07/31/2000 12:23*	5.73
08/08/2000 12:45	5.84
08/14/2000 13:06	3.57
08/22/2000 12:53	1.45
08/29/2000 12:44	0.90
09/05/2000 10:57	0.95
09/12/2000 12:41	0.94
09/18/2000 13:12	1.41
09/25/2000 10:55	0.93
10/02/2000 12:49	1.19
10/10/2000 12:47	1.47
10/17/2000 12:39	2.13
10/24/2000 10:32	0.88
10/30/2000 11:26	0.26
11/06/2000 11:11	0.14
11/13/2000 14:00	11.02
11/20/2000 13:17	9.90
11/27/2000 14:36	7.27
12/04/2000 14:12	7.96
12/14/2000 11:48	9.80
12/18/2000 14:02	9.74
01/02/2001 13:25	7.58
02/05/2001 10:47	9.98
02/09/2001 12:20	9.42
02/10/2001 12:40*	9.10
02/12/2001 10:32	12.09

Table E3. (Continued)

<i>Date/Time</i>	<i>Nitrate-N</i>
02/13/2001 12:08	11.96
02/20/2001 10:21	12.04
02/25/2001 12:15	5.12
02/26/2001 14:05	8.21
02/27/2001 11:05	10.53
02/28/2001 10:39	11.27
03/01/2001 10:40	11.52
03/05/2001 13:14	11.32
03/12/2001 11:25	10.44
03/19/2001 13:51	13.09
03/26/2001 13:38	11.20
04/02/2001 12:27	10.04
04/09/2001 11:57	9.39
04/16/2001 12:05	12.84
04/23/2001 11:24	10.50
04/30/2001 12:16	9.35
05/07/2001 11:53	8.05
05/14/2001 09:43	7.38
05/21/2001 11:47	15.42
05/30/2001 09:52	12.35
06/06/2001 18:30*	17.67
06/08/2001 09:38*	19.41
06/13/2001 09:45	14.76
06/18/2001 09:19	12.49
06/25/2001 10:11	10.57
07/02/2001 10:00	6.79
07/09/2001 09:43	6.97
07/16/2001 09:38	6.98
07/23/2001 12:45	2.37
07/30/2001 10:54	2.10
08/06/2001 11:52	1.97
08/14/2001 11:22	0.95
08/20/2001 11:06	1.83
08/27/2001 11:58	1.31
08/31/2001 10:18	2.19
09/01/2001 09:50*	5.05
09/04/2001 10:02	4.73
09/10/2001 10:00	6.35
09/17/2001 10:14	5.64
09/24/2001 10:37	6.00
10/01/2001 12:55	4.18
10/09/2001 10:23	8.08
10/15/2001 12:10	3.07
10/15/2001 18:54	3.75
10/16/2001 12:15	5.01
10/17/2001 17:03	6.14
10/18/2001 09:05	6.99
10/22/2001 10:19	7.49
10/31/2001 10:44	7.62
11/05/2001 11:38	7.68
11/14/2001 10:09	7.07

Table E3. (Concluded)

<i>Date/Time</i>	<i>Nitrate-N</i>
11/19/2001 11:13	6.39
11/26/2001 11:04	6.38
12/03/2001 12:12	8.93
12/10/2001 11:53	7.71
12/19/2001 11:42	10.20
12/27/2001 11:23	9.20
01/02/2002 12:32	8.68
01/07/2002 13:16	7.77
01/14/2002 11:45	7.22
01/23/2002 11:02	6.63
01/28/2002 11:15	5.85
01/31/2002 10:39	8.72
01/31/2002 16:38	7.91
02/01/2002 08:20	7.49
02/02/2002 12:10	9.43
02/04/2002 11:20	10.32
02/05/2002 17:15	9.79
02/13/2002 11:14	9.19
02/19/2002 11:06	8.06
02/20/2002 14:20	8.17
02/21/2002 10:33	9.87
02/22/2002 09:43	10.60
02/25/2002 11:15	10.27
03/06/2002 10:55	10.36
03/11/2002 12:36	10.01
03/18/2002 12:14	9.85
03/27/2002 12:18	8.18
04/04/2002 12:06	10.70

Note:

*Holding time violation - sample not analyzed within 48 hours of collection

**Table E4. Nitrate-N Concentrations (mg/L), Vermilion River near Danville (Station 704),
03/29/00–04/04/02 Central Standard Time**

<i>Date/Time</i>	<i>Nitrate-N</i>
03/29/2000 12:15	6.61
04/04/2000 12:55	6.58
04/10/2000 11:37	5.52
04/17/2000 12:45*	3.72
04/24/2000 12:20*	9.31
05/01/2000 11:50	6.64
05/08/2000 11:45*	4.87
05/17/2000 10:31	4.89
05/22/2000 10:42	10.56
05/28/2000 22:19	11.47
05/29/2000 10:08	12.27
06/01/2000 11:04	13.70
06/07/2000 11:37	12.18
06/12/2000 11:02	11.42
06/19/2000 11:53	10.76
06/26/2000 11:01	11.36
07/05/2000 11:10	9.94
07/11/2000 11:56	8.92
07/17/2000 11:42	7.16
07/24/2000 11:08	4.24
07/31/2000 11:23*	2.91
08/08/2000 11:00	3.10
08/14/2000 12:03	1.36
08/22/2000 11:28	1.54
08/29/2000 11:20	1.45
09/05/2000 10:09	1.26
09/12/2000 11:23	1.56
09/18/2000 12:00	1.22
09/25/2000 12:23	2.24
10/02/2000 11:23	1.36
10/10/2000 11:42	1.16
10/17/2000 11:35	2.62
10/24/2000 11:32	1.87
10/30/2000 12:21	2.11
11/06/2000 10:02	1.75
11/13/2000 12:37	2.99
11/20/2000 14:06	5.77
11/27/2000 12:49	5.07
12/04/2000 13:19	5.35
12/14/2000 13:04	5.55
01/02/2001 11:54	7.00
02/05/2001 11:38	8.69
02/09/2001 13:20	7.67
02/10/2001 14:05*	8.39
02/12/2001 11:31	11.01
02/13/2001 13:34	11.15
02/20/2001 11:34	11.76
02/25/2001 13:20	7.56
02/26/2001 15:55	6.09
02/27/2001 09:43	7.00

Table E4. (Continued)

<i>Date/Time</i>	<i>Nitrate-N</i>
02/28/2001 09:19	9.37
03/01/2001 09:19	10.33
03/05/2001 11:44	10.83
03/12/2001 12:25	10.84
03/19/2001 12:12	11.49
03/26/2001 12:03	11.03
04/02/2001 11:02	10.37
04/09/2001 10:32	10.74
04/16/2001 10:29	10.48
04/23/2001 10:11	9.86
04/30/2001 11:09	8.77
05/07/2001 10:36	7.29
05/14/2001 11:08	6.80
05/21/2001 10:25	8.98
05/30/2001 11:27	14.53
06/06/2001 20:10	10.75
06/08/2001 08:20*	16.27
06/13/2001 11:06	14.00
06/18/2001 10:32	11.83
06/25/2001 11:23	9.15
07/02/2001 11:17	7.98
07/09/2001 10:42	7.13
07/16/2001 10:44	5.65
07/23/2001 11:53	1.04
07/30/2001 11:47	1.12
08/06/2001 10:53	0.07
08/14/2001 10:23	0.16
08/20/2001 12:10	0.45
08/27/2001 10:53	2.00
09/04/2001 10:57	1.33
09/10/2001 10:44	1.40
09/17/2001 10:56	1.62
09/24/2001 11:22	2.13
10/01/2001 13:42	1.93
10/09/2001 11:06	2.33
10/15/2001 11:25	3.44
10/15/2001 19:32	3.51
10/16/2001 11:26	4.42
10/17/2001 16:11	5.13
10/18/2001 09:48	5.89
10/22/2001 11:03	6.86
10/31/2001 11:30	7.46
11/05/2001 12:39	7.15
11/14/2001 10:46	6.87
11/19/2001 12:33	6.42
11/26/2001 12:03	6.11
12/03/2001 13:10	8.28
12/10/2001 12:43	8.04
12/19/2001 12:53	9.85
12/27/2001 11:58	9.78
01/02/2002 13:47	9.90

Table E4. (Concluded)

<i>Date/Time</i>	<i>Nitrate-N</i>
01/07/2002 12:20	9.38
01/14/2002 12:54	8.35
01/23/2002 12:02	8.22
01/28/2002 11:58	7.48
01/31/2002 11:15	6.36
01/31/2002 15:56	7.38
02/01/2002 08:53	7.52
02/02/2002 11:27	9.00
02/04/2002 12:53	10.56
02/05/2002 16:37	10.75
02/13/2002 11:52	10.19
02/19/2002 11:42	8.72
02/20/2002 15:20	7.37
02/21/2002 11:27	8.38
02/22/2002 09:09	9.86
02/25/2002 12:10	10.64
03/06/2002 11:55	10.52
03/11/2002 13:10	9.72
03/18/2002 13:37	10.09
03/27/2002 13:01	9.75
04/04/2002 13:05	10.67

Note:

*Holding time violation - sample not analyzed within 48 hours of collection

Appendix F. Pesticide Concentrations

**Table F1. Pesticides ($\mu\text{g/L}$), Little Vermilion River (Station 701),
06/03/2002–09/17/2002 Central Standard Time**

<i>Date/Time</i>	<i>Atrazine</i>	<i>Alachlor</i>	<i>Metolachlor</i>
06/03/2002 13:12	0.69	<0.23	<0.24
06/11/2002 14:58	20.93	<0.23	1.31
06/18/2002 15:00	1.17	<0.23	<0.24
06/27/2002 14:07	0.74	<0.23	<0.24
07/02/2002 12:46	0.44	<0.23	<0.24
07/12/2002 08:20	0.35	<0.23	<0.24
07/15/2002 13:10	0.32	<0.23	<0.24
07/23/2002 13:40	2.65	<0.23	0.72
07/30/2002 13:41	0.81	<0.23	<0.24
08/06/2002 13:50	0.39	<0.23	<0.24
08/14/2002 14:41	0.22	<0.23	<0.24
08/20/2002 13:35	0.36	<0.23	<0.24
08/27/2002 14:20	0.43	<0.23	<0.24
09/04/2002 12:55	0.19	<0.23	<0.24
09/10/2002 12:55	<0.16	<0.23	<0.24
09/17/2002 15:08	<0.16	<0.23	<0.24

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