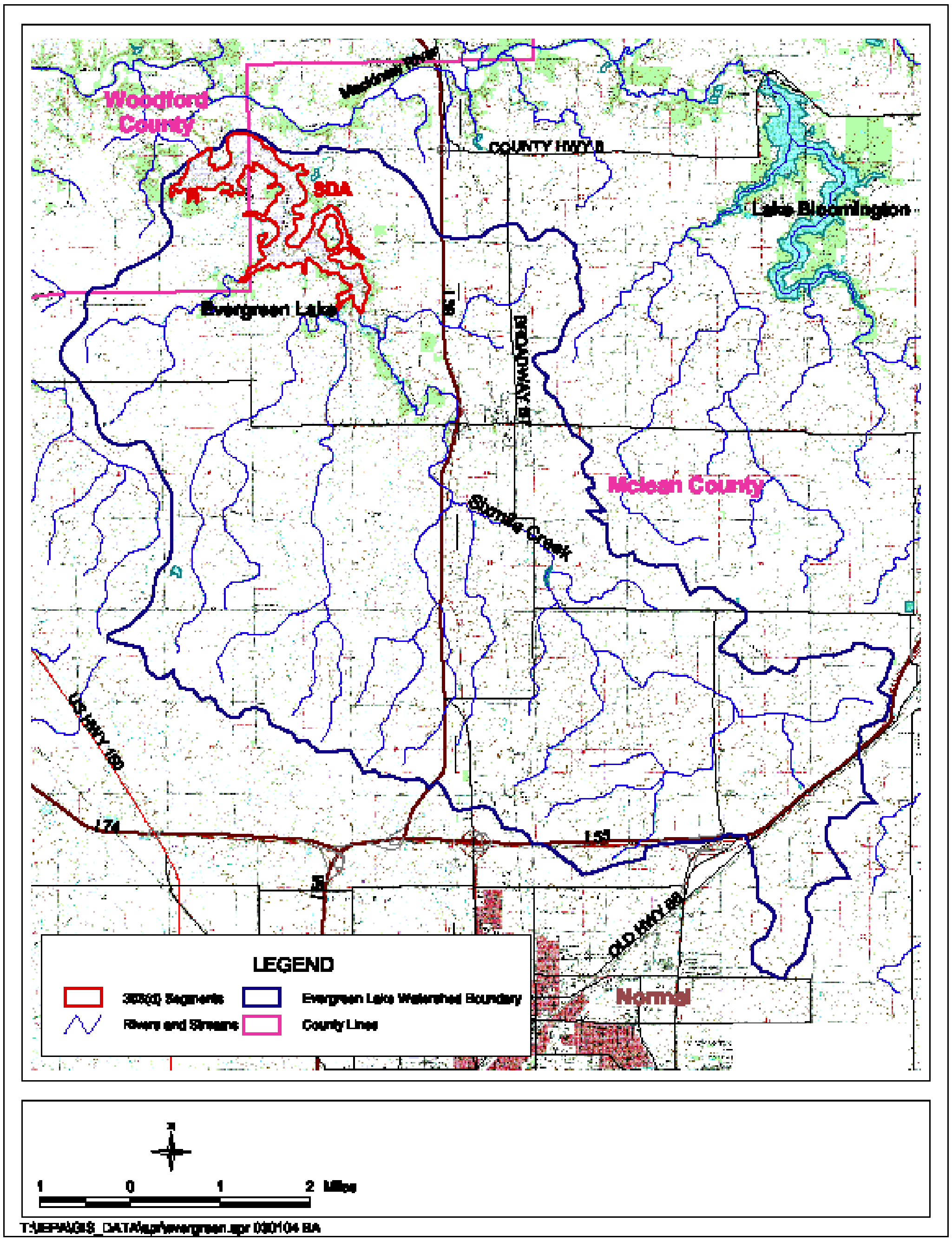
Illinois
Environmental
Protection Agency

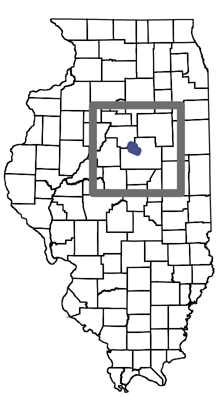
Bureau of Water
P.O. Box 19276
Springfield, IL 62794-9276

December 2006

IEPA/BOW/07-001

EVERGREEN LAKE WATERSHED TMDL REPORT





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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

SEP 27 2005

WW-16J

Marcia T. Willhite, Chief
Bureau of Water
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Dear Ms. Willhite:

The United States Environmental Protection Agency (U.S. EPA) has conducted a complete review of the final Total Maximum Daily Load (TMDL) including supporting documentation and information for Evergreen Lake, which is located in Woodford County and McLean County, Illinois. Based on this review, U.S. EPA has determined that Illinois' TMDL for phosphorous addressing the total suspended solids and phosphorus impairments meets the requirements of Section 303(d) of the Clean Water Act (CWA) and U.S. EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, U.S. EPA hereby approves Illinois' one TMDL for phosphorus addressing two impairments in segment ILDK17-SDA of Mackinaw River watershed. The statutory and regulatory requirements, and U.S. EPA's review of Illinois' compliance with each requirement, are described in the enclosed decision document.

We appreciate your hard work in this area and the submittal of the TMDL as required. If you have any questions, please contact Mr. Kevin Pierard, Chief of the Watersheds and Wetlands Branch at 312-886-4448.

Sincerely yours,

Jo Lynn Traub,
Director, Water Division

Enclosure

cc: Bruce Yurdin, IEPA
Trevor Sample, IEPA

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Acronyms

°F	degrees Fahrenheit
ALMP	Ambient Lake Monitoring Program
BMP	best management practice
BOD	biochemical oxygen demand
$CBOD_5$	5-day carbonaceous biochemical oxygen demand
CCC	Commodity Credit Corporation
cfs	cubic feet per second
CPP	Conservation Practices Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
DEM	Digital Elevation Model
DMR	Discharge Monitoring Reports
DO	dissolved oxygen
DP	dissolved phosphorus
EQIP	Environmental Quality Incentive Program
ft	foot
FSA	Forest Service Agency
GIS	geographic information system
HUC	Hydrologic Unit Code
IBI	Index of Biotic Integrity
ICLP	Illinois Clean Lakes Program
IDA	Illinois Department of Agriculture
IDNR	Illinois Department of Natural Resources
ILLCP	Illinois Interagency Landscape Classification Project
Illinois EPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
ISWS	Illinois State Water Survey
LA	load allocation
LC	loading capacity
MBI	Macroinvertebrate Biotic Index
mg/L	micrograms per liter
MOS	margin of safety
MS4	Municipal Separate Storm Sewer System
NASS	National Agricultural Statistics Service

NCDC	National Climatic Data Center
NRCS	National Resource Conservation Service
PO_4	phosphate
RR	Rock Riffle Grade Control
SSRP	Streambank Stabilization and Restoration Practice
SSURGO	Soil Survey Geographic Database
STATSGO	State Soil Geographic
STORET	Storage and Retrieval
STP	Stone Toe Protection
SWCD	Soil and Water Conservation District
TMDL	total maximum daily load
TP	total phosphorus
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WASCOBs	Water and Sediment Control Basins
WLA	waste load allocation
WRP	Wetland Reserve Program

Section 1
Goals and Objectives for Evergreen Lake Watershed (ILDK17)

1.1 Total Maximum Daily Load (TMDL) Overview

A Total Maximum Daily Load, or TMDL, is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. TMDLs are a requirement of Section 303(d) of the Clean Water Act (CWA). To meet this requirement, the Illinois Environmental Protection Agency (Illinois EPA) must identify water bodies not meeting water quality standards and then establish TMDLs for restoration of water quality. Illinois EPA lists water bodies not meeting water quality standards every two years. This list is called the 303(d) list and water bodies on the list are then prioritized and targeted for TMDL development.

In general, a TMDL is a quantitative assessment of water quality problems, contributing sources, and pollution reductions needed to attain water quality standards. The TMDL specifies the amount of pollution or other stressor that needs to be reduced to meet water quality standards, allocates pollution control or management responsibilities among sources in a watershed, and provides a scientific and policy basis for taking actions needed to restore a water body.

Water quality standards are laws or regulations that states authorize to enhance water quality and protect public health and welfare. Water quality standards provide the foundation for accomplishing two of the principal goals of the CWA. These goals are:

- Restore and maintain the chemical, physical, and biological integrity of the nation's waters
- Where attainable, to achieve water quality that promotes protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water

Water quality standards consist of three elements:

- The designated beneficial use or uses of a water body or segment of a water body
- The water quality criteria necessary to protect the use or uses of that particular water body
- An antidegradation policy

Examples of designated uses are recreation and protection of aquatic life. Water quality criteria describe the quality of water that will support a designated use. Water quality criteria can be expressed as numeric limits or as a narrative statement. Antidegradation policies are adopted so that water quality improvements are conserved, maintained, and protected. At this time, Illinois EPA is only developing TMDLs for pollutants which have numeric water quality criteria.

1.2 TMDL Goals and Objectives for Evergreen Lake Watershed

The Illinois EPA has a three-stage approach to TMDL development. The stages are:

- Stage 1 – Watershed Characterization, Data Analysis, Methodology Selection
- Stage 2 – Data Collection (optional)
- Stage 3 – Model Calibration, TMDL Scenarios, Implementation Plan

Evergreen Lake was ranked as high priority on the 2004 303(d) list. This report addresses Stage 1 and Stage 3 of TMDL development for Evergreen Lake. Stage 2 was not performed as it was determined that data collection was not necessary.

Following this process, the TMDL goals and objectives for the Evergreen Lake Watershed will include developing TMDLs for all impaired water bodies within the watershed, describing all of the necessary elements of the TMDL, developing an implementation plan for each TMDL, and gaining public acceptance of the process. Following is the impaired water body segment in the Evergreen Lake Watershed for which a TMDL will be developed at this time:

- Evergreen Lake (SDA)

The impaired water body segment is shown on Figure 1-1.

The TMDL for the segment listed above will specify the following elements:

- Loading Capacity (LC) or the maximum amount of pollutant loading a water body can receive without violating water quality standards
- Waste Load Allocation (WLA) or the portion of the TMDL allocated to existing or future point sources
- Load Allocation (LA) or the portion of the TMDL allocated to existing or future nonpoint sources and natural background
- Margin of Safety (MOS) or an accounting of uncertainty about the relationship between pollutant loads and receiving water quality

These elements are combined into the following equation:

$$\mathbf{TMDL = LC = \Sigma WLA + \Sigma LA + MOS}$$

The TMDL developed must also take into account the seasonal variability of pollutant loads so that water quality standards are met during all seasons of the year. Also, reasonable assurance that the TMDL will be achieved will be described in the implementation plan. The implementation plan for the Evergreen Lake Watershed will describe how water quality standards will be attained. This implementation plan will include recommendations for implementing best management practices (BMPs), cost estimates, institutional needs to implement BMPs and controls throughout the watershed, and time frame for completion of implementation activities. For potential causes that do not have numeric water quality standards, TMDLs will not be developed at this time. However, in the implementation plans completed during Stage 3 of the TMDL, many of these potential causes may be addressed by implementation of controls for the pollutants with water quality standards.

1.3 Report Overview

The remaining sections of this report contain:

- **Section 2 Evergreen Lake Watershed Description** provides a description of the impaired water body and general watershed characteristics.
- **Section 3 Public Participation and Involvement** discusses public participation activities that occurred throughout the TMDL development.
- **Section 4 Evergreen Lake Watershed Water Quality Standards** defines the water quality standards for the impaired water body. Potential pollution sources will also be discussed in this section.
- **Section 5 Evergreen Lake Watershed Data Review** provides an overview of available data for the Evergreen Lake Watershed.
- **Section 6 Methodologies to Complete TMDLs for the Evergreen Lake Watershed** discusses the models and analyses needed for TMDL development.
- **Section 7 Model Development for Evergreen Lake** provides an explanation of model development for Evergreen Lake.
- **Section 8 Total Maximum Daily Load for the Evergreen Lake Watershed** discusses the allowable loadings to water bodies to meet water quality standards and the reduction in existing loadings needed to meet allowable loads.
- **Section 9 Implementation Plan** includes recommendations for implementing BMPs and continued monitoring throughout the watershed.
- **Section 10 References** lists references used in this report.

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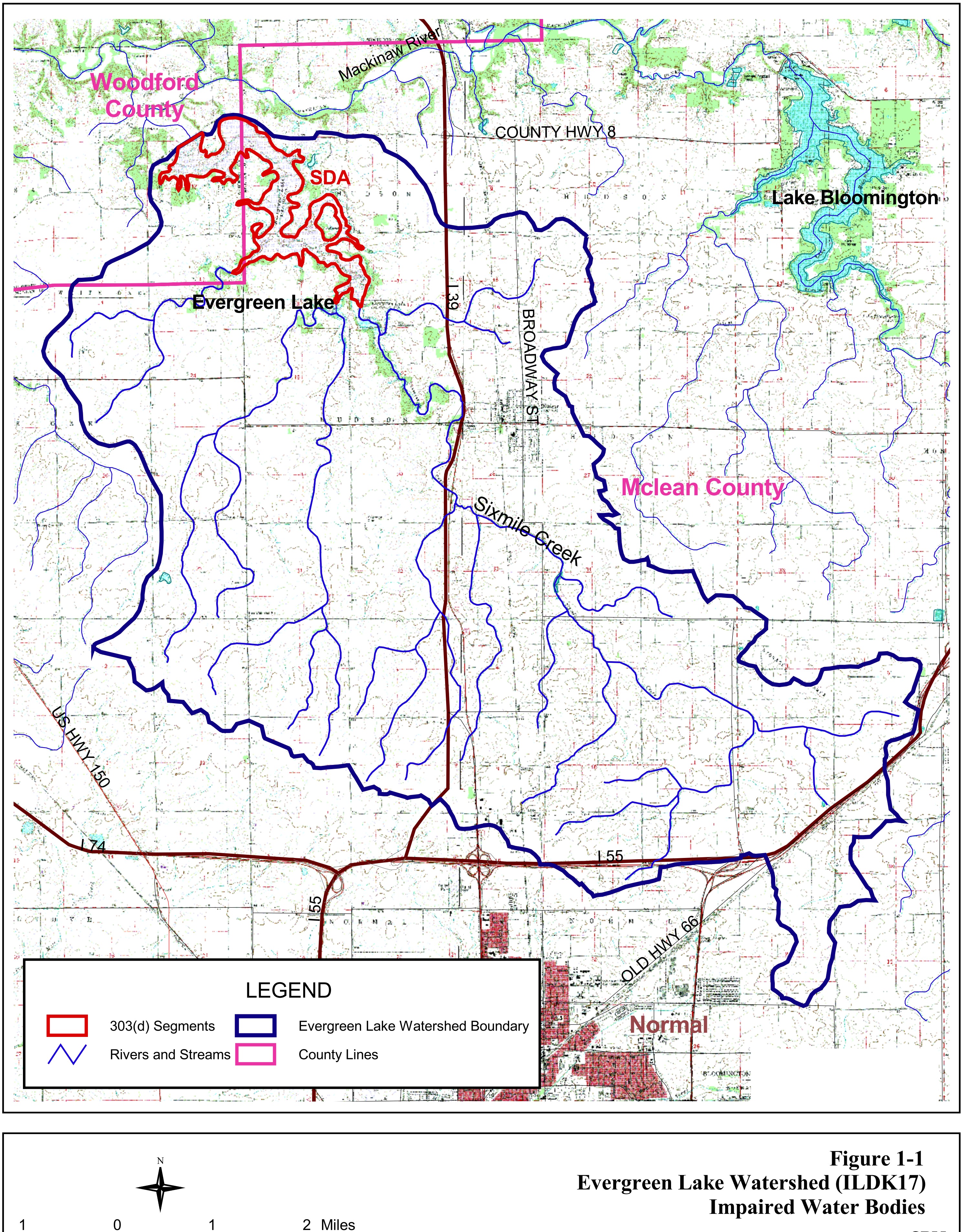

Figure 1-1
Evergreen Lake Watershed (ILDK17)
Impaired Water Bodies

CDM

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Section 2
Evergreen Lake Watershed Description

2.1 Evergreen Lake Watershed Overview

The Evergreen Lake watershed (ILDK17) is located within Woodford County and McLean County, Illinois. The watershed is located within the U.S. Geological Survey (USGS) Mackinaw River Basin (Hydrologic Unit Code [HUC] 07130004). The Evergreen Lake watershed encompasses an area of approximately 40 square miles.

There are two impaired segments within the Evergreen Lake watershed. Table 2-1 lists the water body segment, water body size, and potential causes of impairment for the water body.

Table 2-1 Impaired Water Bodies in Evergreen Lake Watershed

Water Body Segment ID	Water Body Name	Size	Potential Causes of Impairment
SDA	Evergreen Lake	900 acres	Phosphorus, Total Suspended Solids (TSS)
DKN 01	Sixmile Creek	11.2 miles	Physical Habitat Alterations

The TSS and physical habitat alterations impairments are determined based on assessment guidelines rather than a specific numeric water quality standard. Because Illinois EPA is currently developing TMDLs for parameters that have numeric water quality standards, the remaining sections of the report will focus on the phosphorus impairment in Evergreen Lake segment SDA.

Figure 1-1 shows the watershed. The impaired segment for which a TMDL will be developed (segment SDA) is shown in red.

There are no industries in the watershed, and the village of Hudson, population of 1,000, is the only community in the watershed [Illinois State Water Survey (ISWS 1998)]. Land use data were obtained from The Illinois Interagency Landscape Classification Project (IILCP) (U. S. Department of Agriculture National Agricultural Statistics Service [NASS], the Illinois Department of Agriculture [IDA], and the Illinois Department of Natural Resources [IDNR] 1999-2000). Land use in the watershed is predominantly agricultural followed by rural grassland. Farmers in the area primarily raise cash crops, such as corn and soybeans.

The climate in the Evergreen Lake Watershed is cold in the winter and warm in the summer. In the winter, October through March, the average temperature is 36 degrees Fahrenheit (°F) and the average daily minimum temperature is 27°F according to data collected at Normal, Illinois. Summer temperatures are typically 67°F with an average daily maximum of 78°F. Annual precipitation is 38 inches of which 23 inches, approximately 61 percent, usually falls in April through September (National Climatic Data Center [NCDC] 2004).

2.2 Evergreen Lake Watershed Reconnaissance

Evergreen Lake at Site One Near Dam Looking South.

Evergreen Lake, Segment SDA, is located on Sixmile Creek, a tributary to the Mackinaw River in northwest McLean County and southeast Woodford County as shown in Figure 1-1. The lake was formed in 1971 by damming Sixmile Creek where it flows northward into the Mackinaw River. When originally created, the lake had a surface area of 754 acres and a mean depth of 17 feet. The lake was formed as a supplemental water supply source for the city of Bloomington in addition to its regular source, Lake Bloomington, and for recreational fishing, sailing, and boating. Modifications to the Evergreen Lake dam were completed in 1996 which increased the lakes surface area to 900 acres and increased the storage volume by approximately 36 percent. The mean and maximum depths after the modifications were 22 feet and 53 feet, respectively (Raman et al. 1998). The contributing drainage area of Evergreen Lake is approximately 40 square miles and is comprised of Sixmile Creek and two unnamed tributaries.

Northern Eroded Shoreline of Evergreen Lake.

Evergreen Lake was observed from several points around the lake. Some of the shoreline showed signs of erosion. Erosion control measures can help mitigate the TSS impairment in the lake.

Section 3
Public Participation and Involvement

3.1 Evergreen Lake Watershed Public Participation and Involvement

Public knowledge, acceptance, and follow through are necessary to implement a plan to meet recommended TMDLs. It is important to involve the public as early in the process as possible to achieve maximum cooperation and counter concerns as to the purpose of the process and the regulatory authority to implement any recommendations.

Illinois EPA, along with CDM, held three public meetings within the watershed throughout the course of the TMDL development. The first public meeting was held March 10, 2005 at the Hudson Town Hall in Hudson, Illinois to discuss Stage 1 of the Evergreen Lake TMDL development. A total of 23 people attended the meeting. A second meeting was held at the same location on August 10, 2005. This meeting was held in order to present Stage 3 progress. Ten people attended the meeting. A final meeting was held at the Hudson Town Hall on July 13, 2006 to present the Implementation Plan for the watershed. Again, there were ten people in attendance.

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Section 4
Evergreen Lake Watershed Water Quality Standards

4.1 Illinois Water Quality Standards

Water quality standards are developed and enforced by the state to protect the "designated uses" of the state's waterways. In the state of Illinois, setting the water quality standards is the responsibility of the Illinois Pollution Control Board (IPCB). Illinois is required to update water quality standards every three years in accordance with the CWA. The standards requiring modifications are identified and prioritized by Illinois EPA, in conjunction with USEPA. New standards are then developed or revised during the three-year period.

Illinois EPA is also responsible for developing scientifically based water quality criteria and proposing them to the IPCB for adoption into state rules and regulations. The Illinois water quality standards are established in the Illinois Administrative Rules Title 35, Environmental Protection; Subtitle C, Water Pollution; Chapter I, Pollution Control Board; Part 302, Water Quality Standards.

4.2 Designated Uses

The waters of Illinois are classified by designated uses, which include: General Use, Public and Food Processing Water Supplies, Lake Michigan, and Secondary Contact and Indigenous Aquatic Life Use (Illinois EPA 2004). The designated uses applicable to the Evergreen Lake Watershed are the General Use and Public and Food Processing Water Supplies use.

4.2.1 General Use

The General Use classification provides for the protection of aquatic life, wildlife, agricultural, primary contact, secondary contact, and most industrial uses. The General Use is applicable to the majority of Illinois streams and lakes (Illinois EPA 2004).

4.2.2 Public and Food Processing Water Supplies

The Public and Food Processing Water Supplies use was developed for the protection of potable water supplies and water used for food processing purposes. These waters have more stringent water quality standards and apply at any point from which water is withdrawn for these uses (Illinois EPA 2004).

4.3 Illinois Water Quality Standards

To make 303(d) listing determinations, Illinois EPA compares collected data for the water body to the available water quality standards developed by Illinois EPA for assessing water body impairment. Table 4-1 presents the water quality standards of the potential causes of impairment for TMDLs that will be developed in the Evergreen

Lake Watershed at this time. These water quality standards are further discussed in the remainder of the section.

Table 4-1 Summary of General Use Water Quality Standards for Evergreen Lake Watershed

Parameter	General Use Water Quality Standard
Phosphorus	0.05 mg/L Lakes/reservoirs >20 acres and streams entering lakes or reservoirs

4.3.1 Phosphorus

Phosphorus is listed as a cause of impairment for Evergreen Lake. The General Use water quality standard for phosphorus shall not exceed 0.05 milligrams per liter (mg/L) in any lake or reservoir with a surface area of 20 acres or more, or in any stream at the point where it enters any such reservoir or lake. The General Use water quality standard for phosphorus does not apply to streams outside the point where the stream enters a lake or reservoir. At this time, Illinois EPA has not established phosphorus water quality standards for streams that do not enter lakes or reservoirs.

Phosphorus is listed as a cause of less than full support use attainment in lakes or reservoirs if the surface total phosphorus concentration is greater than 0.05 mg/L based on Ambient Lake Monitoring Programs (ALMP) or Illinois Clean Lakes Programs (ICLP) data.

The ALMP and ICLP are both inland-lake monitoring programs conducted and supported by the Illinois EPA. The Clean Lake Program is in place to meet the requirements of Federal and Illinois Clean Lakes Program regulations and grant agreements. The program involves intensive lake-specific monitoring and consists of Phase I diagnostic/feasibility and Phase II implementation project evaluation monitoring. A Phase I study was conducted on Evergreen Lake in 1998. A final report is pending.

4.4 Potential Pollutant Sources

Phosphorus impairments can be attributed to various potential pollutant sources. In order to properly address the conditions within the Evergreen Lake Watershed, all potential pollution sources must be investigated. The following is a summary of the potential sources associated with the listed causes for the TMDL listed segment in this watershed. They are summarized in Table 4-2.

Table 4-2 Summary of Potential Sources of Pollutants

Potential Source	Cause of Impairment
Land Disposal Onsite wastewater systems (septic tanks)	Phosphorus
Agriculture Nonirrigated crop production Pasture Land Animal Holding/Management Areas	Phosphorus
Contaminated Sediments	Phosphorus

4.4.1 Land Disposal

Land disposal sources include onsite wastewater systems, mainly septic systems. Several residential/camping areas were observed on the banks of Evergreen Lake. Most of these areas appeared to be connected to septic systems. These systems are designed to remove solids from wastewater. The domestic waste constituents such as nitrogen, nitrate, and phosphorus pass through the septic tanks and into the leach fields. Given the close proximity to the lake, the leachate flow direction would likely be to the lake. Control of phosphorus entering the lake may reduce the amount of algal growth/chlorophyll "a."

4.4.2 Agriculture

The central Illinois area is largely agriculture land use. Row crop agriculture is the largest single category land use in the basin. Agricultural land uses potentially contribute sediment, TSS, nitrogen, phosphorus, and biochemical oxygen demand (BOD) loads to the water resource loading. The amount that is contributed is a function of the soil type, slope, crop management, precipitation, total amount of cropland, and the distance to the water resource (Muir et al. 1997).

Erosion of the land and streambanks carries sediment to the streams and lakes, resulting in higher levels of TSS and siltation. This can be also be caused by livestock on pastures and feedlots. Wastes from livestock can enter streams, adding to the pollutant loadings.

Agriculture practices can potentially contribute to phosphorus loads based on over application of fertilizer and erosion from fields. The current practice within the Evergreen Lake Watershed is to apply 18-46-0 fertilizer in the fall. Diammonium phosphate (18-46-0) is produced by adding ammonia to phosphoric acid. The phosphorus present in this fertilizer is present in the orthophosphate form.

4.4.3 Contaminated Sediments

Sediments are carried to streams, lakes, and reservoirs during runoff conditions and are generally deposited in streambeds or lake bottoms. Constituents contained in sediment may include nutrients, which can impact BOD loads. Both agricultural lands and urban areas contribute to the nutrient loading in the sediment.

Suspended sediments settle out to stream bottoms during periods of low flow. During periods of high flow, sediments are resuspended and carried downstream to be deposited in another location. Once the sediment reaches a lake or reservoir, the sediments are deposited and typically accumulate in these areas. The source of the contaminated sediment can therefore be located much farther upstream than the location detected.

Contaminated sediments can slowly leach contaminants to the water column, thereby being a continual source of impact to the water body. Phosphorus is commonly released from sediment into the water column especially when anoxic conditions persist.

Lakes in temporate zones cycle through times when stratification exists or completely mixed conditions exist. Typically, in early spring, lakes warm up to a uniform temperature and mixing is driven by wind action. By late spring, the differences in thermal resistance cause the mixing to cease, and the lake beings to stratify thermally for the summer. During times of stratification, the lower layer of water (the hypolimnion) is separated from the upper layer of water (the epilimnion). The hypolimnion is stagnant and becomes increasingly devoid of oxygen because of the isolation from the atmosphere and availability of organic matter. The absence of oxygen leads to conditions favorable for chemical reduction, and nutrients are released from the bottom sediments to the hypolimnion. When cooler temperatures set in during fall, the epilimnion cools and eventually leads to a uniform temperature throughout the water column. This, in turn, leads once again to wind-driven mixing of the waterbody. The nutrient-rich bottom water becomes redistributed, with the potential of introducing high levels of nutrients throughout the water column.

Section 5
Evergreen Lake Watershed Data Review

5.1 Existing Data Review

The following data sources were reviewed for model selection and analysis:

- Mapping
- Topography
- Flow
- Precipitation
- Temperature
- Evaporation rates
- Existing water quality
- Land use
- Soil data
- Cropping practices
- Reservoir characteristics
- Point sources
- Dairy and animal confinement locations
- Septic systems

5.1.1 Mapping Data

USGS quadrangle maps (scale 1:24,000) were collected for the watershed in paper and electronic form. These were utilized for base mapping.

5.1.2 Topography Data

Watershed boundaries define the area investigated for causes of impairment in each segment. A Digital Elevation Model (DEM) was used to delineate watershed boundaries in a geographic information system (GIS). A DEM is a digital representation of the landscape as a GIS-compatible grid in which each grid cell is assigned an elevation. USGS DEMs with 30-meter resolution were downloaded for each USGS quadrangle corresponding to the watershed area. GIS watershed delineation defines the boundaries of a watershed by computing flow directions from elevations and locating elevation peaks on the DEM. The GIS-delineated watershed was checked against USGS 7.5-minute topographic maps to ensure agreement between the watershed boundaries and natural topographic boundaries. Figure 5-1 shows the location of historic water quality gages and the watershed boundaries for the Evergreen Lake Watershed.

5.1.3 Flow Data

Analyses of the Evergreen Lake Watershed requires an understanding of flow into Evergreen Lake. The stage data that have been collected in the watershed have not been converted to flow data, so in the interim, the drainage area ratio method, represented by the following equation, was used to estimate flows.

$$Q_{gaged}\left(\frac{Area_{ungaged}}{Area_{gaged}}\right) = Q_{ungaged}$$

where	Q_{gaged}	=	Streamflow of the gaged basin
	$Q_{ungaged}$	=	Streamflow of the ungaged basin
	$Area_{gaged}$	=	Area of the gaged basin
	$Area_{ungaged}$	=	Area of the ungaged basin

The assumption behind the equation is that the flow per unit area is equivalent in watersheds with similar characteristics. Therefore, the flow per unit area in the gaged watershed multiplied by the area of the ungaged watershed estimates the flow for the ungaged watershed.

USGS gage 05567000 (Panther Creek near El Paso, Illinois) was chosen as an appropriate gage from which to estimate flow into Evergreen Lake. The Panther Creek watershed is about 15 miles west northwest of Evergreen Lake, is of similar order of magnitude in drainage area size and receives comparable precipitation throughout the year to the Evergreen Lake watershed. Gage 05567000 captures flow from a drainage area of 84 square miles in an upstream section of the Panther Creek watershed. Average monthly streamflow data for the gage were available through BASINS GIS data (USEPA). Using the drainage area ratio method and data from gage 05567000, the average monthly flows into Evergreen Lake range from 1.3 cubic feet per second (cfs) to 68 cfs with a mean annual flow of 26 cfs (Figure 5-2).

5.1.4 Precipitation, Temperature, and Evaporation Data

As discussed in Section 2.1, the Evergreen Lake Watershed is located within McLean and Woodford Counties. Daily precipitation and temperature data for McLean County were extracted from the NCDC database for the years of 1977 through 2003. The data station in Normal, IL was chosen to be representative of meteorological conditions at Evergreen Lake (Table 5-1).

Table 5-1 Historical Precipitation Data for the Evergreen Lake Watershed

NCDC Gage Number	Station Location	Period of Record
6200	McLean County (Normal)	1977-present

Table 5-2 Average Monthly Precipitation in McLean County from 1977 to 2003

Month	Average Precipitation (inches)
January	1.8
February	1.8
March	2.7
April	3.8
May	4.4
June	3.9
July	4.2
August	4.0
September	2.9
October	2.9
November	3.2
December	2.3
TOTAL	**37.9**

Table 5-2 shows the average monthly precipitation for the years 1977 to 2003. The average annual precipitation is approximately 38 inches for McLean County.

Through the ISWS website, pan evaporation data are available from nine locations across Illinois (ISWS 2000). The Hennepin Power Plant station was chosen to be representative of pan evaporation conditions for Evergreen Lake. The Hennepin Power Plant station is located approximately 60 miles north northwest of the Evergreen Lake watershed along the Senachwine Lake. The station was chosen for its proximity to the 303(d)-listed water bodies and stream segments in central Illinois and the completeness of the dataset compared to other stations. The average monthly pan evaporation at the Hennepin Power Plant station for the years 1980 to 2002 yields an average annual pan evaporation of 37.8 inches. Actual evaporation is typically less than pan evaporation, so the average annual pan evaporation was multiplied by 0.75 to calculate an average annual evaporation of 28.4 inches (ISWS 2000).

5.1.5 Water Quality Data

Seven water quality stations exist within the Evergreen Lake Watershed (Table 5-3). Table 5-3 provides the location, station identification number, and the agency that collected the water quality data; Figure 5-1 illustrates the location and station identification number.

Table 5-3 Historical Water Quality Stations for Evergreen Lake Watershed

Location	Station Identification Number	Data Collection Agency
Evergreen Lake	SD-A03-A-1	Illinois EPA
Evergreen Lake	SD-A03-A-2	Illinois EPA
Evergreen Lake	SD-A03-A-3	Illinois EPA
Evergreen Lake	SD-A03-A-4	Illinois EPA
Tributary	SDA 03	City of Bloomington
Sixmile Creek	DKN 01/SDA 04	Illinois EPA / City of Bloomington

The impaired water body segment in the Evergreen Lake Watershed segment SDA was presented in Section 2. Table 5-4 summarizes available phosphorus water quality data gathered since 1990 and contained in the USEPA *Storage and Retrieval (STORET)* database (USEPA 2002b). Data collected after 1998 were available from the Illinois EPA and were incorporated into the electronic database. The table provides information on each lake sampling location regarding the period of record and number of samples. For total and dissolved phosphorus data, the number of samples is provided for both samples collected at one-foot depth and all samples collected throughout the water column. The raw data are contained in Appendix A.

Table 5-4 Summary of Constituents Associated with the Impairment for Evergreen Lake

Sample Location and Parameter	Period of Record Examined for Samples	Number of Samples
Evergreen Lake Segment SDA; Sample Locations SD-A03-A-1, SD-A03-A-2, SD-A03-A-3, SD-A03-A-4		
SD-A03-A-1		
Total Phosphorus (@ 1 ft/total)	1990-2002	96/250
Dissolved Phosphorus (@ 1 ft/total)	1990-1998	32/73
Sediment Phosphorus	1990-2001	5
SD-A03-A-2		
Total Phosphorus (@ 1 ft/total)	1990-2002	121/146
Dissolved Phosphorus (@ 1 ft/total)	1990-1998	35/35
Sediment Phosphorus	—	—
SD-A03-A-3		
Total Phosphorus (@ 1 ft/total)	1990-2002	118/135
Dissolved Phosphorus (@ 1 ft/total)	1990-1998	34/34
Sediment Phosphorus	1990-2001	5
SD-A03-A-4		
Total Phosphorus (@ 1 ft/total)	1998-2001	46/93
Dissolved Phosphorus (@ 1 ft/total)	1998	10/20
Sediment Phosphorus	1998-2001	2

5.1.5.1 Evergreen Lake Water Quality Data

Water quality data have been collected from all of the above mentioned water quality stations. In order to understand the phosphorus cycle within Evergreen Lake, lake samples, sediment samples, tributary samples, and point source discharge records must be examined. All are summarized below.

5.1.5.1.1 Total and Dissolved Phosphorus in Evergreen Lake

There are four water quality stations in Evergreen Lake (Figure 5-1; Table 5-3). Constituents are sampled at various depths throughout Evergreen Lake, and assessment of water quality standards is determined from a sample collected at a one-foot depth from the lake surface. This section discusses the one-foot depth samples of total phosphorus that will be used in modeling efforts for Evergreen Lake. Future modeling of the reservoir will also require use of all phosphorus samples at all depths, and therefore, a summary of all total and dissolved phosphorus samples has also been included in the following discussion.

Phosphorus exists in water in either a particulate phase or a dissolved phase. Particulate matter includes living and dead plankton, precipitates of phosphorus, phosphorus adsorbed to particulates, and amorphous phosphorus. The dissolved phase includes inorganic phosphorus and organic phosphorus. Phosphorus in natural waters is usually found in the form of phosphates (PO4-3). Phosphates can be in inorganic or organic form. Inorganic phosphate is phosphate that is not associated with organic material. Types of inorganic phosphate include orthophosphate and polyphosphates. Orthophosphate is sometimes referred to as "reactive phosphorus." Orthophosphate is the most stable kind of phosphate, and is the form used by plants or algae.

There are several forms of phosphorus that can be measured. Total phosphorus is a measure of all the forms of phosphorus, dissolved or particulate, that are found in a sample. Soluble reactive phosphorus is a measure of orthophosphate, the filterable (soluble, inorganic) fraction of phosphorus, the form directly taken up by plant cells.

Table 5-5 summarizes the average total and dissolved phosphorus concentrations at a one-foot depth for each year of available data from 1990 to 2002 at each lake monitoring site. The water quality standard is for total phosphorus and is less than or equal to 0.05 mg/L and is assessed at a one-foot depth. The TMDL endpoint for total phosphorus in lakes is 0.05 mg/L. The raw data for all sample depths are contained in Appendix A.

Table 5-5 Average Total and Dissolved Phosphorus (TP and DP) Concentrations (mg/L) in Evergreen Lake at One-Foot Depth (Illinois EPA 2004 and USEPA 2004)

Year	SD-A03-A-1		SD-A03-A-2		SD-A03-A-3		SD-A03-A-4		Lake Average	
	TP	DP	TP	DP	TP	DP	TP	DP	TP	DP
1990	0.06	0.03	0.07	0.03	0.08	0.04			0.07	0.03
1992	0.02	0.01	0.03	0.01	0.05	0.01			0.03	0.01
1995	0.05	0.00	0.10	0.03	0.16	0.07			0.10	0.04
1996	0.02	0.00	0.03	0.01	0.05	0.01			0.03	0.01
1997	0.02	0.01	0.03	0.01	0.04	0.01			0.03	0.01
1998	0.03	0.01	0.06	0.01	0.07	0.02	0.03	0.01	0.05	0.01
1999	0.03		0.37		0.34		0.03		0.19	
2000	0.03		0.09		0.20		0.06		0.09	
2001	0.02		0.03		0.05		0.02		0.03	
2002	0.03		0.04		0.09		0.04		0.05	

Because modeling efforts will include examining all phosphorus data for the lake, the total and dissolved phosphorus samples taken throughout the water column have been summarized in Table 5-6.

Table 5-6 Average Total and Dissolved Phosphorus (TP and DP) Concentrations (mg/L) in Evergreen Lake at All Depths (Illinois EPA 2004 and USEPA 2004)

Year	SD-A03-A-1		SD-A03-A-2		SD-A03-A-3		SD-A03-A-4		Lake Average	
	TP	DP	TP	DP	TP	DP	TP	DP	TP	DP
1990	0.07	0.03	0.07	0.03	0.08	0.04			0.08	0.03
1992	0.12	0.01	0.03	0.01	0.05	0.01			0.06	0.01
1995	0.04	0.00	0.10	0.03	0.16	0.07			0.10	0.04
1996	0.04	0.01	0.03	0.01	0.05	0.01			0.04	0.01
1997	0.03	0.01	0.03	0.01	0.04	0.01			0.03	0.01
1998	0.04	0.01	0.21	0.01	0.15	0.02	0.04	0.01	0.11	0.01
1999	0.07		0.36		0.34		0.05		0.20	
2000	0.12		0.09		0.20		0.06		0.12	
2001	0.05		0.03		0.05		0.03		0.04	
2002	0.05		0.04		0.09		0.05		0.06	

The standard for assessing an impairment for total phosphorus in Illinois is "surface total phosphorus exceeds applicable standard (>0.05 mg/l) in at least one sample during the monitoring year" (IEPA, 2004). The >0.05 mg/l standard applies to any reservoir or lake with a surface area of 20 acres or more, as well as any stream at the point where it enters any such reservoir or lake. Each sampling location had at least one violation for each monitoring year. Figure 5-3 contains the total number of samples taken at each site along with the number of samples that qualified as a violation. Over the sampling period, a total of 390 surface samples were taken at all the lake sampling locations, and of those, 162 exceeded the 0.05 mg/l standard. Figure 5-4 graphically represents the annual average phosphorus values at each lake sampling location. The water quality standard of 0.05 mg/l is displayed on the figure as a reference.

5.1.5.1.2 Phosphorus values in Evergreen Lake Sediment Samples

Sediment samples are important in order to help differentiate between internal and external loads. Internal loads are caused by low DO conditions near lake sediments, which promote re-suspension of phosphorus from the sediments into the water column (see discussion in Section 4.4.3). All available phosphorus data collected in sediment samples are summarized in the following table.

Table 5-7 Average Total Phosphorus Concentrations (mg/kg-P dry wt) in Bottom Deposits in Evergreen Lake (Illinois EPA 2004 and USEPA 2004)

Year	SD-A03-A-1	SD-A03-A-2	SD-A03-A-3	SD-A03-A-4	Lake Average
1990	750		589		670
1992	662		538		600
1997	902		642		772
1998	700		623	691	671
2001	804		600	663	689

5.1.5.1.3 Total Phosphorus from External Loads

There are two main tributaries to Evergreen Lake with available water quality data. One tributary to Evergreen Lake is Sixmile Creek; the other main tributary is unnamed (Figure 5-1). Tributary water quality data, along with flow information, is useful in assessing contributing external loads from the watersheds. External loads are those loadings from the watershed such as nonpoint source runoff and point sources. The following table summarizes the available total phosphorus and dissolved data collected on Evergreen Lake tributaries. Total phosphorus is generated in the watershed in the solid phase by erosion from the land surface, and in the dissolved phase by runoff through vegetation. Eroded sediment can have phosphorus bound to the sediment particles in the solid form and when deposited into waterways it becomes part of the total phosphorus measurement in the water column. Dissolved phosphorus is not bound to eroded particles and is transported through surface runoff through the land surface. Dissolved phosphorus data was only available at SDA 03 for 1998. The average annual total phosphorus values for each site are graphically displayed on Figure 5-5.

Table 5-8 Average Total and Dissolved Phosphorus (TP/DP) Concentrations (mg/L) in Tributaries to Evergreen Lake (Illinois EPA 2004 and USEPA 2004)

Year	SDA 03 (Unnamed Tributary)	SDA 04/DKN 01 (Sixmile Creek)	Average
1998	0.25/0.02		0.25/0.02
1999			
2000	0.26	0.08	0.17
2001		0.49	0.49
2002	0.70	0.65	0.68

5.1.5.1.3.1 Point Sources

There are two permitted point sources within the Evergreen Lake watershed. Figure 5-6 shows both locations. Data is collected from the facilities in order to monitor discharge and is reported yearly in discharge monitoring reports (DMRs). No phosphorus data were available in the DMRs because phosphorus samples are not required by the facilities' current permits.

5.1.6 Land Use

In late 1999, the U. S. Department of Agriculture National Agricultural Statistics Service (NASS), the Illinois Department of Agriculture (IDA), and the Illinois Department of Natural Resources (IDNR) began a cooperative, interagency initiative to produce statewide land cover information on a recurring basis. The Illinois Interagency Landscape Classification Project (IILCP) completed Cycle 1 of this initiative in the summer of 2002, resulting in the Land Cover of Illinois 1999-2000 inventory and associated database. The GIS-delineated watershed for Evergreen Lake was used to obtain the land use from the Critical Trends Assessment Land Cover grid. Table 5-9 lists the land uses contributing to the Evergreen Lake Watershed as well as each land use area and percent of total area. Figure 5-7 shows the land use categories found within the watershed.

Table 5-9 Illinois Interagency Landscape Classification Land Uses in Evergreen Lake (1999-2000)

Land Use	Acres	Percent of Area
Soybeans	10,635	41%
Corn	10,104	38%
Rural Grassland	2,268	9%
High Density	1,142	4%
Surface Water	564	2%
Urban Open Space	502	2%
Floodplain Forest	268	1%
Upland	268	1%
Partial Canopy/Savannah Upland	222	1%
Low/Medium Density	184	1%
Winter Wheat/Soybeans	41	0%
Winter Wheat	19	0%
Seasonally/Temporarily Flooded	15	0%
Shallow Water	8	0%
Deep Marsh	2	0%
Shallow Marsh/Wet Meadow	1	0%
Total	**26,243**	**100%**

5.1.7 Animal Confinement Operations

Table 5-10 contains the McLean County Evergreen Lake Watershed livestock assessment.

Table 5-10 Evergreen Lake Watershed Livestock Assessment (McLean County 1998)

Township	# of Operations	Cattle	Swine	Horses	Sheep	Dairy	Other	Total # of Head
Normal	1	0	0	0	0	0	1	1
Hudson	7	115	45	4	0	0	0	164
Dry Grove	1	15	0	0	0	0	0	15
White Oak	4	55	0	2	26	0	0	83
Total	**13**	**185**	**45**	**6**	**26**	**0**	**1**	**263**

**There are no feedlots or confinement areas listed

Cattle, swine, horses, sheep, dairy, and other animals were surveyed in a 1998 assessment of the watershed and closely surrounding areas. The survey was conducted as part of the Clean Lakes Program. This survey found the total number of livestock animals to be 263. Since 1998, it is likely that overall livestock numbers have decreased. Based on the watershed size, this is a relatively low number of livestock animal density within the watershed and should be considered a small potential pollutant source to Evergreen Lake.

5.1.8 Soil Data

Soil Survey Geographic Database *(SSURGO)* data have been downloaded for McLean County and clipped to the watershed boundary using GIS. Unfortunately, SSURGO data are not available for Woodford County which includes approximately 1000 acres in the northwest portion of the watershed. State Soil Geographic *(STATSGO)* data was used in lieu of the SSURGO data in this area. STATSGO Database data, created by the USDA – National Resource Conservation Service (NRCS) Soil Survey Division, which were published for Illinois in 1994, are aggregated soil surveys for GIS use. The STATSGO shapefiles were downloaded by HUC from the USEPA BASINS website (USEPA 2004a).

According to the McLean County soil survey, "McLean County is mainly on a loess-covered till plain characterized by numerous terminal glacial moraines cutting diagonally across the county from northwest to southeast. Glacial ice, running water, and windblown deposits have all contributed to the landforms in the county. In general, nearly all of the ridges and knobs in the county have a glacial origin. These areas were then modified by the wearing down of hills and knobs and the filling in of lower areas with outwash sediments. Finally, a blanket of loess, which tends to smooth out landscape features, covered the entire landscape."

"The Bloomington Moraine is one of the most prominent landform features in the county, especially in the eastern and northwestern parts. This moraine cuts through the center of the county. In the extreme northwestern part of the county, the landscape is gently sloping to very steep."

The most predominant soil type in the watershed is Sable silty clay loam on zero to two percent slopes, followed by Ipava silt loam on zero to two percent slopes. Sable silty clay loam's parent material is loess and it is listed in the "poorly drained" drainage class. Sable is a Class D soil. Class D soil has very slow infiltration rates and high clay content. The soil typically has poor drainage with high amounts of runoff. It is likely that in the Evergreen Lake Watershed that areas with this soil type contain tile drains and therefore this soil could be classified as a Class B soil. Ipava silt loam is similar to soils with less clay in the subsoil and with loamy outwash or till in the substratum (NRCS 2002).

5.1.9 Cropping Practices and Drainage Tiles

Tillage practices can be categorized as conventional till, reduced till, mulch-till, and no-till. The percentage of each tillage practice for corn, soybeans, and small grains by county are generated by the Illinois Department of Agriculture from County Transect Surveys. Data specific to the Evergreen Lake Watershed were not available; however, the McLean County practices were available and are as shown in Table 5-11 (NRCS 2001).

Table 5-11 Tillage Practices in McLean County (McLean County Soil & Water Conservation District, 2001)

Tillage Practice	Corn	Soybeans	Small Grains
Conventional Till	61%	0%	0%
Reduced Till	10%	4%	0%
Mulch-Till	10%	58%	0%
No-Till	19%	38%	0%

Subsurface drainage is designed to remove excess water from the soil profile. The water table level is controlled through a series of drainage pipes (tile or tubing) that are installed below the soil surface, usually just below the root zone. In Illinois, subsurface drainage pipes are typically installed at a depth of 3 to 4 feet and at a spacing of 80 to 120 feet. The subsurface drainage network generally outlets to an open ditch or stream.

In 1998, as part of the Clean Lakes Program, a survey was conducted to estimate tile footage within the Evergreen Lake Watershed. Two 160-acre farms were surveyed. The first farm, located in Section 24 of White Oak, had 13,500 feet of tile lines while the second farm, located in Section 3 of Normal, had 12,650 feet of tile line. The average of the two surveyed locations is approximately 13,000 feet. It is highly probable that poorly and somewhat poorly drained cropped soils are tile drained. Based on soil classifications detailing what soils are poorly drained versus those that are well drained it is estimated that 10,000 acres in the watershed have tile drainage.

5.1.10 Reservoir Characteristics

Reservoir characteristics were obtained from GIS analysis, the Illinois EPA, McLean County, and USEPA water quality data.

GIS analysis calculated the surface area of Evergreen Lake to be approximately 674 acres with 16 miles of shoreline. McLean County Parks and Recreation lists Evergreen Lake as having 900 surface area acres and 22.5 miles of shoreline. As described in Section 2, modifications to the lake in 1996 increased the size Evergreen Lake. Since the McLean County data is the most recent data available, it will be used for modeling purposes.

The water quality dataset described in Section 5.1.5.1 was used to examine the average depth of Evergreen Lake. On each date sampled for water quality constituents, the total depth at the site was measured. Table 5-12 lists the average depth calculated for each water quality site in Evergreen Lake for each year of available data after 1990.

Table 5-12 Average Depths (ft) for Evergreen Lake (Illinois EPA 2002 and USEPA 2002a)

Year	SD-A03-A-1	SD-A03-A-2	SD-A03-A-3	SD-A03-A-4
1990	43.3	21.6	11.7	
1992	42.0	21.2	10.6	
1995	43.5	22.0	11.0	
1996	42.0	20.3	11.4	
1997	44.6	25.4	15.0	
1998	43.9	23.8	12.5	33.9

Since SD-A03-A-1 is located closest to the dam, it has the greatest depth. As discussed in Section 2, originally Evergreen Lake had a mean depth of 17 feet. After the 1996 modifications, the mean depth value changed to 22 feet.

5.1.11 Septic Systems

Typically, septic systems near lake waters have greater potential for impacting water quality than systems near streams due to their proximity to the water body of concern. The McLean County Environmental Health department estimates that there are 765 permitted septic systems within the Evergreen Lake watershed (McLean County, 2004). During site reconnaissance, no septic systems were observed along the lake shore. McLean County is currently in the process of verifying the presence and location of systems in the watershed; however, as of December 2006, the data were not publicly available. When the data are available, a more detailed assessment of septic system impacts to the lake may be completed.

5.1.12 Aerial Photography

Aerial photographs of the Evergreen Lake Watershed were obtained from the Illinois Natural Resources Geospatial Data Clearinghouse. The photographs can be used to supplement the USGS quadrangle maps when reviewing the overview of the watershed. The maps can also be used to assist in future planning efforts.

5.1.13 Watershed Studies and Management Practices

Previous planning efforts have been conducted within the watershed. As mentioned before, a Phase I Clean Lakes Study was conducted for Evergreen Lake in 1998. A final report is still pending. Throughout the watershed, there are 600 acres estimated to be in the Conservation Reserve Program (CRP), CRP filter strips, and CRP waterways. CRP is discussed further in the implementation plan presented in Section 9.

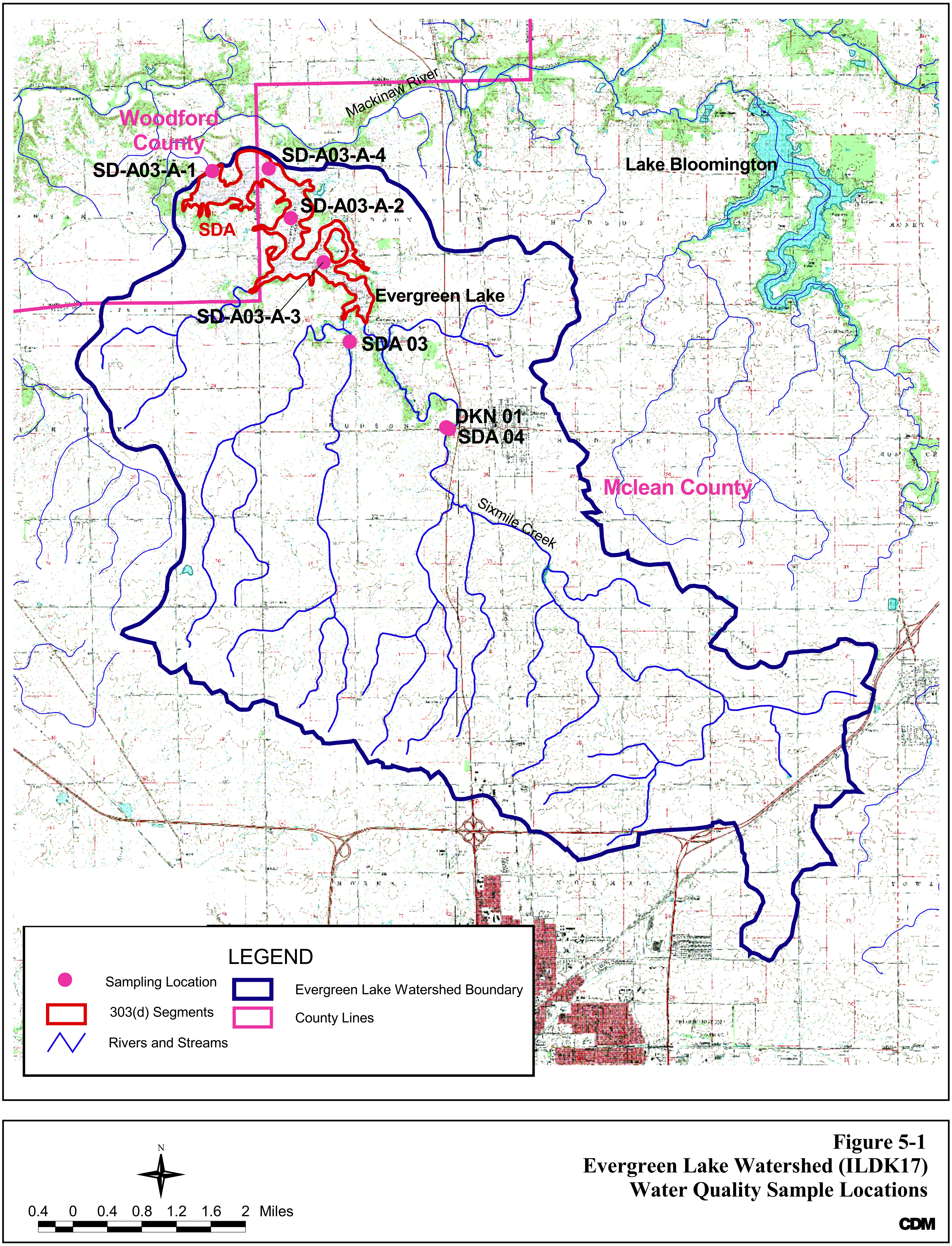

Figure 5-1
Evergreen Lake Watershed (ILDK17)
Water Quality Sample Locations

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Figure 5-2: Estimated Streamflow in the Evergreen Lake Watershed Watershed Calculated from Gage 05567000

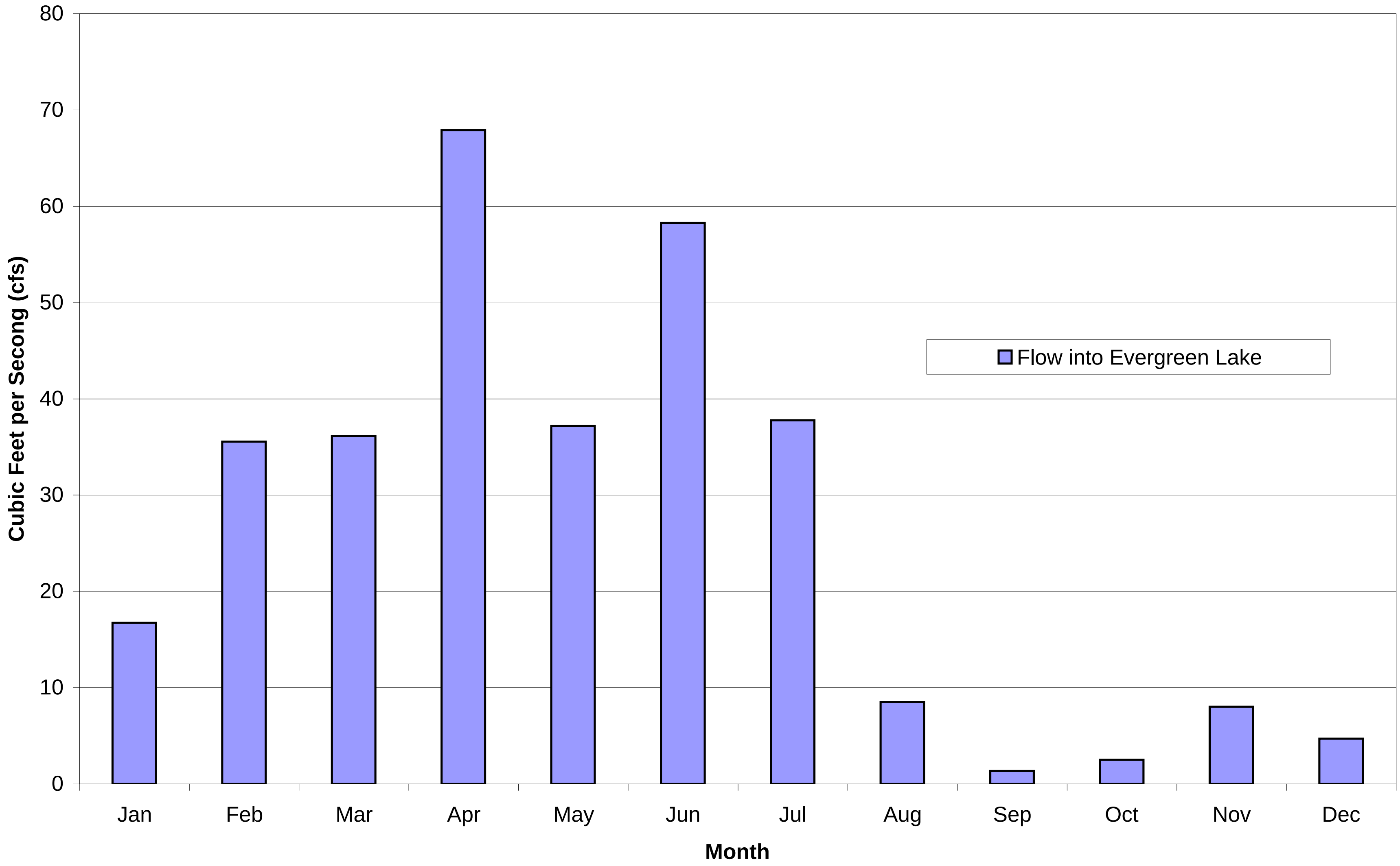

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Figure 5-3
Total Phosphorus Samples at 1 ft depth in Evergreen Lake

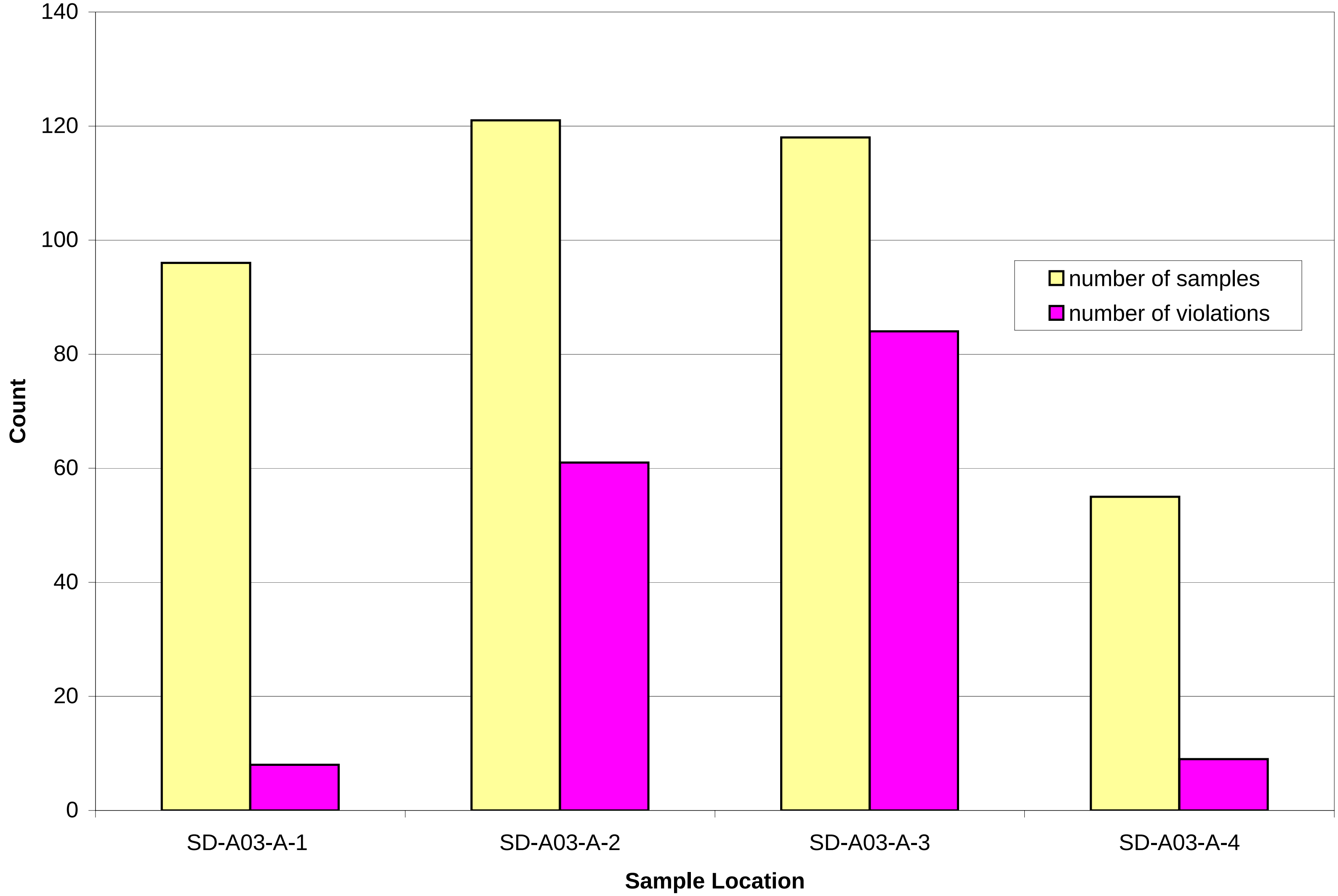

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Figure 5-4
Annual Average Total Phosphorus in Evergreen lake

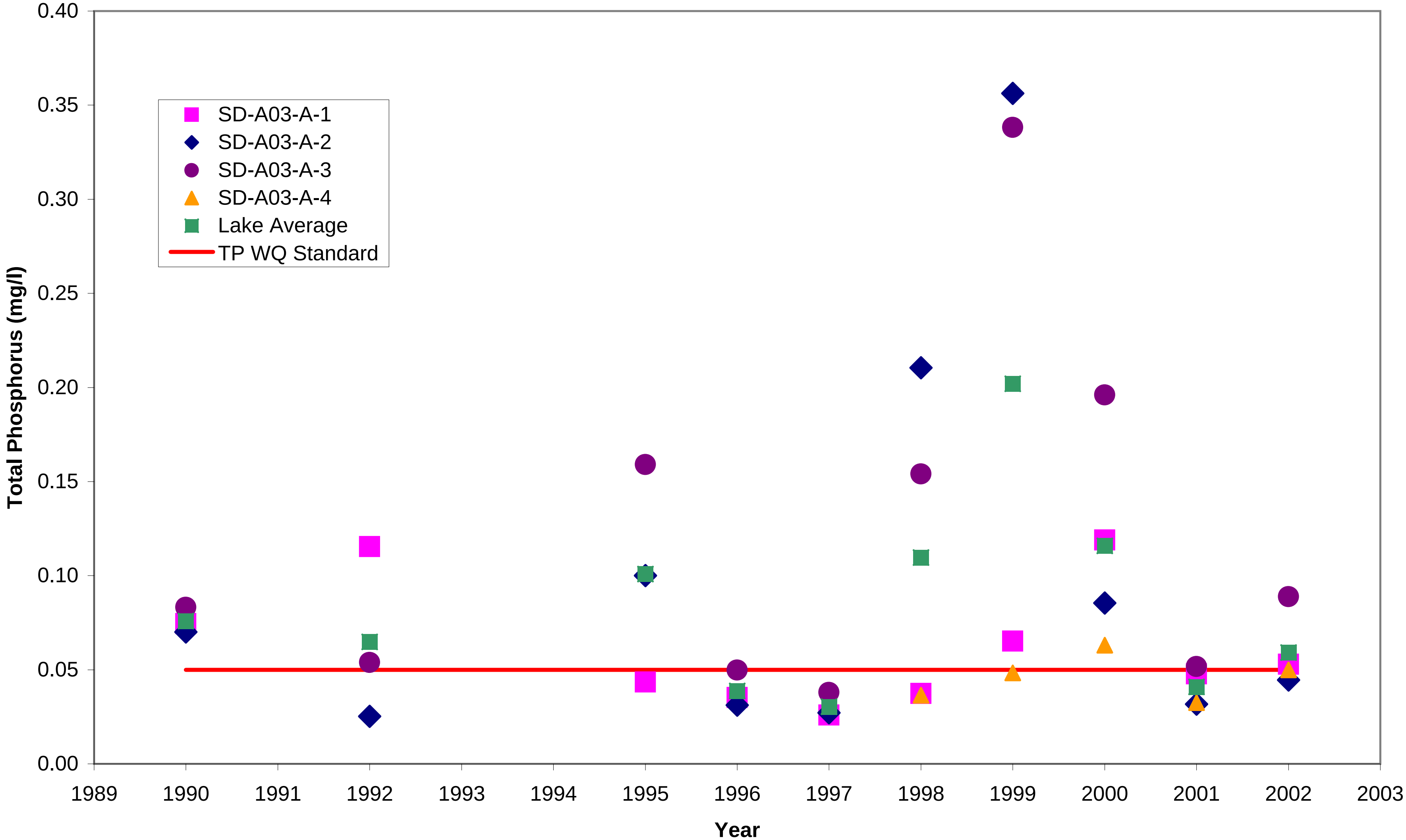

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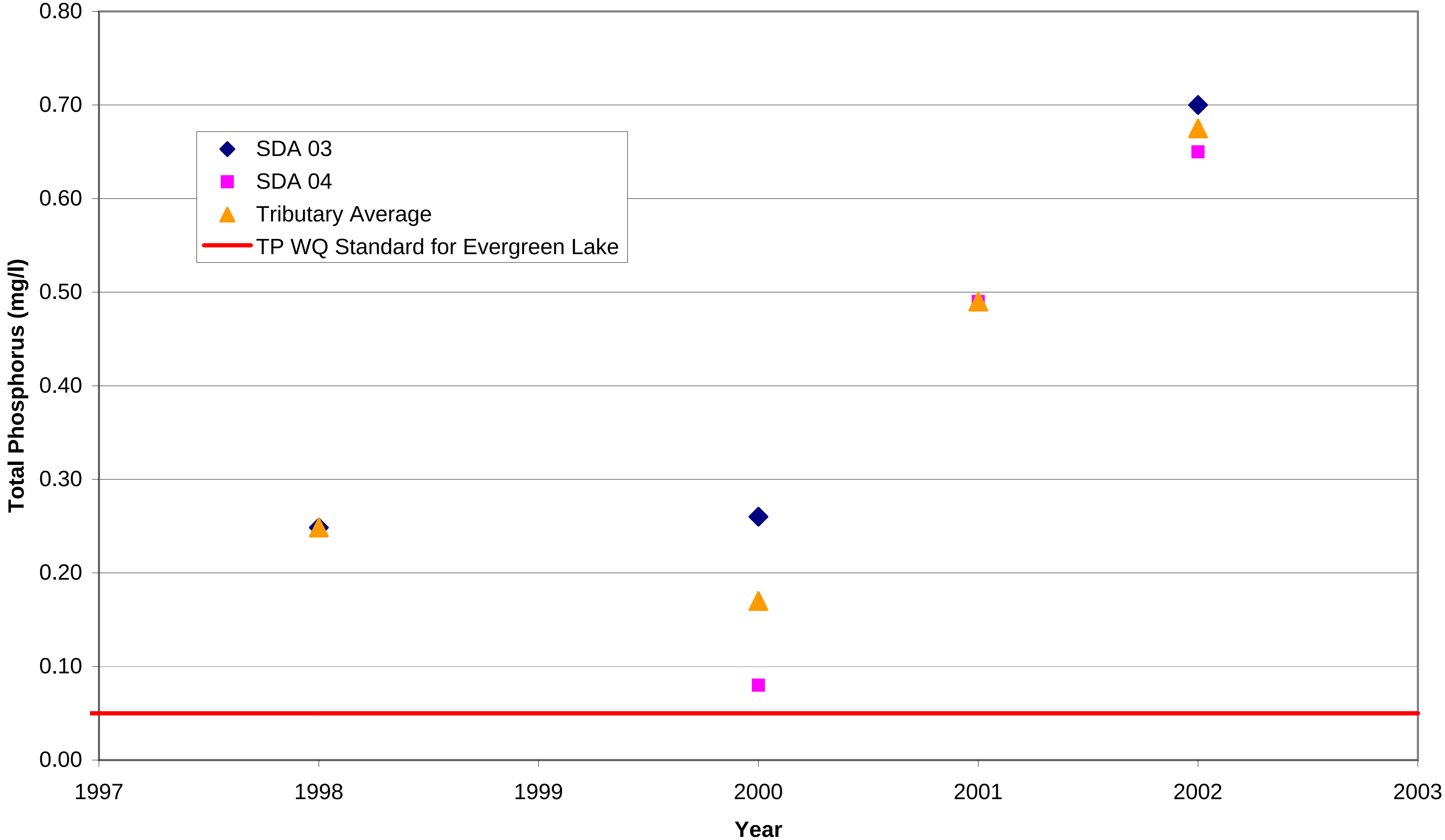
Figure 5-5
Average Annual Total Phosphorus (mg/l) for Evergreen Lake Tributaries



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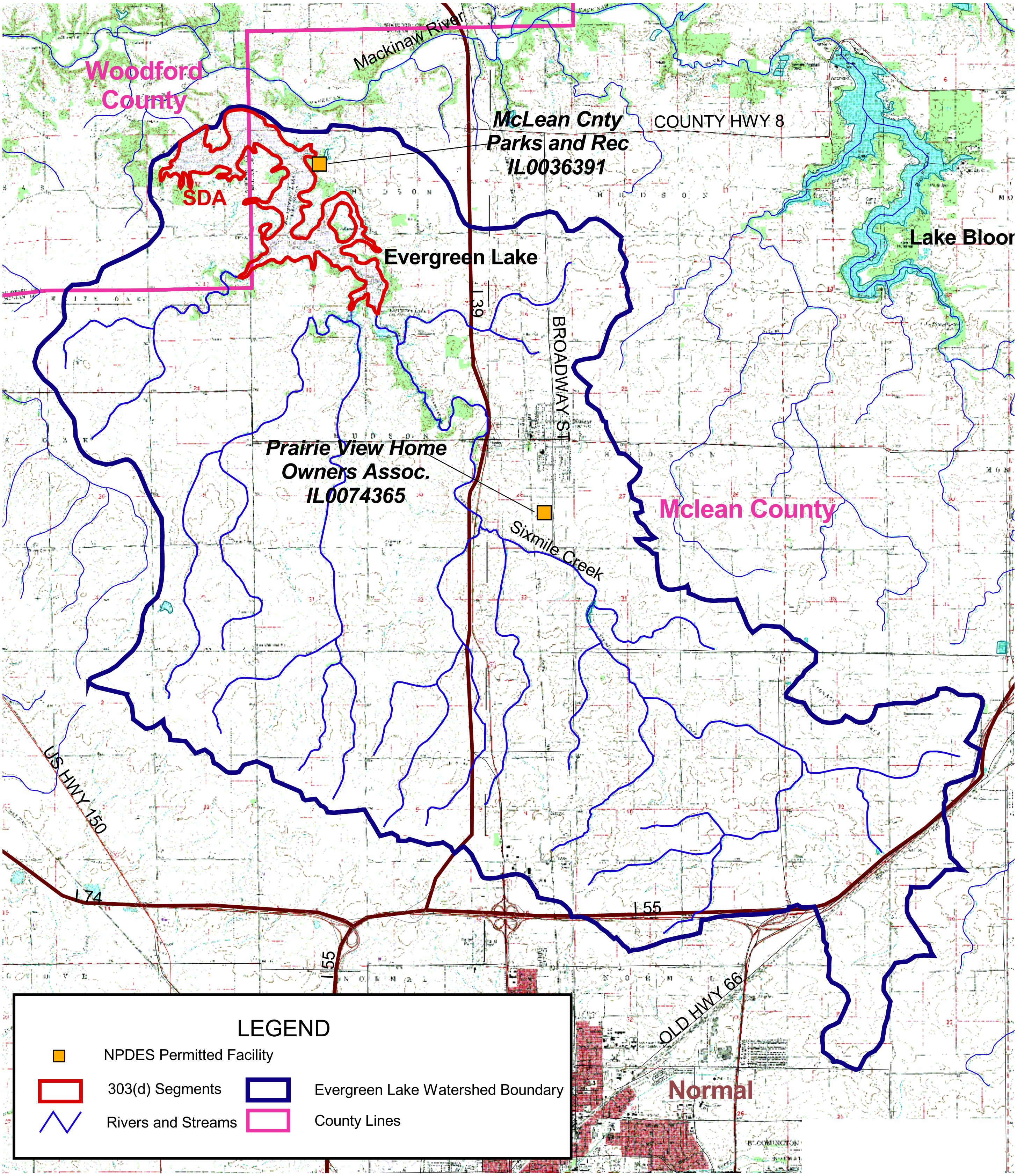

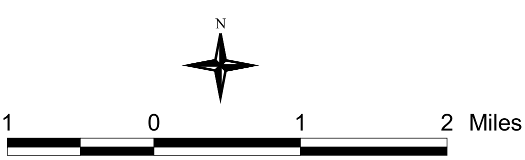

Figure 5-6
Evergreen Lake Watershed (ILDK17)
NPDES Permitted Facilities

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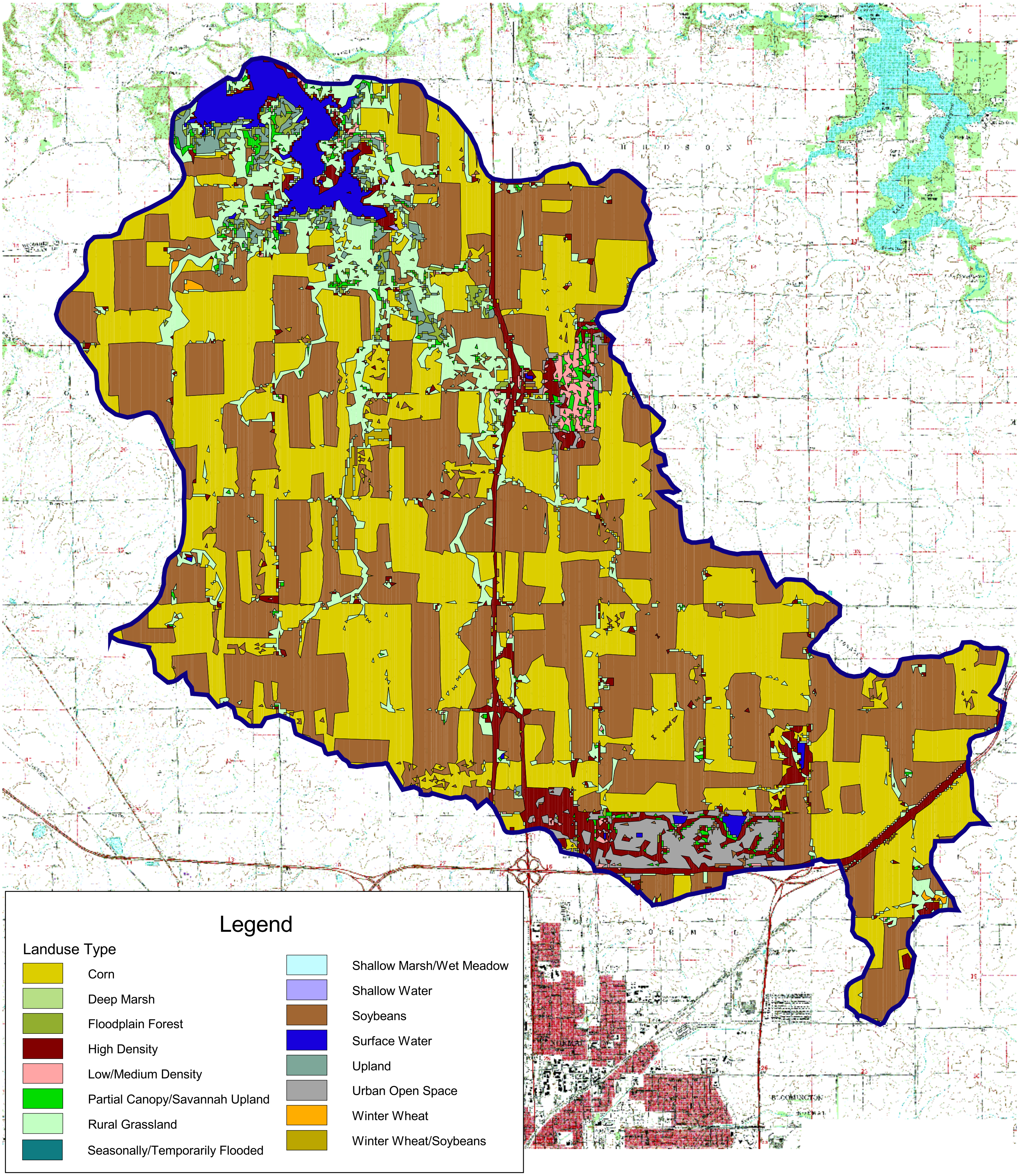

Figure 5-7
Evergreen Lake Watershed (ILDK17)
Landuse

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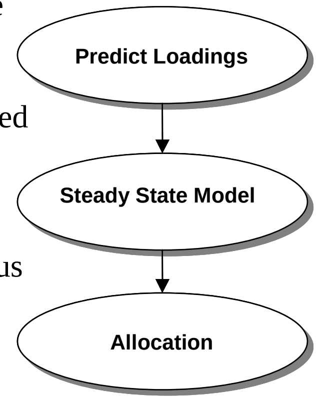
Section 6
Methodologies and Models to Complete TMDLs for the Evergreen Lake Watershed

6.1 Evergreen Lake TMDL

For Evergreen Lake, a TMDL for phosphorus was completed using a receiving water quality model along with watershed loading based on a surrogate flow gage. The strategy for completing the TMDL for Evergreen Lake is shown in Schematic 1 to the right. This strategy applies to constituents whose loads can be predicted based on tributary flows. This approach allows a linkage between source and endpoint resulting in an allocation to meet water quality standards. After phosphorus loads were predicted, the steady state model was used to determine the resulting phosphorus concentrations within Evergreen Lake. The remainder of this section will describe the decision making process for model selection. Model development is discussed further in Section 7.



Schematic 1

6.2 Set Endpoints for TMDLs

TMDLs are used to define the total amount of pollutants that may be discharged into a particular water body within any given day based on a particular use of that water body. Developing TMDLs must, therefore, account for both present and future lake users, habitat, flow variability, and current and future point and nonpoint pollutant loadings that may impact the water body. Defining a TMDL for any particular lake segment must take into account not only the science related to physical, chemical, and biological processes that may impact water body water quality, but must also be responsive to temporal changes in the watershed and likely influences of potential solutions to water quality impairments on entities that reside in the watershed.

Stream and lake water quality standards were presented in Section 4, specifically in Table 4-1. Biological data, such as the Index of Biotic Integrity (IBI) and the Macroinvertebrate Biotic Index (MBI), are used to support 305(b) and 303(d) listing decisions; however, TMDLs were not developed specifically to meet biological endpoints for the Evergreen Lake Watershed. The phosphorus endpoints were presented in Section 4.

6.3 Methodologies and Models to Assess TMDL Endpoints

Methodologies and models may be utilized to assess TMDL endpoints for the Evergreen Lake Watershed. Model development is more data intensive than using simpler methodologies or mathematical relationships for the basis of TMDL development. In situations where only limited or qualitative data exist to characterize impairments, methodologies will be used to develop TMDLs and implementation plans as appropriate.

In addition to methodologies, watershed and receiving water computer models are available for TMDL development. Most models have similar overall capabilities but operate at different time and spatial scales and were developed for varying conditions. The available models range between empirical and physically based. However, all existing watershed and receiving water computer models simplify processes and often include obviously empirical components that omit the general physical laws. They are, in reality, a representation of data.

Each model has its own set of limitations on its use, applicability, and predictive capabilities. For example, watershed models may be designed to project loads within annual, seasonal, monthly, or storm event time-scales with spatial scales ranging from large watersheds to small subbasins to individual parcels such as construction sites. With regard to time, receiving water models can be steady state, quasi-dynamic, or fully dynamic. As the level of temporal and spatial detail increases, the data requirements and level of modeling effort increase.

6.3.1 Watershed Models

Watershed or loading models can be divided into categories based on complexity, operation, time step, and simulation technique. USEPA has grouped existing watershed-scale models for TMDL development into three categories based on the number of processes they incorporate and the level of detail they provide (USEPA 1997):

- Simple models
- Mid-range models
- Detailed models

Simple models primarily implement empirical relationships between physiographic characteristics of the watershed and pollutant runoff. A list of simple category models with an indication of the capabilities of each model is shown in Table 6-1. Simple models may be used to support an assessment of the relative significance of different nonpoint sources, guide decisions for management plans, and focus continuing monitoring efforts. Generally, simple models aggregate watershed physiographic data spatially at a large-scale and provide pollutant loading estimates on large time-scales. Although they can easily be adopted to estimate storm event loading, their accuracy decreases since they cannot capture the large fluctuations of pollutant concentrations observed over smaller time-scales.

Table 6-1 Evaluation of Watershed Model Capabilities - Simple Models (USEPA 1997)

Criteria		USEPA Screening[1]	Simple Method[1]	Regression Method[1]	SLOSS-PHOSPH[2]	Watershed	FHWA	WMM
Land Uses	Urban	○	◒	◒	–	◒	○[3]	●
	Rural	◒	–	○	◒	◒	○	●
	Point Sources	–	–	–	–	○	–	○
Time-scale	Annual	●	●	●	●	●	●	●
	Single Event	○	○	○	–	–	○	–
	Continuous	–	–	–	–	–	–	–
Hydrology	Runoff	–[4]	◒	–	–	–	○	○
	Baseflow	–	–	–	–	–	–	○
Pollutant Loading	Sediment	◒	◒	◒	◒	◒	–	–
	Nutrients	◒	◒	◒	◒	◒	◒	◒
	Others	○	◒	◒	–	◒	◒	◒
Pollutant Routing	Transport	–	–	–	–	–	–	–
	Transformation	–	–	–	–	–	–	○
Model Output	Statistics	–	–	–	–	◒	○	○
	Graphics	–	–	–	–	◒	–	○
	Format Options	–	–	–	–	◒	–	○
Input Data	Requirements	○	○	○	○	○	○	○
	Calibration	–	–	–	○	◒	–	◒
	Default Data	●	●	◒	◒	○	◒	◒
	User Interface	–	–	–	–	◒	○	◒
BMPs	Evaluation	○	○	–	○	◒	◒	◒
	Design Criteria	–	–	–	–	–	–	–
Documentation		●	●	●	●	●	●	◒

[1] Not a computer program
[2] Coupled with GIS
[3] Highway drainage basins
[4] Extended Versions recommended use of SCS-curve number method for runoff estimation

● High ◒ Medium ○ Low – Not Incorporated

Mid-range models attempt a compromise between the empiricism of the simple models and complexity of detailed mechanistic models. Mid-range models are designed to estimate the importance of pollutant contributions from multiple land uses and many individual source areas in a watershed. Therefore, they require less aggregation of the watershed physiographic characteristics than the simple models. Mid-range models may be used to define large areas for pollution migration programs on a watershed basis and make qualitative evaluations of BMP alternatives. A list of models within the mid-range category and their capabilities is shown in Table 6-2.

Table 6-2 Evaluation of Watershed Model Capabilities - Mid-Range Models (USEPA 1997)

Criteria		SITEMAP	GWLF	P8-UCM	Auto-QI	AGNPS	SLAMM
Land Uses	Urban	●	●	●	●	–	●
	Rural	●	●	–	–	●	–
	Point Sources	◒	◒	●	–	●	●
Time-scale	Annual	–	–	–	–	–	–
	Single Event	○	–	●	–	●	–
	Continuous	●	●	●	●	–	●
Hydrology	Runoff	●	●	●	●	●	●
	Baseflow	○	●	○	○	–	○
Pollutant Loading	Sediment	–	●	●	●	●	●
	Nutrients	●	●	●	●	●	●
	Others	–	–	●	●	–	●
Pollutant Routing	Transport	○	○	○	◒	●	◒
	Transformation	–	–	–	–	–	–
Model Output	Statistics	◒	○	–	–	–	○
	Graphics	◒	◒	●	–	●	○
	Format Options	●	●	●	○	●	●
Input Data	Requirements	◒	◒	◒	◒	◒	◒
	Calibration	○	○	○	◒	○	◒
	Default Data	●	●	◒	○	◒	◒
	User Interface	●	●	●	◒	◒	●
BMPs	Evaluation	○	○	●	◒	◒	◒
	Design Criteria	–	–	●	◒	◒	○
Documentation		●	●	●	◒	●	◒

● High ◒ Medium ○ Low – Not Incorporated

Detailed models use storm event or continuous simulation to predict flow and pollutant concentrations for a range of flow conditions. These models explicitly simulate the physical processes of infiltration, runoff, pollutant accumulation, instream effects, and groundwater/surface water interaction. These models are complex and were not designed with emphasis on their potential use by the typical state or local planner. Many of these models were developed for research into the fundamental land surface and instream processes that influence runoff and pollutant generation rather than to communicate information to decision makers faced with planning watershed management (USEPA 1997). Although detailed or complex models provide a comparatively high degree of realism in form and function, complexity does not come without a price of data requirements for model construction, calibration, verification, and operation. If the necessary data are not available, and many inputs must be based upon professional judgment or taken from literature, the resulting uncertainty in predicted values undermines the potential benefits from greater realism. Based on the available data for the Evergreen Lake Watershed, a mid-range model is appropriate for this watershed. The available tributary data for lake's watershed will be beneficial in calibration of the watershed model and will lessen the uncertainty with the model's predictive capabilities.

6.3.1.1 Watershed Model for the Evergreen Lake Watershed

A watershed model for Evergreen Lake was not used. Available data from tributaries in the watershed and flow data from the USGS discussed in Section 5.1.3. were used to estimate loads to Evergreen Lake.

6.3.2 Receiving Water Quality Models

Receiving water quality models differ in many ways, but some important dimensions of discrimination include conceptual basis, input conditions, process characteristics, and output. Table 6-3 presents extremes of simplicity and complexity for each condition as a point of reference. Most receiving water quality models have some mix of simple and complex characteristics that reflect tradeoffs made in optimizing performance for a particular task.

Table 6-3 General Receiving Water Quality Model Characteristics

Model Characteristic	Simple Models	Complex Models
Conceptual Basis	Empirical	Mechanistic
Input Conditions	Steady State	Dynamic
Process	Conservative	Nonconservative
Output Conditions	Deterministic	Stochastic

The concept behind a receiving water quality model may reflect an effort to represent major processes individually and realistically in a formal mathematical manner (mechanistic), or it may simply be a "black-box" system (empirical) wherein the output is determined by a single equation, perhaps incorporating several input variables, but without attempting to portray constituent processes mechanistically.

In any natural system, important inputs such as flow in the river, change over time. Most receiving water quality models assume that the change occurs sufficiently slowly so that the parameter (for example, flow) can be treated as a constant (steady state). A dynamic receiving water quality model, which can handle unsteady flow conditions, provides a more realistic representation of hydraulics, especially those conditions associated with short duration storm flows, than a steady state model. However, the price of greater realism is an increase in model complexity that may be neither justified nor supportable.

The manner in which input data are processed varies greatly according to the purpose of the receiving water quality model. The simplest conditions involve conservative substances where the model need only calculate a new flow-weighted concentration when a new flow is added (conservation of mass). Such an approach is unsatisfactory for constituents such as DO or labile nutrients, such as nitrogen and phosphorus, which will change in concentration due to biological processes occurring in the stream.

Whereas the watershed nonpoint model's focus is the generation of flows and pollutant loads from the watershed, the receiving water models simulate the fate and transport of the pollutant in the water body. Table 6-4 presents the steady state (constant flow and loads) models applicable for this watershed. The steady state models are less complex than the dynamic models. Also, as discussed above, the dynamic models require significantly more data to develop and calibrate an accurate simulation of a water body.

Table 6-4 Descriptive List of Model Components - Steady State Water Quality Models

Model	Water Body Type	Parameters Simulated	Process Simulated	
			Physical	Chemical/Biological
USEPA Screening Methods	River, lake/ reservoir, estuary, coastal	Water body nitrogen, phosphorus, chlorophyll "a," or chemical concentrations	Dilution, advection, dispersion	First order decay - empirical relationships between nutrient loading and eutrophication indices
EUTROMOD	Lake/reservoir	DO, nitrogen, phosphorus, chlorophyll "a"	Dilution	Empirical relationships between nutrient loading and eutrophication indices
BATHTUB	Lake/reservoir	DO, nitrogen, phosphorus, chlorophyll "a"	Dilution	Empirical relationships between nutrient loading and eutrophication indices
QUAL2E	Rivers (well mixed/shallow lakes or estuaries)	DO, CBOD, arbitrary, nonconservative substances, three conservative substances	Dilution, advection, dispersion	First order decay, DO-BOD cycle, nutrient-algal cycle
EXAMSII	Rivers	Conservative and nonconservative substances	Dilution, advection, dispersion	First order decay, process kinetics, daughter products, exposure assessment
SYMPTOX3	River/reservoir	Conservative and nonconservative substances	Dilution, advection, dispersion	First order decay, sediment exchange
STREAMDO	Rivers	DO, CBOD, and ammonium	Dilution	First order decay, BOD-DO cycle, limited algal component

CBOD carbonaceous biochemical oxygen demand

6.3.2.1 Receiving Water Model for the Evergreen Lake Watershed

The receiving water model utilized for Evergreen Lake was BATHTUB. The BATHTUB model applies a series of empirical eutrophication models to reservoirs and lakes. The program performs steady state water and nutrient balance calculations in a spatially segmented hydraulic network that accounts for advective and diffusive transport, and nutrient sedimentation. Eutrophication-related water quality conditions are predicted using empirical relationships (USEPA 1997).

6.3.3 Seasonal Variation

Consideration of seasonal variation, such that water quality standards for the allocated pollutant will be met during all seasons of the year, is a requirement of a TMDL submittal. TMDLs must maintain or attain water quality standards throughout the year and consider variations in the water body's assimilative capacity caused by seasonal changes in temperature and flow (USEPA 1999). Seasonal variation is discussed further in Section 8.3.2

6.3.4 Allocation

Establishing a TMDL requires the determination of the LC of each waterbody segment. The models or methodologies were used to establish what the LC is for each segment for each pollutant. The next step was to determine the appropriate MOS for each segment. After setting the MOS, WLA of point sources and LA from the nonpoint sources were set.

The MOS can be set explicitly as a portion of the LC or implicitly through applying conservative assumptions in data analysis and modeling approaches. Data analyses and modeling limitations were taken into account when recommending a MOS. The allocation scheme (both LA and WLA) will need to demonstrate that water quality standards will be attained and maintained and that the load reductions are technically achievable. The allocation is the foundation for the implementation and monitoring plan. Further discussion on the allocation is presented in Section 8.3 while the implementation plan and recommended monitoring activities are presented in Section 9..

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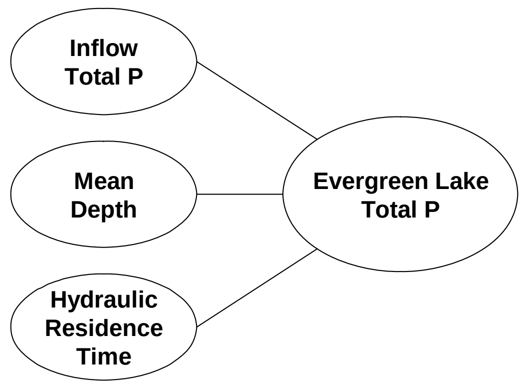
Section 7
Model Development

7.1 Overview

To develop the TMDL for Evergreen Lake, a model called BATHTUB was utilized. Model selection was discussed in Section 6.

Schematic 1 shows that by using total phosphorus concentrations, the resulting in-lake total phosphorus concentrations can be predicted. The BATHTUB model uses empirical relationships between mean reservoir depth, total phosphorus inflow into the lake, and the hydraulic residence time to determine in-reservoir concentrations.



Schematic 1
BATHTUB Model Schematic

7.2 BATHTUB Model Development and Input

BATHTUB has three primary input interfaces: global, reservoir segment(s), and watershed inputs. The individual inputs for each of these interfaces are described in the following sections.

7.2.1 Global Inputs

Global inputs represent atmospheric contributions of precipitation, evaporation, and atmospheric phosphorus. Based on precipitation and evaporation rates discussed in the previous sections, the average annual precipitation input to the model was 38 inches, and the average annual evaporation input to the model was 28.4 inches. The default atmospheric phosphorus deposition rate suggested in the BATHTUB model was used in absence of site-specific data, which is a value of 30 kg/km^2-yr (USACE 1999).

7.2.2 Reservoir Segment Inputs

Reservoir segment inputs in BATHTUB are used for physical characterization of the reservoir. Evergreen Lake is modeled with three segments in BATHTUB. The segment boundaries are shown on Figure 7-1. Segmentation was established based on available water quality and lake morphologic data.

Segment inputs to the model include average depth, segment length, and depth to the metalimnion. The lake depth was represented by the averaged data from the water quality stations discussed in Section 5 (Section 5.1.10, Table 5-12). These data are shown below (Table 7-1) for reference. Segment lengths were determined in geographic information system (GIS).

Table 7-1 Average Depths (ft) for Evergreen Lake (Illinois EPA 2002 and USEPA 2002a)

Year	SD-A03-A-1	SD-A03-A-2	SD-A03-A-3	SD-A03-A-4
1990	43.3	21.6	11.7	
1992	42.0	21.2	10.6	
1995	43.5	22.0	11.0	
1996	42.0	20.3	11.4	
1997	44.6	25.4	15.0	
1998	43.9	23.8	12.5	33.9
Average	43.22	22.38	12.03	33.9

7.2.3 Tributary Inputs

Tributary inputs to BATHTUB include drainage area, flow, and total phosphorus (dissolved and solid-phase) loading. The drainage area of each tributary is equivalent to the basin or subbasin it represents, which was determined with GIS analyses. See Figure 7-1 for subbasin boundaries. The watershed was broken up into four tributaries for purposes of the model. There are two tributaries that flow into the upstream lake segment (Sixmile Creek and unnamed tributary). The third tributary flowing into the middle lake segment is unnamed, and the fourth tributary represents overland flow into the downstream lake segment. The tributary areas are shown in Table 7-2.

Table 7-2 Evergreen Lake Tributary Subbasin Information

Tributary Name	Lake Segment Receiving Drainage	Subbasin Area (mi^2)	Estimated Subbasin flow (cfs)	Percent Contribution to Total External Load
Sixmile Creek	SD-AO3-A-3	24.3	15.4	59%
Unnamed Tributary	SD-AO3-A-3	9.3	5.9	23%
Unnamed Tributary	SD-AO3-A-2	4.5	2.8	11%
Overland Flow	SD-AO3-A-1	3	1.9	7%
	Total	41.1	26	100%

The total mean annual flow into Evergreen Lake was determined to be 26 cubic feet per second (cfs) (Section 5.1.3). The flow contribution from each tributary was estimated by multiplying the total mean annual inflow by the ratio of the subbasin areas. The estimated flow from each tributary is shown in Table 7-2.

The normal storage volume for Evergreen Lake of 15,480 acre-feet (ac-ft) was obtained from the U.S. Army Corp of Engineers (USACE) National Dam Inventory data for Evergreen Lake Dam. Based on this storage volume and the inflow of 26 cfs, the lake residence time is approximately 300 days.

To determine phosphorus loads into the lake, available phosphorus concentration data (Table 7-3) for tributaries to Evergreen Lake and the flow data provided in Table 7-2 were used to determine loadings. Loadings calculated included a minimum loading condition, mean loading condition and maximum loading condition based on the data shown in Table 7-3.

Table 7-3 Tributary Total Phosphorus Concentrations (mg/L)

Tributary	Minimum	Mean	Maximum
Sixmile Creek, Observed	0.08	0.41	0.65
Unnamed, Observed	0.25	0.40	0.7

7.3 BATHTUB Confirmatory Analysis

Available lake and tributary historical water quality data are summarized in Section 5. These data were used to help confirm model calculations. The following setup was used in the BATHTUB Model:

- Conservative Substance Balance: Not computed
- Phosphorus Balance: 2nd Order, Available Phosphorus
- Nitrogen Balance: Not computed
- Chlorophyll-*a*: Not computed
- Secchi Depth: Not computed
- Longitudinal Dispersion: Fischer-Numeric
- Error Analysis: Not computed
- Phosphorus Calibration: None
- Nitrogen Calibration: None
- Application of Nutrient Availability Factors: Ignore
- Calculation of Mass Balances: Use estimated concentration

The loadings described above were entered into the BATHTUB model and compared with available water quality data for the lake. When using these loadings, the BATHTUB model under-predicted the concentrations when compared to actual water quality data. To achieve a better match with actual water quality data, internal loading rates were adjusted. Internal loading rates reflect nutrient recycling from bottom sediments. Based on the confirmatory analysis internal cycling is occurring nearest the dam where oxygen levels could be depleted at lower levels, which indicates favorable conditions for internal cycling. Table 7-4 shows the results of this analysis.

Table 7-4 Summary of Model Confirmatory Analysis: Lake Total Phosphorus (μg/L)

Loading Condition	Predicted Concentration	Observed Concentration	Internal Loading Rate (mg/m^2-day)
Minimum	94.3	94.6	35 (near dam)
Mean	95.4	94.6	10 (near dam)
Maximum	116.1	94.6	0

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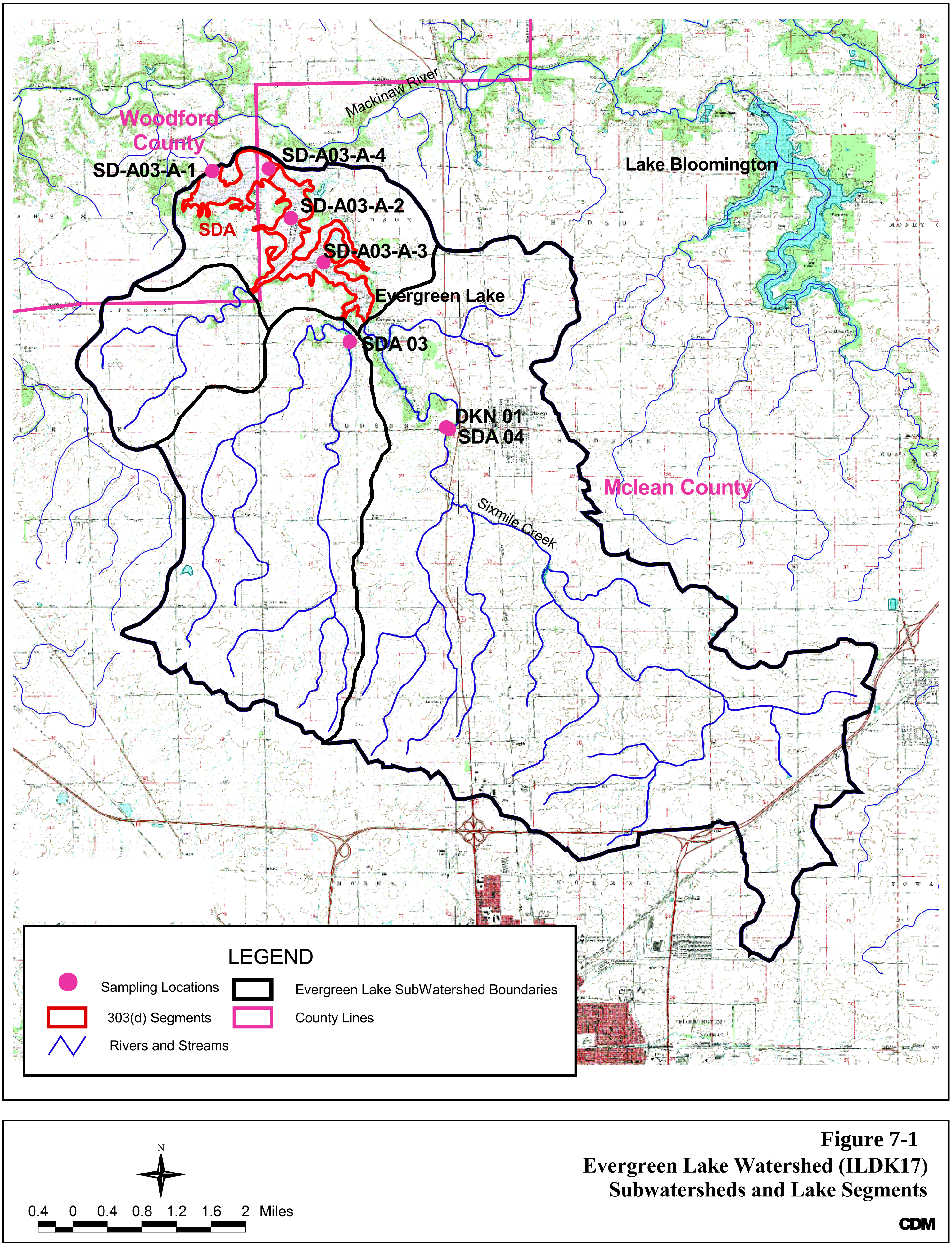

Figure 7-1
Evergreen Lake Watershed (ILDK17)
Subwatersheds and Lake Segments

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Section 8
TMDL Development

8.1 TMDL Calculations

The desired in-lake water quality concentration for total phosphorus is less than or equal to 0.05 mg/L. Section 5 summarized the average total phosphorus concentrations sampled in the Evergreen Lake watershed. As noted in Section 5, observed in-lake total phosphorus averages have exceeded the target. The total phosphorus target is set to prevent eutrophic conditions in Evergreen Lake and maintain aquatic life. Phosphorus is a concern as nuisance plant and algae growth in many freshwater lakes is enhanced by the availability of phosphorus. Additionally, this enhanced plant growth can result in large dissolved oxygen fluctuations.

8.2 Pollutant Sources and Linkages

Pollutant sources and their linkages to Evergreen Lake were established through the BATHTUB modeling and loading calculations discussed in Section 7. Sources of total phosphorus in the watershed include nonpoint sources such as runoff from agricultural areas, failing septic tanks, erosion (bank and lake shore), natural sources, tile drainage, and internal loading from lake sediments. The TMDL explained throughout the remainder of this section will examine how much the loads need to be reduced in order to meet the total phosphorus water quality standard of 0.05 mg/L in Evergreen Lake.

8.3 TMDL Allocations for Evergreen Lake

As explained in Section 1, the TMDL for Evergreen Lake addresses the following equation:

$$\mathbf{TMDL = LC = \Sigma WLA + \Sigma LA + MOS}$$

where LC = Maximum amount of pollutant loading a water body can receive without violating water quality standards

WLA = The portion of the TMDL allocated to existing or future point sources

LA = Portion of the TMDL allocated to existing or future nonpoint sources and natural background

MOS = An accounting of uncertainty about the relationship between pollutant loads and receiving water quality

Each of these elements will be discussed in this section as well as consideration of seasonal variation in the TMDL calculation.

8.3.1 Loading Capacity

The LC of Evergreen Lake is the pounds per year of total phosphorus that can be allowed as input to the lake and still meet the water quality standard of 0.05-mg/L total phosphorus. The allowable phosphorus loads that can be generated in the watershed and still maintain water quality standards were determined with the models that were set up and confirmed as discussed above. To accomplish this, the median loads discussed in Section 7 were reduced by a percentage and entered into the BATHTUB model until the water quality standard of 0.05-mg/L total phosphorus was met in Evergreen Lake. The allowable annual phosphorus load determined by reducing modeled inputs to Evergreen Lake through BATHTUB was determined to be **4,900 lbs/year**. This analysis is included as Appendix B.

8.3.2 Seasonal Variation

A season is represented by changes in weather; for example, a season can be classified as warm or cold as well as wet or dry. Seasonal variation is represented in the Evergreen Lake TMDL as conditions were modeled on an annual basis. Modeling on an annual basis takes into account the seasonal effects the lake will undergo during a given year. Since the pollutant source can be expected to contribute loadings in different quantities during different time periods (e.g., various portions of the agricultural season resulting in different runoff characteristics), the loadings for this TMDL will focus on average annual loadings rather than specifying different loadings by season. The Evergreen Lake Watershed would most likely experience critical conditions annually based on the growing season. Because an average annual basis was used for TMDL development, it is assumed that the critical condition is accounted for within the analysis.

8.3.3 Margin of Safety

The MOS can be implicit (incorporated into the TMDL analysis through conservative assumptions) or explicit (expressed in the TMDL as a portion of the loadings) or a combination of both. The MOS for the Evergreen Lake TMDL is implicit. The analysis completed for Evergreen Lake is conservative because of the following:

- In the absence of site-specific data, an atmospheric loading rate of 30 kg/km^2-yr total phosphorus (USACE 1999) was assumed in the BATHTUB model
- Default values were used in the BATHTUB model, which in absence of site-specific information are assumed conservative
- Because site-specific data were not available on internal cycling rates, estimates were used based on modeling and available in-lake concentration data. This analysis resulted in the model achieving a close estimate of in-lake concentration data for average-loading conditions and an overprediction of in-lake concentrations for high-loading conditions.

8.3.4 Waste Load Allocation

There are two point sources located within the watershed. Neither permitted facility collects phosphorus data; however, the low effluent flow from the facilities makes the loadings to Evergreen Lake negligible in comparison to loadings from the remainder of the watershed. However, these point sources must be accounted for in the TMDL.

Because effluent phosphorus concentration data were not available for these point sources, best professional judgment was used to estimate their existing concentrations. For McLean County Parks and Recreation, an effluent concentration of 4 mg/L was assumed based on the use of a septic treatment system. Prairie View Home Owners Association uses a package plant and therefore, an effluent concentration of 1 mg/L was assumed. Based on this information and the flow information presented in Table 8-1 the wasteload allocation for McClean County Parks and Recreation is 50 lbs/year and for Prairie View Home Owners Association is 65 lbs/year.

Table 8-1 Evergreen Lake Watershed Point Source Information

Facility	Data available	Average Flow (MGD)
McLean County Parks and Recreation	1994-2004	0.022
Prairie View Home Owners Association	2001-2004	0.004

8.3.5 Load Allocation and TMDL Summary

Table 8-2 shows a summary of the TMDL for Evergreen Lake. On average, a total reduction of 82 percent of total phosphorus loads to Evergreen Lake would result in compliance with the water quality standard of 0.05 mg/L total phosphorus. The 82 percent reduction would need to come from the sources discussed above. Table 8-2 also shows where resulting load reductions could be achieved from either internal cycling or from external watershed loadings.

Table 8-2 TMDL Summary for Total Phosphorus in Evergreen Lake

Load Source	LC (lb/yr)	WLA (lb/yr)	LA (lb/yr)	MOS (lb/yr)	Reduction Needed (lb/yr)	Reduction Needed (percent)
Total	4900	115	4785	0	22,800	82%
Internal	700	0	700	0	6500	90%
External	4200	115	4085	0	16300	80%

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Section 9
Implementation Plan for Evergreen Lake

Evergreen Lake was ranked as high priority on the 2004 303(d) list. As a result, Illinois EPA began the process of developing a total phosphorus TMDL to address use impairment in the lake. Stage One of the TMDL (Sections 1 through 6 of this report), which characterized the watershed and summarized available watershed data, was completed in early 2005. No further data collection was performed for Stage Two and therefore, the TMDL progressed to Stage Three (Sections 7 and 8) during the summer of 2005. The TMDL assessment for Evergreen Lake addressed the sources of the water body impairment and the reductions in source loading necessary to comply with water quality standards. The TMDL was approved by the USEPA in September 2005. Following is the implementation plan for Evergreen Lake which provides information on the procedures available for mitigating the impairment.

9.1 Implementation Actions and Management Measures for Phosphorus

Phosphorus loads in the Evergreen Lake watershed originate from both external and internal sources. As discussed in previous sections, possible sources of total phosphorus in the watershed include runoff from agricultural areas, failing septic tanks, erosion (bank and lake shore), natural sources, tile drainage, and internal loading from lake sediments. The phosphorus TMDL determined that the total allowable load to Evergreen Lake is 4,900 lbs/year. Of the total allowable load, 86 percent was allocated to external sources while 14 percent was allocated to internal sources. A total reduction of 82 percent of total phosphorus loads will need to be achieved for Evergreen Lake to be in compliance with the water quality standard of 0.05 mg/L. To achieve a reduction of total phosphorus for Evergreen Lake, management measures must address loading through sediment and surface runoff controls and internal nutrient cycling through in-lake management.

Implementation actions, management measures, or BMPs are used to control the generation or distribution of pollutants. BMPs are either structural, such as wetlands, sediment basins, fencing, or filter strips; or managerial, such as conservation tillage, nutrient management plans, or crop rotation. Both types require good management to be effective in reducing pollutant loading to water resources (Osmond et al. 1995).

It is generally more effective to install a combination of BMPs or a BMP system. A BMP system is a combination of two or more individual BMPs that are used to control a pollutant from the same critical source. In other words, if the watershed has more than one identified pollutant, but the transport mechanism is the same, then a BMP system that establishes controls for the transport mechanism can be employed. (Osmond et al. 1995). The remainder of this section will discuss implementation actions and management measures for phosphorus sources in the watershed.

9.1.1 Point Sources of Phosphorus

The phosphorus TMDL for Evergreen Lake describes waste load allocations for point source dischargers in the watershed. Point source contributions of total phosphorus are not considered to be significant in the watershed when compared to non-point sources. The load allocated to point sources accounts for roughly two percent of the total external load.

9.1.1.1 Wastewater Treatment Sources

Two permitted facilities are located in the Evergreen Lake watershed (see Figure 5-6). Phosphorus data were not available from either facility and average effluent flows from each facility were very low (0.022 mgd for McLean County Parks and Recreation, and 0.004 mgd for the Prairie View Home Owners Association). A waste load was allocated to the facilities based on best professional estimates. Phosphorus contributions from these facilities are thought to be negligible relative to non-point source contributions. It is recommended that effluent monitoring for total phosphorus be performed in order to confirm the discharge estimates and to further develop implementable control measures if needed.

9.1.1.2 Stormwater Sources

The southern portion of the watershed contains some urban development from the Town of Normal. At the time of TMDL development, Normal was in the process of applying for a Municipal Separate Storm Sewer System (MS4) discharge permit and stormwater was not considered in the final waste load allocation. However, Normal is now covered under the Illinois General Permit with Six-Mile Creek listed as a receiving water. Urban stormwater is thus considered a point source.

Again, the total phosphorus contributions from stormwater are considered small relative to the loading associated with agricultural runoff throughout the watershed. Discussions with Normal representatives indicated that large-scale urban growth within the watershed was not anticipated. Normal's MS4 permit requires that six minimum controls be implemented to reduce pollutants discharged. The minimum controls are:

- Public Education/Outreach
- Public Participation/Involvement
- Illicit Discharge Detection/Elimination
- Construction Site Runoff Control
- Post Construction Runoff Control
- Pollution Prevention/Good Housekeeping

Normal has developed a stormwater management program which incorporates the controls described above. These six minimum controls should result in stormwater quality that does not affect the loads of phosphorus within the lake.

9.1.2 Nonpoint Sources of Phosphorus

Potential sources of nonpoint source phosphorus pollution identified by the 303(d) list include septic systems, agricultural lands, and contaminated sediment. BMPs evaluated that could be utilized to treat these nonpoint sources are:

- Conservation tillage practices
- Filter strips
- Wetlands
- Nutrient management
- Septic system maintenance or sanitary system
- Bank stabilization

Total phosphorus originating from cropland is most efficiently treated with a combination of no-till or conservation tillage practices and grass filter strips. Bank stabilization would help control phosphorus entering the lake through eroded sediments. Wetlands located upstream of the reservoir could provide further reductions in total and dissolved phosphorus in runoff from croplands. Nutrient management focuses on source control of nonpoint source contributions to Evergreen Lake.

9.1.2.1 Conservation Tillage Practices

For the Evergreen Lake watershed, conservation tillage practices could help reduce nutrient loads in the lake. The lake potentially receives nonpoint source runoff from approximately 20,000 acres of row crops and small grain agriculture. Total phosphorus loading from cropland is controlled through management BMPs, such as conservation tillage. Conservation tillage maintains at least 30 percent of the soil surface covered by residue after planting. Crop residuals or living vegetation cover on the soil surface protect against soil detachment from water and wind erosion. Conservation tillage practices can remove up to 45 percent of the dissolved and total phosphorus from runoff and approximately 75 percent of the sediment. Additionally, studies have found around 93 percent less erosion occurred from no-till acreage compared to acreage subject to moldboard plowing (USEPA 2003); however, filter strips are less effective at removing dissolved phosphorus only. The 2004 Illinois Department of Agriculture's Soil Transect Survey estimated that conventional till currently accounts for 61 percent of corn, 0 percent of soybean, and 0 percent of small grain tillage practices in McLean County, and these percentages were assumed to apply to the Evergreen Lake watershed as well. To achieve TMDL load allocations, tillage practices already in place should be continued, and practices should be assessed and improved upon for all 20,000 agricultural acres in the Evergreen Lake watershed.

9.1.2.2 Filter Strips

Filter strips can be used as a structural control to reduce pollutant loads, including nutrients and sediment, to Evergreen Lake. Filter strips implemented along stream segments slow and filter nutrients and sediment out of runoff and provide bank stabilization decreasing erosion and deposition. Additionally, filter strips mitigate nutrient loads to lakes. The following paragraphs focus on the implementation of filter strips in the Evergreen Lake watershed. Design criteria and size selection of filter strips are also discussed.

Grass and riparian buffer strips filter out nutrients and organic matter associated with sediment loads to a water body. Filter strips reduce nutrient and sediment loads to lakes by establishing ground depressions and roughness that settle sediment out of runoff and providing vegetation to filter nutrients out of overland flow. In addition, filter strips should be harvested periodically in accordance with the federal and/or state conservation program in which the practice was enrolled, so that removal rate efficiencies over extended periods of time remain high (USEPA 1993).

Table 9-1 Filter Strip Flow Lengths Based on Land Slope

Percent Slope	0.5%	1.0%	2.0%	3.0%	4.0%	5.0% or greater
Minimum (feet)	36	54	72	90	108	117
Maximum (feet)	72	108	144	180	216	234

According to the NRCS Planning and Design Manual, the majority of sediment is removed in the first 25 percent of the width of the filter strip (NRCS 1994). Table 9-1 above outlines the guidance for filter strip flow length by slope (NRCS 1999).The majority of the land adjacent to tributaries of Evergreen Lake is agricultural. Figure 9-1 shows an aerial photograph of the watershed for reference. GIS land use data described in Section 5 was used in conjunction with soil slope data to provide an estimate of acreage where filter strips could be installed. As discussed in Section 5.1.8, the most predominant soil type in the watershed is Sable silty clay loam on zero to two percent slopes, followed by Ipava silt loam on zero to two percent slopes. Based on these slope values, filter strip widths of 36 to 144 feet could be incorporated into lands adjacent to the tributaries. Mapping software was then used to buffer stream segments to determine the total area found within 144 feet of tributaries in the watershed. There are approximately 830 total acres within this buffer distance. The landuse data were then clipped to the buffer area to determine the amount of this land that is agricultural. There are 480 acres of agricultural land that could potentially be converted to filter strips. Landowners should evaluate their land near watershed streams and Evergreen Lake and create or extend filter strips according to the NRCS guidance provided in Table 9-1. Programs available to fund the construction of these buffer strips are discussed in Section 9.2.

9.1.2.3 Wetlands

The use of wetlands as a structural control is applicable to nutrient reduction from agricultural lands in the Evergreen Lake watershed. To treat loads from agricultural runoff, a wetland could be constructed on the upstream end of the reservoir. Wetlands are an effective BMP for sediment and phosphorus control because they:

- Prevent floods by temporarily storing water, allowing the water to evaporate, or percolate into the ground
- Improve water quality through natural pollution control such as plant nutrient uptake

- Filter sediment
- Slow overland flow of water thereby reducing soil erosion (USDA 1996)

A properly designed and functioning wetland can provide very efficient treatment of pollutants, such as phosphorus. Design of wetland systems is very important and should consider soils in the proposed location, hydraulic retention time, and space requirements. Constructed wetlands, which comprise the second or third stage of nonpoint source treatment, can be effective at improving water quality. Studies have shown that artificial wetlands designed and constructed specifically to remove pollutants from surface water runoff have removal rates for suspended solids of greater than 90 percent, 0 to 90 percent for total phosphorus, 20 to 80 percent of orthophosphate, and 10 to75 percent for nitrogen species (Johnson, Evans, and Bass 1996; Moore 1993; USEPA 1993; Kovosic et al. 2000). Although the removal rate for phosphorus is low in long-term studies, the rate can be improved if sheet flow is maintained to the wetland and vegetation and substrate are monitored to ensure the wetland is operation optimally. Sediment or vegetation removal may be necessary if the wetland removal efficiency is lessened over time (USEPA 1993; NCSU 2000).

Table 9-2 Acres of Wetland for Evergreen Lake Watershed

Subbasin	Area (acres)	Recommended Wetlands (acre)	Existing Wetlands (acre)
1	15,552	93	35
2	5,952	35	13
3	2,752	16	9
4	1,920	11	3

Guidelines for wetland design suggest a wetland to watershed ratio of 0.6 percent for nutrient and sediment removal from agricultural runoff. Table 9-2 outlines estimated wetland areas for each subbasin based on these recommendations. A wetland system to treat agricultural runoff from the four subbasins comprising the 26,000-acre (41-sq. miles) Evergreen Lake watershed would range between 11 to 93 acres (Denison and Tilton 1993).

According to the U.S. Division of Fish and Wildlife's National Wetland Inventory, there are approximately 60 acres of freshwater forested/shrub and emergent wetlands currently existing within the watershed. Figure 9-2 shows the wetlands identified by the inventory in the vicinity of Evergreen Lake (where the majority of acreage is located). Table 9-2 further categorizes the wetlands by subbasin for reference. Restoring or improving these areas can potentially improve the quality of agricultural runoff that reaches Evergreen Lake.

9.1.2.4 Nutrient Management

Nutrient management could result in reduced nutrient loads to Evergreen Lake. Crop management of nitrogen and phosphorus can be accomplished through Nutrient Management Plans, which focus on increasing the efficiency with which applied nutrients are used by crops, thereby reducing the amount available to be transported to both surface and groundwater. In the past, nutrient management focused on application rates designed to meet crop nitrogen requirements but avoid groundwater quality problems created by excess nitrogen leaching. This results in buildup of soil phosphorus above amounts sufficient for optimal crop yields. Illinois, along with most Midwestern states, demonstrates high soil test phosphorus in greater than 50 percent of soil samples analyzed (Sharpley et al. 1999).

The overall goal of phosphorus reduction from agriculture should increase the efficiency of phosphorus use by balancing phosphorus inputs in feed and fertilizer with outputs in crops and animal produce as well as managing the level of phosphorus in the soil. Reducing phosphorus loss in agricultural runoff may be brought about by source and transport control measures, such as filter strips or grassed waterways. The Nutrient Management Plans account for all inputs and outputs of phosphorus to determine reductions. Nutrient Management Plans include:

- Review of aerial photography and soil maps;
- Regular soil testing;
- Review of current and/or planned crop rotation practices;
- Yield goals and associated nutrient application rates;
- Nutrient budgets with planned rates, methods, timing and form of application;
- Identification of sensitive areas and restrictions on application when land is snow covered, frozen or saturated.

In Illinois, Nutrient Management Plans have successfully reduced phosphorus application to agricultural lands by 36-lb/acre. National reductions range from 11 to 106-lb/acre, with an average reduction of 35-lb/acre (USEPA 2003).

9.1.2.5 Septic System Maintenance and Sanitary System

Septic systems are a potential source of nonpoint source phosphorus loading. The McLean County Environmental Health Department estimates that there are 750 permitted septic systems throughout the Evergreen Lake watershed. McLean County Parks and Recreation has a permit for a lagoon-type system that is located near the lake. Conversations with local officials have indicated that there are no known leach field septic systems in close proximity to the lake.

To reduce the excessive amounts of contaminants from a faulty septic system, a regular maintenance plan that includes regular pumping and maintenance of the septic system should be followed. The majority of failures originate from excessive suspended solids, nutrients, and BOD loading to the septic system. Reduction of solids to the tank can be achieved via limiting garbage disposals use and water conservation.

Septic system management activities can extend the life and maintain the efficiency of a septic system. Water conservation practices, such as limiting daily water use or using low flow toilets and faucets, are the most effective methods to maintain a properly functioning septic system. Additionally, the system should not be used for the disposal of solids, such as cigarette butts, cat litter, cotton swabs, coffee grinds, disposable diapers, etc. Finally, physical damage to the drainfield can be prevented by:

- Maintaining a vegetative cover over the drainfield to prevent erosion,

- Avoiding construction over the system,
- Protecting the area down slope of the system from excavation, and
- Landscape the area to divert surface flow away from the drainfield (Johnson 1998).

The cost of each management measure is site specific and there are no houses that reside on the lake's perimeter; therefore, costs for these practices were not outlined in Section 9.2.

Alternatively, a long-range solution to failing septic systems is connection to a municipal sanitary sewer system. Installation of a sanitary sewer will reduce existing nutrient sources by replacing failing septic systems and will allow communities to develop without further contribution of phosphorus loads to Evergreen Lake. Costs for the installation are generally paid over a period of several years (average of 20 years) instead of forcing homeowners to shoulder the entire cost of installing a new septic system. In addition, costs are sometimes shared between the lake community and the utility responsible for treating the wastewater generated from replacing the septic tanks. The planning process is involved and requires participation from townships, cities, counties, lake associations, and citizens.

9.1.2.6 Erosion Control/Bank Stabilization

Contaminated sediments were listed on the 303(d) list as a potential source of pollutant loading to Evergreen Lake. Soil erosion is the process of moving soil particles or sediment by flowing water or wind. Eroding soil transports pollutants, such as nutrients, that can potentially degrade water quality.

In 2005, a stream inventory and analysis for erosion was performed in the Evergreen Lake watershed. The study inventoried bank and stream conditions on Six Mile Creek and additional unnamed tributaries of Evergreen Lake. Figure 9-3 shows the areas assessed as part of the report. The assessment found that over 90 percent of the sediment contributed from streambank erosion is generated within four miles of Evergreen Lake (STREAMS 2005). The study went on to recommend three approaches to stabilizing the eroding banks which could, in turn, decrease nonpoint source phosphorus loads:

- Stone Toe Protection (STP);
- Rock Riffle Grade Control (RR); and
- Floodplain Excavation

Stone Toe Protection uses nonerodible materials to protect the eroding banks. The stream inventory study suggested that the meandering bends found in the Evergreen Lake watershed could possibly be stabilized by placing the hard armor only on the toe of the bank. STP is most commonly implemented “using stone quarry stone that is sized to resist movement and is placed on the lower one third of the bank in a windrow fashion" (STREAMS, 2005).

Naturally stable stream systems typically have an alternating riffle-pool sequence which helps to dissipate stream energy. Rock Riffle Grade Control places loose rock grade control structures at locations where natural riffles would occur to create and enhance the riffle-pool flow sequence of stable streams. By installing RR in an incised channel, the riffles will raise the water surface elevation resulting in lower effective bank heights, which increases the bank stability by reducing the tractive force on the banks (STREAMS, 2005).

Rather than raising the water level, Floodplain Excavation lowers the floodplain to create a more stable stream. Floodplain Excavation uses mechanical means to restore the floodplain by excavating and utilizing the soil that would eventually be eroded away and deposited in the lake (STREAMS, 2005).

The STREAMS report concluded that the two largest contributors to sediment in Evergreen Lake are tributary #3 and Six-Mile Creek. Tributary #5 was found to have the highest rate of sediment delivery. The report suggested that these streams should be the highest priority for treatment and that a combination of the practices described above could be implemented to mitigate sediment erosion. At this time, a demonstration project is planned for the portion of Tributary #3 closest to Evergreen Lake. A combination of the above mentioned practices will be implemented on a 40-acre parcel owned by the City of Bloomington.

In addition to sediment entering the system via streambank erosion, sediment loads are contributed directly from Evergreen lake shore erosion. The City of Bloomington has a planned shore stabilization project for the lake. Bloomington plans to install rip-rap along 1,500 feet of shore near the bathing area. Plans have been put on hold due to recent lake levels but it is hoped that installation can occur in the summer or fall of 2006.

9.1.3 In-Lake Phosphorus

The Evergreen Lake phosphorus TMDL allocated 15 percent of the total allowable phosphorus load to internal cycling. Reduction of phosphorus from in-lake cycling through management strategies is necessary for attainment of the TMDL load allocation. Internal phosphorus loading occurs when the water above the sediments become anoxic causing the release of phosphorus from the sediment in a form which is available for plant uptake. The addition of bioavailable phosphorus in the water column stimulates more plant growth and die-off, which perpetuates the anoxic conditions and enhances the subsequent release of phosphorus into the water.

Control of internal phosphorus cycling must limit the release of phosphorus from the sediments either through lake oxygen concentration or sediment management. Aeration, which simulates lake mixing and keeps oxygen conditions from being depleted in the epilimnon, can be very effective at preventing re-release of bound phosphorus. Reduction of internal phosphorus cycling from this measure is typically determined based on site-specific studies. Evergreen Lake has an aerator installed and samples are taken regularly to monitor lake stratification. Discussions with officials from the City of Bloomington indicate that the aerator is currently operating to their satisfaction.

Phosphorus release from the sediment is greatest from recently deposited layers. Dredging about one meter of recently deposited phosphorus–rich sediment can remove approximately 80 to 90 percent of the internally loaded phosphorus without the addition of potentially toxic compounds to the reservoir. However, dredging is more costly than other management options (NRCS 1992).

9.2 Reasonable Assurance

Reasonable assurance means that a demonstration is given that nonpoint source reductions in this watershed will be implemented. It should be noted that all programs discussed in this section are voluntary and some are currently in practice in the watershed. The discussion in section 9.1 provided information on available BMPs for reducing phosphorus loads from nonpoint sources. The remainder of this section discusses an estimate of costs to the watershed for implementing these practices and programs available to assist with funding.

9.2.1 Available Programs for Phosphorus TMDL

Approximately 91 percent of the Evergreen Lake watershed is classified as rural grassland (pasture land, CRP, waterways, buffer strip, etc.), row crop, and small grains land. There are several voluntary conservation programs established through the 2002 U.S. Farm Bill, which encourage landowners to implement resource-conserving practices for water quality and erosion control purposes. These programs would apply to crop fields and rural grasslands that are presently used as pasture land. Each program is discussed separately in the following paragraphs.

9.2.1.1 Illinois Department of Agriculture and Illinois EPA Nutrient Management Plan Project

The IDA and Illinois EPA are presently co-sponsoring a cropland Nutrient Management Plan project in watersheds that have or are developing a TMDL. This voluntary project supplies incentive payments to producers to have Nutrient Management Plans developed and implemented. Additionally, watersheds that have sediments or phosphorus identified as a cause for impairment (as is the case in this watershed), are eligible for cost-share assistance in implementing traditional erosion control practices through the Nutrient Management Plan project.

9.2.1.2 Conservation Reserve Program (CRP)

This voluntary program encourages landowners to plant long-term resource-conserving cover to improve soils, water, and wildlife resources. CRP is the USDA's single largest environmental improvement program and one of its most productive and cost-efficient. It is administered through the Farm Service Agency (FSA) by USDA's Commodity Credit Corporation (CCC). The program was initially established in the Food & Security Act of 1985. The duration of the contracts under CRP range from 10 to 15 years.

Eligible land must be one of the following:

1. Cropland that is planted or considered planted to an agricultural commodity two of the five most recent crop years (including field margins) and must be physically and legally capable of being planted in a normal manner to an agricultural commodity.

2. Certain marginal pastureland enrolled in the Water Bank Program.

The CCC bases rental rates on the relative productivity of soils within each county and the average of the past three years of local dry land cash rent or cash-rent equivalent. The maximum rental rate is calculated in advance of enrollment. Producers may offer land at the maximum rate or at a lower rental rate to increase likelihood of offer acceptance. In addition, the CCC provides cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices (USDA 2006).

Finally, CCC offers additional financial incentives of up to 20 percent of the annual payment for certain continuous sign-up practices (USDA 2006). Continuous sign-up provides management flexibility to farmers and ranchers to implement certain high-priority conservation practices on eligible land. The land must be determined by NRCS to be eligible and suitable for any of the following practices:

- Riparian buffers
- Filter strips
- Grass waterways
- Shelter belts
- Field windbreaks
- Living snow fences
- Contour grass strips
- Salt tolerant vegetation
- Shallow water areas for wildlife
- Eligible acreage within an EPA-designated wellhead protection area (FSA 1997)

Currently, there are approximately 600 acres of the Evergreen Lake watershed enrolled in CRP. Table 9-3 contains information on the CRP practices and associated acreage that are currently implemented in the watershed.

Table 9-3 BMPs Implemented in Evergreen Lake Watershed

Practice	Description	Number of Acres
CP1	Introduced Grasses	29.08
CP10	Grass-Already Established	36.51
CP11	Trees-Already Established	235.93
CP12	Wildlife Food Plot	6.70
CP2	Native Grasses	32.58
CP21	Filter Strip	129.22
CP22	Riparian Forest Buffer	17.02
CP33	Habitat Buffers for Upland Birds	31.34
CP3A	Hardwood Tree Planting	33.8
CP8A	Waterway	39.84

9.2.1.3 Clean Water Act Section 319 Grants

Section 319 was added to the CWA to establish a national program to address nonpoint sources of water pollution. Through this program, each state is allocated section 319 funds on an annual basis according to a national allocation formula based on the total annual appropriation for the section 319 grant program. The total award consists of two categories of funding: incremental funds and base funds. A state is eligible to receive EPA 319(b) grants upon USEPA's approval of the state's Nonpoint Source Assessment Report and Nonpoint Source Management Program. States may reallocate funds through subawards (e.g., contracts, subgrants) to both public and private entities, including local governments, tribal authorities, cities, counties, regional development centers, local school systems, colleges and universities, local nonprofit organizations, state agencies, federal agencies, watershed groups, for-profit groups, and individuals.

USEPA designates incremental funds, a $100-million award, for the restoration of impaired water through the development and implementation of watershed-based plans and TMDLs for impaired waters. Base funds, funds other than incremental funds, are used to provide staffing and support to manage and implement the stat Nonpoint Source Management Program. Section 319 funding can be used to implement activities which improve water quality, such as filter strips, streambank stabilization, etc (USEPA 2003).

9.2.1.4 Wetlands Reserve Program (WRP)

The Wetlands Reserve Program (WRP) is a voluntary program that provides technical and financial assistance to eligible landowners to restore, enhance, and protect wetlands. The goal of WRP is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. At least 70 percent of each project area will be restored to the original natural condition, to the extent practicable. The remaining 30 percent of each area may be restored to other than natural conditions. Landowners have the option of enrolling eligible lands through permanent easements, 30-year easements, or 10-year restoration cost-share agreements. The program is offered on a continuous sign-up basis and is available nationwide. WRP offers landowners an opportunity to establish, at minimal cost, long-term conservation and wildlife habitat enhancement practices and protection. It is administered through the NRCS (2002b).

Eligible participants must have owned the land for at least 1 year and be able to provide clear title. Restoration agreement participants must show evidence of ownership. Owners may be an individual, partnership, association, corporation, estate, trust, business, or other legal entity; a state (when applicable); a political subdivision of a state; or any agency thereof owning private land. Land eligibility is dependent on length of ownership, whether the site has been degraded as a result of agriculture, and the land's ability to be restored.

The 2002 Farm Bill reauthorized the program through 2007. The reauthorization increased the acreage enrollment cap to 2,275,000 acres with an annual enrollment of 250,000 acres per calendar year. The program is limited by the acreage cap and not by program funding. Since the program began in 1985, the average cost per acre is $1,400 in restorative costs and the average project size is 177 acres. The costs for each enrollment options follow in Table 9-4 (USDA 2006).

Table 9-4 Costs for Enrollment Options of WRP Program

Option	Permanent Easement	30-year Easement	Restoration Agreement
Payment for Easement	100% Agricultural Value	75% Agricultural Value	NA
Payment Options	Lump Sum	Lump Sum	NA
Restoration Payments	100% Restoration Cost Reimbursements	75% Restoration Cost Reimbursements	75% Restoration Cost Reimbursements

9.2.1.5 Environmental Quality Incentive Program (EQIP)

The Environmental Quality Incentive Program (EQIP) is a voluntary USDA conservation program for farmers and private landowners engaged in livestock or agricultural production who are faced with serious threats to soil, water, and related natural resources. It provides technical, financial, and educational assistance primarily in designated "priority areas." National priorities include the reduction of non-point source pollution, such as nutrients, sediment, pesticides, or excess salinity in impaired watersheds, consistent with TMDLs where available, and the reduction in soil erosion and sedimentation from unacceptable levels on agricultural land. The program goal is to maximize environmental benefits per dollar expended and provides "(1) flexible technical and financial assistance to farmers and ranchers that face the most serious natural resource problems, (2) assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourage environmental enhancement, (3) assistance to farmers and ranchers in making beneficial, cost-effective changes to measures needed to conserve and improve natural resources, and (4) for the consolidation and simplification of the conservation planning process (NRCS 2002)."

Landowners, with the assistance of a local NRCS or other service provider, are responsible for the development of an EQIP plan which includes a specific conservation and environmental objective, one or more conservation practices in the conservation management system to be implemented to achieve the conservation and environmental objectives, and the schedule for implementing the conservation practices. This plan becomes the basis of the cost-share agreement between NRCS and the participant. NRCS provides cost-share payments to landowners under these agreements that can be up to 10 years in duration.

Cost-share assistance may pay landowners up to 75 percent of the costs of conservation practices, such as grassed waterways, filter strips, manure management, capping abandoned wells, and other practices important to improving and maintaining the health of natural resources in the area. EQIP cost-share rates for limited resource producers and beginning farmers may be up to 90 percent. Total incentive and cost-share payments are limited to an aggregate of $450,000 (NRCS 2006).

9.2.1.6 Wildlife Habitat Incentives Program (WHIP)

The Wildlife Habitat Incentives Program (WHIP) is voluntary program that encourages the creation of high quality wildlife habitat of national, state, tribal, or local significance. WHIP is administered through NRCS, which provides technical and financial assistance to landowners for development of upland, riparian, and aquatic habitat areas on their property. NRCS works with the participant to develop a wildlife habitat development plan which becomes the basis of the cost-share agreement between NRCS and the participant. Most contracts are 5 to 10 years in duration, depending upon the practices to be installed. However, longer term contracts of 15 years or greater may also funded. In addition, if the landowner agrees, cooperating State wildlife agencies and nonprofit or private organizations may provide expertise or additional funding to help complete a project.

Currently in the Evergreen Lake watershed, the City of Bloomington, along with the McLean County SWCD and Pheasants Forever, are sharing costs of installing filter strips along tributary streams where landowners and farm operators are willing to participate. The City pays the cost of seeding the strips and the farm operator obtains credit for set aside land under various Department of Agriculture programs (McLean County SWCD, 2005).

9.2.1.7 Streambank Stabilization and Restoration Practice

The Streambank Stabilization and Restoration Practice (SSRP) was established to address problems associated with streambank erosion, such as loss or damage to valuable farmland, wildlife habitat, roads; stream capacity reduction through sediment deposition; and degraded water quality, fish, and wildlife habitat. The primary goals of the SSRP are to develop and demonstrate vegetative, stone structure and other low cost bio-engineering techniques for stabilizing streambanks and to encourage the adoption of low-cost streambank stabilization practices by making available financial incentives, technical assistance, and educational information to landowners with critically eroding streambanks. A cost share of 75 percent is available for approved project components; such as willow post installation, bendway weirs, rock riffles, stream barbs/rock, vanes, lunker structures, gabion baskets, and stone toe protection techniques. There is no limit on the total program payment for cost-share projects that a landowner can receive in a fiscal year. However, maximum cost per foot of bank treated is used to cap the payment assistance on a per foot basis and maintain the program's objectives of funding low-cost techniques (IDA 2000).

9.2.1.8 Conservation Practices Cost-Share Program

The Conservation Practices Program (CPP) is a 10-year program. The practices consist of waterways, water and sediment control basins (WASCOBs), pasture/hayland establishment, critical area, terrace system, no-till system, diversions, and grade stabilization structures. The CPP is state-funded through the Department of Agriculture. There is a project cap of $5,000 per landowner and costs per acre vary significantly from project to project.

9.2.1.9 Local Program Information

The Farm Service Agency (FSA) administers the CRP. NRCS administers the EQIP, WRP, and WHIP. Local NRCS and FSA contact information in McLean County are listed in the Table 9-5 below.

Table 9-5 Local NRCS and FSA Contact Information

Contact	Address	Phone
Local NRCS Office		
Kent Bohnhoff	402 N Kays Drive Normal, IL 61761	(309) 452-3848 x3
Local SWCD Office		
Jim Rutherford	402 N Kays Drive Normal, IL 61761	(309) 452-3848 x3
Local FSA Office		
Jonathan Evers	402 N Kays Drive Normal, IL 61761	(309) 452-3848 x2

9.2.2 Cost Estimates of BMPs

Cost estimates for different best management practices and individual practice prices such as filter strip installation are detailed in the following sections. Table 9-7 outlines the cost of implementation measures per acre. Finally, an estimate of the total order of magnitude costs for implementation measures in the Evergreen Lake watershed are presented in Section 9.2.2.7 and Table 9-8.

9.2.2.1 Wetlands

The price to establish a wetland is very site specific. There are many different costs that could be incurred depending on wetland construction. Examples of costs associated with constructed wetlands include excavation costs. McLean County NRCS estimates excavation cost at $2/cubic foot. Establishment of vegetation in critical areas including seeding and fertilizing is estimated at $230/acre. It should be noted that the larger the wetland acreage to be established, the more cost-effective the project.

9.2.2.2 Filter Strips and Riparian Buffers

McLean County NRCS estimates an average cost per acre to install and maintain a grass filter strip with a 5-year life span at $54/acre for nonnative species and $188/acre for native species. This price quote accounts for seeding and mowing every other year to remove woody sprouts. A riparian buffer strip established with bare root stock has a life span of 10-years and an installation cost of $350/acre.

9.2.2.3 Nutrient Management Plan - NRCS

A significant portion of the agricultural land in the Evergreen Lake watershed is comprised of cropland. The service for developing a nutrient management plan averages $5 to $15/acre.

9.2.2.4 Nutrient Management Plan - IDA and Illinois EPA

The costs associated with development of Nutrient Management Plans co-sponsored by the IDA and the Illinois EPA is estimated as $10/acre paid to the producer and $3/acre for a third party vendor who develops the plans. There is a 200 acre cap per producer. The total plan development cost is estimated at $13/acre.

9.2.2.5 Conservation Tillage

Conservation tillage is assumed to include tillage practices that preserve at least 30 percent residue cover of the soil after crops are planted. Costs associated with converting to conservation tillage will depend on the degree of conservation tillage practices implemented. The University of Iowa has estimated a cost for conversion to no-till practices. The study acknowledged that some equipment conversion is needed, but converting to no-till only means (for most producers) the addition of heavier down-pressure springs, row cleaners, and possibly a coulter on each planter row unit. The cost of converting existing equipment ranges between $300 and $400 per planter row, which for many producers, amounts to a nominal additional production cost of approximately $1 or $2 per acre per year (Al-Kaisi, 2002).

9.2.2.6 Erosion Control/Bank Stabilization Measures

A cost estimate was developed as part of the Stream Inventory and Analysis completed by STREAMS in 2005. The report identified segments throughout the watershed that would benefit from the implementation of erosion control measure discussed in 9.1.2.6 above. Approximately 16 miles of streambank were identified for stabilization. The report estimated total watershed implementation at 1.47 million dollars which equates to approximately $17/ft.

9.2.2.7 Internal Cycling

Controls of internal phosphorus cycling in lakes are costly. As discussed above, an aeration system is already installed in Evergreen Lake and, therefore, cost is not discussed here. However, dredging is typically the most expensive management practice averaging $8,000/acre. Although cost is high, the practice is 80 to 90 percent effective at nutrient removal and will last for at least 50 years (Cortell 2002; Geney 2002)..

9.2.2.8 Planning Level Cost Estimates for Implementation Measures

Cost estimates for different implementation measures are presented in Table 9-6. The column labeled Program or Sponsor lists the financial assistance program or sponsor available for various BMPs. The programs and sponsors represented in the table are the Soil Stabilization and Restoration Practice (SSRP), Wetlands Reserve Program (WRP), the Conservation Reserve Program (CRP), National Resource Conservation Service (NRCS), Conservation Cost-Share Program (CPP), Illinois EPA, and Illinois Department of Agriculture (IDA). It should be noted that IEPA 319 Grants are applicable to all of these practices.

Table 9-6 Cost Estimate of Various BMP Measures in McLean County

Source	Program	Sponsor	BMP	Installation Mean $/acre
Nonpoint	CRP/CPP	NRCS and IDA	Grass filter strip -native	$188
	CRP/CPP	NRCS and IDA	Grass filter strip -nonnative	$54
	WRP	NRCS	Wetland	varies
		NRCS	Nutrient Management Plan	$10
		IDA and Illinois EPA	Nutrient Management Plan	$13
	CRP/CPP	NRCS and IDA	Conservation Tillage	varies
	SSRP	IDA	Erosion Control/Bank Stabilization	$17/ft
Internal Cycling			Dredging	$8,000

Total watershed costs will depend on the combination of BMPs selected to target non-point sources within the watershed. Regular monitoring will support adaptive management of implementation activities to most efficiently reach the TMDL goals.

9.3 Monitoring Plan

The purpose of the monitoring plan for Evergreen Lake is to assess the overall implementation of management actions outlined in this section. This can be accomplished by conducting the following monitoring programs:

- Track implementation of management measures in the watershed
- Estimate effectiveness of management measures
- Monitoring of point source discharges in the watershed
- Continued ambient monitoring of Evergreen Lake
- Investigation of tile line flow and associated water quality
- Further information gathering on area septic systems including locations and failure rates
- Storm-based monitoring of high flow events
- Tributary monitoring

Tracking the implementation of management measures can be used to address the following goals:

- Determine the extent to which management measures and practices have been implemented compared to action needed to meet TMDL endpoints

- Establish a baseline from which decisions can be made regarding the need for additional incentives for implementation efforts
- Measure the extent of voluntary implementation efforts
- Support work-load and costing analysis for assistance or regulatory programs
- Determine the extent to which management measures are properly maintained and operated

Estimating the effectiveness of the BMPs implemented in the watershed could be completed by monitoring before and after the BMP is incorporated into the watershed. Additional monitoring could be conducted on specific structural systems such as a constructed wetland. Inflow and outflow measurements could be conducted to determine site-specific removal efficiency. When aeration is used to control internal loading, site-specific data could be collected to assess the effectiveness of this management measure.

Illinois EPA monitors Evergreen Lake from April through October approximately every three years. The lake is also currently in the diagnostic/feasibility stage of a Clean Lakes study. Continuation of this ambient monitoring will assess lake water quality as improvements in the watershed are completed. This data will also be used to assess whether water quality standards in the reservoir are being attained.

Regular monitoring of point sources in the watershed would confirm their collective contributions. The Prairieview Home Owners' NPDES permit expired on 5/21/2005. An application for renewal was submitted on 10/5/2004. Prairie View Home Owners are requesting an increase in discharge to 0.007 mgd. IEPA is currently reviewing the application.

A watershed group is in place for the Evergreen Lake watershed. The group actively participates in watershed monitoring, planning, and information sharing. The group is comprised of a planning and a technical committee. The technical committee is made up of subgroups focused on Agriculture, Urban areas, and Biology. The committees are attended by personnel from SWCD, NRCS, Illinois State University, the Cities of Bloomington, Normal and Hudson, IDNR, and local landowners and producers.

Continued tributary monitoring is needed to further assess the contribution of internal loading to Evergreen Lake. By having more knowledge on actual contributions from external loads a more precise estimate of internal loads could occur. Along with this tributary monitoring, a stage discharge relationship could be developed with the reservoir spillway so that flows into the reservoir could be paired with tributary water quality data to determine total phosphorus load from the watershed. Data on the different forms of phosphorus (dissolved, total, or orthophosphate) would also be beneficial to better assess reservoir response to phosphorus loading.

9.4 Implementation Time Line

Implementing the actions outlined in this section for the Evergreen Lake Watershed should occur in phases and assessing effectiveness of the management actions as improvements are made. It is assumed that it may take up to five years to secure funding for actions needed in the watershed and five to seven years after funding to implement the measures. Once improvements are implemented, it may take Evergreen Lake 10 years or more to reach its water quality standard target of 0.05 mg/L (Wetzel 1983). If internal loads are not effectively controlled, this time frame could be even greater as the reservoir will take time to "flush" out the phosphorus bound to bottom sediments as reductions in external loads take place. In summary, it may take up to 20 years for Evergreen Lake to meet the total phosphorus water quality standard.

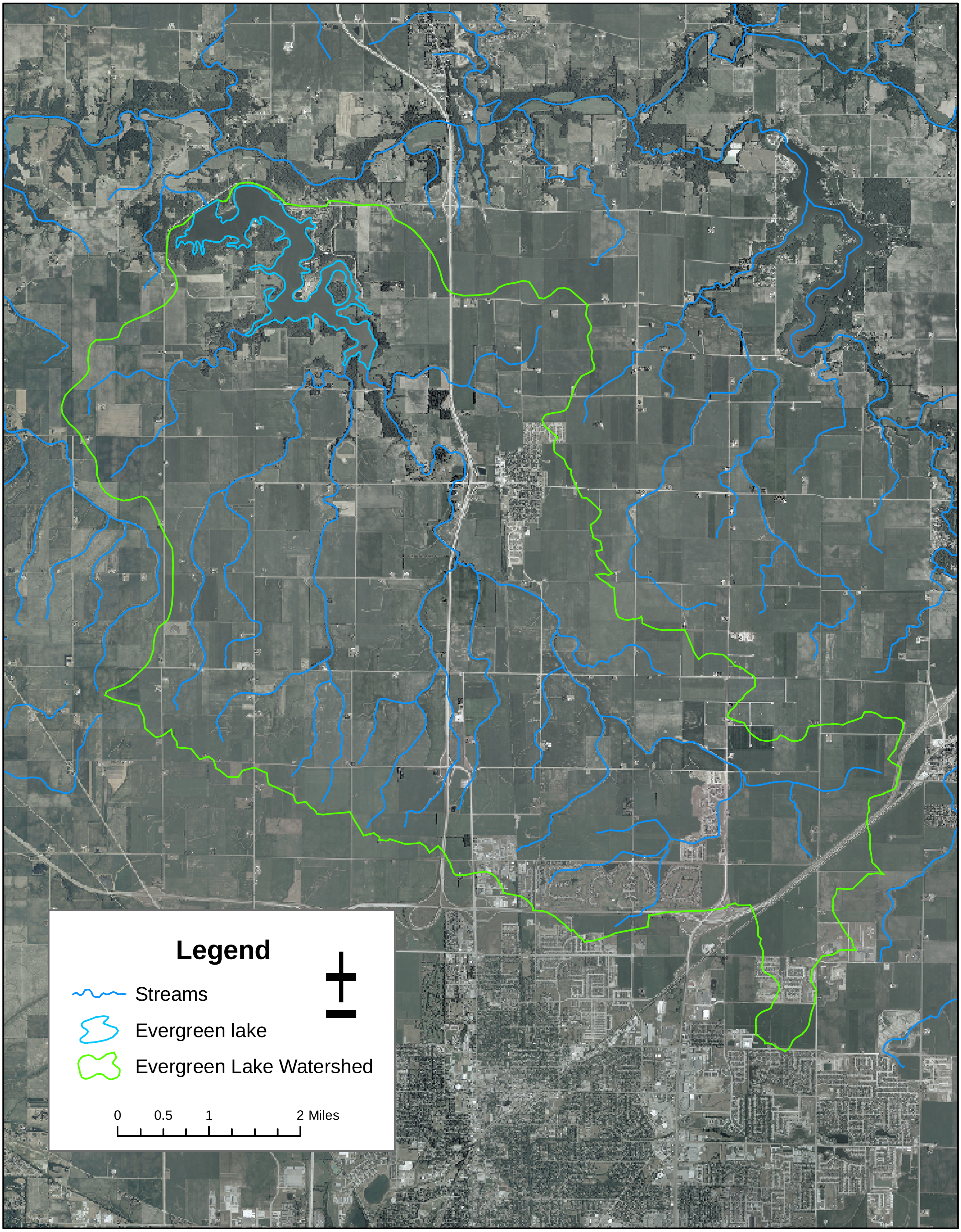

Figure 9-1: Aerial Photograph
Evergeen Lake Watershed

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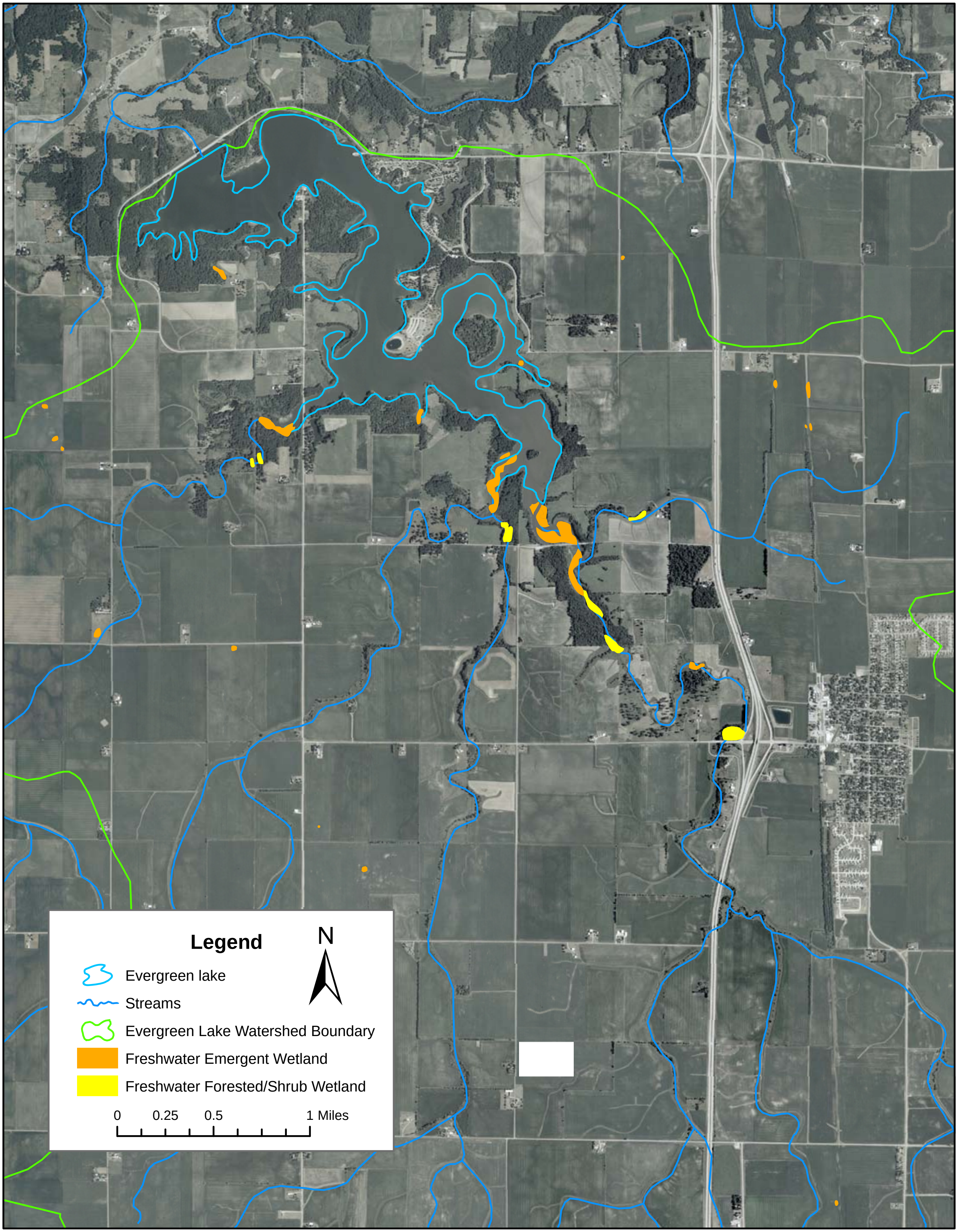

Figure 9-2: National Wetlands Inventory
Evergeen Lake Watershed

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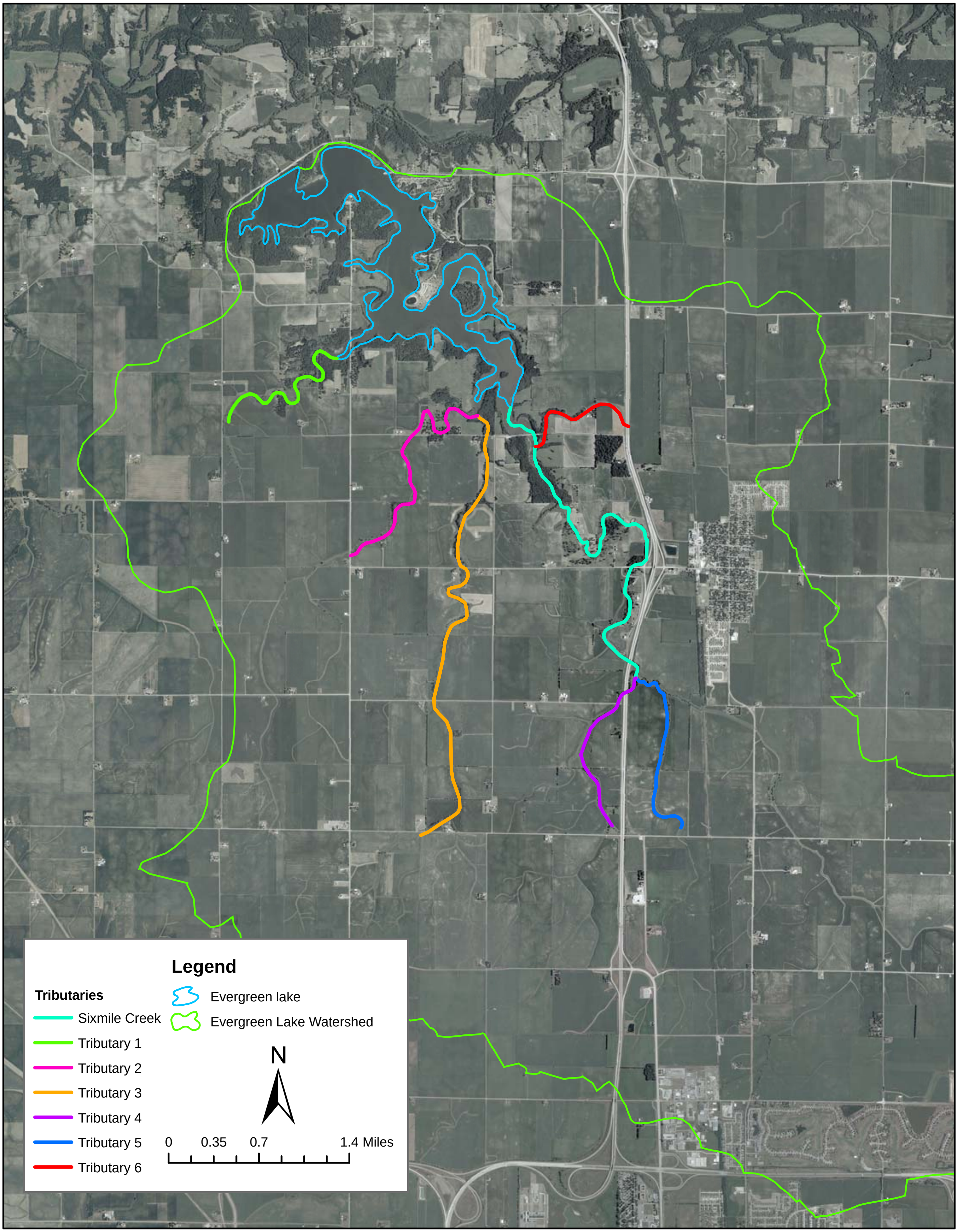

Figure 9-3: Inventoried Streams
Stream Inventory and Analysis Report (STREAMS 2005)
Evergeen Lake Watershed

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Section 10
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Appendix A
Historic Water Quality Data

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Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SDA 03	5-May-88	1115	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SDA 03	8-Jun-88	1300	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SDA 03	5-May-88	1115	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SDA 03	8-Jun-88	1300	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SDA 03	23-Apr-98	915	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SDA 03	23-Jun-98	1130	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SDA 03	15-Jul-98	915	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SDA 04	5-May-88	1200	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SDA 04	5-May-88	1200	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SDA 04	8-Jun-88	1325	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SDA 04	8-Jun-88	1325	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	4/23/1998	9:45	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	4/23/1998	9:45	25	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	4/23/1998	9:45	47	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	6/23/1998	11:15	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	6/23/1998	9:15	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	6/23/1998	9:15	25	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	6/23/1998	9:15	47	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-1	7/15/1998	10:00	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	7/15/1998	10:00	25	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	7/15/1998	10:00	43	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	8/25/1998	10:32	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	8/25/1998	10:32	17	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	8/25/1998	10:32	36	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	10/16/1998	9:32	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	10/16/1998	9:32	17	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	10/16/1998	9:32	40	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-1	16-Jun-81	1330	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	16-Jun-81	1330	41	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	3-Sep-81	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	3-Sep-81	1000	40	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	5-May-88	930	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	5-May-88	930	33	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	8-Jun-88	1130	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	8-Jun-88	1130	34	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	12-Jul-88	1045	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-1	12-Jul-88	1045	36	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	31-Aug-88	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	31-Aug-88	1100	35	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.27
SD-A03-A-1	19-Oct-88	1245	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	19-Oct-88	1245	33	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	12-Apr-90	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-1	12-Apr-90	1015	42	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-1	11-Jun-90	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	11-Jun-90	1015	36	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	17-Jul-90	1045	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	17-Jul-90	1045	43	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-1	23-Aug-90	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.04
SD-A03-A-1	23-Aug-90	1100	41	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-1	11-Oct-90	1300	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-1	11-Oct-90	1300	41	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-1	17-Apr-92	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	17-Apr-92	1100	40	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	4-Jun-92	1315	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	4-Jun-92	1315	41	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	7-Jul-92	1230	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	7-Jul-92	1230	38	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	27-Aug-92	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	27-Aug-92	1015	40	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	19-Oct-92	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	19-Oct-92	1000	41	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-1	14-Apr-95	945	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	14-Apr-95	945	42	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	1-May-96	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	1-May-96	1005	32	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	18-Jun-96	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	18-Jun-96	1015	41	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-1	9-Jul-96	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	9-Jul-96	1000	44	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.04
SD-A03-A-1	13-Aug-96	930	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	13-Aug-96	930	40	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	15-Oct-96	945	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-1	15-Oct-96	945	42	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	29-Apr-97	945	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	29-Apr-97	945	45	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	19-Jun-97	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	19-Jun-97	1015	45	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	21-Jul-97	930	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	21-Jul-97	930	45	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	20-Aug-97	945	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	20-Aug-97	945	45	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.04
SD-A03-A-1	14-Oct-97	930	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	14-Oct-97	930	35	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	23-Apr-98	945	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	23-Apr-98	945	25	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	23-Apr-98	945	47	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	23-Jun-98	915	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	23-Jun-98	915	25	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	23-Jun-98	915	47	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-1	15-Jul-98	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	15-Jul-98	1000	25	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	15-Jul-98	1000	43	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	25-Aug-98	1032	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	25-Aug-98	1032	17	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	25-Aug-98	1032	36	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-1	16-Oct-98	932	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	16-Oct-98	932	17	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-1	16-Oct-98	932	40	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-2	4/23/1998	9:00	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-2	4/23/1998	11:00	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-2	6/23/1998	11:45	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-2	6/23/1998	10:00	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	7/15/1998	9:00	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-2	7/15/1998	11:00	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	8/25/1998	9:05	0.5	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-2	8/25/1998	11:46	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	10/16/1998	10:42	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-2	16-Jun-81	1255	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-2	3-Sep-81	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-2	8-Jun-88	1200	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	12-Jul-88	1130	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-2	31-Aug-88	1200	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	19-Oct-88	1330	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	12-Apr-90	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.04
SD-A03-A-2	11-Jun-90	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	17-Jul-90	1130	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-2	23-Aug-90	1245	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-2	11-Oct-90	1400	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-2	17-Apr-92	1200	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	4-Jun-92	1350	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	7-Jul-92	1315	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	27-Aug-92	1130	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	19-Oct-92	1115	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	14-Apr-95	1030	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-2	1-May-96	1030	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	18-Jun-96	1045	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	8-Jul-96	1045	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-2	13-Aug-96	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-2	15-Oct-96	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	29-Apr-97	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	19-Jun-97	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	21-Jul-97	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	20-Aug-97	1030	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	14-Oct-97	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	23-Apr-98	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-2	23-Jun-98	1000	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	15-Jul-98	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	25-Aug-98	1146	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-2	16-Oct-98	1042	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-3	4/23/1998	9:15	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	4/23/1998	11:15	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	6/23/1998	11:30	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-3	6/23/1998	10:15	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	7/15/1998	9:15	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-3	7/15/1998	11:30	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-3	8/25/1998	12:05	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-3	10/16/1998	11:03	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-3	16-Jun-81	1210	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	3-Sep-81	900	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-3	5-May-88	1045	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	8-Jun-88	1230	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	12-Jul-88	1200	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.08
SD-A03-A-3	31-Aug-88	1245	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	19-Oct-88	1345	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	12-Apr-90	1115	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	11-Jun-90	1130	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-3	17-Jul-90	1200	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	23-Aug-90	1330	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.06
SD-A03-A-3	11-Oct-90	1415	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.08
SD-A03-A-3	17-Apr-92	1215	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	4-Jun-92	1405	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	7-Jul-92	1330	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	27-Aug-92	1245	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	19-Oct-92	1145	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-3	14-Apr-95	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.07
SD-A03-A-3	1-May-96	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	18-Jun-96	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	9-Jul-96	1100	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	13-Aug-96	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	15-Oct-96	1045	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	29-Apr-97	1045	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	19-Jun-97	1130	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	21-Jul-97	1030	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-3	20-Aug-97	1045	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	14-Oct-97	1030	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-3	23-Apr-98	1115	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	23-Jun-98	1015	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-3	15-Jul-98	1130	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-3	25-Aug-98	1205	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.03
SD-A03-A-3	16-Oct-98	1103	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.05
SD-A03-A-4	4/23/1998	10:30	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-4	4/23/1998	10:30	31	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-4	6/23/1998	10:30	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	6/23/1998	10:30	31	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	7/15/1998	10:30	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	7/15/1998	10:30	31	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	8/25/1998	11:20	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-4	8/25/1998	11:20	34	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	10/16/1998	10:13	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-4	10/16/1998	10:13	30	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-4	23-Apr-98	1030	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-4	23-Apr-98	1030	31	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-4	23-Jun-98	1030	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	23-Jun-98	1030	31	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	15-Jul-98	1030	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	15-Jul-98	1030	31	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	25-Aug-98	1120	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.00
SD-A03-A-4	25-Aug-98	1120	34	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.01
SD-A03-A-4	16-Oct-98	1013	1	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SD-A03-A-4	16-Oct-98	1013	30	PHOSPHORUS, DISSOLVED (MG/L AS P)	0.02
SDA 03	8-Jun-88	1300	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SDA 03	5-May-88	1115	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SDA 03	5-May-88	1115	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SDA 03	8-Jun-88	1300	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SDA 03	23-Apr-98	915	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SDA 03	7-May-98	1350	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.69
SDA 03	7-May-98	1525	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.56
SDA 03	7-May-98	1705	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.42
SDA 03	7-May-98	1840	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.36
SDA 03	8-May-98	825	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.65
SDA 03	8-May-98	1140	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.48
SDA 03	8-May-98	1600	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.38
SDA 03	9-May-98	720	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.19
SDA 03	10-May-98	1815	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SDA 03	11-May-98	1325	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SDA 03	24-May-98	934	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SDA 03	3-Jun-98	1530	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SDA 03	11-Jun-98	1715	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.19
SDA 03	15-Jun-98	1410	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
SDA 03	23-Jun-98	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SDA 03	2-Jul-98	1020	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SDA 03	15-Jul-98	915	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SDA 03	4-Aug-98	1459	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.14
SDA 03	18-Aug-98	930	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.40
SDA 03	2/23/2000	2:05 PM		PHOSPHORUS, TOTAL (MG/L AS P)	0.26
SDA 03	8/6/2002	12:00 AM		PHOSPHORUS, TOTAL (MG/L AS P)	0.70
SDA 04	5-May-88	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SDA 04	5-May-88	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SDA 04	8-Jun-88	1325	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SDA 04	8-Jun-88	1325	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SDA 04	5/26/2000	12:55 PM		PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SDA 04	5/30/2000	9:15 AM		PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SDA 04	2/8/2001	1:40 PM		PHOSPHORUS, TOTAL (MG/L AS P)	0.49
SDA 04	8/6/2002	12:00 AM		PHOSPHORUS, TOTAL (MG/L AS P)	0.65
SD-A03-A-1	4/23/1998	9:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	4/23/1998	9:45	25	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	4/23/1998	9:45	47	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/7/1998	13:45		PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	5/7/1998	15:10		PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	5/7/1998	16:55		PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/7/1998	18:30		PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	5/8/1998	8:10		PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/8/1998	11:35		PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	5/8/1998	16:10		PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	5/9/1998	7:10		PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/10/1998	18:05		PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/11/1998	13:15		PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/18/1998	12:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	5/18/1998	12:30	24	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/18/1998	12:30	46	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	5/24/1998	10:40		PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	6/3/1998	15:20		PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/3/1998	11:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/3/1998	11:30	23	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/3/1998	11:30	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/11/1998	16:55		PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/15/1998	14:02		PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/23/1998	11:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/23/1998	9:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/23/1998	9:15	25	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/23/1998	9:15	47	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	7/2/1998	10:00		PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/2/1998	14:14	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/2/1998	14:14	23.5	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/2/1998	14:14	45	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-1	7/15/1998	10:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/15/1998	10:00	25	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/15/1998	10:00	43	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/6/1998	10:05	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/6/1998	10:05	20	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/6/1998	10:05	39	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	8/25/1998	10:32	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/25/1998	10:32	17	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/25/1998	10:32	36	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	9/3/1998	10:50	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/3/1998	10:50	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/3/1998	10:50	43	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/21/1998	10:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/21/1998	10:00	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/21/1998	10:00	43	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-1	10/8/1998	10:51	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	10/8/1998	10:51	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	10/8/1998	10:51	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-1	10/16/1998	9:32	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	10/16/1998	9:32	17	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	10/16/1998	9:32	40	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
SD-A03-A-1	11/18/1998	14:33	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	11/18/1998	14:33	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.03

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-1	11/18/1998	14:33	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	3/8/1999	14:20	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	4/16/1999	11:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	4/20/1999	12:55	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/11/1999	10:40	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	5/11/1999	10:45	23	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	5/11/1999	10:50	35	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	5/17/1999	14:48	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	5/18/1999	10:48	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/19/1999	10:48	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/20/1999	10:48	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/20/1999	14:25	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/26/1999	13:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	5/26/1999	13:15	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	5/26/1999	13:15	45	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/9/1999	10:47	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/9/1999	10:47	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/9/1999	10:47	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/11/1999	10:38	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/11/1999	18:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/12/1999	6:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/12/1999	18:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/13/1999	5:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/13/1999	18:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/13/1999	6:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/13/1999	6:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/13/1999	14:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/13/1999	18:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	6/14/1999	6:31	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/14/1999	13:54	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/24/1999	10:19	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/24/1999	10:19	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	6/24/1999	10:19	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/28/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	6/28/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	6/28/1999	12:00 AM	2	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	6/28/1999	12:00 AM	3	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	6/28/1999	12:00 AM	4	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	6/28/1999	12:00 AM	5	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-1	6/28/1999	12:00 AM	6	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	6/28/1999	12:00 AM	7	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	6/28/1999	12:00 AM	8	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-1	6/28/1999	12:00 AM	9	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	7/7/1999	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	7/7/1999	12:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/7/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/21/1999	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.60
SD-A03-A-1	7/21/1999	12:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	7/21/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	8/3/1999	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	8/3/1999	12:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	8/3/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	8/18/1999	10:30 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
SD-A03-A-1	8/18/1999	10:30 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8/18/1999	10:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/2/1999	10:30 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.32
SD-A03-A-1	9/2/1999	10:30 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/2/1999	10:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/16/1999	10:12 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.70
SD-A03-A-1	9/16/1999	10:10 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	10/14/1999	11:10 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	10/14/1999	11:07 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	10/14/1999	11:05 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	6/13/2000	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	6/13/2000	12:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	6/13/2000	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	7/25/2000	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.20
SD-A03-A-1	7/25/2000	12:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/16/2000	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.31
SD-A03-A-1	8/16/2000	12:01 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	9/19/2000	12:01 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	9/19/2000	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.46

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-1	10/2/2000	11:35 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	10/2/2000	11:30 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	5/29/2001		1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/11/2001		1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/11/2001	11:05 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.12
SD-A03-A-1	6/26/2001	11:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.16
SD-A03-A-1	6/26/2001	11:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6/26/2001	11:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/10/2001	10:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	7/17/2001		1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-1	7/17/2001	11:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	7/17/2001	11:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8/7/2001		1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-1	8/7/2001	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	8/7/2001	12:01 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	9/11/2001		1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	9/12/2001	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.20
SD-A03-A-1	9/12/2001	12:01 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/26/2001	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	9/26/2001	12:01 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9/26/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	10:30 AM	24	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	10:30 AM	26	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	11:05 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	8/26/2002	11:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-1	8/26/2002	10:20 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8/26/2002	1:04 PM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.23
SD-A03-A-1	8/26/2002	11:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.22
SD-A03-A-1	8/26/2002	10:38 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	8/26/2002	10:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	8/26/2002	10:30 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	8/26/2002	11:25 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	1:00 PM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	10:20 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8/26/2002	1:04 PM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	8/26/2002	11:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	10:34 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	8/26/2002	10:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	10:30 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	8/26/2002	11:05 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8/26/2002	1:00 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	10:20 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/26/2002	1:04 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	8/26/2002	11:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8/26/2002	10:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	8/26/2002	10:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	8/27/2002	10:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	8/27/2002	12:40 PM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8/27/2002	12:40 PM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8/27/2002	12:40 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	3-Jun-38	1130	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	16-Jun-77	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	16-Jun-81	1330	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	16-Jun-81	1330	41	PHOSPHORUS, TOTAL (MG/L AS P)	0.12
SD-A03-A-1	3-Sep-81	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-1	3-Sep-81	1000	40	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	5-May-88	930	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	5-May-88	930	33	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	8-Jun-88	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8-Jun-88	1130	34	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	12-Jul-88	1045	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-1	12-Jul-88	1045	36	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	31-Aug-88	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	31-Aug-88	1100	35	PHOSPHORUS, TOTAL (MG/L AS P)	0.40
SD-A03-A-1	19-Oct-88	1245	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	19-Oct-88	1245	33	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	12-Apr-90	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	12-Apr-90	1015	42	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	11-Jun-90	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-1	11-Jun-90	1015	36	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	17-Jul-90	1045	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	17-Jul-90	1045	43	PHOSPHORUS, TOTAL (MG/L AS P)	0.09

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-1	23-Aug-90	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	23-Aug-90	1100	41	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
SD-A03-A-1	11-Oct-90	1300	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SD-A03-A-1	11-Oct-90	1300	41	PHOSPHORUS, TOTAL (MG/L AS P)	0.13
SD-A03-A-1	17-Apr-92	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	17-Apr-92	1100	40	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	4-Jun-92	1315	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	4-Jun-92	1315	41	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	7-Jul-92	1230	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-1	7-Jul-92	1230	38	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	27-Aug-92	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	27-Aug-92	1015	40	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	19-Oct-92	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	19-Oct-92	1000	41	PHOSPHORUS, TOTAL (MG/L AS P)	0.90
SD-A03-A-1	14-Apr-95	945	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-1	14-Apr-95	945	42	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	1-May-96	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	1-May-96	1005	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	18-Jun-96	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	18-Jun-96	1015	41	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	9-Jul-96	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	9-Jul-96	1000	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-1	13-Aug-96	930	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	13-Aug-96	930	40	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	15-Oct-96	945	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	15-Oct-96	945	42	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	29-Apr-97	945	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	29-Apr-97	945	45	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	19-Jun-97	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-1	19-Jun-97	1015	45	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	21-Jul-97	930	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-1	21-Jul-97	930	45	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	20-Aug-97	945	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	20-Aug-97	945	45	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	14-Oct-97	930	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	14-Oct-97	930	35	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	23-Apr-98	945	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	23-Apr-98	945	25	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	23-Apr-98	945	47	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	18-May-98	1230	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-1	18-May-98	1230	24	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	18-May-98	1230	46	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	3-Jun-98	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	3-Jun-98	1130	23	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	23-Jun-98	915	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	23-Jun-98	915	25	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	23-Jun-98	915	47	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-1	2-Jul-98	1414	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	2-Jul-98	1414	24	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	2-Jul-98	1414	45	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-1	15-Jul-98	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	15-Jul-98	1000	25	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	15-Jul-98	1000	43	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6-Aug-98	1005	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6-Aug-98	1005	20	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	6-Aug-98	1005	39	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	25-Aug-98	1032	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	25-Aug-98	1032	17	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	25-Aug-98	1032	36	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8-Oct-98	1051	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	8-Oct-98	1051	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	8-Oct-98	1051	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-1	16-Oct-98	932	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	16-Oct-98	932	17	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	16-Oct-98	932	40	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
SD-A03-A-1	18-Nov-98	1433	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-1	18-Nov-98	1433	22	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-1	18-Nov-98	1433	44	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	4/23/1998	9:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	4/23/1998	11:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	5/7/1998	14:05		PHOSPHORUS, TOTAL (MG/L AS P)	0.43
SD-A03-A-2	5/7/1998	15:35		PHOSPHORUS, TOTAL (MG/L AS P)	1.21

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-2	5/7/1998	17:15		PHOSPHORUS, TOTAL (MG/L AS P)	1.25
SD-A03-A-2	5/7/1998	18:50		PHOSPHORUS, TOTAL (MG/L AS P)	0.74
SD-A03-A-2	5/8/1998	8:30		PHOSPHORUS, TOTAL (MG/L AS P)	0.75
SD-A03-A-2	5/8/1998	11:50		PHOSPHORUS, TOTAL (MG/L AS P)	0.67
SD-A03-A-2	5/8/1998	15:51		PHOSPHORUS, TOTAL (MG/L AS P)	0.47
SD-A03-A-2	5/9/1998	7:25		PHOSPHORUS, TOTAL (MG/L AS P)	0.21
SD-A03-A-2	5/10/1998	16:20		PHOSPHORUS, TOTAL (MG/L AS P)	0.13
SD-A03-A-2	5/11/1998	13:35		PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-2	5/18/1998	11:20	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-2	5/24/1998	9:43		PHOSPHORUS, TOTAL (MG/L AS P)	0.16
SD-A03-A-2	6/3/1998	15:40		PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	6/3/1998	10:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	6/11/1998	17:15		PHOSPHORUS, TOTAL (MG/L AS P)	1.23
SD-A03-A-2	6/15/1998	14:20		PHOSPHORUS, TOTAL (MG/L AS P)	0.22
SD-A03-A-2	6/16/1998	13:02		PHOSPHORUS, TOTAL (MG/L AS P)	0.33
SD-A03-A-2	6/23/1998	11:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	6/23/1998	10:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	7/2/1998	10:10		PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	7/2/1998	13:17	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	7/15/1998	9:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	7/15/1998	11:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-2	8/4/1998	15:07		PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	8/18/1998	9:40		PHOSPHORUS, TOTAL (MG/L AS P)	0.43
SD-A03-A-2	8/25/1998	9:05	0.5	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-2	8/25/1998	11:46	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	9/1/1998	10:15		PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-2	9/3/1998	11:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	9/16/1998	14:30		PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	9/21/1998	11:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	10/8/1998	15:00		PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	10/8/1998	12:25	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	10/16/1998	10:42	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	11/18/1998	13:57	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	11/19/1998	13:30		PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	1/18/1999	15:50	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-2	1/22/1999	13:55	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.48
SD-A03-A-2	1/22/1999	14:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.50
SD-A03-A-2	1/22/1999	19:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.53
SD-A03-A-2	1/23/1999	15:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.58
SD-A03-A-2	1/23/1999	16:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.44
SD-A03-A-2	1/24/1999	6:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.39
SD-A03-A-2	1/24/1999	22:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.31
SD-A03-A-2	1/26/1999	15:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SD-A03-A-2	3/8/1999	13:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-2	4/16/1999	6:25	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
SD-A03-A-2	4/16/1999	10:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.34
SD-A03-A-2	4/16/1999	16:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.29
SD-A03-A-2	4/17/1999	0:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.24
SD-A03-A-2	4/17/1999	4:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.23
SD-A03-A-2	4/17/1999	22:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SD-A03-A-2	4/18/1999	14:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	4/20/1999	11:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	5/11/1999	11:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	5/13/1999	4:06	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.25
SD-A03-A-2	5/13/1999	6:51	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.33
SD-A03-A-2	5/13/1999	8:51	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.36
SD-A03-A-2	5/13/1999	11:51	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.37
SD-A03-A-2	5/13/1999	19:51	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.16
SD-A03-A-2	5/14/1999	1:51	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.14
SD-A03-A-2	5/14/1999	9:51	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	5/15/1999	3:51	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	5/20/1999	15:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	5/26/1999	14:06	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	6/2/1999	0:50	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.00
SD-A03-A-2	6/9/1999	11:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	6/11/1999	11:20	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	6/11/1999	16:44	1	PHOSPHORUS, TOTAL (MG/L AS P)	2.03
SD-A03-A-2	6/11/1999	16:59	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.84
SD-A03-A-2	6/11/1999	17:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.47
SD-A03-A-2	6/11/1999	18:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	2.00
SD-A03-A-2	6/11/1999	19:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.95
SD-A03-A-2	6/11/1999	20:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.40

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-2	6/12/1999	2:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.30
SD-A03-A-2	6/13/1999	14:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.00
SD-A03-A-2	6/14/1999	14:21	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.21
SD-A03-A-2	6/16/1999	11:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-2	6/18/1999	11:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	6/24/1999	11:23	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	6/28/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	6/28/1999	12:00 AM	2	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-2	6/28/1999	12:00 AM	3	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SD-A03-A-2	6/28/1999	12:00 AM	4	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	6/28/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-2	7/7/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	7/21/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	8/3/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.12
SD-A03-A-2	8/18/1999	11:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	9/2/1999	11:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	9/16/1999	10:50 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	10/14/1999	11:55 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	6/13/2000	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-2	7/25/2000	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	8/16/2000	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	9/19/2000	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-2	10/2/2000	12:45 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
SD-A03-A-2	6/11/2001	12:10 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	6/26/2001	11:35 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	7/17/2001	12:00 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	8/7/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	9/12/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	9/26/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	8/27/2002	11:20 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	8/27/2002	1:45 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	8/27/2002	11:20 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	8/27/2002	1:48 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	8/27/2002	12:00 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	8/27/2002	10:58 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-2	8/27/2002	10:45 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	8/27/2002	12:00 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	8/27/2002	2:00 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	16-Jun-77	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	16-Jun-81	1255	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-2	3-Sep-81	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	5-May-88	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	8-Jun-88	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	12-Jul-88	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	31-Aug-88	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	19-Oct-88	1330	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-2	12-Apr-90	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	11-Jun-90	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	17-Jul-90	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	23-Aug-90	1245	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
SD-A03-A-2	11-Oct-90	1400	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	17-Apr-92	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	4-Jun-92	1350	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	7-Jul-92	1315	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	27-Aug-92	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	19-Oct-92	1115	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	14-Apr-95	1030	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-2	1-May-96	1030	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	18-Jun-96	1045	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	8-Jul-96	1045	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	13-Aug-96	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	15-Oct-96	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	29-Apr-97	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	19-Jun-97	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-2	21-Jul-97	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-2	20-Aug-97	1030	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	14-Oct-97	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	23-Apr-98	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	18-May-98	1120	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-2	3-Jun-98	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-2	23-Jun-98	1000	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	2-Jul-98	1317	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-2	15-Jul-98	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-2	6-Aug-98	1102	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-2	18-Aug-98	940	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.43
SD-A03-A-2	25-Aug-98	1146	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-2	16-Oct-98	1042	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-2	18-Nov-98	1357	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	4/23/1998	9:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	4/23/1998	11:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	5/7/1998	13:50		PHOSPHORUS, TOTAL (MG/L AS P)	0.69
SD-A03-A-3	5/7/1998	15:25		PHOSPHORUS, TOTAL (MG/L AS P)	0.56
SD-A03-A-3	5/7/1998	17:05		PHOSPHORUS, TOTAL (MG/L AS P)	0.42
SD-A03-A-3	5/7/1998	18:40		PHOSPHORUS, TOTAL (MG/L AS P)	0.36
SD-A03-A-3	5/8/1998	8:25		PHOSPHORUS, TOTAL (MG/L AS P)	0.65
SD-A03-A-3	5/8/1998	11:40		PHOSPHORUS, TOTAL (MG/L AS P)	0.48
SD-A03-A-3	5/8/1998	16:00		PHOSPHORUS, TOTAL (MG/L AS P)	0.38
SD-A03-A-3	5/9/1998	7:20		PHOSPHORUS, TOTAL (MG/L AS P)	0.19
SD-A03-A-3	5/10/1998	18:15		PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SD-A03-A-3	5/11/1998	13:25		PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	5/18/1998	10:46	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	5/24/1998	9:35		PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-3	6/3/1998	15:30		PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	6/3/1998	9:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-3	6/11/1998	17:15		PHOSPHORUS, TOTAL (MG/L AS P)	0.19
SD-A03-A-3	6/15/1998	14:10		PHOSPHORUS, TOTAL (MG/L AS P)	0.15
SD-A03-A-3	6/23/1998	11:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	6/23/1998	10:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	7/2/1998	10:20		PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	7/2/1998	13:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-3	7/15/1998	9:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	7/15/1998	11:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	8/4/1998	14:59		PHOSPHORUS, TOTAL (MG/L AS P)	0.14
SD-A03-A-3	8/6/1998	11:16	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-3	8/18/1998	9:30		PHOSPHORUS, TOTAL (MG/L AS P)	0.40
SD-A03-A-3	8/25/1998	12:05	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-3	9/3/1998	12:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-3	9/21/1998	11:40	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.13
SD-A03-A-3	10/8/1998	12:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-3	10/16/1998	11:03	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
SD-A03-A-3	11/18/1998	13:36	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	1/22/1999	13:40	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.54
SD-A03-A-3	1/23/1999	13:42	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.67
SD-A03-A-3	1/24/1999	11:00	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.27
SD-A03-A-3	1/26/1999	14:50	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	3/8/1999	14:05	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.00
SD-A03-A-3	4/16/1999	7:14	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.32
SD-A03-A-3	4/16/1999	10:59	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.30
SD-A03-A-3	4/16/1999	15:59	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.41
SD-A03-A-3	4/16/1999	18:59	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.34
SD-A03-A-3	4/16/1999	22:59	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.28
SD-A03-A-3	4/17/1999	2:59	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.28
SD-A03-A-3	4/17/1999	8:59	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.22
SD-A03-A-3	4/20/1999	11:05	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	5/11/1999	11:40	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	5/13/1999	4:25	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.35
SD-A03-A-3	5/13/1999	6:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.49
SD-A03-A-3	5/13/1999	8:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.59
SD-A03-A-3	5/13/1999	10:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.48
SD-A03-A-3	5/13/1999	13:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.34
SD-A03-A-3	5/13/1999	18:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.32
SD-A03-A-3	5/14/1999	0:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.21
SD-A03-A-3	5/14/1999	14:10	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.12
SD-A03-A-3	5/20/1999	14:50	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-3	5/26/1999	14:25	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	6/4/1999	17:57	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.81
SD-A03-A-3	6/9/1999	12:08	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	6/11/1999	10:57	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	6/11/1999	10:44	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.20
SD-A03-A-3	6/11/1999	17:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.50
SD-A03-A-3	6/11/1999	18:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	1.52
SD-A03-A-3	6/11/1999	21:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.61
SD-A03-A-3	6/12/1999	8:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.31
SD-A03-A-3	6/12/1999	18:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.15

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-3	6/12/1999	22:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.66
SD-A03-A-3	6/13/1999	8:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.24
SD-A03-A-3	6/13/1999	14:20	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.23
SD-A03-A-3	6/13/1999	16:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.77
SD-A03-A-3	6/14/1999	0:29	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.19
SD-A03-A-3	6/14/1999	14:08	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SD-A03-A-3	6/16/1999	11:15	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-3	6/18/1999	11:25	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	6/24/1999	11:40	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	7/7/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	7/21/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-3	8/3/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	8/18/1999	12:00 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	9/2/1999	11:45 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-3	9/16/1999	11:20 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SD-A03-A-3	10/14/1999	12:10 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-3	10/28/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	6/13/2000	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.21
SD-A03-A-3	7/25/2000	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.16
SD-A03-A-3	8/16/2000	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.24
SD-A03-A-3	9/19/2000	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.21
SD-A03-A-3	10/2/2000	1:10 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.16
SD-A03-A-3	6/11/2001	12:30 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	6/26/2001	11:50 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	7/17/2001	12:32 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	8/7/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	9/12/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	9/26/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-3	8/27/2002	11:40 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-3	8/27/2002	2:00 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-3	8/27/2002	11:45 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	8/27/2002	2:05 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.13
SD-A03-A-3	8/27/2002	12:20 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	8/27/2002	11:14 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.13
SD-A03-A-3	8/27/2002	11:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-3	8/27/2002	12:20 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	8/27/2002	2:15 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	16-Jun-77	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	16-Jun-81	1210	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	3-Sep-81	900	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	5-May-88	1045	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-3	8-Jun-88	1230	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	12-Jul-88	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.16
SD-A03-A-3	31-Aug-88	1245	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.11
SD-A03-A-3	19-Oct-88	1345	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-3	12-Apr-90	1115	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	11-Jun-90	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	17-Jul-90	1200	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	23-Aug-90	1330	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-3	11-Oct-90	1415	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.24
SD-A03-A-3	17-Apr-92	1215	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	4-Jun-92	1405	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	7-Jul-92	1330	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	27-Aug-92	1245	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	19-Oct-92	1145	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	14-Apr-95	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.16
SD-A03-A-3	1-May-96	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	18-Jun-96	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	9-Jul-96	1100	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-3	13-Aug-96	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-3	15-Oct-96	1045	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-3	29-Apr-97	1045	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	19-Jun-97	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-3	21-Jul-97	1030	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	20-Aug-97	1045	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	14-Oct-97	1030	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-3	23-Apr-98	1115	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-3	18-May-98	1046	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-3	3-Jun-98	945	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-3	23-Jun-98	1015	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-3	2-Jul-98	1300	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-3	15-Jul-98	1130	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-3	6-Aug-98	1116	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-3	25-Aug-98	1205	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-3	8-Oct-98	1245	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-3	16-Oct-98	1103	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.18
SD-A03-A-3	18-Nov-98	1336	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	4/23/1998	10:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	4/23/1998	10:30	31	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	5/18/1998	11:53	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	5/18/1998	11:53	34	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-4	6/3/1998	10:50	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	6/3/1998	10:50	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	6/23/1998	10:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	6/23/1998	10:30	31	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-4	7/2/1998	13:40	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	7/2/1998	13:40	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	7/15/1998	10:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-4	7/15/1998	10:30	31	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	8/6/1998	10:37	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	8/6/1998	10:37	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	8/25/1998	11:20	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	8/25/1998	11:20	34	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-4	9/3/1998	11:20	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	9/3/1998	11:20	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	9/21/1998	10:30	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	9/21/1998	10:30	31	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-4	10/8/1998	11:55	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	10/8/1998	11:55	33	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	10/16/1998	10:13	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	10/16/1998	10:13	30	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	11/18/1998	14:11	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	11/18/1998	14:11	31	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	5/11/1999	10:20	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	5/11/1999	10:25	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	5/26/1999	13:45	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	5/26/1999	13:45	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	6/9/1999	11:18	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	6/9/1999	11:18	34	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	6/24/1999	11:05	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	6/24/1999	11:05	33	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-4	7/7/1999	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.14
SD-A03-A-4	7/7/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	7/21/1999	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-4	7/21/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	8/3/1999	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-4	8/3/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	8/18/1999	11:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-4	8/18/1999	11:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	9/2/1999	11:30 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-4	9/2/1999	11:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	9/16/1999	10:32 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-4	9/16/1999	10:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	10/14/1999	11:35 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	10/14/1999	11:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	10/28/1999	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	10/28/1999	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	6/13/2000	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	6/13/2000	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	7/25/2000	12:00 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	7/25/2000	12:00 AM	M	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	7/25/2000	12:00 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	8/16/2000	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.15
SD-A03-A-4	8/16/2000	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-4	9/19/2000	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-4	9/19/2000	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-4	10/2/2000	12:05 PM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.07
SD-A03-A-4	10/2/2000	12:00 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	6/11/2001	11:45 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	6/11/2001	12:23 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	6/26/2001	12:15 PM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	6/26/2001	12:15 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	7/17/2001	11:35 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	7/17/2001	11:35 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02

Sample Location	Sample Date	Time	Sample Depth	Parameter, Long Name	Result Value
SD-A03-A-4	8/7/2001	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	8/7/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	9/12/2001	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.08
SD-A03-A-4	9/12/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	9/26/2001	12:01 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	9/26/2001	12:01 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	8/27/2002	11:10 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	8/27/2002	1:25 PM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-4	8/27/2002	10:45 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	8/27/2002	1:30 PM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-4	8/27/2002	11:35 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	8/27/2002	11:38 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	8/27/2002	10:30 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	8/27/2002	11:35 AM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.10
SD-A03-A-4	8/27/2002	11:10 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-4	8/27/2002	1:25 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	8/27/2002	10:45 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	8/27/2002	1:30 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	8/27/2002	11:35 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	8/27/2002	11:34 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.09
SD-A03-A-4	8/27/2002	10:30 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	8/27/2002	11:35 AM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	8/27/2002	1:30 PM	B	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	8/27/2002	1:30 PM	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	23-Apr-98	1030	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	23-Apr-98	1030	31	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	18-May-98	1153	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	18-May-98	1153	34	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-4	3-Jun-98	1050	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	3-Jun-98	1050	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	23-Jun-98	1030	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	23-Jun-98	1030	31	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-4	2-Jul-98	1340	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	2-Jul-98	1340	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	15-Jul-98	1030	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.01
SD-A03-A-4	15-Jul-98	1030	31	PHOSPHORUS, TOTAL (MG/L AS P)	0.03
SD-A03-A-4	6-Aug-98	1037	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	6-Aug-98	1037	32	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	25-Aug-98	1120	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.02
SD-A03-A-4	25-Aug-98	1120	34	PHOSPHORUS, TOTAL (MG/L AS P)	0.05
SD-A03-A-4	8-Oct-98	1155	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	8-Oct-98	1155	33	PHOSPHORUS, TOTAL (MG/L AS P)	0.06
SD-A03-A-4	16-Oct-98	1013	1	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-4	16-Oct-98	1013	30	PHOSPHORUS, TOTAL (MG/L AS P)	0.04
SD-A03-A-1	8-Jun-88	1130	1	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	668
SD-A03-A-1	12-Apr-90	1015	44	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	750
SD-A03-A-1	7-Jul-92	1230	40	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	662
SD-A03-A-1	21-Jul-97	930	47	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	902
SD-A03-A-1	15-Jul-98	1000	45	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	700
SD-A03-A-3	8-Jun-88	1230	1	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	564
SD-A03-A-3	12-Apr-90	1115	11	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	589
SD-A03-A-3	7-Jul-92	1230	10	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	538
SD-A03-A-3	21-Jul-97	1030	17	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	642
SD-A03-A-3	15-Jul-98	1130	5	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	623
SD-A03-A-4	15-Jul-98	1030	33	PHOSPHORUS,TOTAL,BOTTOM DEPOSIT (MG/KG-P DRY WGT)	691

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Appendix B
BATHTUB Model Files

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IEPA Evergreen Lake Phosphorus TMDL Phase 3
File: C:\BATHTUB\Evergreen.btb

Variable = TOTAL P MG/M3 **R^2 = -1.11**
Global Calibration Factor = 1.00 CV = 0.45

			Calibration Factor		Predicted		Observed		Log (Obs/Pred)		
Seg	**Group**	**Name**	**Mean**	**CV**	**Mean**	**CV**	**Mean**	**CV**	**Mean**	**SE**	**t**
1	1	Lake Segment 1 (A-3, m	1.00	0.00	98.3	0.00	121.0	0.00	0.21	0.00	0.00
2	1	Lake Segment 2 (A-2, m	1.00	0.00	72.3	0.00	99.0	0.00	0.31	0.00	0.00
3	1	Lake Segment 3 (A-1, m	1.00	0.00	111.8	0.00	63.0	0.00	-0.57	0.00	0.00
4	1	Area-Wtd Mean			94.3	0.00	94.6	0.00	0.00	0.00	0.00

IEPA Evergreen Lake Phosphorus TMDL Phase 3
File: C:\BATHTUB\Evergreen.btb

T Statistics Compare Observed and Predicted Means Using the Following Error Terms:
1 = Observed Water Quality Error Only
2 = Error Typical of Model Development Dataset
3 = Observed & Predicted Error

Segment: Area-Wtd Mean

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	94.6	0.00	94.3	0.00	1.00		0.01	

Segment: 1 Lake Segment 1 (A-3, most upstream)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	121.0	0.00	98.3	0.00	1.23		0.77	

Segment: 2 Lake Segment 2 (A-2, middle)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	99.0	0.00	72.3	0.00	1.37		1.17	

Segment: 3 Lake Segment 3 (A-1, most downstream)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	63.0	0.00	111.8	0.00	0.56		-2.13	

IEPA Evergreen Lake Phosphorus TMDL Phase 3
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Segment	Name
1	Lake Segment 1 (A-3, most upstream)
2	Lake Segment 2 (A-2, middle)
3	Lake Segment 3 (A-1, most downstream)
Mean	Area-Wtd Mean

PREDICTED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	98.3	72.3	111.8	94.3
CARLSON TSI-P	70.3	65.9	72.2	69.5

OBSERVED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	121.0	99.0	63.0	94.6
CARLSON TSI-P	73.3	70.4	63.9	69.2

OBSERVED/PREDICTED RATIOS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	1.2	1.4	0.6	1.0
CARLSON TSI-P	1.0	1.1	0.9	1.0

OBSERVED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

PREDICTED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

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Predicted & Observed Values Ranked Against CE Model Development Dataset

Segment: 4 Area-Wtd Mean

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	94.3		77.4%	94.6		77.5%
CARLSON TSI-P	69.5		77.4%	69.2		77.5%

Segment: 1 Lake Segment 1 (A-3, most upstream)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	98.3		78.8%	121.0		84.8%
CARLSON TSI-P	70.3		78.8%	73.3		84.8%

Segment: 2 Lake Segment 2 (A-2, middle)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	72.3		67.6%	99.0		79.0%
CARLSON TSI-P	65.9		67.6%	70.4		79.0%

Segment: 3 Lake Segment 3 (A-1, most downstream)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	111.8		82.7%	63.0		62.0%
CARLSON TSI-P	72.2		82.7%	63.9		62.0%

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Water Balance Terms (hm3/yr) **Averaging Period = 1.00 Years**

		Inflows			Storage	Outflows------>		Downstr	
Seg	**Name**	**External**	**Precip**	**Advect**	**Increase**	**Advect**	**Disch.**	**Exchange**	**Evap**
1	Lake Segment 1 (A-3, mo	19	1	0	0	19	0	25	1
2	Lake Segment 2 (A-2, mic	3	1	19	0	22	0	13	1
3	Lake Segment 3 (A-1, mo	2	1	22	0	1	23	0	1
Net		23	3	0	0	1	23	0	2

Mass Balance Terms (kg/yr) Based Upon Predicted Reservoir & Outflow Concentrations Component: TOTAL P

		Inflows-->			Storage	Outflows----->		Net	Net
Seg	**Name**	**External**	**Atmos**	**Advect**	**Increase**	**Advect**	**Disch.**	**Exchange**	**Retention**
1	Lake Segment 1 (A-3, mo	4775	28	0	0	1899	0	647	2257
2	Lake Segment 2 (A-2, mic	625	26	1899	0	1594	0	-1161	2118
3	Lake Segment 3 (A-1, mo	425	27	1594	0	85	2594	514	-1147
Net		5825	81	0	0	85	2594	0	3227

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Segment Mass Balance Based Upon Predicted Concentrations

Component: TOTAL P   Segment: 1   Lake Segment 1 (A-3, most upstream)

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
1	1	Sixmile Creek Flowing to La	13.8	69.0%	3450.0	71.8%	250
2	1	Trib 2 Flowing to Lake Segr	5.3	26.5%	1325.0	27.6%	250
PRECIPITATION			0.9	4.5%	27.8	0.6%	31
TRIBUTARY INFLOW			19.1	95.5%	4775.0	99.4%	250
***TOTAL INFLOW			20.0	100.0%	4802.8	100.0%	240
ADVECTIVE OUTFLOW			19.3	96.7%	1899.3	39.5%	98
NET DIFFUSIVE OUTFLOW			0.0	0.0%	646.7	13.5%	
***TOTAL OUTFLOW			19.3	96.7%	2546.1	53.0%	132
***EVAPORATION			0.7	3.3%	0.0	0.0%	
***RETENTION			0.0	0.0%	2256.7	47.0%	

Hyd. Residence Time =	0.1775	yrs
Overflow Rate =	20.8	m/yr
Mean Depth =	3.7	m

Component: TOTAL P   Segment: 2   Lake Segment 2 (A-2, middle)

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
3	1	Trib 3 Flowing to Lake Segr	2.5	11.0%	625.0	16.8%	250
PRECIPITATION			0.8	3.7%	26.2	0.7%	31
TRIBUTARY INFLOW			2.5	11.0%	625.0	16.8%	250
ADVECTIVE INFLOW			19.3	85.3%	1899.3	51.2%	98
NET DIFFUSIVE INFLOW			0.0	0.0%	1160.9	31.3%	
***TOTAL INFLOW			22.7	100.0%	3711.5	100.0%	164
ADVECTIVE OUTFLOW			22.0	97.2%	1593.9	42.9%	72
***TOTAL OUTFLOW			22.0	97.2%	1593.9	42.9%	72
***EVAPORATION			0.6	2.8%	0.0	0.0%	
***RETENTION			0.0	0.0%	2117.5	57.1%	

Hyd. Residence Time =	0.2697	yrs
Overflow Rate =	25.2	m/yr
Mean Depth =	6.8	m

Component:		**TOTAL P**		**Segment:**	**3**	**Lake Segment 3 (A-1, most downstream)**	
			Flow	**Flow**	**Load**	**Load**	**Conc**
Trib	**Type**	**Location**	**hm^3/yr**	**%Total**	**kg/yr**	**%Total**	**mg/m^3**
4	4	Lake Outflow	23.2	94.3%	2594.3	19.3%	112
5	1	Overland Flow into Lake Se	1.7	6.9%	425.0	3.2%	250
PRECIPITATION			0.9	3.5%	26.8	0.2%	31
INTERNAL LOAD			0.0	0.0%	11415.9	84.8%	
TRIBUTARY INFLOW			1.7	6.9%	425.0	3.2%	250
ADVECTIVE INFLOW			22.0	89.6%	1593.9	11.8%	72
***TOTAL INFLOW			24.6	100.0%	13461.6	100.0%	547
GAUGED OUTFLOW			23.2	94.3%	2594.3	19.3%	112
ADVECTIVE OUTFLOW			0.8	3.1%	84.6	0.6%	112
NET DIFFUSIVE OUTFLOW			0.0	0.0%	514.1	3.8%	
***TOTAL OUTFLOW			24.0	97.4%	3193.0	23.7%	133
***EVAPORATION			0.6	2.6%	0.0	0.0%	
***RETENTION			0.0	0.0%	10268.6	76.3%	

Hyd. Residence Time =	0.5032	yrs
Overflow Rate =	26.8	m/yr
Mean Depth =	13.5	m

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Overall Water & Nutrient Balances

Overall Water Balance — **Averaging Period = 1.00 years**

Trb	Type	Seg	Name	Area km^2	Flow hm^3/yr	Variance $(hm3/yr)^2$	CV -	Runoff m/yr
1	1	1	Sixmile Creek Flowing to La	63.0	13.8	0.00E+00	0.00	0.22
2	1	1	Trib 2 Flowing to Lake Segn	24.0	5.3	0.00E+00	0.00	0.22
3	1	2	Trib 3 Flowing to Lake Segn	11.5	2.5	0.00E+00	0.00	0.22
4	4	3	Lake Outflow		23.2	0.00E+00	0.00	
5	1	3	Overland Flow into Lake Se	7.7	1.7	0.00E+00	0.00	0.22
PRECIPITATION				2.7	2.6	0.00E+00	0.00	0.97
TRIBUTARY INFLOW				106.2	23.3	0.00E+00	0.00	0.22
***TOTAL INFLOW				108.9	25.9	0.00E+00	0.00	0.24
GAUGED OUTFLOW					23.2	0.00E+00	0.00	
ADVECTIVE OUTFLOW				108.9	0.8	0.00E+00	0.00	0.01
***TOTAL OUTFLOW				108.9	24.0	0.00E+00	0.00	0.22
***EVAPORATION					1.9	0.00E+00	0.00	

Overall Mass Balance Based Upon Component: **Predicted TOTAL P** — **Outflow & Reservoir Concentrations**

Trb	Type	Seg	Name	Load kg/yr	%Total	Load Variance $(kg/yr)^2$	%Total	CV	Conc mg/m^3	Export $kg/km^2/yr$
1	1	1	Sixmile Creek Flowing to La	3450.0	19.9%	0.00E+00		0.00	250.0	54.8
2	1	1	Trib 2 Flowing to Lake Segn	1325.0	7.6%	0.00E+00		0.00	250.0	55.2
3	1	2	Trib 3 Flowing to Lake Segn	625.0	3.6%	0.00E+00		0.00	250.0	54.3
4	4	3	Lake Outflow	2594.3		0.00E+00		0.00	111.8	
5	1	3	Overland Flow into Lake Se	425.0	2.5%	0.00E+00		0.00	250.0	55.2
PRECIPITATION				80.8	0.5%	0.00E+00		0.00	31.1	30.0
INTERNAL LOAD				11415.9	65.9%	0.00E+00		0.00		
TRIBUTARY INFLOW				5825.0	33.6%	0.00E+00		0.00	250.0	54.8
***TOTAL INFLOW				17321.7	100.0%	0.00E+00		0.00	668.8	159.1
GAUGED OUTFLOW				2594.3	15.0%	0.00E+00		0.00	111.8	
ADVECTIVE OUTFLOW				84.6	0.5%	0.00E+00		0.00	111.8	0.8
***TOTAL OUTFLOW				2678.9	15.5%	0.00E+00		0.00	111.8	24.6
***RETENTION				14642.8	84.5%	0.00E+00		0.00		

Overflow Rate (m/yr)	8.9	Nutrient Resid. Time (yrs)	0.1167
Hydraulic Resid. Time (yrs)	0.8945	Turnover Ratio	8.6
Reservoir Conc (mg/m3)	94	Retention Coef.	0.845

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Hydraulic & Dispersion Parameters

Seg	Name	Outflow Seg	Net Inflow hm^3/yr	Resid Time years	Overflow Rate m/yr	Velocity km/yr	Dispersion--------> Estimated km^2/yr	Numeric km^2/yr	Exchange hm^3/yr
1	Lake Segment 1 (A-3, mos	2	19.3	0.1775	20.8	14.2	64.0	17.9	24.9
2	Lake Segment 2 (A-2, mid	3	22.0	0.2697	25.2	8.9	23.5	10.8	13.0
3	Lake Segment 3 (A-1, mos	0	24.0	0.5032	26.8	4.2	8.5	4.4	0.0

Morphometry

Seg	Name	Area km^2	Zmean m	Zmix m	Length km	Volume hm^3	Width km	L/W -
1	Lake Segment 1 (A-3, mos	0.9	3.7	3.7	2.5	3.4	0.4	6.9
2	Lake Segment 2 (A-2, mid	0.9	6.8	6.8	2.4	5.9	0.4	6.6
3	Lake Segment 3 (A-1, mos	0.9	13.5	13.5	2.1	12.1	0.4	4.9
Totals		2.7	8.0			21.4		

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Segment & Tributary Network

--------Segment:	1	Lake Segment 1 (A-3, most upstream)	
Outflow Segment:	2	Lake Segment 2 (A-2, middle)	
Tributary:	1	Sixmile Creek Flowing to Lake Segment 1	Type: Monitored Inflow
Tributary:	2	Trib 2 Flowing to Lake Segment 1	Type: Monitored Inflow
--------Segment:	2	Lake Segment 2 (A-2, middle)	
Outflow Segment:	3	Lake Segment 3 (A-1, most downstream)	
Tributary:	3	Trib 3 Flowing to Lake Segment 2	Type: Monitored Inflow
--------Segment:	3	Lake Segment 3 (A-1, most downstream)	
Outflow Segment:	0	Out of Reservoir	
Tributary:	4	Lake Outflow	Type: Reservoir Outflow
Tributary:	5	Overland Flow into Lake Segment 3	Type: Monitored Inflow

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Description:

Per Stage 1 Final Report:
Average annual precipitation = 38 inches = 0.9652 m
Average annual evaporation = 28.4 inches = 0.72136 m

Global Variables	Mean	CV
Averaging Period (yrs)	1	0.0
Precipitation (m)	0.9652	0.0
Evaporation (m)	0.72136	0.0
Storage Increase (m)	0	0.0

Atmos. Loads (kg/km²-yr)	Mean	CV
Conserv. Substance	0	0.00
Total P	30	0.50
Total N	1000	0.50
Ortho P	15	0.50
Inorganic N	500	0.50

Model Options	Code	Description
Conservative Substance	0	NOT COMPUTED
Phosphorus Balance	1	2ND ORDER, AVAIL P
Nitrogen Balance	0	NOT COMPUTED
Chlorophyll-a	0	NOT COMPUTED
Secchi Depth	0	NOT COMPUTED
Dispersion	1	FISCHER-NUMERIC
Phosphorus Calibration	0	NONE
Nitrogen Calibration	0	NONE
Error Analysis	0	NOT COMPUTED
Availability Factors	0	IGNORE
Mass-Balance Tables	1	USE ESTIMATED CONCS
Output Destination	2	EXCEL WORKSHEET

Segment Morphometry

		Outflow		Area	Depth	Length	Mixed Depth (m)		Hypol Depth		Non-Algal Turb (m^{-1})		Internal Loads (mg/m2-day) Conserv.		Total P		Total N	
Seg	Name	Segment	Group	km²	m	km	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Lake Segment 1 (A-3, most up	2	1	0.927	3.7	2.52	3.7	0	0	0	0	0	0	0	0	0	0	0
2	Lake Segment 2 (A-2, middle)	3	1	0.874	6.8	2.41	6.8	0	0	0	0	0	0	0	0	0	0	0
3	Lake Segment 3 (A-1, most do	0	1	0.893	13.5	2.1	13.5	0	0	0	0	0	0	0	35	0	0	0

Segment Observed Water Quality

	Conserv		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	0	0	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Segment Calibration Factors

	Dispersion Rate		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
2	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
3	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

Tributary Data

				Dr Area	Flow (hm^3/yr)		Conserv.		Total P (ppb)		Total N (ppb)		Ortho P (ppb)		Inorganic N (ppb)	
Trib	Trib Name	Segment	Type	km²	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Sixmile Creek Flowing to Lake	1	1	63	13.8	0	0	0	250	0	0	0	0	0	0	0
2	Trib 2 Flowing to Lake Segme	1	1	24	5.3	0	0	0	250	0	0	0	0	0	0	0
3	Trib 3 Flowing to Lake Segme	2	1	11.5	2.5	0	0	0	250	0	0	0	0	0	0	0
4	Lake Outflow	3	4	0	23.2	0	0	0	0	0	0	0	0	0	0	0
5	Overland Flow into Lake Segn	3	1	7.7	1.7	0	0	0	250	0	0	0	0	0	0	0

Model Coefficients	Mean	CV
Dispersion Rate	1.000	0.70
Total Phosphorus	1.000	0.45
Total Nitrogen	1.000	0.55
Chl-a Model	1.000	0.26
Secchi Model	1.000	0.10
Organic N Model	1.000	0.12
TP-OP Model	1.000	0.15
HODv Model	1.000	0.15
MODv Model	1.000	0.22
Secchi/Chla Slope (m^2/mg)	0.025	0.00
Minimum Qs (m/yr)	0.100	0.00
Chl-a Flushing Term	1.000	0.00
Chl-a Temporal CV	0.620	0
Avail. Factor - Total P	0.330	0
Avail. Factor - Ortho P	1.930	0
Avail. Factor - Total N	0.590	0
Avail. Factor - Inorganic N	0.790	0

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Water Balance Terms (hm3/yr) **Averaging Period = 1.00 Years**

Seg	Name	External	Inflows Precip	Advect	Storage Increase	Outflows------> Advect	Disch.	Downstr Exchange	Evap
1	Lake Segment 1 (A-3, mo	19	1	0	0	19	0	25	1
2	Lake Segment 2 (A-2, mic	3	1	19	0	22	0	13	1
3	Lake Segment 3 (A-1, mo	2	1	22	0	1	23	0	1
Net		23	3	0	0	1	23	0	2

Mass Balance Terms (kg/yr) Based Upon Predicted Reservoir & Outflow Concentrations Component: TOTAL P

Seg	Name	Inflows--> External	Atmos	Advect	Storage Increase	Outflows-----> Advect	Disch.	Net Exchange	Net Retention
1	Lake Segment 1 (A-3, mo	7640	28	0	0	2517	0	1186	3964
2	Lake Segment 2 (A-2, mic	1000	26	2517	0	1821	0	-1043	2765
3	Lake Segment 3 (A-1, mo	680	27	1821	0	54	1662	-143	955
Net		9320	81	0	0	54	1662	0	7684

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Segment Mass Balance Based Upon Predicted Concentrations

Component: TOTAL P **Segment: 1** **Lake Segment 1 (A-3, most upstream)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
1	1	Sixmile Creek Flowing to La	13.8	69.0%	5520.0	72.0%	400
2	1	Trib 2 Flowing to Lake Segr	5.3	26.5%	2120.0	27.6%	400
PRECIPITATION			0.9	4.5%	27.8	0.4%	31
TRIBUTARY INFLOW			19.1	95.5%	7640.0	99.6%	400
***TOTAL INFLOW			20.0	100.0%	7667.8	100.0%	383
ADVECTIVE OUTFLOW			19.3	96.7%	2517.4	32.8%	130
NET DIFFUSIVE OUTFLOW			0.0	0.0%	1186.3	15.5%	
***TOTAL OUTFLOW			19.3	96.7%	3703.6	48.3%	192
***EVAPORATION			0.7	3.3%	0.0	0.0%	
***RETENTION			0.0	0.0%	3964.2	51.7%	

Hyd. Residence Time = 0.1775 yrs
Overflow Rate = 20.8 m/yr
Mean Depth = 3.7 m

Component: TOTAL P **Segment: 2** **Lake Segment 2 (A-2, middle)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
3	1	Trib 3 Flowing to Lake Segr	2.5	11.0%	1000.0	21.8%	400
PRECIPITATION			0.8	3.7%	26.2	0.6%	31
TRIBUTARY INFLOW			2.5	11.0%	1000.0	21.8%	400
ADVECTIVE INFLOW			19.3	85.3%	2517.4	54.9%	130
NET DIFFUSIVE INFLOW			0.0	0.0%	1043.2	22.7%	
***TOTAL INFLOW			22.7	100.0%	4586.8	100.0%	202
ADVECTIVE OUTFLOW			22.0	97.2%	1821.5	39.7%	83
***TOTAL OUTFLOW			22.0	97.2%	1821.5	39.7%	83
***EVAPORATION			0.6	2.8%	0.0	0.0%	
***RETENTION			0.0	0.0%	2765.3	60.3%	

Hyd. Residence Time = 0.2697 yrs
Overflow Rate = 25.2 m/yr
Mean Depth = 6.8 m

Component: TOTAL P **Segment: 3** **Lake Segment 3 (A-1, most downstream)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
4	4	Lake Outflow	23.2	94.3%	1662.4	28.0%	72
5	1	Overland Flow into Lake Se	1.7	6.9%	680.0	11.5%	400
PRECIPITATION			0.9	3.5%	26.8	0.5%	31
INTERNAL LOAD			0.0	0.0%	3261.7	55.0%	
TRIBUTARY INFLOW			1.7	6.9%	680.0	11.5%	400
ADVECTIVE INFLOW			22.0	89.6%	1821.5	30.7%	83
NET DIFFUSIVE INFLOW			0.0	0.0%	143.1	2.4%	
***TOTAL INFLOW			24.6	100.0%	5933.0	100.0%	241
GAUGED OUTFLOW			23.2	94.3%	1662.4	28.0%	72
ADVECTIVE OUTFLOW			0.8	3.1%	54.2	0.9%	72
***TOTAL OUTFLOW			24.0	97.4%	1716.6	28.9%	72
***EVAPORATION			0.6	2.6%	0.0	0.0%	
***RETENTION			0.0	0.0%	4216.4	71.1%	

Hyd. Residence Time = 0.5032 yrs
Overflow Rate = 26.8 m/yr
Mean Depth = 13.5 m

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Overall Water & Nutrient Balances

Overall Water Balance **Averaging Period = 1.00 years**

Trb	Type	Seg	Name	Area km^2	Flow hm^3/yr	Variance $(hm3/yr)^2$	CV -	Runoff m/yr
1	1	1	Sixmile Creek Flowing to La	63.0	13.8	0.00E+00	0.00	0.22
2	1	1	Trib 2 Flowing to Lake Segn	24.0	5.3	0.00E+00	0.00	0.22
3	1	2	Trib 3 Flowing to Lake Segn	11.5	2.5	0.00E+00	0.00	0.22
4	4	3	Lake Outflow		23.2	0.00E+00	0.00	
5	1	3	Overland Flow into Lake Se	7.7	1.7	0.00E+00	0.00	0.22
PRECIPITATION				2.7	2.6	0.00E+00	0.00	0.97
TRIBUTARY INFLOW				106.2	23.3	0.00E+00	0.00	0.22
***TOTAL INFLOW				108.9	25.9	0.00E+00	0.00	0.24
GAUGED OUTFLOW					23.2	0.00E+00	0.00	
ADVECTIVE OUTFLOW				108.9	0.8	0.00E+00	0.00	0.01
***TOTAL OUTFLOW				108.9	24.0	0.00E+00	0.00	0.22
***EVAPORATION					1.9	0.00E+00	0.00	

Overall Mass Balance Based Upon **Predicted** **Outflow & Reservoir Concentrations**
Component: **TOTAL P**

Trb	Type	Seg	Name	Load kg/yr	%Total	Load Variance $(kg/yr)^2$	%Total	CV	Conc mg/m^3	Export $kg/km^2/yr$
1	1	1	Sixmile Creek Flowing to La	5520.0	43.6%	0.00E+00		0.00	400.0	87.6
2	1	1	Trib 2 Flowing to Lake Segn	2120.0	16.7%	0.00E+00		0.00	400.0	88.3
3	1	2	Trib 3 Flowing to Lake Segn	1000.0	7.9%	0.00E+00		0.00	400.0	87.0
4	4	3	Lake Outflow	1662.4		0.00E+00		0.00	71.7	
5	1	3	Overland Flow into Lake Se	680.0	5.4%	0.00E+00		0.00	400.0	88.3
PRECIPITATION				80.8	0.6%	0.00E+00		0.00	31.1	30.0
INTERNAL LOAD				3261.7	25.8%	0.00E+00		0.00		
TRIBUTARY INFLOW				9320.0	73.6%	0.00E+00		0.00	400.0	87.8
***TOTAL INFLOW				12662.5	100.0%	0.00E+00		0.00	488.9	116.3
GAUGED OUTFLOW				1662.4	13.1%	0.00E+00		0.00	71.7	
ADVECTIVE OUTFLOW				54.2	0.4%	0.00E+00		0.00	71.7	0.5
***TOTAL OUTFLOW				1716.6	13.6%	0.00E+00		0.00	71.7	15.8
***RETENTION				10945.9	86.4%	0.00E+00		0.00		

Overflow Rate (m/yr)	8.9	Nutrient Resid. Time (yrs)	0.1614
Hydraulic Resid. Time (yrs)	0.8945	Turnover Ratio	6.2
Reservoir Conc (mg/m3)	95	Retention Coef.	0.864

Average Loadings Model Files

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Hydraulic & Dispersion Parameters

Seg	Name	Outflow Seg	Net Inflow hm^3/yr	Resid Time years	Overflow Rate m/yr	Velocity km/yr	Dispersion--------> Estimated km^2/yr	Numeric km^2/yr	Exchange hm^3/yr
1	Lake Segment 1 (A-3, mos	2	19.3	0.1775	20.8	14.2	64.0	17.9	24.9
2	Lake Segment 2 (A-2, mid	3	22.0	0.2697	25.2	8.9	23.5	10.8	13.0
3	Lake Segment 3 (A-1, mos	0	24.0	0.5032	26.8	4.2	8.5	4.4	0.0

Morphometry

Seg	Name	Area km^2	Zmean m	Zmix m	Length km	Volume hm^3	Width km	L/W -
1	Lake Segment 1 (A-3, mos	0.9	3.7	3.7	2.5	3.4	0.4	6.9
2	Lake Segment 2 (A-2, mid	0.9	6.8	6.8	2.4	5.9	0.4	6.6
3	Lake Segment 3 (A-1, mos	0.9	13.5	13.5	2.1	12.1	0.4	4.9
Totals		2.7	8.0			21.4		

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Segment & Tributary Network

--------Segment:	1	Lake Segment 1 (A-3, most upstream)	
Outflow Segment:	2	Lake Segment 2 (A-2, middle)	
Tributary:	1	Sixmile Creek Flowing to Lake Segment 1	Type: Monitored Inflow
Tributary:	2	Trib 2 Flowing to Lake Segment 1	Type: Monitored Inflow
--------Segment:	2	Lake Segment 2 (A-2, middle)	
Outflow Segment:	3	Lake Segment 3 (A-1, most downstream)	
Tributary:	3	Trib 3 Flowing to Lake Segment 2	Type: Monitored Inflow
--------Segment:	3	Lake Segment 3 (A-1, most downstream)	
Outflow Segment:	0	Out of Reservoir	
Tributary:	4	Lake Outflow	Type: Reservoir Outflow
Tributary:	5	Overland Flow into Lake Segment 3	Type: Monitored Inflow

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Description:
Per Stage 1 Final Report:
Average annual precipitation = 38 inches = 0.9652 m
Average annual evaporation = 28.4 inches = 0.72136 m

Global Variables	Mean	CV
Averaging Period (yrs)	1	0.0
Precipitation (m)	0.9652	0.0
Evaporation (m)	0.72136	0.0
Storage Increase (m)	0	0.0

Atmos. Loads (kg/km^2-yr)	Mean	CV
Conserv. Substance	0	0.00
Total P	30	0.50
Total N	1000	0.50
Ortho P	15	0.50
Inorganic N	500	0.50

Model Options	Code	Description
Conservative Substance	0	NOT COMPUTED
Phosphorus Balance	1	2ND ORDER, AVAIL P
Nitrogen Balance	0	NOT COMPUTED
Chlorophyll-a	0	NOT COMPUTED
Secchi Depth	0	NOT COMPUTED
Dispersion	1	FISCHER-NUMERIC
Phosphorus Calibration	0	NONE
Nitrogen Calibration	0	NONE
Error Analysis	0	NOT COMPUTED
Availability Factors	0	IGNORE
Mass-Balance Tables	1	USE ESTIMATED CONCS
Output Destination	2	EXCEL WORKSHEET

Segment Morphometry

		Outflow		Area	Depth	Length	Mixed Depth (m)		Hypol Depth		Non-Algal Turb (m^{-1})		Internal Loads (mg/m2-day) Conserv.		Total P		Total N	
Seg	Name	Segment	Group	km^2	m	km	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Lake Segment 1 (A-3, most up	2	1	0.927	3.7	2.52	3.7	0	0	0	0	0	0	0	0	0	0	0
2	Lake Segment 2 (A-2, middle)	3	1	0.874	6.8	2.41	6.8	0	0	0	0	0	0	0	0	0	0	0
3	Lake Segment 3 (A-1, most do	0	1	0.893	13.5	2.1	13.5	0	0	0	0	0	0	0	10	0	0	0

Segment Observed Water Quality

	Conserv		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	0	0	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Segment Calibration Factors

	Dispersion Rate		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
2	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
3	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

Tributary Data

				Dr Area	Flow (hm^3/yr)		Conserv.		Total P (ppb)		Total N (ppb)		Ortho P (ppb)		Inorganic N (ppb)	
Trib	Trib Name	Segment	Type	km^2	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Sixmile Creek Flowing to Lake	1	1	63	13.8	0	0	0	400	0	0	0	0	0	0	0
2	Trib 2 Flowing to Lake Segme	1	1	24	5.3	0	0	0	400	0	0	0	0	0	0	0
3	Trib 3 Flowing to Lake Segme	2	1	11.5	2.5	0	0	0	400	0	0	0	0	0	0	0
4	Lake Outflow	3	4	0	23.2	0	0	0	0	0	0	0	0	0	0	0
5	Overland Flow into Lake Segn	3	1	7.7	1.7	0	0	0	400	0	0	0	0	0	0	0

Model Coefficients	Mean	CV
Dispersion Rate	1.000	0.70
Total Phosphorus	1.000	0.45
Total Nitrogen	1.000	0.55
Chl-a Model	1.000	0.26
Secchi Model	1.000	0.10
Organic N Model	1.000	0.12
TP-OP Model	1.000	0.15
HODv Model	1.000	0.15
MODv Model	1.000	0.22
Secchi/Chla Slope (m^2/mg)	0.025	0.00
Minimum Qs (m/yr)	0.100	0.00
Chl-a Flushing Term	1.000	0.00
Chl-a Temporal CV	0.620	0
Avail. Factor - Total P	0.330	0
Avail. Factor - Ortho P	1.930	0
Avail. Factor - Total N	0.590	0
Avail. Factor - Inorganic N	0.790	0

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Variable = TOTAL P MG/M3 **R^2 = 0.76**
Global Calibration Factor = 1.00 CV = 0.45

			Calibration Factor		Predicted		Observed		Log (Obs/Pred)		
Seg	**Group**	**Name**	**Mean**	**CV**	**Mean**	**CV**	**Mean**	**CV**	**Mean**	**SE**	**t**
1	1	Lake Segment 1 (A-3, m	1.00	0.00	130.3	0.00	121.0	0.00	-0.07	0.00	0.00
2	1	Lake Segment 2 (A-2, m	1.00	0.00	82.6	0.00	99.0	0.00	0.18	0.00	0.00
3	1	Lake Segment 3 (A-1, m	1.00	0.00	71.7	0.00	63.0	0.00	-0.13	0.00	0.00
4	1	Area-Wtd Mean			95.4	0.00	94.6	0.00	-0.01	0.00	0.00

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T Statistics Compare Observed and Predicted Means Using the Following Error Terms:
1 = Observed Water Quality Error Only
2 = Error Typical of Model Development Dataset
3 = Observed & Predicted Error

Segment: **Area-Wtd Mean**

		Observed		Predicted		Obs/Pred	T-Statistics ---->		
Variable		**Mean**	**CV**	**Mean**	**CV**	**Ratio**	**T1**	**T2**	**T3**
TOTAL P	MG/M3	94.6	0.00	95.4	0.00	0.99		-0.03	

Segment: **1** **Lake Segment 1 (A-3, most upstream)**

		Observed		Predicted		Obs/Pred	T-Statistics ---->		
Variable		**Mean**	**CV**	**Mean**	**CV**	**Ratio**	**T1**	**T2**	**T3**
TOTAL P	MG/M3	121.0	0.00	130.3	0.00	0.93		-0.27	

Segment: **2** **Lake Segment 2 (A-2, middle)**

		Observed		Predicted		Obs/Pred	T-Statistics ---->		
Variable		**Mean**	**CV**	**Mean**	**CV**	**Ratio**	**T1**	**T2**	**T3**
TOTAL P	MG/M3	99.0	0.00	82.6	0.00	1.20		0.67	

Segment: **3** **Lake Segment 3 (A-1, most downstream)**

		Observed		Predicted		Obs/Pred	T-Statistics ---->		
Variable		**Mean**	**CV**	**Mean**	**CV**	**Ratio**	**T1**	**T2**	**T3**
TOTAL P	MG/M3	63.0	0.00	71.7	0.00	0.88		-0.48	

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Segment	Name
1	Lake Segment 1 (A-3, most upstream)
2	Lake Segment 2 (A-2, middle)
3	Lake Segment 3 (A-1, most downstream)
Mean	Area-Wtd Mean

PREDICTED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	130.3	82.6	71.7	95.4
CARLSON TSI-P	74.4	67.8	65.8	69.4

OBSERVED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	121.0	99.0	63.0	94.6
CARLSON TSI-P	73.3	70.4	63.9	69.2

OBSERVED/PREDICTED RATIOS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	0.9	1.2	0.9	1.0
CARLSON TSI-P	1.0	1.0	1.0	1.0

OBSERVED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

PREDICTED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

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Predicted & Observed Values Ranked Against CE Model Development Dataset

Segment: 4 Area-Wtd Mean

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	95.4		77.8%	94.6		77.5%
CARLSON TSI-P	69.4		77.8%	69.2		77.5%

Segment: 1 Lake Segment 1 (A-3, most upstream)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	130.3		86.7%	121.0		84.8%
CARLSON TSI-P	74.4		86.7%	73.3		84.8%

Segment: 2 Lake Segment 2 (A-2, middle)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	82.6		72.8%	99.0		79.0%
CARLSON TSI-P	67.8		72.8%	70.4		79.0%

Segment: 3 Lake Segment 3 (A-1, most downstream)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	71.7		67.3%	63.0		62.0%
CARLSON TSI-P	65.8		67.3%	63.9		62.0%

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Variable =		TOTAL P MG/M3	R^2 =	0.18							
Global Calibration Factor =			1.00	CV =	0.45						
			Calibration Factor		Predicted		Observed		Log (Obs/Pred)		
Seg	Group	Name	Mean	CV	Mean	CV	Mean	CV	Mean	SE	t
1	1	Lake Segment 1 (A-3, m	1.00	0.00	183.6	0.00	121.0	0.00	-0.42	0.00	0.00
2	1	Lake Segment 2 (A-2, m	1.00	0.00	104.2	0.00	99.0	0.00	-0.05	0.00	0.00
3	1	Lake Segment 3 (A-1, m	1.00	0.00	57.7	0.00	63.0	0.00	0.09	0.00	0.00
4	1	Area-Wtd Mean			116.1	0.00	94.6	0.00	-0.20	0.00	0.00

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T Statistics Compare Observed and Predicted Means Using the Following Error Terms:
1 = Observed Water Quality Error Only
2 = Error Typical of Model Development Dataset
3 = Observed & Predicted Error

Segment: Area-Wtd Mean

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	94.6	0.00	116.1	0.00	0.82		-0.76	

Segment: 1 Lake Segment 1 (A-3, most upstream)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	121.0	0.00	183.6	0.00	0.66		-1.55	

Segment: 2 Lake Segment 2 (A-2, middle)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	99.0	0.00	104.2	0.00	0.95		-0.19	

Segment: 3 Lake Segment 3 (A-1, most downstream)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	63.0	0.00	57.7	0.00	1.09		0.33	

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Segment	Name
1	Lake Segment 1 (A-3, most upstream)
2	Lake Segment 2 (A-2, middle)
3	Lake Segment 3 (A-1, most downstream)
Mean	Area-Wtd Mean

PREDICTED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	183.6	104.2	57.7	116.1
CARLSON TSI-P	79.3	71.2	62.6	71.1

OBSERVED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	121.0	99.0	63.0	94.6
CARLSON TSI-P	73.3	70.4	63.9	69.2

OBSERVED/PREDICTED RATIOS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	0.7	0.9	1.1	0.8
CARLSON TSI-P	0.9	1.0	1.0	1.0

OBSERVED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

PREDICTED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

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Predicted & Observed Values Ranked Against CE Model Development Dataset

Segment:	4	Area-Wtd Mean				
	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	116.1		83.7%	94.6		77.5%
CARLSON TSI-P	71.1		83.7%	69.2		77.5%

Segment:	1	Lake Segment 1 (A-3, most upstream)				
	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	183.6		93.2%	121.0		84.8%
CARLSON TSI-P	79.3		93.2%	73.3		84.8%

Segment:	2	Lake Segment 2 (A-2, middle)				
	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	104.2		80.6%	99.0		79.0%
CARLSON TSI-P	71.2		80.6%	70.4		79.0%

Segment:	3	Lake Segment 3 (A-1, most downstream)				
	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	57.7		58.2%	63.0		62.0%
CARLSON TSI-P	62.6		58.2%	63.9		62.0%

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Water Balance Terms (hm3/yr) **Averaging Period = 1.00 Years**

		Inflows			Storage	Outflows------>		Downstr	
Seg	**Name**	**External**	**Precip**	**Advect**	**Increase**	**Advect**	**Disch.**	**Exchange**	**Evap**
1	Lake Segment 1 (A-3, mo	19	1	0	0	19	0	25	1
2	Lake Segment 2 (A-2, mic	3	1	19	0	22	0	13	1
3	Lake Segment 3 (A-1, mo	2	1	22	0	1	23	0	1
Net		23	3	0	0	1	23	0	2

Mass Balance Terms (kg/yr) Based Upon Predicted Reservoir & Outflow Concentrations **Component: TOTAL P**

		Inflows-->			Storage	Outflows----->		Net	Net
Seg	**Name**	**External**	**Atmos**	**Advect**	**Increase**	**Advect**	**Disch.**	**Exchange**	**Retention**
1	Lake Segment 1 (A-3, mo	13370	28	0	0	3548	0	1977	7873
2	Lake Segment 2 (A-2, mic	1750	26	3548	0	2297	0	-1371	4398
3	Lake Segment 3 (A-1, mo	1190	27	2297	0	44	1339	-605	2736
Net		16310	81	0	0	44	1339	0	15008

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Segment Mass Balance Based Upon Predicted Concentrations

Component: TOTAL P **Segment: 1** **Lake Segment 1 (A-3, most upstream)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
1	1	Sixmile Creek Flowing to La	13.8	69.0%	9660.0	72.1%	700
2	1	Trib 2 Flowing to Lake Segi	5.3	26.5%	3710.0	27.7%	700
PRECIPITATION			0.9	4.5%	27.8	0.2%	31
TRIBUTARY INFLOW			19.1	95.5%	13370.0	99.8%	700
***TOTAL INFLOW			20.0	100.0%	13397.8	100.0%	670
ADVECTIVE OUTFLOW			19.3	96.7%	3547.7	26.5%	184
NET DIFFUSIVE OUTFLOW			0.0	0.0%	1976.8	14.8%	
***TOTAL OUTFLOW			19.3	96.7%	5524.5	41.2%	286
***EVAPORATION			0.7	3.3%	0.0	0.0%	
***RETENTION			0.0	0.0%	7873.3	58.8%	

Hyd. Residence Time = 0.1775 yrs
Overflow Rate = 20.8 m/yr
Mean Depth = 3.7 m

Component: TOTAL P **Segment: 2** **Lake Segment 2 (A-2, middle)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
3	1	Trib 3 Flowing to Lake Segi	2.5	11.0%	1750.0	26.1%	700
PRECIPITATION			0.8	3.7%	26.2	0.4%	31
TRIBUTARY INFLOW			2.5	11.0%	1750.0	26.1%	700
ADVECTIVE INFLOW			19.3	85.3%	3547.7	53.0%	184
NET DIFFUSIVE INFLOW			0.0	0.0%	1371.5	20.5%	
***TOTAL INFLOW			22.7	100.0%	6695.4	100.0%	295
ADVECTIVE OUTFLOW			22.0	97.2%	2297.1	34.3%	104
***TOTAL OUTFLOW			22.0	97.2%	2297.1	34.3%	104
***EVAPORATION			0.6	2.8%	0.0	0.0%	
***RETENTION			0.0	0.0%	4398.2	65.7%	

Hyd. Residence Time = 0.2697 yrs
Overflow Rate = 25.2 m/yr
Mean Depth = 6.8 m

Component: TOTAL P **Segment: 3** **Lake Segment 3 (A-1, most downstream)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
4	4	Lake Outflow	23.2	94.3%	1339.2	32.5%	58
5	1	Overland Flow into Lake Se	1.7	6.9%	1190.0	28.9%	700
PRECIPITATION			0.9	3.5%	26.8	0.7%	31
TRIBUTARY INFLOW			1.7	6.9%	1190.0	28.9%	700
ADVECTIVE INFLOW			22.0	89.6%	2297.1	55.8%	104
NET DIFFUSIVE INFLOW			0.0	0.0%	605.3	14.7%	
***TOTAL INFLOW			24.6	100.0%	4119.3	100.0%	167
GAUGED OUTFLOW			23.2	94.3%	1339.2	32.5%	58
ADVECTIVE OUTFLOW			0.8	3.1%	43.7	1.1%	58
***TOTAL OUTFLOW			24.0	97.4%	1382.9	33.6%	58
***EVAPORATION			0.6	2.6%	0.0	0.0%	
***RETENTION			0.0	0.0%	2736.4	66.4%	

Hyd. Residence Time = 0.5032 yrs
Overflow Rate = 26.8 m/yr
Mean Depth = 13.5 m

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Overall Water & Nutrient Balances

Overall Water Balance — **Averaging Period = 1.00 years**

Trb	Type	Seg	Name	Area km^2	Flow hm^3/yr	Variance $(hm3/yr)^2$	CV -	Runoff m/yr
1	1	1	Sixmile Creek Flowing to La	63.0	13.8	0.00E+00	0.00	0.22
2	1	1	Trib 2 Flowing to Lake Segn	24.0	5.3	0.00E+00	0.00	0.22
3	1	2	Trib 3 Flowing to Lake Segn	11.5	2.5	0.00E+00	0.00	0.22
4	4	3	Lake Outflow		23.2	0.00E+00	0.00	
5	1	3	Overland Flow into Lake Se	7.7	1.7	0.00E+00	0.00	0.22
PRECIPITATION				2.7	2.6	0.00E+00	0.00	0.97
TRIBUTARY INFLOW				106.2	23.3	0.00E+00	0.00	0.22
***TOTAL INFLOW				108.9	25.9	0.00E+00	0.00	0.24
GAUGED OUTFLOW					23.2	0.00E+00	0.00	
ADVECTIVE OUTFLOW				108.9	0.8	0.00E+00	0.00	0.01
***TOTAL OUTFLOW				108.9	24.0	0.00E+00	0.00	0.22
***EVAPORATION					1.9	0.00E+00	0.00	

Overall Mass Balance Based Upon **Predicted** **Outflow & Reservoir Concentrations**
Component: **TOTAL P**

Trb	Type	Seg	Name	Load kg/yr	%Total	Load Variance $(kg/yr)^2$	%Total	CV	Conc mg/m^3	Export $kg/km^2/yr$
1	1	1	Sixmile Creek Flowing to La	9660.0	58.9%	0.00E+00		0.00	700.0	153.3
2	1	1	Trib 2 Flowing to Lake Segn	3710.0	22.6%	0.00E+00		0.00	700.0	154.6
3	1	2	Trib 3 Flowing to Lake Segn	1750.0	10.7%	0.00E+00		0.00	700.0	152.2
4	4	3	Lake Outflow	1339.2		0.00E+00		0.00	57.7	
5	1	3	Overland Flow into Lake Se	1190.0	7.3%	0.00E+00		0.00	700.0	154.5
PRECIPITATION				80.8	0.5%	0.00E+00		0.00	31.1	30.0
TRIBUTARY INFLOW				16310.0	99.5%	0.00E+00		0.00	700.0	153.6
***TOTAL INFLOW				16390.8	100.0%	0.00E+00		0.00	632.8	150.5
GAUGED OUTFLOW				1339.2	8.2%	0.00E+00		0.00	57.7	
ADVECTIVE OUTFLOW				43.7	0.3%	0.00E+00		0.00	57.7	0.4
***TOTAL OUTFLOW				1382.9	8.4%	0.00E+00		0.00	57.7	12.7
***RETENTION				15007.9	91.6%	0.00E+00		0.00		

Overflow Rate (m/yr)	8.9	Nutrient Resid. Time (yrs)	0.1518
Hydraulic Resid. Time (yrs)	0.8945	Turnover Ratio	6.6
Reservoir Conc (mg/m3)	116	Retention Coef.	0.916

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Hydraulic & Dispersion Parameters

Seg	Name	Outflow Seg	Net Inflow hm^3/yr	Resid Time years	Overflow Rate m/yr	Velocity km/yr	Dispersion--------> Estimated km^2/yr	Numeric km^2/yr	Exchange hm^3/yr
1	Lake Segment 1 (A-3, mos	2	19.3	0.1775	20.8	14.2	64.0	17.9	24.9
2	Lake Segment 2 (A-2, mid	3	22.0	0.2697	25.2	8.9	23.5	10.8	13.0
3	Lake Segment 3 (A-1, mos	0	24.0	0.5032	26.8	4.2	8.5	4.4	0.0

Morphometry

Seg	Name	Area km^2	Zmean m	Zmix m	Length km	Volume hm^3	Width km	L/W -
1	Lake Segment 1 (A-3, mos	0.9	3.7	3.7	2.5	3.4	0.4	6.9
2	Lake Segment 2 (A-2, mid	0.9	6.8	6.8	2.4	5.9	0.4	6.6
3	Lake Segment 3 (A-1, mos	0.9	13.5	13.5	2.1	12.1	0.4	4.9
Totals		2.7	8.0			21.4		

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Segment & Tributary Network

--------Segment:	1	Lake Segment 1 (A-3, most upstream)		
Outflow Segment:	2	Lake Segment 2 (A-2, middle)		
Tributary:	1	Sixmile Creek Flowing to Lake Segment 1	Type:	Monitored Inflow
Tributary:	2	Trib 2 Flowing to Lake Segment 1	Type:	Monitored Inflow
--------Segment:	2	Lake Segment 2 (A-2, middle)		
Outflow Segment:	3	Lake Segment 3 (A-1, most downstream)		
Tributary:	3	Trib 3 Flowing to Lake Segment 2	Type:	Monitored Inflow
--------Segment:	3	Lake Segment 3 (A-1, most downstream)		
Outflow Segment:	0	Out of Reservoir		
Tributary:	4	Lake Outflow	Type:	Reservoir Outflow
Tributary:	5	Overland Flow into Lake Segment 3	Type:	Monitored Inflow

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Description:
Per Stage 1 Final Report:
Average annual precipitation = 38 inches = 0.9652 m
Average annual evaporation = 28.4 inches = 0.72136 m

Global Variables	Mean	CV
Averaging Period (yrs)	1	0.0
Precipitation (m)	0.9652	0.0
Evaporation (m)	0.72136	0.0
Storage Increase (m)	0	0.0

Atmos. Loads (kg/km^2-yr)	Mean	CV
Conserv. Substance	0	0.00
Total P	30	0.50
Total N	1000	0.50
Ortho P	15	0.50
Inorganic N	500	0.50

Model Options	Code	Description
Conservative Substance	0	NOT COMPUTED
Phosphorus Balance	1	2ND ORDER, AVAIL P
Nitrogen Balance	0	NOT COMPUTED
Chlorophyll-a	0	NOT COMPUTED
Secchi Depth	0	NOT COMPUTED
Dispersion	1	FISCHER-NUMERIC
Phosphorus Calibration	0	NONE
Nitrogen Calibration	0	NONE
Error Analysis	0	NOT COMPUTED
Availability Factors	0	IGNORE
Mass-Balance Tables	1	USE ESTIMATED CONCS
Output Destination	2	EXCEL WORKSHEET

Segment Morphometry

													Internal Loads (mg/m2-day)					
		Outflow		Area	Depth	Length	Mixed Depth (m)		Hypol Depth		Non-Algal Turb (m^{-1})		Conserv.		Total P		Total N	
Seg	Name	Segment	Group	km^2	m	km	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Lake Segment 1 (A-3, most up	2	1	0.927	3.7	2.52	3.7	0	0	0	0	0	0	0	0	0	0	0
2	Lake Segment 2 (A-2, middle)	3	1	0.874	6.8	2.41	6.8	0	0	0	0	0	0	0	0	0	0	0
3	Lake Segment 3 (A-1, most do	0	1	0.893	13.5	2.1	13.5	0	0	0	0	0	0	0	0	0	0	0

Segment Observed Water Quality

	Conserv		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	0	0	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Segment Calibration Factors

	Dispersion Rate		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
2	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
3	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

Tributary Data

				Dr Area	Flow (hm^3/yr)		Conserv.		Total P (ppb)		Total N (ppb)		Ortho P (ppb)		Inorganic N (ppb)	
Trib	Trib Name	Segment	Type	km^2	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Sixmile Creek Flowing to Lake	1	1	63	13.8	0	0	0	700	0	0	0	0	0	0	0
2	Trib 2 Flowing to Lake Segme	1	1	24	5.3	0	0	0	700	0	0	0	0	0	0	0
3	Trib 3 Flowing to Lake Segme	2	1	11.5	2.5	0	0	0	700	0	0	0	0	0	0	0
4	Lake Outflow	3	4	0	23.2	0	0	0	0	0	0	0	0	0	0	0
5	Overland Flow into Lake Segn	3	1	7.7	1.7	0	0	0	700	0	0	0	0	0	0	0

Model Coefficients	Mean	CV
Dispersion Rate	1.000	0.70
Total Phosphorus	1.000	0.45
Total Nitrogen	1.000	0.55
Chl-a Model	1.000	0.26
Secchi Model	1.000	0.10
Organic N Model	1.000	0.12
TP-OP Model	1.000	0.15
HODv Model	1.000	0.15
MODv Model	1.000	0.22
Secchi/Chla Slope (m^2/mg)	0.025	0.00
Minimum Qs (m/yr)	0.100	0.00
Chl-a Flushing Term	1.000	0.00
Chl-a Temporal CV	0.620	0
Avail. Factor - Total P	0.330	0
Avail. Factor - Ortho P	1.930	0
Avail. Factor - Total N	0.590	0
Avail. Factor - Inorganic N	0.790	0

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Variable = TOTAL P MG/M3 **R^2 = -10.43**
Global Calibration Factor = 1.00 CV = 0.45

			Calibration Factor		Predicted		Observed		Log (Obs/Pred)		
Seg	**Group**	**Name**	**Mean**	**CV**	**Mean**	**CV**	**Mean**	**CV**	**Mean**	**SE**	**t**
1	1	Lake Segment 1 (A-3, m	1.00	0.00	49.6	0.00	121.0	0.00	0.89	0.00	0.00
2	1	Lake Segment 2 (A-2, m	1.00	0.00	37.2	0.00	99.0	0.00	0.98	0.00	0.00
3	1	Lake Segment 3 (A-1, m	1.00	0.00	25.7	0.00	63.0	0.00	0.90	0.00	0.00
4	1	Area-Wtd Mean			37.7	0.00	94.6	0.00	0.92	0.00	0.00

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T Statistics Compare Observed and Predicted Means Using the Following Error Terms:
1 = Observed Water Quality Error Only
2 = Error Typical of Model Development Dataset
3 = Observed & Predicted Error

Segment: Area-Wtd Mean

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	94.6	0.00	37.7	0.00	2.51		3.42	

Segment: 1 Lake Segment 1 (A-3, most upstream)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	121.0	0.00	49.6	0.00	2.44		3.31	

Segment: 2 Lake Segment 2 (A-2, middle)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	99.0	0.00	37.2	0.00	2.66		3.64	

Segment: 3 Lake Segment 3 (A-1, most downstream)

Variable		Observed Mean	CV	Predicted Mean	CV	Obs/Pred Ratio	T-Statistics ----> T1	T2	T3
TOTAL P	MG/M3	63.0	0.00	25.7	0.00	2.45		3.33	

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Segment	Name
1	Lake Segment 1 (A-3, most upstream)
2	Lake Segment 2 (A-2, middle)
3	Lake Segment 3 (A-1, most downstream)
Mean	Area-Wtd Mean

PREDICTED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	49.6	37.2	25.7	37.7
CARLSON TSI-P	60.4	56.3	51.0	56.0

OBSERVED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	121.0	99.0	63.0	94.6
CARLSON TSI-P	73.3	70.4	63.9	69.2

OBSERVED/PREDICTED RATIOS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	2.4	2.7	2.5	2.5
CARLSON TSI-P	1.2	1.3	1.3	1.2

OBSERVED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

PREDICTED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

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Predicted & Observed Values Ranked Against CE Model Development Dataset

Segment: 4 Area-Wtd Mean

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	37.7		39.5%	94.6		77.5%
CARLSON TSI-P	56.0		39.5%	69.2		77.5%

Segment: 1 Lake Segment 1 (A-3, most upstream)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	49.6		51.6%	121.0		84.8%
CARLSON TSI-P	60.4		51.6%	73.3		84.8%

Segment: 2 Lake Segment 2 (A-2, middle)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	37.2		39.0%	99.0		79.0%
CARLSON TSI-P	56.3		39.0%	70.4		79.0%

Segment: 3 Lake Segment 3 (A-1, most downstream)

	Predicted Values--->			Observed Values--->		
Variable	**Mean**	**CV**	**Rank**	**Mean**	**CV**	**Rank**
TOTAL P MG/M3	25.7		24.5%	63.0		62.0%
CARLSON TSI-P	51.0		24.5%	63.9		62.0%

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Water Balance Terms (hm3/yr) **Averaging Period = 1.00 Years**

		Inflows			Storage	Outflows------>		Downstr	
Seg	**Name**	**External**	**Precip**	**Advect**	**Increase**	**Advect**	**Disch.**	**Exchange**	**Evap**
1	Lake Segment 1 (A-3, mo	19	1	0	0	19	0	25	1
2	Lake Segment 2 (A-2, mic	3	1	19	0	22	0	13	1
3	Lake Segment 3 (A-1, mo	2	1	22	0	1	23	0	1
Net		23	3	0	0	1	23	0	2

Mass Balance Terms (kg/yr) Based Upon Predicted Reservoir & Outflow Concentrations **Component: TOTAL P**

		Inflows-->			Storage	Outflows----->		Net	Net
Seg	**Name**	**External**	**Atmos**	**Advect**	**Increase**	**Advect**	**Disch.**	**Exchange**	**Retention**
1	Lake Segment 1 (A-3, mo	1815	28	0	0	959	0	309	575
2	Lake Segment 2 (A-2, mic	238	26	959	0	820	0	-159	561
3	Lake Segment 3 (A-1, mo	162	27	820	0	19	596	-150	543
Net		2214	81	0	0	19	596	0	1678

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Segment Mass Balance Based Upon Predicted Concentrations

Component: TOTAL P **Segment: 1** **Lake Segment 1 (A-3, most upstream)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
1	1	Sixmile Creek Flowing to La	13.8	69.0%	1311.0	71.2%	95
2	1	Trib 2 Flowing to Lake Segi	5.3	26.5%	503.5	27.3%	95
PRECIPITATION			0.9	4.5%	27.8	1.5%	31
TRIBUTARY INFLOW			19.1	95.5%	1814.5	98.5%	95
***TOTAL INFLOW			20.0	100.0%	1842.3	100.0%	92
ADVECTIVE OUTFLOW			19.3	96.7%	958.7	52.0%	50
NET DIFFUSIVE OUTFLOW			0.0	0.0%	308.6	16.8%	
***TOTAL OUTFLOW			19.3	96.7%	1267.3	68.8%	66
***EVAPORATION			0.7	3.3%	0.0	0.0%	
***RETENTION			0.0	0.0%	575.0	31.2%	

Hyd. Residence Time = 0.1775 yrs
Overflow Rate = 20.8 m/yr
Mean Depth = 3.7 m

Component: TOTAL P **Segment: 2** **Lake Segment 2 (A-2, middle)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
3	1	Trib 3 Flowing to Lake Segi	2.5	11.0%	237.5	17.2%	95
PRECIPITATION			0.8	3.7%	26.2	1.9%	31
TRIBUTARY INFLOW			2.5	11.0%	237.5	17.2%	95
ADVECTIVE INFLOW			19.3	85.3%	958.7	69.4%	50
NET DIFFUSIVE INFLOW			0.0	0.0%	158.7	11.5%	
***TOTAL INFLOW			22.7	100.0%	1381.2	100.0%	61
ADVECTIVE OUTFLOW			22.0	97.2%	820.3	59.4%	37
***TOTAL OUTFLOW			22.0	97.2%	820.3	59.4%	37
***EVAPORATION			0.6	2.8%	0.0	0.0%	
***RETENTION			0.0	0.0%	560.9	40.6%	

Hyd. Residence Time = 0.2697 yrs
Overflow Rate = 25.2 m/yr
Mean Depth = 6.8 m

Component: TOTAL P **Segment: 3** **Lake Segment 3 (A-1, most downstream)**

Trib	Type	Location	Flow hm^3/yr	Flow %Total	Load kg/yr	Load %Total	Conc mg/m^3
4	4	Lake Outflow	23.2	94.3%	596.4	51.5%	26
5	1	Overland Flow into Lake Se	1.7	6.9%	161.5	13.9%	95
PRECIPITATION			0.9	3.5%	26.8	2.3%	31
TRIBUTARY INFLOW			1.7	6.9%	161.5	13.9%	95
ADVECTIVE INFLOW			22.0	89.6%	820.3	70.8%	37
NET DIFFUSIVE INFLOW			0.0	0.0%	149.9	12.9%	
***TOTAL INFLOW			24.6	100.0%	1158.5	100.0%	47
GAUGED OUTFLOW			23.2	94.3%	596.4	51.5%	26
ADVECTIVE OUTFLOW			0.8	3.1%	19.5	1.7%	26
***TOTAL OUTFLOW			24.0	97.4%	615.8	53.2%	26
***EVAPORATION			0.6	2.6%	0.0	0.0%	
***RETENTION			0.0	0.0%	542.7	46.8%	

Hyd. Residence Time = 0.5032 yrs
Overflow Rate = 26.8 m/yr
Mean Depth = 13.5 m

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Overall Water & Nutrient Balances

Overall Water Balance — **Averaging Period = 1.00 years**

Trb	Type	Seg	Name	Area km^2	Flow hm^3/yr	Variance $(hm3/yr)^2$	CV -	Runoff m/yr
1	1	1	Sixmile Creek Flowing to La	63.0	13.8	0.00E+00	0.00	0.22
2	1	1	Trib 2 Flowing to Lake Segn	24.0	5.3	0.00E+00	0.00	0.22
3	1	2	Trib 3 Flowing to Lake Segn	11.5	2.5	0.00E+00	0.00	0.22
4	4	3	Lake Outflow		23.2	0.00E+00	0.00	
5	1	3	Overland Flow into Lake Se	7.7	1.7	0.00E+00	0.00	0.22
PRECIPITATION				2.7	2.6	0.00E+00	0.00	0.97
TRIBUTARY INFLOW				106.2	23.3	0.00E+00	0.00	0.22
***TOTAL INFLOW				108.9	25.9	0.00E+00	0.00	0.24
GAUGED OUTFLOW					23.2	0.00E+00	0.00	
ADVECTIVE OUTFLOW				108.9	0.8	0.00E+00	0.00	0.01
***TOTAL OUTFLOW				108.9	24.0	0.00E+00	0.00	0.22
***EVAPORATION					1.9	0.00E+00	0.00	

Overall Mass Balance Based Upon Component: **Predicted TOTAL P** — **Outflow & Reservoir Concentrations**

Trb	Type	Seg	Name	Load kg/yr	%Total	Load Variance $(kg/yr)^2$	%Total	CV	Conc mg/m^3	Export $kg/km^2/yr$
1	1	1	Sixmile Creek Flowing to La	1311.0	57.1%	0.00E+00		0.00	95.0	20.8
2	1	1	Trib 2 Flowing to Lake Segn	503.5	21.9%	0.00E+00		0.00	95.0	21.0
3	1	2	Trib 3 Flowing to Lake Segn	237.5	10.4%	0.00E+00		0.00	95.0	20.7
4	4	3	Lake Outflow	596.4		0.00E+00		0.00	25.7	
5	1	3	Overland Flow into Lake Se	161.5	7.0%	0.00E+00		0.00	95.0	21.0
PRECIPITATION				80.8	3.5%	0.00E+00		0.00	31.1	30.0
TRIBUTARY INFLOW				2213.5	96.5%	0.00E+00		0.00	95.0	20.8
***TOTAL INFLOW				2294.3	100.0%	0.00E+00		0.00	88.6	21.1
GAUGED OUTFLOW				596.4	26.0%	0.00E+00		0.00	25.7	
ADVECTIVE OUTFLOW				19.5	0.8%	0.00E+00		0.00	25.7	0.2
***TOTAL OUTFLOW				615.8	26.8%	0.00E+00		0.00	25.7	5.7
***RETENTION				1678.5	73.2%	0.00E+00		0.00		

Overflow Rate (m/yr)	8.9	Nutrient Resid. Time (yrs)	0.3518
Hydraulic Resid. Time (yrs)	0.8945	Turnover Ratio	2.8
Reservoir Conc (mg/m3)	38	Retention Coef.	0.732

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Hydraulic & Dispersion Parameters

Seg	Name	Outflow Seg	Net Inflow hm^3/yr	Resid Time years	Overflow Rate m/yr	Velocity km/yr	Dispersion--------> Estimated km^2/yr	Numeric km^2/yr	Exchange hm^3/yr
1	Lake Segment 1 (A-3, mos	2	19.3	0.1775	20.8	14.2	64.0	17.9	24.9
2	Lake Segment 2 (A-2, mid	3	22.0	0.2697	25.2	8.9	23.5	10.8	13.0
3	Lake Segment 3 (A-1, mos	0	24.0	0.5032	26.8	4.2	8.5	4.4	0.0

Morphometry

Seg	Name	Area km^2	Zmean m	Zmix m	Length km	Volume hm^3	Width km	L/W -
1	Lake Segment 1 (A-3, mos	0.9	3.7	3.7	2.5	3.4	0.4	6.9
2	Lake Segment 2 (A-2, mid	0.9	6.8	6.8	2.4	5.9	0.4	6.6
3	Lake Segment 3 (A-1, mos	0.9	13.5	13.5	2.1	12.1	0.4	4.9
Totals		2.7	8.0			21.4		

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Segment & Tributary Network

--------Segment:	1	Lake Segment 1 (A-3, most upstream)		
Outflow Segment:	2	Lake Segment 2 (A-2, middle)		
Tributary:	1	Sixmile Creek Flowing to Lake Segment 1	Type:	Monitored Inflow
Tributary:	2	Trib 2 Flowing to Lake Segment 1	Type:	Monitored Inflow
--------Segment:	2	Lake Segment 2 (A-2, middle)		
Outflow Segment:	3	Lake Segment 3 (A-1, most downstream)		
Tributary:	3	Trib 3 Flowing to Lake Segment 2	Type:	Monitored Inflow
--------Segment:	3	Lake Segment 3 (A-1, most downstream)		
Outflow Segment:	0	Out of Reservoir		
Tributary:	4	Lake Outflow	Type:	Reservoir Outflow
Tributary:	5	Overland Flow into Lake Segment 3	Type:	Monitored Inflow

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Description:

Per Stage 1 Final Report:
Average annual precipitation = 38 inches = 0.9652 m
Average annual evaporation = 28.4 inches = 0.72136 m

Global Variables	Mean	CV
Averaging Period (yrs)	1	0.0
Precipitation (m)	0.9652	0.0
Evaporation (m)	0.72136	0.0
Storage Increase (m)	0	0.0

Atmos. Loads (kg/km^2-yr)	Mean	CV
Conserv. Substance	0	0.00
Total P	30	0.50
Total N	1000	0.50
Ortho P	15	0.50
Inorganic N	500	0.50

Model Options	Code	Description
Conservative Substance	0	NOT COMPUTED
Phosphorus Balance	1	2ND ORDER, AVAIL P
Nitrogen Balance	0	NOT COMPUTED
Chlorophyll-a	0	NOT COMPUTED
Secchi Depth	0	NOT COMPUTED
Dispersion	1	FISCHER-NUMERIC
Phosphorus Calibration	0	NONE
Nitrogen Calibration	0	NONE
Error Analysis	0	NOT COMPUTED
Availability Factors	0	IGNORE
Mass-Balance Tables	1	USE ESTIMATED CONCS
Output Destination	2	EXCEL WORKSHEET

Segment Morphometry

		Outflow		Area	Depth	Length	Mixed Depth (m)		Hypol Depth		Non-Algal Turb (m^{-1})		Internal Loads (mg/m2-day) Conserv.		Total P		Total N	
Seg	Name	Segment	Group	km^2	m	km	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Lake Segment 1 (A-3, most up	2	1	0.927	3.7	2.52	3.7	0	0	0	0	0	0	0	0	0	0	0
2	Lake Segment 2 (A-2, middle)	3	1	0.874	6.8	2.41	6.8	0	0	0	0	0	0	0	0	0	0	0
3	Lake Segment 3 (A-1, most do	0	1	0.893	13.5	2.1	13.5	0	0	0	0	0	0	0	0	0	0	0

Segment Observed Water Quality

	Conserv		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	0	0	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Segment Calibration Factors

	Dispersion Rate		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
2	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
3	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

Tributary Data

				Dr Area	Flow (hm^3/yr)		Conserv.		Total P (ppb)		Total N (ppb)		Ortho P (ppb)		Inorganic N (ppb)	
Trib	Trib Name	Segment	Type	km^2	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Sixmile Creek Flowing to Lake	1	1	63	13.8	0	0	0	95	0	0	0	0	0	0	0
2	Trib 2 Flowing to Lake Segme	1	1	24	5.3	0	0	0	95	0	0	0	0	0	0	0
3	Trib 3 Flowing to Lake Segme	2	1	11.5	2.5	0	0	0	95	0	0	0	0	0	0	0
4	Lake Outflow	3	4	0	23.2	0	0	0	0	0	0	0	0	0	0	0
5	Overland Flow into Lake Segm	3	1	7.7	1.7	0	0	0	95	0	0	0	0	0	0	0

Model Coefficients	Mean	CV
Dispersion Rate	1.000	0.70
Total Phosphorus	1.000	0.45
Total Nitrogen	1.000	0.55
Chl-a Model	1.000	0.26
Secchi Model	1.000	0.10
Organic N Model	1.000	0.12
TP-OP Model	1.000	0.15
HODv Model	1.000	0.15
MODv Model	1.000	0.22
Secchi/Chla Slope (m^2/mg)	0.025	0.00
Minimum Qs (m/yr)	0.100	0.00
Chl-a Flushing Term	1.000	0.00
Chl-a Temporal CV	0.620	0
Avail. Factor - Total P	0.330	0
Avail. Factor - Ortho P	1.930	0
Avail. Factor - Total N	0.590	0
Avail. Factor - Inorganic N	0.790	0

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Variable = TOTAL P MG/M3 **R^2 = 0.18**
Global Calibration Factor = 1.00 CV = 0.45

			Calibration Factor		Predicted		Observed		Log (Obs/Pred)		
Seg	**Group**	**Name**	**Mean**	**CV**	**Mean**	**CV**	**Mean**	**CV**	**Mean**	**SE**	**t**
1	1	Lake Segment 1 (A-3, m	1.00	0.00	183.6	0.00	121.0	0.00	-0.42	0.00	0.00
2	1	Lake Segment 2 (A-2, m	1.00	0.00	104.2	0.00	99.0	0.00	-0.05	0.00	0.00
3	1	Lake Segment 3 (A-1, m	1.00	0.00	57.7	0.00	63.0	0.00	0.09	0.00	0.00
4	1	Area-Wtd Mean			116.1	0.00	94.6	0.00	-0.20	0.00	0.00

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T Statistics Compare Observed and Predicted Means Using the Following Error Terms:
1 = Observed Water Quality Error Only
2 = Error Typical of Model Development Dataset
3 = Observed & Predicted Error

Segment: Area-Wtd Mean

		Observed		Predicted		Obs/Pred	T-Statistics ---->		
Variable		**Mean**	**CV**	**Mean**	**CV**	**Ratio**	**T1**	**T2**	**T3**
TOTAL P	MG/M3	94.6	0.00	116.1	0.00	0.82		-0.76	

Segment: 1 Lake Segment 1 (A-3, most upstream)

		Observed		Predicted		Obs/Pred	T-Statistics ---->		
Variable		**Mean**	**CV**	**Mean**	**CV**	**Ratio**	**T1**	**T2**	**T3**
TOTAL P	MG/M3	121.0	0.00	183.6	0.00	0.66		-1.55	

Segment: 2 Lake Segment 2 (A-2, middle)

		Observed		Predicted		Obs/Pred	T-Statistics ---->		
Variable		**Mean**	**CV**	**Mean**	**CV**	**Ratio**	**T1**	**T2**	**T3**
TOTAL P	MG/M3	99.0	0.00	104.2	0.00	0.95		-0.19	

Segment: 3 Lake Segment 3 (A-1, most downstream)

		Observed		Predicted		Obs/Pred	T-Statistics ---->		
Variable		**Mean**	**CV**	**Mean**	**CV**	**Ratio**	**T1**	**T2**	**T3**
TOTAL P	MG/M3	63.0	0.00	57.7	0.00	1.09		0.33	

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Segment	Name
1	Lake Segment 1 (A-3, most upstream)
2	Lake Segment 2 (A-2, middle)
3	Lake Segment 3 (A-1, most downstream)
Mean	Area-Wtd Mean

PREDICTED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	183.6	104.2	57.7	116.1
CARLSON TSI-P	79.3	71.2	62.6	71.1

OBSERVED CONCENTRATIONS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	121.0	99.0	63.0	94.6
CARLSON TSI-P	73.3	70.4	63.9	69.2

OBSERVED/PREDICTED RATIOS:

Variable Segment-->	1	2	3	Mean
TOTAL P MG/M3	0.7	0.9	1.1	0.8
CARLSON TSI-P	0.9	1.0	1.0	1.0

OBSERVED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

PREDICTED STANDARD ERRORS

Variable Segment-->	1	2	3	Mean

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Predicted & Observed Values Ranked Against CE Model Development Dataset

Segment: 4 Area-Wtd Mean

Variable		Predicted Values---> Mean	CV	Rank	Observed Values---> Mean	CV	Rank
TOTAL P	MG/M3	116.1		83.7%	94.6		77.5%
CARLSON TSI-P		71.1		83.7%	69.2		77.5%

Segment: 1 Lake Segment 1 (A-3, most upstream)

Variable		Predicted Values---> Mean	CV	Rank	Observed Values---> Mean	CV	Rank
TOTAL P	MG/M3	183.6		93.2%	121.0		84.8%
CARLSON TSI-P		79.3		93.2%	73.3		84.8%

Segment: 2 Lake Segment 2 (A-2, middle)

Variable		Predicted Values---> Mean	CV	Rank	Observed Values---> Mean	CV	Rank
TOTAL P	MG/M3	104.2		80.6%	99.0		79.0%
CARLSON TSI-P		71.2		80.6%	70.4		79.0%

Segment: 3 Lake Segment 3 (A-1, most downstream)

Variable		Predicted Values---> Mean	CV	Rank	Observed Values---> Mean	CV	Rank
TOTAL P	MG/M3	57.7		58.2%	63.0		62.0%
CARLSON TSI-P		62.6		58.2%	63.9		62.0%

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Water Balance Terms (hm3/yr) **Averaging Period = 1.00 Years**

Seg	Name	External	Inflows Precip	Advect	Storage Increase	Outflows------> Advect	Disch.	Downstr Exchange	Evap
1	Lake Segment 1 (A-3, mo	19	1	0	0	19	0	25	1
2	Lake Segment 2 (A-2, mic	3	1	19	0	22	0	13	1
3	Lake Segment 3 (A-1, mo	2	1	22	0	1	23	0	1
Net		23	3	0	0	1	23	0	2

Mass Balance Terms (kg/yr) Based Upon Predicted Reservoir & Outflow Concentrations Component: TOTAL P

Seg	Name	Inflows--> External	Atmos	Advect	Storage Increase	Outflows-----> Advect	Disch.	Net Exchange	Net Retention
1	Lake Segment 1 (A-3, mo	13370	28	0	0	3548	0	1977	7873
2	Lake Segment 2 (A-2, mic	1750	26	3548	0	2297	0	-1371	4398
3	Lake Segment 3 (A-1, mo	1190	27	2297	0	44	1339	-605	2736
Net		16310	81	0	0	44	1339	0	15008

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Segment Mass Balance Based Upon Predicted Concentrations

Component:		**TOTAL P**		**Segment:**	**1**	**Lake Segment 1 (A-3, most upstream)**	
			Flow	**Flow**	**Load**	**Load**	**Conc**
Trib	**Type**	**Location**	**hm^3/yr**	**%Total**	**kg/yr**	**%Total**	**mg/m^3**
1	1	Sixmile Creek Flowing to La	13.8	69.0%	9660.0	72.1%	700
2	1	Trib 2 Flowing to Lake Segi	5.3	26.5%	3710.0	27.7%	700
PRECIPITATION			0.9	4.5%	27.8	0.2%	31
TRIBUTARY INFLOW			19.1	95.5%	13370.0	99.8%	700
***TOTAL INFLOW			20.0	100.0%	13397.8	100.0%	670
ADVECTIVE OUTFLOW			19.3	96.7%	3547.7	26.5%	184
NET DIFFUSIVE OUTFLOW			0.0	0.0%	1976.8	14.8%	
***TOTAL OUTFLOW			19.3	96.7%	5524.5	41.2%	286
***EVAPORATION			0.7	3.3%	0.0	0.0%	
***RETENTION			0.0	0.0%	7873.3	58.8%	

Hyd. Residence Time = 0.1775 yrs
Overflow Rate = 20.8 m/yr
Mean Depth = 3.7 m

Component:		**TOTAL P**		**Segment:**	**2**	**Lake Segment 2 (A-2, middle)**	
			Flow	**Flow**	**Load**	**Load**	**Conc**
Trib	**Type**	**Location**	**hm^3/yr**	**%Total**	**kg/yr**	**%Total**	**mg/m^3**
3	1	Trib 3 Flowing to Lake Segi	2.5	11.0%	1750.0	26.1%	700
PRECIPITATION			0.8	3.7%	26.2	0.4%	31
TRIBUTARY INFLOW			2.5	11.0%	1750.0	26.1%	700
ADVECTIVE INFLOW			19.3	85.3%	3547.7	53.0%	184
NET DIFFUSIVE INFLOW			0.0	0.0%	1371.5	20.5%	
***TOTAL INFLOW			22.7	100.0%	6695.4	100.0%	295
ADVECTIVE OUTFLOW			22.0	97.2%	2297.1	34.3%	104
***TOTAL OUTFLOW			22.0	97.2%	2297.1	34.3%	104
***EVAPORATION			0.6	2.8%	0.0	0.0%	
***RETENTION			0.0	0.0%	4398.2	65.7%	

Hyd. Residence Time = 0.2697 yrs
Overflow Rate = 25.2 m/yr
Mean Depth = 6.8 m

Component:		**TOTAL P**		**Segment:**	**3**	**Lake Segment 3 (A-1, most downstream)**	
			Flow	**Flow**	**Load**	**Load**	**Conc**
Trib	**Type**	**Location**	**hm^3/yr**	**%Total**	**kg/yr**	**%Total**	**mg/m^3**
4	4	Lake Outflow	23.2	94.3%	1339.2	32.5%	58
5	1	Overland Flow into Lake Se	1.7	6.9%	1190.0	28.9%	700
PRECIPITATION			0.9	3.5%	26.8	0.7%	31
TRIBUTARY INFLOW			1.7	6.9%	1190.0	28.9%	700
ADVECTIVE INFLOW			22.0	89.6%	2297.1	55.8%	104
NET DIFFUSIVE INFLOW			0.0	0.0%	605.3	14.7%	
***TOTAL INFLOW			24.6	100.0%	4119.3	100.0%	167
GAUGED OUTFLOW			23.2	94.3%	1339.2	32.5%	58
ADVECTIVE OUTFLOW			0.8	3.1%	43.7	1.1%	58
***TOTAL OUTFLOW			24.0	97.4%	1382.9	33.6%	58
***EVAPORATION			0.6	2.6%	0.0	0.0%	
***RETENTION			0.0	0.0%	2736.4	66.4%	

Hyd. Residence Time = 0.5032 yrs
Overflow Rate = 26.8 m/yr
Mean Depth = 13.5 m

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Overall Water & Nutrient Balances

Overall Water Balance — **Averaging Period = 1.00 years**

Trb	Type	Seg	Name	Area km^2	Flow hm^3/yr	Variance (hm3/yr)^2	CV -	Runoff m/yr
1	1	1	Sixmile Creek Flowing to La	63.0	13.8	0.00E+00	0.00	0.22
2	1	1	Trib 2 Flowing to Lake Segn	24.0	5.3	0.00E+00	0.00	0.22
3	1	2	Trib 3 Flowing to Lake Segn	11.5	2.5	0.00E+00	0.00	0.22
4	4	3	Lake Outflow		23.2	0.00E+00	0.00	
5	1	3	Overland Flow into Lake Se	7.7	1.7	0.00E+00	0.00	0.22
PRECIPITATION				2.7	2.6	0.00E+00	0.00	0.97
TRIBUTARY INFLOW				106.2	23.3	0.00E+00	0.00	0.22
***TOTAL INFLOW				108.9	25.9	0.00E+00	0.00	0.24
GAUGED OUTFLOW					23.2	0.00E+00	0.00	
ADVECTIVE OUTFLOW				108.9	0.8	0.00E+00	0.00	0.01
***TOTAL OUTFLOW				108.9	24.0	0.00E+00	0.00	0.22
***EVAPORATION					1.9	0.00E+00	0.00	

Overall Mass Balance Based Upon — **Predicted** — **Outflow & Reservoir Concentrations**
Component: — **TOTAL P**

Trb	Type	Seg	Name	Load kg/yr	%Total	Load Variance (kg/yr)^2	%Total	CV	Conc mg/m^3	Export kg/km^2/yr
1	1	1	Sixmile Creek Flowing to La	9660.0	58.9%	0.00E+00		0.00	700.0	153.3
2	1	1	Trib 2 Flowing to Lake Segn	3710.0	22.6%	0.00E+00		0.00	700.0	154.6
3	1	2	Trib 3 Flowing to Lake Segn	1750.0	10.7%	0.00E+00		0.00	700.0	152.2
4	4	3	Lake Outflow	1339.2		0.00E+00		0.00	57.7	
5	1	3	Overland Flow into Lake Se	1190.0	7.3%	0.00E+00		0.00	700.0	154.5
PRECIPITATION				80.8	0.5%	0.00E+00		0.00	31.1	30.0
TRIBUTARY INFLOW				16310.0	99.5%	0.00E+00		0.00	700.0	153.6
***TOTAL INFLOW				16390.8	100.0%	0.00E+00		0.00	632.8	150.5
GAUGED OUTFLOW				1339.2	8.2%	0.00E+00		0.00	57.7	
ADVECTIVE OUTFLOW				43.7	0.3%	0.00E+00		0.00	57.7	0.4
***TOTAL OUTFLOW				1382.9	8.4%	0.00E+00		0.00	57.7	12.7
***RETENTION				15007.9	91.6%	0.00E+00		0.00		

Overflow Rate (m/yr)	8.9	Nutrient Resid. Time (yrs)	0.1518
Hydraulic Resid. Time (yrs)	0.8945	Turnover Ratio	6.6
Reservoir Conc (mg/m3)	116	Retention Coef.	0.916

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Hydraulic & Dispersion Parameters

Seg	Name	Outflow Seg	Net Inflow hm^3/yr	Resid Time years	Overflow Rate m/yr	Velocity km/yr	Dispersion--------> Estimated km^2/yr	Numeric km^2/yr	Exchange hm^3/yr
1	Lake Segment 1 (A-3, mos	2	19.3	0.1775	20.8	14.2	64.0	17.9	24.9
2	Lake Segment 2 (A-2, mid	3	22.0	0.2697	25.2	8.9	23.5	10.8	13.0
3	Lake Segment 3 (A-1, mos	0	24.0	0.5032	26.8	4.2	8.5	4.4	0.0

Morphometry

Seg	Name	Area km^2	Zmean m	Zmix m	Length km	Volume hm^3	Width km	L/W -
1	Lake Segment 1 (A-3, mos	0.9	3.7	3.7	2.5	3.4	0.4	6.9
2	Lake Segment 2 (A-2, mid	0.9	6.8	6.8	2.4	5.9	0.4	6.6
3	Lake Segment 3 (A-1, mos	0.9	13.5	13.5	2.1	12.1	0.4	4.9
Totals		2.7	8.0			21.4		

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Segment & Tributary Network

--------Segment:	1	Lake Segment 1 (A-3, most upstream)		
Outflow Segment:	2	Lake Segment 2 (A-2, middle)		
Tributary:	1	Sixmile Creek Flowing to Lake Segment 1	Type:	Monitored Inflow
Tributary:	2	Trib 2 Flowing to Lake Segment 1	Type:	Monitored Inflow
--------Segment:	2	Lake Segment 2 (A-2, middle)		
Outflow Segment:	3	Lake Segment 3 (A-1, most downstream)		
Tributary:	3	Trib 3 Flowing to Lake Segment 2	Type:	Monitored Inflow
--------Segment:	3	Lake Segment 3 (A-1, most downstream)		
Outflow Segment:	0	Out of Reservoir		
Tributary:	4	Lake Outflow	Type:	Reservoir Outflow
Tributary:	5	Overland Flow into Lake Segment 3	Type:	Monitored Inflow

IEPA Evergreen Lake Phosphorus TMDL Phase 3
File: C:\BATHTUB\Evergreen.btb
Description:

Per Stage 1 Final Report:
Average annual precipitation = 38 inches = 0.9652 m
Average annual evaporation = 28.4 inches = 0.72136 m

Global Variables	Mean	CV
Averaging Period (yrs)	1	0.0
Precipitation (m)	0.9652	0.0
Evaporation (m)	0.72136	0.0
Storage Increase (m)	0	0.0

Atmos. Loads (kg/km^2-yr)	Mean	CV
Conserv. Substance	0	0.00
Total P	30	0.50
Total N	1000	0.50
Ortho P	15	0.50
Inorganic N	500	0.50

Model Options	Code	Description
Conservative Substance	0	NOT COMPUTED
Phosphorus Balance	1	2ND ORDER, AVAIL P
Nitrogen Balance	0	NOT COMPUTED
Chlorophyll-a	0	NOT COMPUTED
Secchi Depth	0	NOT COMPUTED
Dispersion	1	FISCHER-NUMERIC
Phosphorus Calibration	0	NONE
Nitrogen Calibration	0	NONE
Error Analysis	0	NOT COMPUTED
Availability Factors	0	IGNORE
Mass-Balance Tables	1	USE ESTIMATED CONCS
Output Destination	2	EXCEL WORKSHEET

Segment Morphometry

		Outflow		Area	Depth	Length	Mixed Depth (m)		Hypol Depth		Non-Algal Turb (m^{-1})		Internal Loads (mg/m2-day) Conserv.		Total P		Total N	
Seg	Name	Segment	Group	km^2	m	km	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Lake Segment 1 (A-3, most up	2	1	0.927	3.7	2.52	3.7	0	0	0	0	0	0	0	0	0	0	0
2	Lake Segment 2 (A-2, middle)	3	1	0.874	6.8	2.41	6.8	0	0	0	0	0	0	0	0	0	0	0
3	Lake Segment 3 (A-1, most do	0	1	0.893	13.5	2.1	13.5	0	0	0	0	0	0	0	0	0	0	0

Segment Observed Water Quality

	Conserv		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	0	0	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Segment Calibration Factors

	Dispersion Rate		Total P (ppb)		Total N (ppb)		Chl-a (ppb)		Secchi (m)		Organic N (ppb)		TP - Ortho P (ppb)		HOD (ppb/day)		MOD (ppb/day)	
Seg	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
2	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
3	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

Tributary Data

				Dr Area	Flow (hm^3/yr)		Conserv.		Total P (ppb)		Total N (ppb)		Ortho P (ppb)		Inorganic N (ppb)	
Trib	Trib Name	Segment	Type	km^2	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV	Mean	CV
1	Sixmile Creek Flowing to Lake	1	1	63	13.8	0	0	0	700	0	0	0	0	0	0	0
2	Trib 2 Flowing to Lake Segme	1	1	24	5.3	0	0	0	700	0	0	0	0	0	0	0
3	Trib 3 Flowing to Lake Segme	2	1	11.5	2.5	0	0	0	700	0	0	0	0	0	0	0
4	Lake Outflow	3	4	0	23.2	0	0	0	0	0	0	0	0	0	0	0
5	Overland Flow into Lake Segn	3	1	7.7	1.7	0	0	0	700	0	0	0	0	0	0	0

Model Coefficients	Mean	CV
Dispersion Rate	1.000	0.70
Total Phosphorus	1.000	0.45
Total Nitrogen	1.000	0.55
Chl-a Model	1.000	0.26
Secchi Model	1.000	0.10
Organic N Model	1.000	0.12
TP-OP Model	1.000	0.15
HODv Model	1.000	0.15
MODv Model	1.000	0.22
Secchi/Chla Slope (m^2/mg)	0.025	0.00
Minimum Qs (m/yr)	0.100	0.00
Chl-a Flushing Term	1.000	0.00
Chl-a Temporal CV	0.620	0
Avail. Factor - Total P	0.330	0
Avail. Factor - Ortho P	1.930	0
Avail. Factor - Total N	0.590	0
Avail. Factor - Inorganic N	0.790	0

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Appendix C
Responsiveness Summary

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Responsiveness Summary

This responsiveness summary responds to substantive questions and comments received during the public comment period from July 29, 2005 through August 26, 2005 postmarked, including those from the August 10, 2005 public meeting discussed below.

What is a TMDL?

A Total Maximum Daily Load (TMDL) is the sum of the allowable amount of a pollutant that a water body can receive from all contributing sources and still meet water quality standards or designated uses. The Evergreen Lake TMDL report contains a plan detailing the actions necessary to reduce pollutant loads to the impaired water bodies and ensure compliance with applicable water quality standards. The Illinois EPA implements the TMDL program in accordance with Section 303(d) of the federal Clean Water Act and regulations thereunder.

Background

The watershed targeted for TMDL development is Evergreen Lake (SDA), which originates in McLean County. The watershed encompasses an area of approximately 40 square miles. Land use in the watershed is predominately agriculture. Evergreen Lake consists of 900 acres and is used as a backup drinking water source for the city of Bloomington. The water body is listed on the Illinois EPA 2004 Section 303(d) List as being impaired for total phosphorus and total suspended solids. The Clean Water Act and USEPA regulations require that states develop TMDLs for waters on the Section 303(d) List. Illinois EPA is currently developing TMDLs for pollutants that have numeric water quality standards. Therefore, a TMDL was only developed for total phosphorus. The Illinois EPA contracted with Camp Dresser & McKee (CDM) to prepare a TMDL report for the Evergreen Lake watershed.

Public Meetings

Public meetings were held in the village of Hudson on March 10, 2005, and August 10, 2005. The Illinois EPA provided public notice for both meetings by placing display ads in the Bloomington Pantagraph and the Woodford County Journal. This notice gave the date, time, location, and purpose of the meeting. The notice also provided references to obtain additional information about this specific site, the TMDL Program and other related issues. Approximately 62 individuals and organizations were also sent the public notice by first class mail. The draft TMDL Report was available for review at the Hudson Town Hall and also on the Agency's web page at http://www.epa.state.il.us/water/tmdl .

A public meeting started at 6:30 p.m. on Wednesday, August 10, 2005. It was attended by approximately 10 people and concluded at 8:45 p.m. with the meeting record remaining open until midnight, August 26, 2005.

Questions and Comments

1. How can a watershed group adequately control nonpoint source pollutants when there are no regulatory means to do so? Even with a good implementation plan and money to install the practices, if stakeholders don't adopt the practices, the watershed will not improve.

   Response: Communication and education is key in getting stakeholder and landowner participation to adopt Best Management Practices (BMPs) recommended in the watershed implementation plan. This can be accomplished through mailings, public meetings, or media coverage. We plant to continue this process in the implementation plan of this TMDL, and take advantage of existing watershed planning efforts.

2. Was it appropriate to use pan evaporation data from another lake and apply it to Lake Evergreen?

   Response: Yes, pan evaporation is a standard method for calculating evaporation. The nearest pan evaporation site to the Evergreen Lake watershed was utilized as there was not site-specific data for Evergreen Lake. To estimate actual evaporation, a reduction factor is typically applied to the pan evaporation measurements.

3. How appropriate was it to apply the flow gage data on Panther Creek at El Paso to this watershed?

   Response: Using the drainage area ratio method for estimating flow is an accepted practice in watersheds that do not have flow gage data available. The gage used had a long period of record and an average annual flow was calculated based on gage data. Using this annual measure of flow is appropriate for the modeling effort for this TMDL.

4. Explain the residence time component of the model and how it was used.

   Response: Residence time is the volume of the reservoir divided by the inflow (volume/time) and the result is typically a period of days that it takes for the reservoir to displace its contents. Residence time in the model is used as a portion of the relationship for determining resulting phosphorus concentrations in the reservoir based on a loading of phosphorus in the lake.

5. It would be helpful if the report could show the percent of the total phosphorus loads that each subwatershed contributes. This could help prioritize areas for the implementation plan.

Response: We agree. The final report will reflect the percentage of the phosphorus load that is generated in each subwatershed.

6. Where does the thermocline occur in this lake?

   Response: The thermocline is approximately 12-18 feet deep without the destratifier on, and approximately 30 feet deep when it is running.

7. Why was the phosphorus calibration component set to “none” in the model?

   Response: Phosphorus levels in the lake were estimated by assuming an amount of internal cycling not, by adjusting calibration factors within the model. The phosphorus calibration component adjusts the settling rate of phosphorus within the reservoir and data were not available to justify increasing or decreasing the settling rate in the reservoir.

8. Why was the application of nutrient availability factor ignored in the model?

   Response: The model was based on total phosphorus to compare to the water quality standard and not available phosphorus, so this option was not used in the model.

9. What is the conservative substance balance component of the model?

   Response: Conservative substances do not have any chemical formation or losses within the system. They aren't affected by chemical or biological reactions. Therefore these substances obey mass conservation: what goes in equals what comes out. Examples of conservative substances are total dissolved solids, total organic carbon, arsenic, manganese, and chloride. Conservative substances (typically chloride) can be modeled to verify water budgets and calibrate longitudinal dispersion rates. Phosphorus experiences decay within the system, and therefore, is a non-conservative substance. A TMDL was not being developed for any conservative substances, so this option was not used.

10. How was the atmospheric deposition of phosphorus used in the model? Assuming the rate used in the report, when this number is multiplied by the watershed area, the load is nearly 25,000 lb/yr.

    Response: The model only applies this rate to the lake area. It assumes that this is the rate generated from the surrounding land area from land use activities. Because there was no watershed model constructed, atmospheric deposition on watershed area was not calculated.

11. Does IEPA have a program that will track the effectiveness of BMPs as they are installed in TMDL watersheds? Otherwise, how do you know if the water quality is improving and the practices are having any effect?

    Response: IEPA currently does not have a program in place that specifically tracks water quality improvements after BMP implementation. However, the Agency continues to obtain water quality data through the Ambient Water Quality Monitoring Network, Intensive Basin Survey, and Facility Related Stream Survey programs. These are the same programs through which water quality data were obtained to identify water quality impairment and develop TMDLs. Every two years, all water bodies in the state are reassessed using the most recent data obtained through these programs. Over time, these data can be used to gauge water quality improvement after BMPs are implemented. Additional water quality monitoring could be part of the implementation plan, in which a local group partners with the agency to conduct water quality monitoring in the watershed.

12. What entity has the authority to identify failing septic systems?

    Response: The McLean County Health Department's Environmental Health Services regulates methods of disposing sewage from facilities and homes that are not served by public sewer systems. The Private Sewage Disposal Program activities include issuing private sewage disposal permits, approving plans for new sewage disposal installations, inspecting private sewage disposal systems, investigating sewage complaints, and testing and licensing installers.