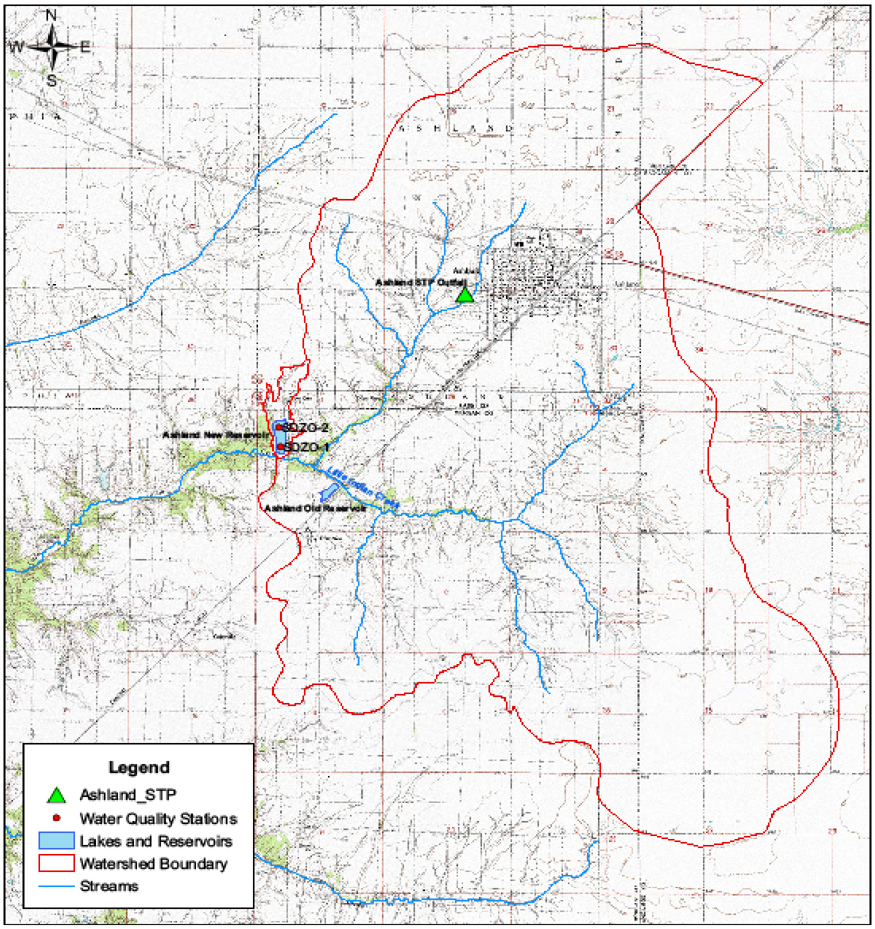
Illinois
Environmental
Protection Agency

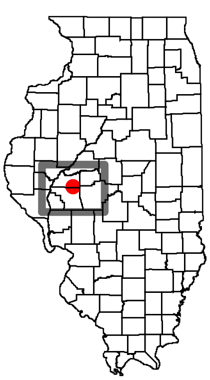
Bureau of Water
P.O. Box 19276
Springfield, IL 62794-9276

November 2009

IEPA/BOW/09-004

ASHLAND NEW RESERVOIR WATERSHED TMDL REPORT





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Illinois Environmental Protection Agency

Ashland New Reservoir Watershed TMDL Final Report

November 2009

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

NOV - 5 2009

REPLY TO THE ATTENTION OF:

WW-16J

Marcia Willhite, Chief
Bureau of Water
Illinois Environmental Protection Agency
P.O. Box 19276
Springfield, Illinois 62794-9276

RECEIVED
NOV 12 2009
Watershed Management Section
BUREAU OF WATER

Dear Ms. Willhite:

The U. S. Environmental Protection Agency has conducted a complete review of the final Total Maximum Daily Load (TMDL), including supporting documentation and follow up information for the Ashland New Reservoir Watershed. The reservoir is located in west-central Illinois, in Cass and Morgan Counties. The TMDL addresses the Public and Food Processing Water Supply Use impairment due to excessive manganese.

The TMDL meets the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. Therefore, EPA hereby approves Illinois' TMDL for manganese for the Ashland New Reservoir Watershed. The statutory and regulatory requirements, and EPA's review of Illinois' compliance with each requirement, are described in the enclosed decision document.

We wish to acknowledge Illinois' effort in submitting this TMDL and look forward to future TMDL submissions by the State of Illinois. If you have any questions, please contact Mr. Thomas Davenport, Acting Chief of the Watersheds and Wetlands Branch, at 312-886-0209.

Sincerely,

Tinka G. Hyde
Director, Water Division

Enclosure

cc: Amy Walkenbach, IEPA
Trevor Sample, IEPA

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Contents

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Section 1
Goals and Objectives for Ashland New Reservoir Watershed

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 develops a list known as the “303(d) list” of water bodies not meeting water quality standards every two years, and it is included in the Integrated Water Quality Report (Integrated Report). Water bodies on the 303(d) list are then targeted for TMDL development. The Illinois EPA’s most recent Integrated Report was issued in March 2008 and was partially approved by USEPA. In accordance with USEPA’s guidance, the report assigns all waters of the state to one of five categories. 303(d) listed water bodies make up category five in the Integrated Report (Appendix A of the 2008 Integrated Report).

In general, a TMDL is a quantitative assessment of water quality impairments, contributing sources, and pollutant reductions needed to attain water quality standards. The TMDL specifies the amount of pollutant or other stressor that needs to be reduced to meet water quality standards, allocates pollutant 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. In Illinois, water quality standards are adopted by the Illinois Pollution Control Board. 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 primary contact (swimming), protection of aquatic life, and public and food processing water supply. 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.

1.2 TMDL Goals and Objectives for Ashland New Reservoir 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

This report includes Stages 1 and 3 of TMDL development for the Ashland New Reservoir watershed. Stage 2 is optional and data collection was not necessary as additional data were not required to establish the TMDL.

This document contains the TMDL goals and objectives for the Ashland New Reservoir watershed, describes all of the necessary elements of the TMDL, includes an implementation plan for the TMDL, and contains information on the public process employed during TMDL development. Following is the impaired water body segment in the Ashland New Reservoir watershed for which a TMDL was developed:

- Ashland New Reservoir (SDZO)

This impaired water body segment is shown on Figure 1-1. Table 1-1 lists the water body segment, water body size, impaired water body use, the potential cause and sources of impairment for the water body.

Table 1-1 Impaired Water Bodies in Ashland New Reservoir Watershed

Water Body Segment ID	Water Body Name	Size	Impaired Use	Cause of Impairment	Potential Sources
SDZO	Ashland New Reservoir	13.5 acres	Public Water Supply	Manganese	Sources Unknown

The remaining sections of this report will focus on the impairment and TMDL for the Ashland New Reservoir.

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 also takes 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 is described in the implementation plan. The implementation plan for the Ashland New Reservoir watershed describes how water quality standards will be attained. The implementation plan includes recommendations for implementing best management practices (BMPs), cost estimates, institutional needs to implement BMPs and controls throughout the watershed, and a timeframe for completion of implementation activities.

1.3 Report Overview

The remaining sections of this report contain:

- **Section 2 Ashland New Reservoir Watershed Characteristics** provides a description of the watershed’s location, topography, geology, land use, soils, population, and hydrology.

- **Section 3 Public Participation and Involvement** discusses public participation activities that occurred throughout TMDL development.

- **Section 4 Ashland New Reservoir Watershed Water Quality Standards** defines the water quality standards for the impaired water body.

- **Section 5 Ashland New Reservoir Watershed Characterization** presents the available water quality data needed to develop TMDLs, discusses the characteristics of the impaired reservoir in the watershed, and also describes the point and non-point sources with potential to contribute to the watershed load.

- **Section 6 Approach to Developing TMDL and Identification of Data Needs** makes recommendations for the models and analysis needed for TMDL development and also evaluates the need for Stage 2 data collection.

- **Section 7 Model Development for the Ashland New Reservoir Watershed** provides an explanation of modeling tools used to develop the TMDL for the impaired segment and potential cause of impairment within the watershed.

- **Section 8 Total Maximum Daily Load for Manganese in Ashland New Reservoir** discusses the calculated allowable loading to Ashland New Reservoir in order to meet water quality standard and the reductions in existing loadings needed to meet the determined allowable loads.

- **Section 9 Implementation Plan** includes recommendations for implementing BMPs and continued monitoring throughout the watershed
- **Section 10 References**

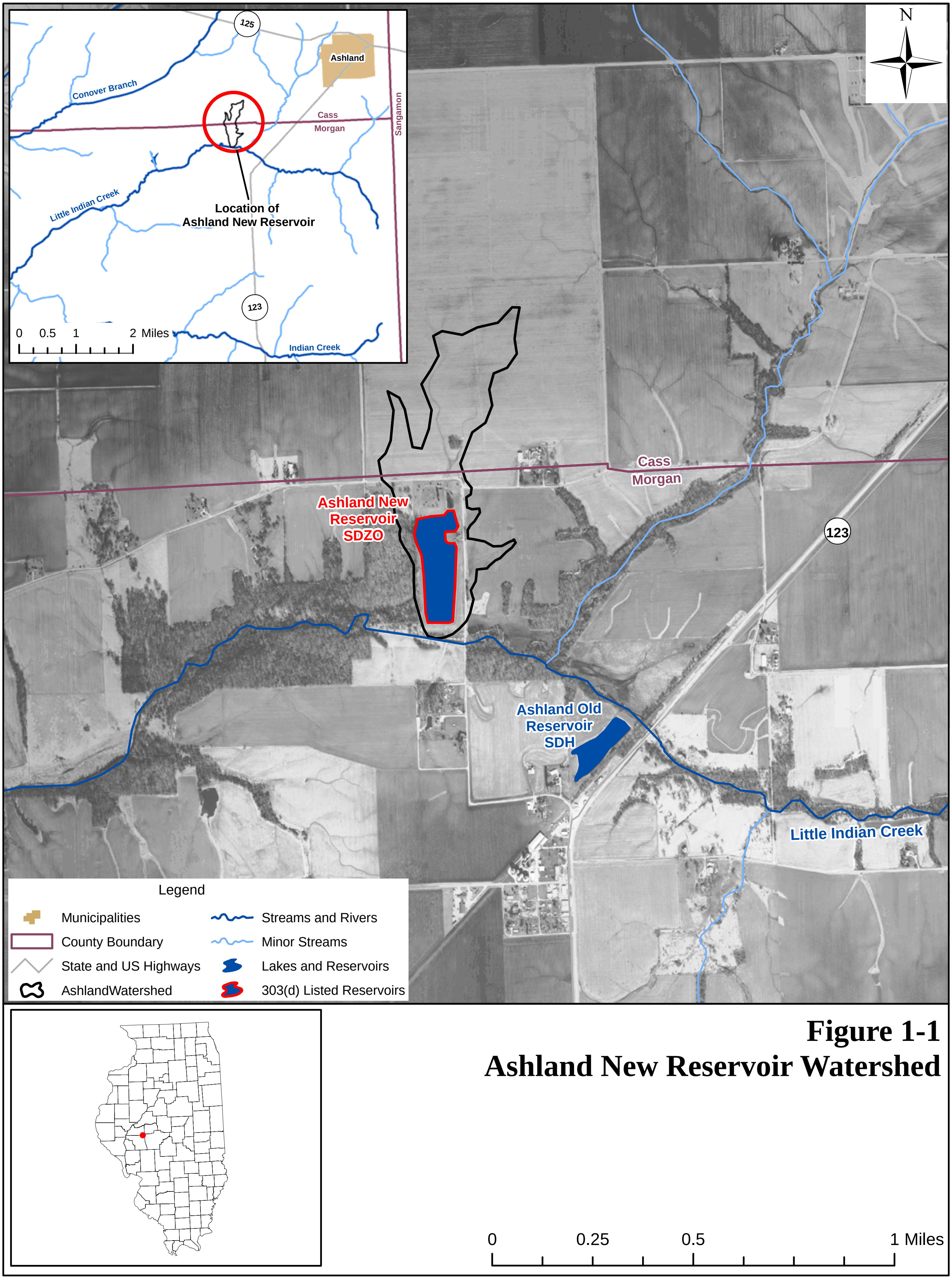

Figure 1-1
Ashland New Reservoir Watershed

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Section 2
Ashland New Reservoir Watershed Description

2.1 Ashland New Reservoir Watershed Location

The Ashland New Reservoir watershed (Figure 1-1) is located in central Illinois and drains approximately 87 acres within the state of Illinois. The watershed is located in eastern Cass and Morgan Counties.

2.2 Topography

Topography is an important factor in watershed management because stream types, precipitation, and soil types can vary dramatically by elevation. National Elevation Dataset (NED) coverages containing 30-meter grid resolution elevation data are available from the U.S. Geological Survey (USGS) for each 1:24,000-topographic quadrangle in the United States. Elevation data for the Ashland New Reservoir Watershed were obtained by overlaying the NED grid onto the GIS-delineated watershed. Figure 2-1 shows the elevations found within the watersheds.

Elevation in the watershed ranges from 630 feet above sea level at the northern end of the Ashland New Reservoir watershed and to 584 feet at Little Indian Creek, the downstream point of the watershed.

2.3 Land Use

Land use data for the Ashland New Reservoir watershed were extracted from the Illinois Gap Analysis Project (IL-GAP) Land Cover data layer. IL-GAP was started at the Illinois Natural History Survey (INHS) in 1996, and the land cover layer was the first component of the project. The IL-GAP Land Cover data layer is a product of the Illinois Interagency Landscape Classification Project (IILCP), an initiative to produce statewide land cover information on a recurring basis cooperatively managed by the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS), the Illinois Department of Agriculture (IDA), and the Illinois Department of Natural Resources (IDNR). The land cover data was generated using 30-meter grid resolution satellite imagery taken during 1999 and 2000. The IL-GAP Land Cover data layer contains 23 land cover categories, including detailed classification in the vegetated areas of Illinois. Appendix A contains a complete listing of land cover categories. (Source: IDNR, INHS, IDA, USDA NASS's 1:100,000 Scale Land Cover of Illinois 1999-2000, Raster Digital Data, Version 2.0, September 2003.)

The land use of the Ashland New Reservoir watershed was determined by overlaying the IL-GAP Land Cover data layer onto the GIS-delineated watershed. Table 2-1 contains the land uses contributing to the Ashland New Reservoir watershed, based on the IL-GAP land cover categories and also includes the area of each land cover category and percentage of the watershed area. Figure 2-2 illustrates the land uses of the watershed.

In the Ashland New Reservoir watershed, approximately 62 acres, representing nearly 71 percent of the total watershed area, are devoted to agricultural activities. Corn and soybean farming account for 43 percent and 20 percent of the watershed area, respectively and rural grassland accounts for 8 percent of the area. The reservoir itself accounts for 15 percent of the watershed. Upland and floodplain forest account for about 7 and 4 percent of the watershed area, respectively. Other land cover types each represent one percent or less of the watershed area. It should be noted that the area dedicated to corn and soybean production may vary from year to year based on changing crop rotations.

Table 2-1 Land Cover and Land Use in Ashland New Reservoir Watershed

Land Cover Category	Area (Acres)	Percentage
Corn	37.7	43.4
Soybeans	17.6	20.3
Surface Water	12.9	14.9
Rural Grassland	6.7	7.7
Upland Forest	5.8	6.7
Floodplain Forest	3.5	4.1
Shallow Marsh/Wet Meadow	1.1	1.3
Seasonally/Temporarily Flooded	0.9	0.8
Partial Canopy/Savannah Upland	0.7	0.8
Total	**86.9**	**100.0**

2.4 Soils

Soil information for the watershed is available through the Soil Survey Geographic (SSURGO) database. For SSURGO data, field mapping methods using national standards are used to construct the soil maps. Mapping scales generally range from 1:12,000 to 1:63,360 making SSURGO the most detailed level of soil mapping done by the NRCS.

Attributes of the spatial coverage can be linked to the SSURGO databases, which provide information on various chemical and physical soil characteristics for each map unit and soil series. Of particular interest for TMDL development are the hydrologic soil groups as well as the K-factor of the Universal Soil Loss Equation. The following sections describe and summarize the specified soil characteristics for the Ashland New Reservoir watershed.

2.4.1 Ashland New Reservoir Watershed Soil Characteristics

Three soil types cover a significant percent of the watershed (see Figure 2-3). Sylvan-Bold complex with 10 to 18 percent slope covers 14 percent, Ipava silt loam with 0 to 2 percent slope covers 13 percent, and Sylvan silt loam with 10 to 15 percent slopes covers approximately 9 percent of the watershed. NRCS soil surveys of Cass and Morgan Counties were also reviewed for information regarding the presence of manganese in area soils. Many of the soil series present in the area are described as having "masses of iron and manganese accumulation throughout". Further soil series information is available in Appendix B.

Figure 2-4 shows the hydrologic soils groups found within the Ashland New Reservoir watershed. Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms. Hydrologic soil groups B and B/D are found within the Ashland New Reservoir Watershed with the vast majority of the watershed falling into group B. Group B soils are defined as having "moderately low runoff potential when thoroughly wet." These soils have a moderate rate of water transmission (NRCS, 2007). Soil hydrology can be affected by the presence of tile drainage. Field drains are widely used in Illinois and affect the rate of water transmission by increasing field drainage. Watershed-specific practices and estimates are discussed further in Section 5.

A commonly used soil attribute is the K-factor. The K-factor:

> *Indicates the susceptibility of a soil to sheet and rill erosion by water.* (The K-factor) *is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water (NRCS 2005).*

The distribution of K-factor values in the Ashland New Reservoir Watershed range from 0.28 to 0.43.

2.5 Population

Specific population data associated with the Ashland New Reservoir watershed were available from the Illinois EPA Source Water Assessment Program (SWAP) Fact Sheet dated March 22, 2001. The watershed has no major cities or areas of urban development and lies on the boarder of Cass and Morgan Counties. The nearest municipality is the village of Ashland, Illinois, which has a population of 1,250 people. Ashland is approximately 2.5 miles northeast of the Ashland New Reservoir watershed. Figure 1-1 shows the watershed, village of Ashland, Illinois, and surrounding area.

2.6 Climate, Pan Evaporation, and Streamflow

2.6.1 Climate

Central Illinois has a temperate climate with hot summers and cold, snowy winters. Monthly precipitation data from the Lincoln station in Springfield, Illinois (station id. 8179) in Sangamon County, which is located approximately 20 miles southeast of the Ashland New Reservoir, were extracted from the NCDC database for the years of 1901 through 2006. The data station in Springfield, Illinois was chosen to be representative of precipitation throughout the Ashland New Reservoir watershed.

Table 2-2 contains the average monthly precipitation along with average high and low temperatures for the period of record. The average annual precipitation is approximately 37.9 inches.

Table 2-2 Average Monthly Climate Data in Springfield, Illinois (1901-2006)

Month	Total Precipitation (inches)	Maximum Temperature (degrees F)	Minimum Temperature (degrees F)
January	0.9	33	18
February	0.9	38	22
March	3.9	49	31
April	5.2	63	42
May	3.1	73	52
June	2.7	84	62
July	4.4	87	66
August	3.3	85	64
September	5.8	78	54
October	2.8	67	44
November	2.1	51	33
December	2.8	39	23
Total	**37.9**	**62**	**42**

2.6.2 Pan Evaporation

Through the ISWS website, pan evaporation data are available from nine locations across Illinois (ISWS 2007). The Springfield station was chosen to be representative of pan evaporation conditions for Ashland New Reservoir. The Springfield station is located approximately 20 miles southeast of the Ashland New Reservoir. The station was chosen for its proximity to the 303(d)-listed water body and the completeness of the dataset compared to other stations. The average monthly pan evaporation at the Springfield station for the years 1980 to 1990 yields an average annual pan evaporation of 63.59 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 47.69 inches (ISWS 2007).

2.6.3 Streamflow

Analysis of the Ashland New Reservoir watershed requires an understanding of flow throughout the drainage area. There are no streamflow gages within this watershed; therefore, stage data were estimated using the drainage area ratio method, represented by the following equation.

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

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 05577500 (Spring Creek at Springfield, Illinois) was chosen as an appropriate gage from which to estimate flow into the Ashland New Reservoir. The surrogate gage is located on Spring Creek, and is approximately 19 miles southeast of Ashland New Reservoir and is located just outside of the northwestern portion of Springfield. The contributing watershed is a larger watershed with a larger drainage area. Gage 05577500 captures flow from a drainage area of 107 square miles in rural areas northeast of Springfield. Due to the close proximity and similar land uses, it is assumed that the surrogate gage and contributing area receive comparable precipitation throughout the year to the Ashland New Reservoir watershed. The Ashland New Reservoir watershed is 0.13 square miles.

Data were downloaded through the USGS for the Spring Creek gage for the available period of record (1948-2008) and adjusted to account for point source influence in the watershed upstream of the gaging station. There is one permitted facility upstream of the USGS gage on Spring Creek. The New Berlin Water Treatment Plant (WTP) (ILG640025) is permitted to discharge 0.091 million gallons per day (mgd). This flow was subtracted from the USGS gage flows to account for flows associated with precipitation and overland runoff only. Once these flows were determined, they were multiplied by the area ratio to estimate flows within the Ashland New Reservoir watershed. Using the drainage area ratio method and data from gage 05577500, the average monthly flows into the Ashland New Reservoir were calculated. The average monthly flows into the Ashland New Reservoir range from 0.0 cubic feet per second (cfs) to 0.15 cfs with a mean flow of 0.08 cfs (see Figure 2-4). It is likely that overland runoff to the reservoir occurs only during and following measurable precipitation events.

Site-specific information regarding the operation of the reservoir was gathered from local users. The Village of Ashland pumps from the New Reservoir into the Old Reservoir, then pumps to the water plant. A direct line from the New Reservoir to the water plant also exists but is not used. Additionally, there is an intake in the Little Indian Creek which pumps into the New Reservoir to maintain water levels. Although pumping records are not kept, local officials stated that it is not uncommon to pump 24 hours a day, 7 days a week for three months during the summer to keep the New Reservoir “full” as often as possible.

2.7 Watershed Photographs

The following pictures were taken on October 7, 2008.

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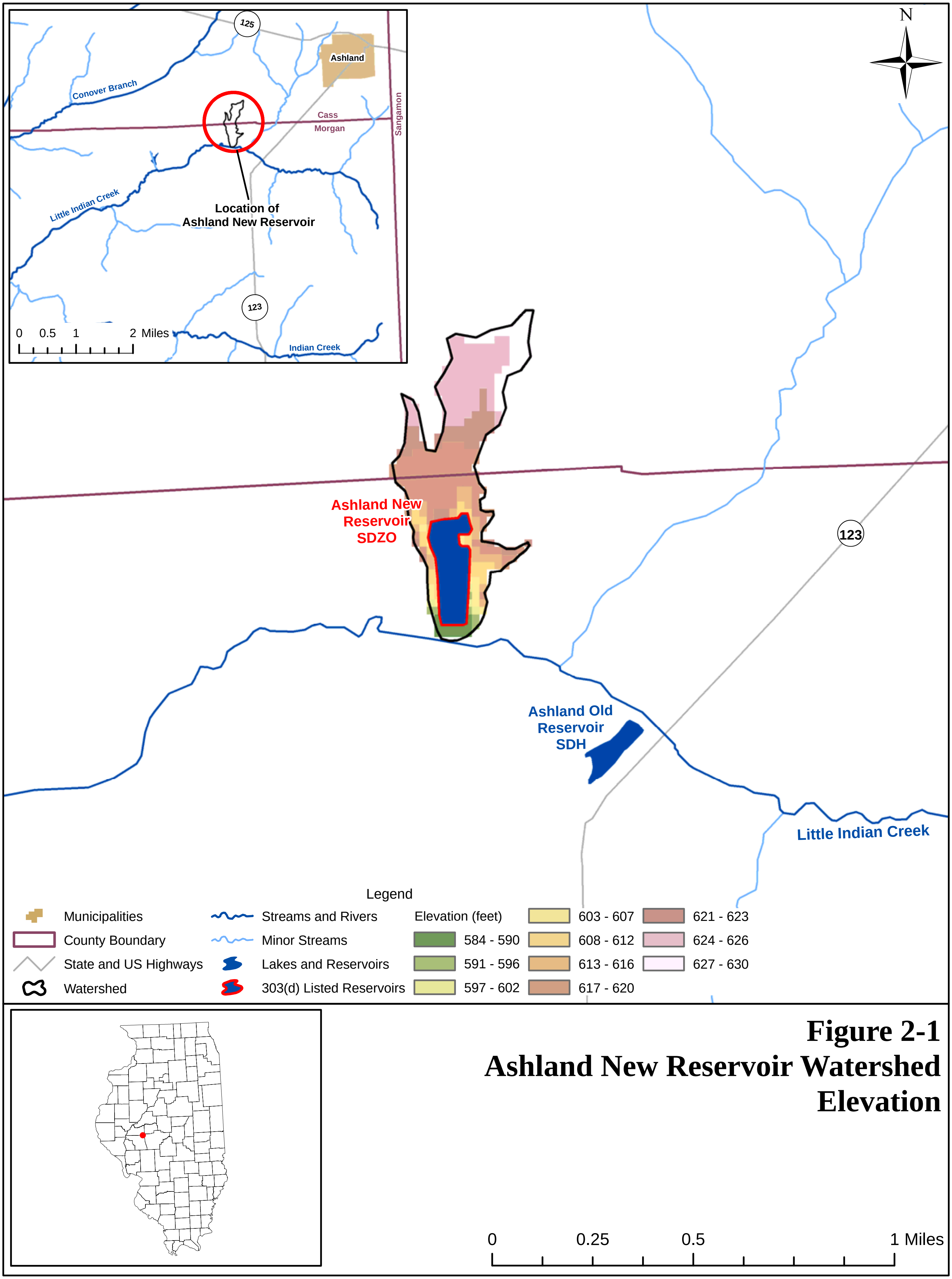

Figure 2-1
Ashland New Reservoir Watershed Elevation

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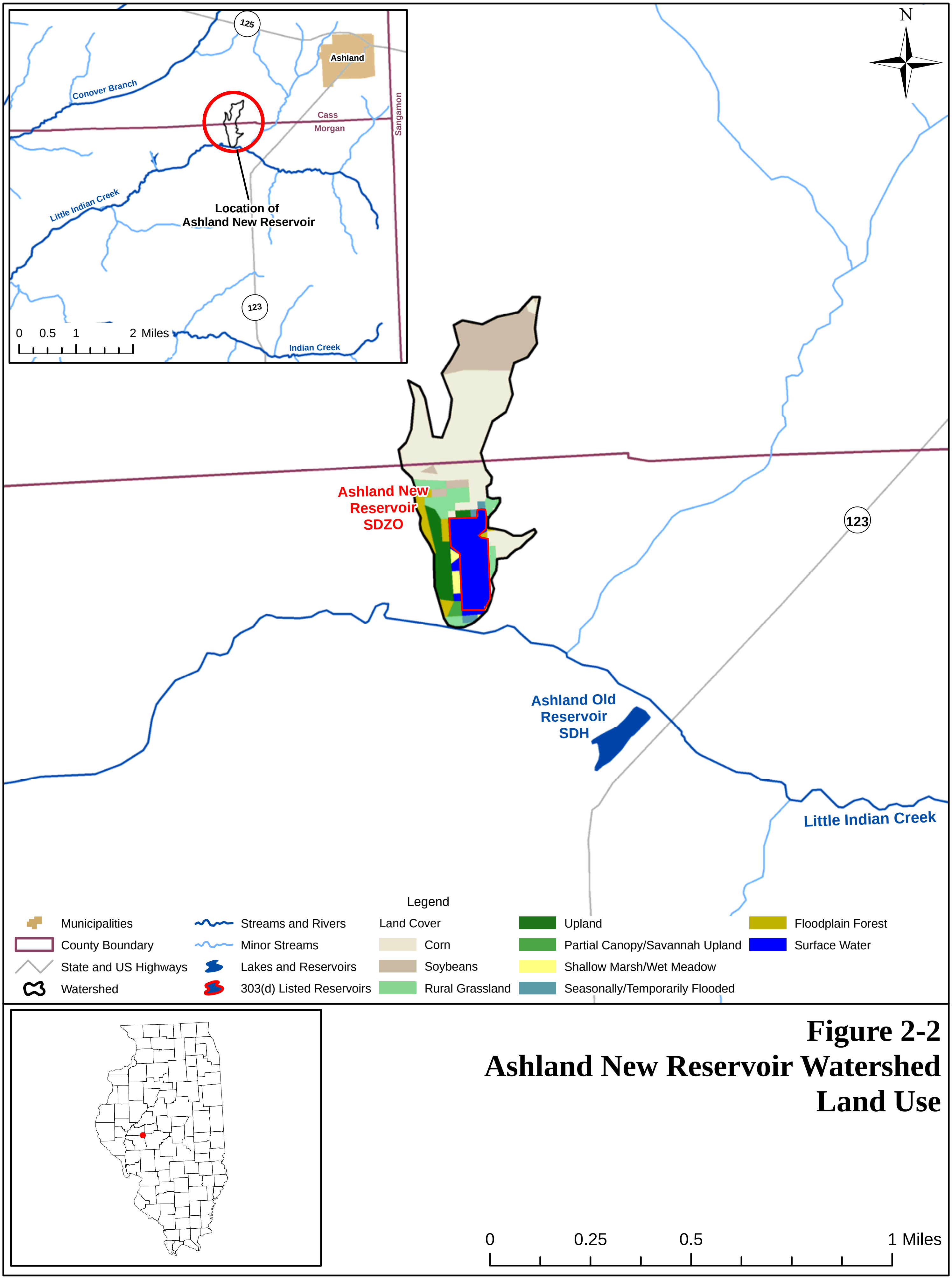

Figure 2-2
Ashland New Reservoir Watershed Land Use

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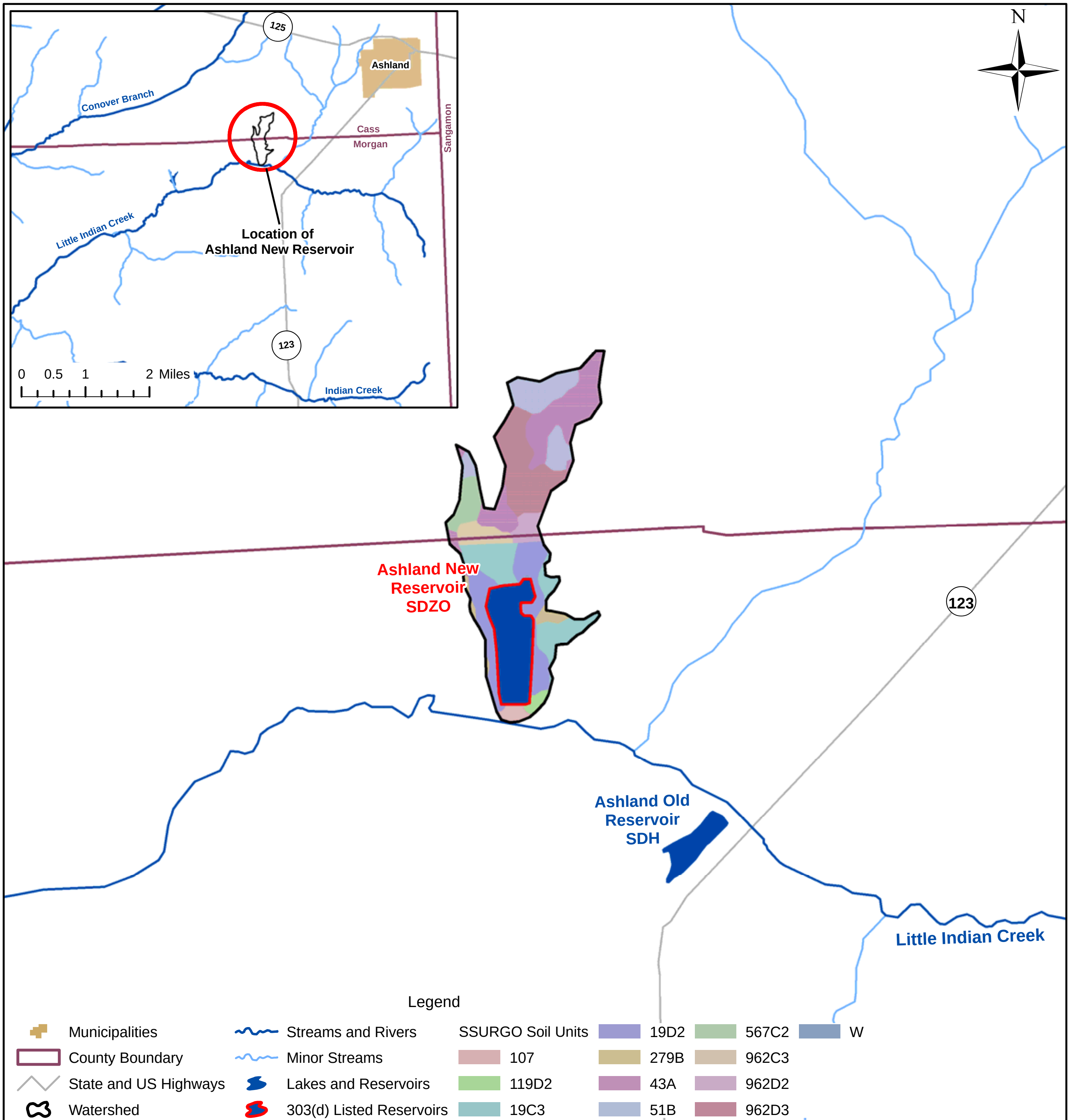

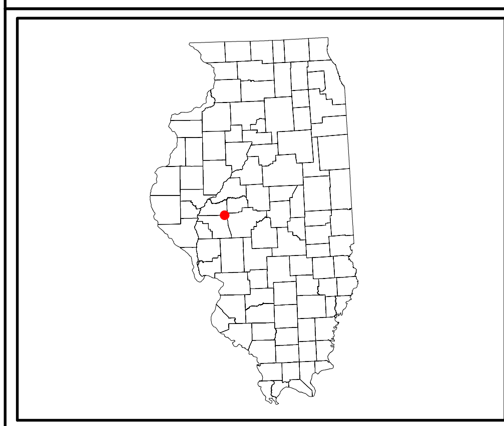

Figure 2-3
Ashland New Reservoir Watershed
Soil Series

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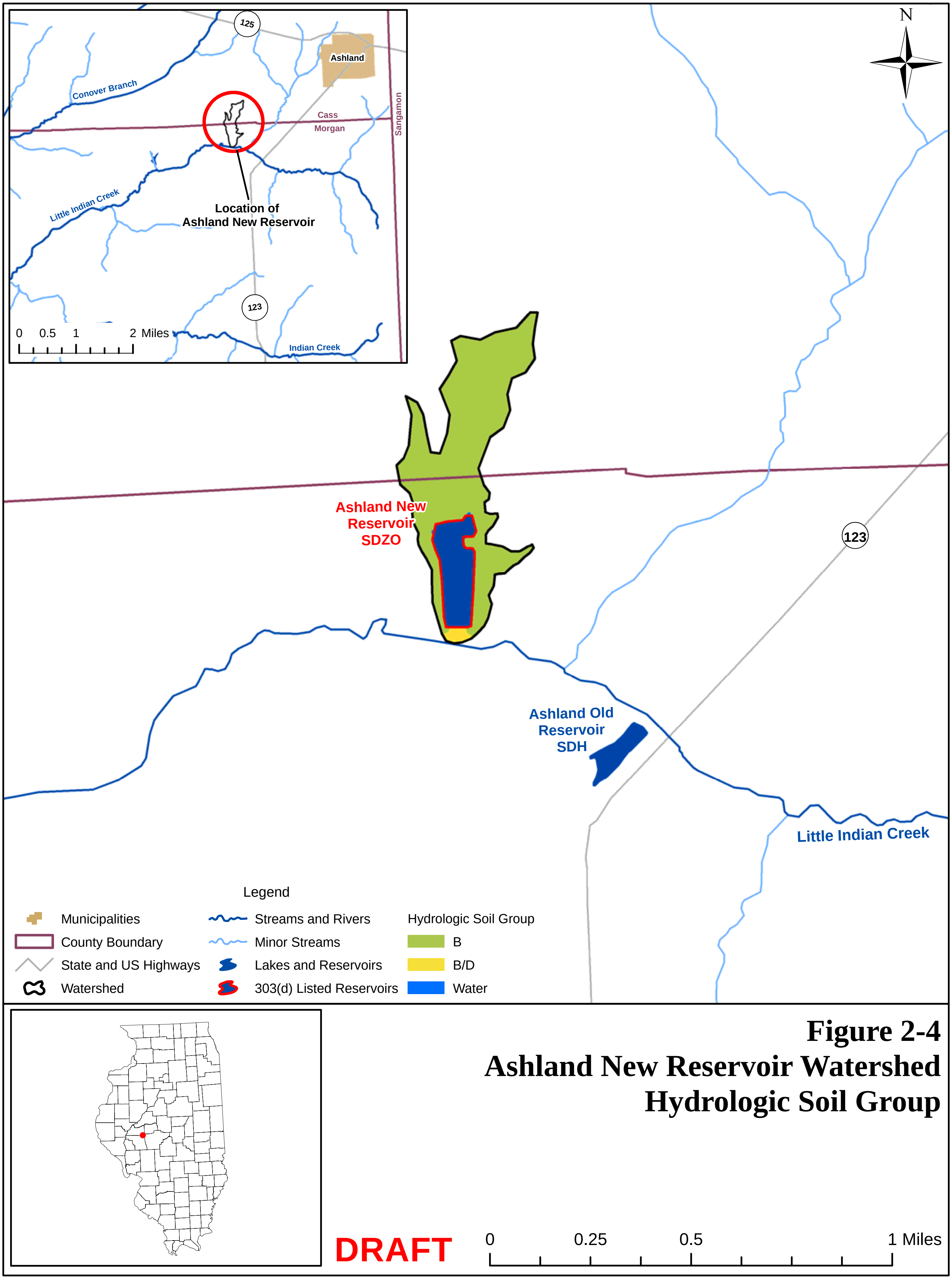

Figure 2-4
Ashland New Reservoir Watershed
Hydrologic Soil Group

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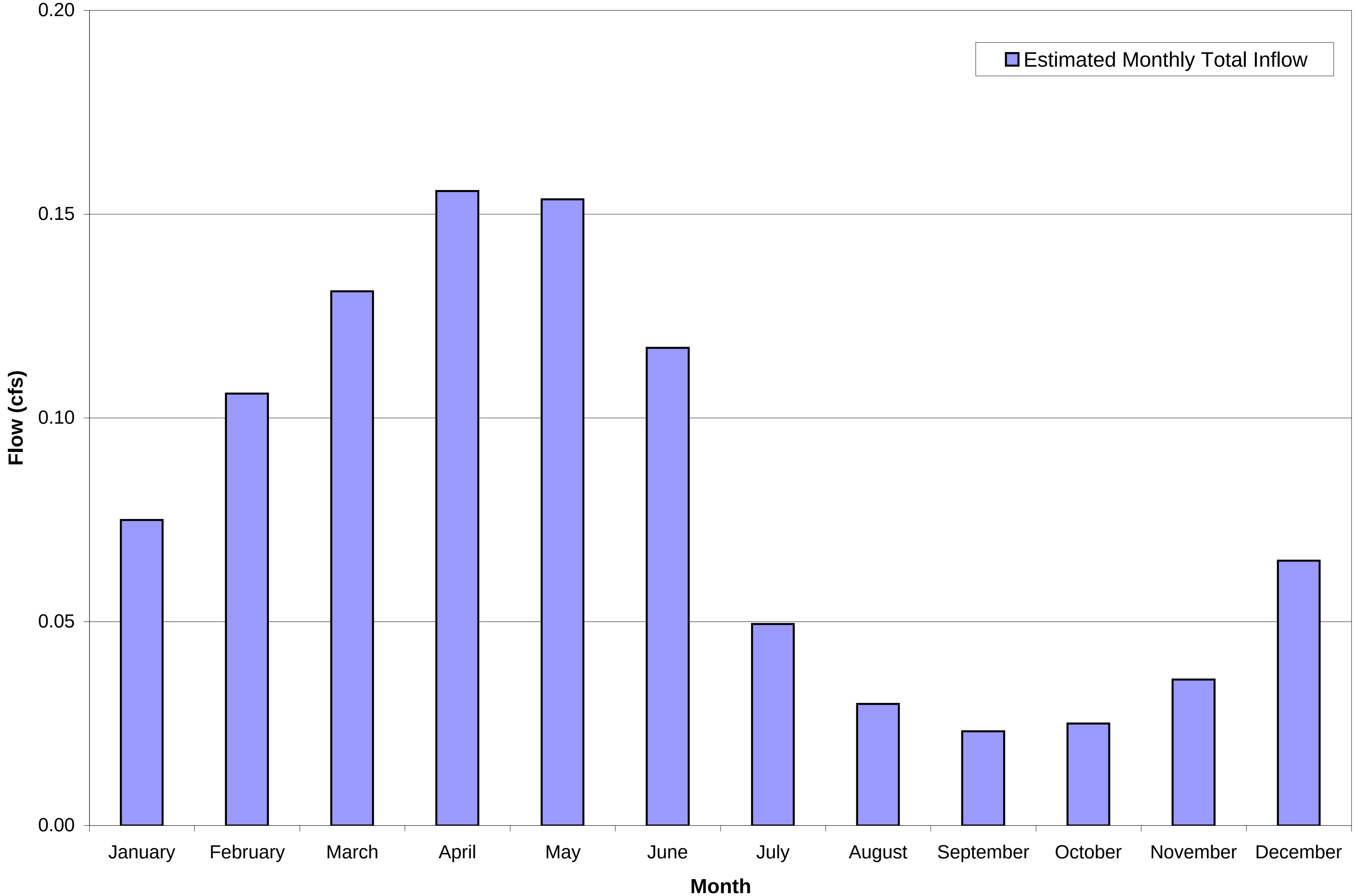

Figure 2-5:
Estimated Total Monthly Inflow
in Ashland New Reservoir

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Section 3
Public Participation and Involvement

3.1 Ashland New Reservoir 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 held two public meetings within the watershed throughout the course of the TMDL development. The Stage 1 public meeting was held on November 12, 2008 at a special Ashland Village board meeting. Thirteen people attended, including Ashland Village trustees, the mayor, and village employees. No comments were received during the public comment period. An additional public meeting was held on August 12, 2009 to present the TMDL allocations and implementation plan. Twelve people attended the meeting including village board members, the village president, and village employees. During this meeting, discussions were held regarding the public water supply use of the reservoir. The Village of Ashland is planning to purchase their drinking water form Cass Rural Water District and North Morgan Water Cooperative. It is estimated that Ashland New Reservoir will be taken offline as a drinking water source by the end of 2011.

Public notices for each meeting are included on the following pages.

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NOTICE OF PUBLIC MEETING

Ashland New Reservoir Watershed

(Cass and Morgan Counties)

The Illinois Environmental Protection Agency (IEPA) Bureau of Water will hold a public meeting on

Wednesday, November 12, 2008 (6:30 pm)

at the

Ashland Village Hall
101 North Yates Street
Ashland, Illinois

The purpose of this meeting is to provide an opportunity for the public to receive information and comment on the draft Total Maximum Daily Load (TMDL) concerning impairments to Ashland New Reservoir watershed. Stakeholders and participants will also be asked for input and ideas to be applied to the TMDL report. An additional public meeting will be held in the future to discuss the next stage of the TMDL.

The potential cause of impairment for Ashland New Reservoir is manganese. This TMDL report includes watershed characterization, data analysis and selection of model to determine the pollutant loading capacity and reductions necessary to meet designated uses and water quality standards.

The IEPA implements the TMDL program in accordance with Section 303(d) of the federal Clean Water Act. A TMDL is the sum of the allowable amounts of a single pollutant (phosphorus, metals, etc.) that a waterbody can receive from all contributing sources and still meet water quality standards or designated uses.

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NOTICE OF PUBLIC MEETING

Ashland New Reservoir Watershed
(Cass and Morgan Counties)

The Illinois Environmental Protection Agency (IEPA) Bureau of Water
will hold a public meeting on

Wednesday, August 12, 2009 (6:30 pm)

at the

Ashland Village Hall
101 North Yates Street
Ashland, Illinois

The purpose of this meeting is to provide an opportunity for the public to comment on the proposed final Total Maximum Daily Load (TMDL) report for Ashland New Reservoir Watershed. This TMDL report includes data analysis, modeling and an implementation plan to determine the pollutant loading capacity and reductions necessary to meet designated uses and water quality standards.

The IEPA implements the TMDL program in accordance with Section 303(d) of the federal Clean Water Act. A TMDL is the sum of the allowable amounts of a single pollutant (phosphorus, metals, etc.) that a waterbody can receive from all contributing sources and still meet water quality standards or designated uses.

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Section 4
Ashland New Reservoir 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 2008). The designated uses applicable to the Ashland New Reservoir watershed are the General Use and Public and Food Processing Water Supplies Use.

4.2.1 General Use

The General Use classification is defined by IPCB as standards that "will protect the state's water for aquatic life, wildlife, agricultural use, secondary contact use and most industrial uses and ensure the aesthetic quality of the state's aquatic environment." Primary contact uses are protected for all General Use waters whose physical configuration permits such use. The 2008 Illinois Integrated Report lists the aquatic life use and aesthetic quality use as fully supported.

4.2.2 Public and Food Processing Water Supplies

The Public and Food Processing Water Supplies Use is defined by IPCB as standards that are "cumulative with the general use standards of Subpart B and must be met in all waters designated in Part 303 at any point at which water is withdrawn for treatment and distribution as a potable supply or for food processing."

4.3 Illinois Water Quality Standards

To make 303(d) listing determinations for public and food processing water supply waters, Illinois EPA compares available data with water quality standards to make impairment determinations. Table 4-1 presents the water quality standards of the cause of impairment for the Ashland New Reservoir watershed.

Table 4-1 Summary of Numeric Water Quality Standards for Potential Causes of Impairments in the Ashland New Reservoir Watershed

Parameter	Units	General Use Water Quality Standard	Regulatory Reference	Public and Food Processing Water Supplies	Regulatory Reference
Manganese (total)	µg/L	1000	302.208(g)	150	302.304

Because Ashland New Reservoir is currently a source of public water, the more stringent water quality standard of 150µg/L will be used for this TMDL analysis. Manganese is considered a "secondary contaminant" by USEPA. The standard is not based on a human health concern but is based on the fact that elevated manganese may cause black staining in laundry. According to Village personnel, there have been no citizen complaints regarding laundry staining in the Village of Ashland. Ashland is only required to report manganese levels in its finished water once a year. Manganese concentrations in finished water since 1999 have ranged from 0 to 4.1 ug/L.

If the reservoir is no longer used as a public water supply in the future (as discussed in Section 3), the more stringent standard of 150 ug/L would no longer apply.

4.4 Potential Pollutant Sources

In order to properly address the conditions within the Ashland New Reservoir watershed, potential pollution sources must be investigated for the pollutants where TMDLs will be developed. At this time, the 303(d) list does not identify potential sources of manganese within the watershed. Further discussion of sources is included in Sections 7, 8, and 9 of this document.

Section 5
Ashland New Reservoir Watershed Characterization

Data were collected and reviewed from many sources in order to further characterize the Ashland New Reservoir watershed. Data have been collected in regards to water quality, reservoir characteristics, and both point and nonpoint sources. This information is presented and discussed in further detail in the remainder of this section.

5.1 Water Quality Data

There are 2 water quality stations located on Ashland New Reservoir. Data collected from both stations were used for this section. Figure 5-1 shows the locations for Illinois EPA water quality data stations.

Ashland New Reservoir is listed as impaired for the public water supply use due to high manganese concentrations. Data are summarized and discussed in relation to the applicable Illinois numeric water quality standard. Data analysis is focused on all available data collected since 1999. The information presented was provided by Illinois EPA in electronic and hard copy. All historic water quality data are available in Appendix C.

5.1.2 Ashland New Reservoir

Ashland New Reservoir is listed for impairment caused by manganese. There are two active stations in Ashland New Reservoir (see Figure 5-1). The applicable water quality standard for manganese is 1,000 µg/L for general use and 150 µg/L for public water supplies. Table 5-1 summarizes available manganese data for Ashland New Reservoir. The table also shows annual average values for reference. As shown, one sample collected on August 8, 2006 was in violation of the public water supply standard. It should be noted that precipitation records show a half-inch precipitation event on the same day.

Table 5-1: Manganese Data for the Ashland New Reservoir Collected at Site SDZO-1

Sample Date	Sample Depth	Sample Result (ug/L)
4/21/1999	Mid-depth	ND
6/3/1999	Mid-depth	51
7/12/1999	Mid-depth	31
8/5/1999	Mid-depth	40
10/21/1999	Mid-depth	37
1999 Average		39.8
4/9/2003	9	50
8/5/2003	9	0.1
7/3/2003	11	0.1
6/2/2003	9	24
2003 Average		18.6
4/17/2006	at PWS Intake	33
7/5/2006	at PWS Intake	39
8/8/2006	at PWS Intake	**530**
8/30/2006	at PWS Intake	120
2006 Average		180.5

In addition to the in-lake water quality data, four sediment samples are available for Ashland New Reservoir. On July 3, 2003, sediment concentrations of manganese were 750 mg/kg at station SDZO-1 and 790 mg/kg at station SDZO-2. On August 15, 2006, sediment concentrations of manganese were 620 mg/kg at station SDZO-1 and 610 mg/kg at station SDZO-3.

5.2 Reservoir Characteristics

Local information revealed that Ashland New Reservoir was constructed in 1977 and has a surface area of 10 acres. The Illinois EPA database lists the Ashland New Reservoir as 13 acres. Table 5-2 contains depth information from both sampling locations on the reservoir. According to the Illinois EPA Source Water Protection Assessment Fact Sheet, drinking water for the village of Ashland, Illinois (Facility No. 0170100) is supplied by the Ashland community water supply (CWS). The Ashland Old and New Reservoirs act as the source of this drinking water. Ashland operates a surface water intake in each lake (IEPA #52035 and #52036) drawing an average of 110,000 gallons per day. An intake (IEPA #52034) is also located on Little Indian Creek. This intake is used to supplement the New Reservoir in times of drought or when the lake level is low (see discussion in Section 2.6.3). Ashland provides water to approximately 600 service connections and a population of approximately 1,300 people.

Table 5-2: Average Depths in Ashland New Reservoir

	Station	
Year	**SDZO-1**	**SDZO-2**
1999	21	12
2003	20	13
2006	16	10
Maximum	21	13
Average	19	12

5.3 Point Sources

There are no point sources located within the direct drainage of Ashland New Reservoir. However, the Village of Ashland Sanitary Treatment Plant (STP) is authorized to discharge effluent to an unnamed tributary of Little Indian Creek. Because water for Little Indian Creek is used to supplement lake levels, the Ashland STP was considered in TMDL development for Ashland New Reservoir. This point source is further discussed in Sections 8 and 9.

5.4 Nonpoint Sources

A number of TMDLs have been completed for manganese throughout Illinois. The sources of manganese identified by these TMDLs were typically natural background sources which include runoff and soil erosion and release from sediments when dissolved oxygen is absent in lake-bottom waters. As discussed in Section 2.4.1, area soil information was reviewed to confirm the presence of manganese in local soil series showing that natural sources are a plausible cause. Additional nonpoint source data were collected through communication with the local NRCS and Soil and Water Conservation District (SWCD) officials.

5.4.1 Crop Information

Although it is a small watershed, the majority of the land found within the Ashland New Reservoir watershed is devoted to crops. Corn and soybean farming account for approximately 43 percent and 20 percent of the watershed respectively. Tillage practices can be categorized as conventional till, reduced till, mulch-till, and no-till.

Certain types of tillage practices influence the amount of soil erosion that occurs from farm fields. 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. The most recent survey available was conducted in 2006. Data specific to the Ashland New Reservoir watershed were not available; however, the Cass and Morgan County practices were available and are shown in the following tables.

Table 5-3 Tillage Practices in Cass County

Tillage System	Corn	Soybean	Small Grain
Conventional	21%	5%	0%
Reduced - Till	11%	9%	10%
Mulch - Till	30%	22%	14%
No - Till	38%	65%	76%

Table 5-4 Tillage Practices in Morgan County

Tillage System	Corn	Soybean	Small Grain
Conventional	60%	27%	0%
Reduced - Till	20%	12%	0%
Mulch - Till	1%	17%	0%
No - Till	19%	44%	100%

According to officials from both Cass and Morgan counties, the area surrounding the New Reservoir is primarily cropland. Estimates on tile drainage were provided by the Cass and Morgan county NRCS offices. It is estimated that for Cass County in the areas surrounding Ashland New Reservoir watershed, 50 percent of the farms are drained by field tiles. In Morgan County, it is estimated that approximately 80 to 90 percent of the farms near the watershed are drained by field tiles. Without more precise local information, soils data may be reviewed for information on hydrologic soil group in order to provide a basis for tile drain estimates. Tile drainage is not considered to be a primary source for manganese deposition to the lake.

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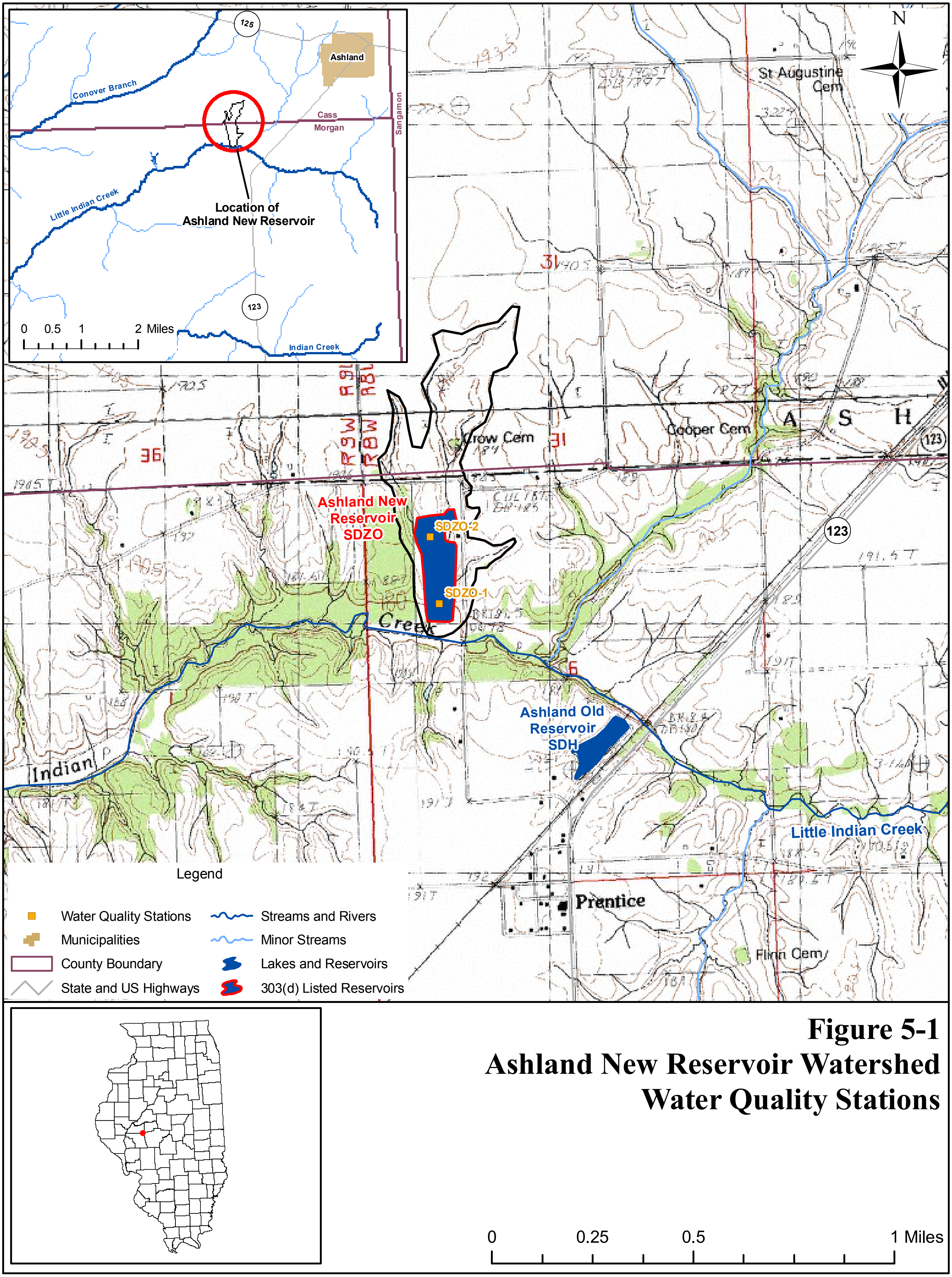

Figure 5-1
Ashland New Reservoir Watershed Water Quality Stations

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Section 6
Approach to Developing TMDL and Identification of Data Needs

The public water supply use in Ashland New Reservoir is currently impaired by manganese. The public water supply water quality standard of 150 µg/L was violated by a single sample collected at site SDZO-1 on August 8, 2006. High manganese is associated with taste and odor issues in finished drinking water. It is also associated with staining in water fixtures and laundry. Recommended technical approaches for developing a TMDL to address this issue are presented in this section. It is assumed that enough data exist to perform a simple analysis to complete a TMDL for this watershed.

6.1 Simple and Detailed Approaches for Developing TMDLs

The range of analyses used for developing TMDLs varies from simple to complex. Examples of a simple approach include mass-balance, load-duration, and simple watershed and receiving water models. Detailed approaches incorporate the use of complex watershed and receiving water models. Simple approaches typically require less data than detailed approaches and therefore these are the analyses recommended for the Ashland New Reservoir. Establishing a link between pollutant loads and resulting water quality is one of the most important steps in developing a TMDL. As discussed above, this link can be established through a variety of techniques. The objective of the remainder of this section is to recommend approaches for establishing these links for the constituents of concern in the Ashland New Reservoir watershed.

6.2 Approaches for Developing TMDL for Ashland New Reservoir

The Ashland New Reservoir is a source of public water. Therefore, the applicable water quality standard for manganese in the lake is 150 µg/L. It is likely that the main source of manganese to the reservoir is through lake-bottom sediments and watershed erosion. The initial step for TMDL development will be to confirm that background manganese levels are elevated in this area and that no other controllable sources exist. It is possible to complete a TMDL using basic spreadsheet analysis of available empirical data. This would be accomplished using simplified mass-balance equations based on watershed and waterbody assumptions along with available empirical data.

It is also possible to investigate nutrient and oxygen levels within the lake and develop a surrogate TMDL for either parameter based on the interrelated nature of high nutrient levels, low dissolved oxygen concentrations, and the release of manganese from lake sediments during periods when there is no dissolved oxygen in lake-bottom waters. The lake is not 303(d) listed for impairments caused by total phosphorus or dissolved oxygen, however, both total phosphorus and dissolved oxygen compliance is assessed at one-foot depth and the total phosphorus standard is not applicable in lakes less than

20 acres in size. Dissolved oxygen and total phosphorus data throughout the water column could be reviewed to determine if concentrations are present above the water quality standards. If concentrations seem to indicate conditions favorable for manganese leaching from bottom sediments, the BATHTUB model could be used to develop a surrogate TMDL for total phosphorus. The BATHTUB model performs steady-state water and nutrient balance calculations in a spatially segmented hydraulic network that accounts for advective and diffusive transport, and nutrient sedimentation. The model relies on empirical relationships to predict lake trophic conditions and subsequent DO conditions as functions of total phosphorus and nitrogen loads, residence time, and mean depth. (USEPA 1997). Oxygen conditions in the model are simulated as meta and hypolimnetic depletion rates, rather than explicit concentrations. Due to the limited availability of watershed data, tributary information will be estimated using runoff coefficients for area land uses coupled with event mean concentration data.

Section 7
Methodology Development for Ashland New Reservoir TMDL

The following subsections summarize the TMDL analysis performed for manganese in Ashland New Reservoir. In addition, Section 9 presents implementation actions that can be adopted within the watershed.

7.1 Methodology Overview

As discussed in Section 2.6.3, the Village of Ashland pumps from the New Reservoir into the Old Reservoir, then pumps to the water plant. A direct line from the New Reservoir to the water plant also exists but is not used. Additionally, there is an intake in Little Indian Creek which pumps into the New Reservoir to maintain water levels. Although pumping records are not kept, local officials stated that it is not uncommon to pump 24 hours a day, 7 days a week for three months during the summer to keep the New Reservoir “full” as often as possible. A customized spreadsheet model was developed to calculate the manganese (Mn) TMDL for Ashland New Reservoir. The model was developed in Excel and includes dynamic (daily) predictions of runoff, pumping, internal sediment releases, lake volume, and lake Mn concentrations. The model assumes a well-mixed lake, often referred to as a continuously stirred tank reactor (CSTR). This assumption is known to be approximately valid for small, shallow lakes such as Ashland New Reservoir.

The model was parameterized using all available data, both measured and narrative. Literature was also used to guide the parameterization. An approximate calibration of the model was achieved using surrogate gage flow data, anecdotal information, and measured lake manganese concentrations.

7.2 Methodology Development

The following sections further discuss and describe the methodologies utilized to examine manganese levels in the Ashland New Reservoir.

7.2.1 Model Construction

A conceptual depiction of the model mechanics is provided in Figure 7-1. The model simulates total manganese on a daily timestep. Particulate and dissolved fractions are estimated based on user-input constant particulate fractions. Simulated external sources of Mn include: wet weather runoff, dry weather baseflow, and supplemental "make-up" water pumped into the lake from Little Indian Creek by the Village of Ashland during summer months. Wet weather runoff is calculated in the model as a function of daily precipitation (measured historical data) and watershed physical characteristics using the Soil Conservation Service (SCS) curve number (CN) approach. Simulated outflows from the reservoir are drinking water pumping by the

Village and evaporation. Internal processes in the model include settling of particulate Mn and internal loading of dissolved Mn from the sediments to the water column.

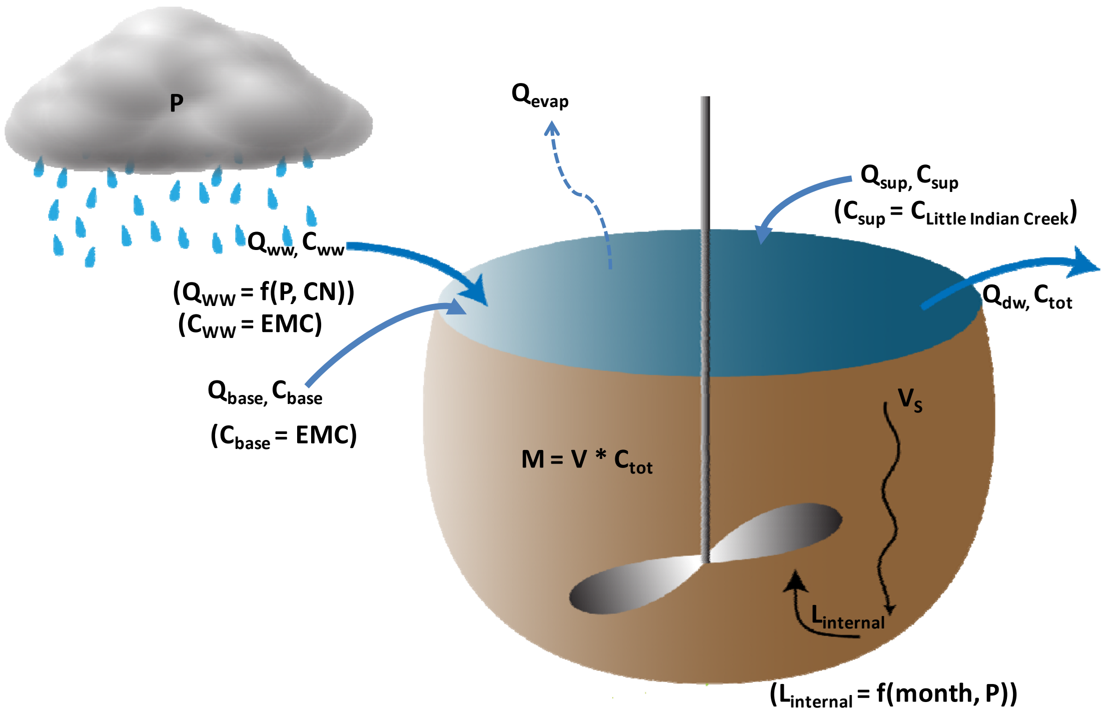

Figure 7-1
Conceptual Model for Ashland New Reservoir

The model water and mass balance equations are:

$$\frac{dV}{dt} = Q_{WW} + Q_{base} + Q_{sup} - Q_{dw} - Q_{evap} \quad (1)$$

$$\frac{dM}{dt} = Q_{ww}EMC + Q_{base}C_{base} + Q_{sup}C_{sup} + L_{internal} - Q_{dw}C_{tot} - v_sC_pA \quad (2)$$

Where:

V	=	lake volume ($\leq V_{cap}$, where V_{cap} = full reservoir capacity)
Q_{WW}	=	wet weather flow (in./day)
	=	$\{(P-I_a)^2 / [(P-I_a) + S)]\} * A_{watershed}$
$A_{watershed}$	=	watershed area
P	=	daily precipitation (in./day)
Ia	=	initial abstraction

	=	$0.2*S$
S	=	potential maximum retention
	=	$1000/CN – 10$
CN	=	SCS curve number for watershed
Q_{base}	=	dry weather baseflow
Q_{sup}	=	supplemental make-up water (pumped from Little Indian Creek)
Q_{dw}	=	drinking water pumping rate
	=	$AnnualQ_{dw} * df_{dw}$
$AnnualQ_{dw}$	=	mean annual drinking water pumping rate
df_{dw}	=	monthly distribution factor
Q_{evap}	=	evaporation losses
	=	$A * E * df_E$
E	=	annual total evaporation
A	=	lake surface area
df_E	=	monthly distribution factor
M	=	total mass of manganese in lake
	=	$V * C_{tot}$
C_{tot}	=	total lake manganese concentration
EMC	=	event mean concentration for manganese
C_{base}	=	mean baseflow manganese concentration
C_{sup}	=	supplemental make-up water manganese concentration
	=	mean Little Indian Creek concentration
$L_{internal}$	=	internal load of Mn released by sediments
	=	$Lavg_{internal} * df_L$
$Lavg_{internal}$	=	mean summer internal load of Mn released by sediments
df_L	=	monthly distribution factor
v_s	=	settling velocity for particulate manganese
C_p	=	concentration of particulate manganese
	=	$f_p * C_{tot}$
f_p	=	manganese particulate fraction.

Coupled equations (1) and (2) are solved for V and C_{tot} for each day in the simulation period.

7.2.2 Model Parameterization

The model was parameterized using the best available data and information for the reservoir and, to a lesser extent, published literature. A summary of model parameterization is provided in Table 7-1.

Table 7-1 Summary of Ashland Reservoir Model Parameterization

Parameter	Description	Value	Units	Source
depth	lake mean depth	4.7	m	measured data (Section 5)
A	lake surface area	58,000	m^2	IEPA (pers. comm.)
V_{cap}	full volume lake capacity	274,000	m^3	V_{cap} = depth * A
$A_{watershed}$	watershed drainage area	352,000	m^2	GIS analysis (Section 2)
P	daily precipitation	variable	in d^{-1}	Springfield (IL) rainfall gage (#3950000894)
CN	SCS Curve Number	71.8	unitless	calculated function of landuse and soil characteristics
Q_{base}	dry weather baseflow rate[1a]	10 – 160	m^3 d^{-1}	hydrologic calibration
Q_{sup}	supplemental make-up water	0 - 1170	m^3 d^{-1}	calculated[1b]
$AnnualQ_{dw}$	mean annual drinking water pumping rate[1a]	416	m^3 d^{-1}	IEPA (Section 5)
E	annual evaporation[1a]	48	inches	ISWS (2007)
EMC	Mn event mean concentration	17	mg m^{-3}	USGS (2002)
C_{base}	baseflow Mn concentration	17	mg m^{-3}	USGS (2002)
C_{sup}	supplemental water Mn concentration	222	μg m^{-3}	Indian Creek measured data (downstream of confluence with Little Indian Creek)
f_p	Mn particulate fraction	0.49	unitless	Indian Creek measured data
v_s	particulate settling velocity	0.5	m d^{-1}	water quality calibration (typical range = 0.1 – 10 m d^{-1}, Chapra 1998)
$Lavg_{internal}$	mean monthly sediment Mn release[1a]	40	mg m^2 d^{-1}	Beutal et al. (2007)
SFEH	sediment flux enhancement factor	15	unitless	water quality calibration[1c]
P_{storm}	minimum cutoff for application of SFEH	0.5	in d^{-1}	water quality calibration[1c]

1a = distributed monthly as described below;
1b = calculated in the model as daily flow required to maintain full lake volume throughout the year'
1c = see explanation below.

User-specified monthly factors were used in the model to seasonally distribute mean annual or mean summer values of Q_{base}, Q_{dw}, E, and $L_{internal}$, as indicated above. These monthly data are summarized in Table 7-2.

Table 7-2 Monthly Distribution of Seasonal Model Parameters

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Q_{base} (m^3 d^{-1}) (Source: hydrologic calibration)											
10	20	80	80	160	80	40	20	10	10	10	10
df_{dw} (m^3 d^{-1}) (Source: typical municipal patterns)											
0.5	0.5	0.5	0.7	1.2	1.6	1.9	1.8	1.4	1	0.5	0.5
df_E (unitless) (Source: pan evaporation data for Springfield (IL) station)											
0	0	0	0.12	0.16	0.18	0.18	0.15	0.12	0.09	0	0
df_L (unitless) (Source: water quality calibration)											
0	0	0	0.6	0.8	1	1.1	1.1	1	0.9	0	0

As indicated in Table 7-1, a number of model parameters were set based on calibration processes. Given the limited measured data available, this model calibration should be viewed as an approximation.

The hydrologic model was calibrated using surrogate gage data obtained for USGS gage 05577500 (Spring Creek at Springfield, IL), adjusted for the New Berlin Water Treatment Plant discharge, as described in Section 2 of this report. Model monthly baseflows were adjusted to achieve an approximate optimal match in predicted vs. surrogate gage daily flows for water years 2005 and 2006 based on visual assessment of plotted data. Water years 2005 and 2006 were selected because the recorded exceedence in Mn concentration was sampling during this time period. Runoff parameters, associated with the SCS CN method, were maintained at independently calculated values (Table 7-1). Hydrologic calibration results are shown in Figure 7-2.

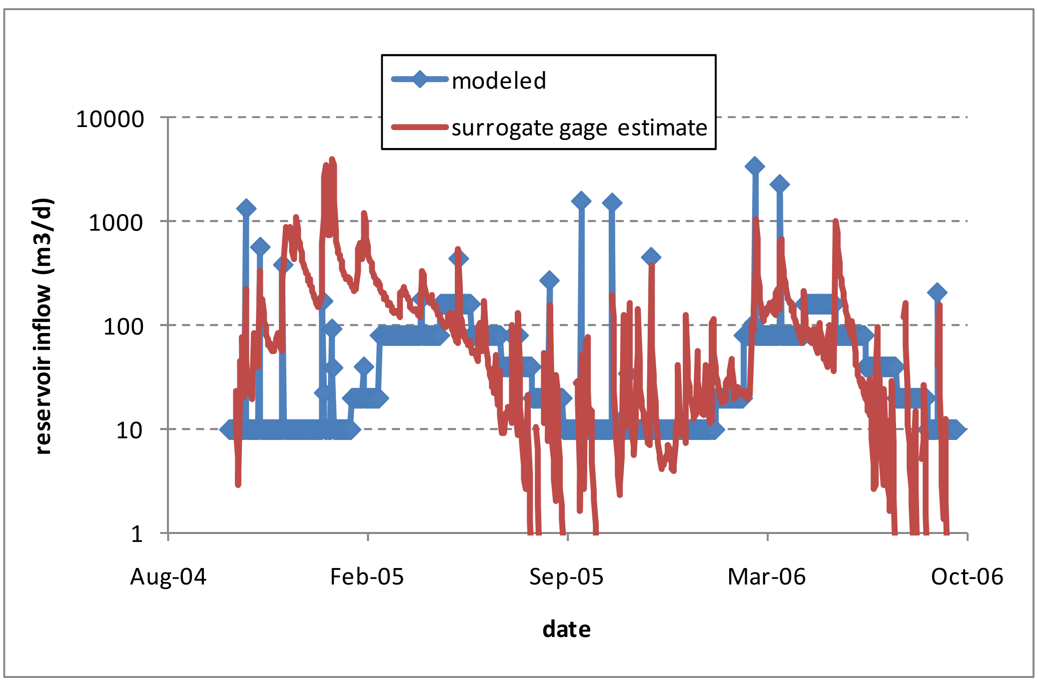

Figure 7-2
Hydrologic Model Calibration Results

Water quality parameters were calibrated using a sparse data set of measured water column manganese concentrations for the reservoir, described in Section 5 of this report. Results are shown in Figure 7-3. Adjustments were made to the model particulate settling velocity based primarily on the mean of the measured concentration data. Adjustments were made to the internal loading storm enhancement factor (SFEH) based primarily on the single observed spike in the measured data (August 2006), which represents an exceedance of water quality standards. Over half an inch of rain occurred on this day and measured lake hypolimnetic dissolved oxygen levels were measured as low as 0.1 mg/L. This evidence points toward a combination of anaerobic summer hypolimnon conditions and storm resuspension of sediments causing the spike in water column Mn concentration. Thus the justification for the use of the storm enhancement factor.

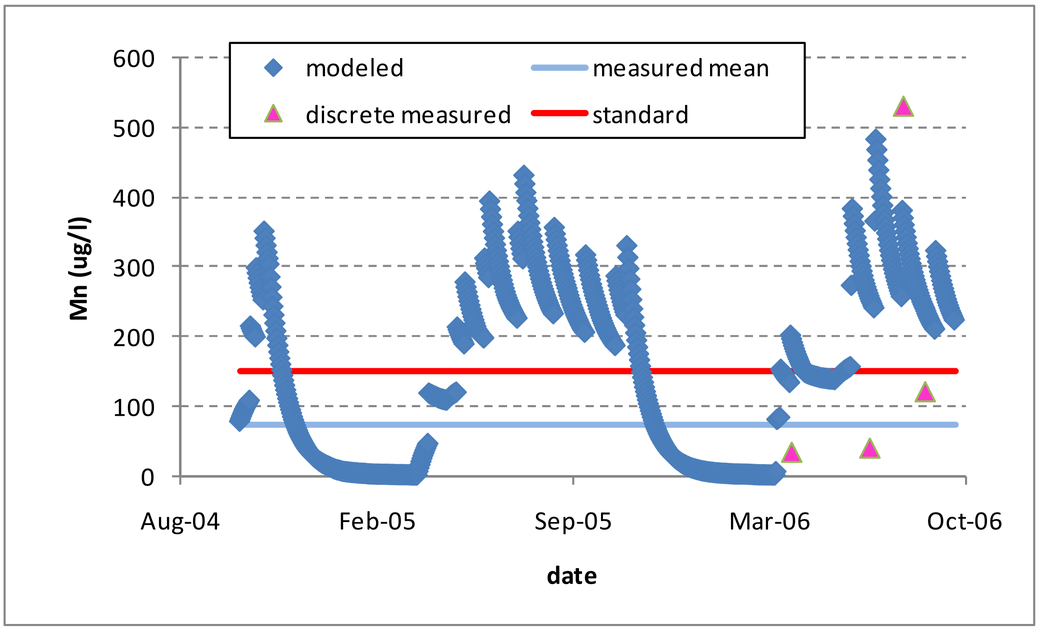

Figure 7-3
Water Quality Model Calibration Results

Section 8
Total Maximum Daily Loads for Manganese in the Ashland New Reservoir

8.1 TMDL Endpoints

The TMDL endpoint for manganese in the Ashland New Reservoir is 150 µg/L. This endpoint is based on the standard for public drinking water supplies. As described in Section 5, a single exceedance of this standard occurred in August 2006. This exceedance is the basis for this TMDL analysis.

8.2 Pollutant Sources and Linkage

Potential pollutant sources of manganese for the Ashland New Reservoir were identified in Section 5 of this document. Application of the water quality model described in Section 7 indicates that approximately 95% of the annual manganese load to the reservoir water column is attributable to internal releases from the sediments ("internal load"). This internal load is believed to be released primarily during summer months when stratification is likely and hypolimnetic dissolved oxygen levels are low. Additionally, as discussed in Section 7, these loads are likely exacerbated during summer storm events when bottom sediments are stirred up and temporary resuspension occurs. The measured high precipitation event associated with the standard-exceeding data point support these assertions.

The remaining 5% of the annual Mn load to the reservoir appears to be primarily attributable to make-up water pumping from Little Indian Creek. Due to the relatively small drainage area of this reservoir, and the Mn event mean concentration assumed in the model (based on literature), the modeling indicates that nonpoint runoff loadings into this reservoir are insignificant on an annual basis, however, the internal loads that dominate have likely formed from many years of runoff and erosion.

8.3 Allocation

As explained in Section 1, the TMDL for the Ashland New Reservoir will utilize the following equation:

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

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 Ashland New Reservoir TMDL

8.3.1.1 Loading Capacity

The LC is the maximum amount of manganese that the Ashland New Reservoir can receive and still maintain compliance with the water quality standards. The single exceedance value measured in the reservoir was 530 µg/L. This peak needs to be reduced by 72 percent in order to meet the water quality standard.

The loading capacity for the reservoir was determined by incremental reductions in the modeled mean summer internal loading rate until the water quality standard was achieved throughout the model simulation period (water years 2005 and 2006). The loading capacity, as defined by the mean daily load averaged over the simulation period, is 1.6 lb/d (Table 8-1). This represents a 69% reduction in the mean daily load from current conditions. Similarly, it represents a 73% reduction in the mean summer internal loading rate.

8.3.1.2 Seasonal Variation

Consideration of seasonality is inherent in the modeling described above. The standard is not seasonal and the full range of expected inflows and lake conditions are represented in the model used to determine the loading capacity (Table 8-1). Therefore, the loading capacity quantified here represents conditions throughout the year, including summer storm event critical conditions.

8.3.1.3 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 TMDL developed for the Ashland New Reservoir contains an implicit MOS based on the following conservative elements of the modeling analysis:

- The loading capacity analysis described above was strongly influenced by a few discrete days during the simulation when large summer storms caused short-term spikes in predicted Mn concentrations. The stated required loading reductions are based on the ability to meet the standard under these critical, but relatively infrequent, conditions. For the majority of the simulated period, predicted Mn concentrations are well below the standard. Calculating the TMDL using only the exceedance values (rather than the long term average which is below the standard) overestimates reductions needed to meet the standard.

- Assumed concentrations of make-up water pumping into the reservoir are based on measured data for Indian Creek, downstream of the confluence with Little Indian

Creek and well downstream of the actual point of withdrawl. Without actual measured data for upstream locations, we can surmise that downstream concentrations are likely higher than at the actual point of withdrawl due to the impacts of nonpoint runoff from a larger watershed. Overestimating the Little Indian Creek contributions is a conservative assumption in the modeling.

8.3.1.4 Waste Load Allocation

There are no point sources located within the direct drainage of Ashland New Reservoir. However, the Village of Ashland Sanitary Treatment Plant (STP) is authorized to discharge effluent to an unnamed tributary of Little Indian Creek. Because water for Little Indian Creek is used to supplement lake levels, the Ashland STP was assigned a WLA. The STP (permit IL0027529) is permitted to discharge 0.15 million gallons per day (mgd). The WLA for the STP was determined by multiplying the facility's permitted discharge rate by the Mn standard of 150 μg/L. This translates to a WLA of 0.19 lbs/day.

8.3.1.5 Load Allocation and TMDL Summary

Because the MOS in this TMDL is implicit, the manganese load has been fully allocated to the WLA (point source: Ashland STP) and LA (nonpoint sources). As discussed in Section 8.3.1.1, a modeling analysis determined that a 73 percent reduction in manganese loading is needed to meet the water quality standard of 150 μg/L throughout the year. Table 8-1 shows the summary of the manganese TMDL for the Ashland New Reservoir.

Table 8-1 TMDL Summary for Manganese in the Ashland New Reservoir

Load Source	LC (lb/day)	WLA (lb/day)	LA (lb/day)	MOS (lb/day)	Current Load (lb/day)	Reduction Needed (lb/day)	Reduction Needed (percent)
Total	1.6	0.19	1.41	implicit	5.1	3.5	69%
Internal	1.3	0	1.3	implicit	4.8	3.5	73%
External	0.3	0.19	0.11	implicit	0.3	0	0%

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Section 9
Implementation Plan for the Ashland New Reservoir Watershed

Water quality modeling described in Section 7 determined that approximately 95% of the annual manganese load to the Ashland New Reservoir water column is attributable to internal releases from the sediments (“internal load”). This internal load is believed to be released primarily during summer months when stratification may occur and hypolimnetic dissolved oxygen levels are low near the bottom. Additionally, as discussed in Section 7, these loads are likely exacerbated during summer storm events when bottom sediments are stirred up and temporary resuspension occurs. The remaining 5% of the annual manganese load to the reservoir appears to be primarily attributable to make-up water pumping from Little Indian Creek.

As presented in Section 8, the loading capacity for the Ashland New Reservoir was determined to be 1.6 lb of Mn per day (refer to table 8-1). In order to achieve this loading rate, a total reduction of 69% from the current conditions of the mean daily Mn load will need to occur. Modeling determined this includes a 73% reduction in the mean summer internal loading rate. The following sections describe management measures that can be implemented in the Ashland New Reservoir and Little Indian Creek watersheds to reduce manganese-rich sediments from reaching the reservoir and from settling into the reservoir sediments, contributing to the internal loading. This, in turn, will help achieve the TMDL reduction goals.

9.1 Adaptive Management

An adaptive management or phased approach is recommended for the TMDL developed for the Ashland New Reservoir watershed. Adaptive management is a systematic process for continually improving management policies and practices through learning from the outcomes of operational programs. Some of the differentiating characteristics of adaptive management are:

- Acknowledgement of uncertainty about what policy or practice is "best" for the particular management issue
- Thoughtful selection of the policies or practices to be applied (the assessment and design stages of the cycle)
- Careful implementation of a plan of action designed to reveal the critical knowledge that is currently lacking
- Monitoring of key response indicators
- Analysis of the management outcomes in consideration of the original objectives and incorporation of the results into future decisions (British Columbia Ministry of Forests 2000)

Implementation actions, point source controls, 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 point source controls and 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).

To assist in adaptive management, implementation actions, management measures, available assistance programs, and recommended continued monitoring are all discussed throughout the remainder of this section.

9.2 Implementation Actions and Management Measures for Manganese in Ashland New Reservoir

9.2.1 Potential Sources of Manganese in the Ashland New Reservoir and Little Indian Creek Watersheds

It is likely that the main contributors of elevated manganese in Ashland New Reservoir are internal loading caused by historic settling of suspended sediments high in manganese concentration due to natural background levels. As such, nonpoint source controls that are designed to reduce erosion and in-lake measures to decrease sediment releases are expected to provide a benefit of reducing manganese that may be attached to the soils.

The following implementation plan includes information for management measures within the Little Indian Creek watershed because make-up water is pumped from the creek to keep the reservoir full and as such, is a contributor to the total manganese load in the lake.

Following are examples of potentially applicable erosion control measures and in-lake management measures:

- Filter Strips
- Sediment Control Basins
- Streambank Stabilization/Erosion Control
- Wetlands
- Aeration
- Dredging

The remainder of this section discusses these management options as well as provides an overview of the Little Indian Creek watershed.

9.2.1.1 Little Indian Creek Watershed Characterization

The Little Indian Creek watershed (Figure 9-1) is located in central Illinois and drains approximately 12,100 acres upgradient of the approximate Ashland New Reservoir make-up water extraction location. The watershed is located in eastern Cass and Morgan Counties, western Sangamon County and a small area in southwest Menard County.

Topography

Topography is an important factor in watershed management because stream types, precipitation, and soil types can vary dramatically by elevation. National Elevation Dataset (NED) coverages containing 30-meter grid resolution elevation data are available from the U.S. Geological Survey (USGS) for each 1:24,000-topographic quadrangle in the United States. Elevation data for the Little Indian Creek Watershed were obtained by overlaying the NED grid onto the GIS-delineated watershed. Figure 9-2 shows the elevations found within the watersheds.

Elevation in the watershed ranges from 641 feet above sea level at the northeast end of the Little Indian Creek watershed and to 579 feet at the downstream extent of Little Indian Creek within this subwatershed.

Land Use

The land use of the Little Indian Creek watershed was determined by overlaying the IL-GAP Land Cover data layer onto the GIS-delineated watershed. Table 9-1 contains the land uses contributing to the Little Indian Creek watershed, based on the IL-GAP land cover categories and also includes the area of each land cover category and percentage of the watershed area. Figure 9-3 illustrates the land uses of the watershed.

In the Little Indian Creek watershed, approximately 11,400 acres, representing 95 percent of the total watershed area, are devoted to agricultural activities. Corn and soybean farming account for 54 percent and 37 percent of the watershed area, respectively and winter wheat and rural grasslands combined account for 3 percent of the area. Surface water and wetlands account for less than 1 percent of the watershed area. Upland forest accounts for about 1 percent of the watershed area. Other land cover types each represent one percent or less of the watershed area. Approximately 4 percent of the watershed is comprised of urban and built up land. It should be noted that the area dedicated to corn, wheat and soybean production may vary from year to year based on changing crop rotations.

Table 9-1 Land Cover and Land Use in Little Indian Creek Watershed

Land Cover Category	Area (Acres)	Percentage
Type	**Total Acres**	**Percent**
Corn	6609.24	54.61%
Soybeans	4458.07	36.83%
Rural Grassland	353.09	2.92%
Urban Open Space	214.25	1.77%
Low/Medium Density	156.61	1.29%
High Density	139.77	1.15%
Upland	69.03	0.57%
Floodplain Forest	41.62	0.34%
Surface Water	20.83	0.17%
Winter Wheat	19.74	0.16%
Partial Canopy/Savannah Upland	16.08	0.13%
Seasonally/Temporarily Flooded	2.67	0.02%
Shallow Marsh/Wet Meadow	1.87	0.02%
TOTAL	**12103.42**	**100.00%**

Soils

Three soil types cover a majority of the watershed (see Figure 9-4). Hartsburg silty clay loam with 0 to 2 percent slope covers 34 percent, Ipava silt loam with 0 to 2 percent slope covers 22 percent, and Sable silty clay loam with 0 to 2 percent slopes covers approximately 9 percent of the watershed. As presented in Section 2, NRCS soil surveys for Cass and Morgan Counties were reviewed to confirm the presence of manganese in area soils. Many of the soil series present in the area are described as having "masses of iron and manganese accumulation throughout". Soil series information is available in Appendix B.

Figure 9-5 shows the hydrologic soils groups found within the Little Indian Creek watershed. Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms. Hydrologic soil groups B, C and B/D are found within the Little Indian Creek watershed with the majority of the watershed falling into groups B (50.2% of the watershed) and B/D (49.5% of the watershed). Group B soils are defined as having "moderately low runoff potential when thoroughly wet." These soils have a moderate rate of water transmission (NRCS, 2007). Group B/D soils are considered a dual hydrologic soil group which consists of wet soils that can potentially be adequately drained. The first letter in the series (B) denotes the soil falls into Group B when drained, and the second letter (D) indicates that the soil falls into the Group D when undrained. Group D soils have a high runoff potential and low infiltration rates when saturated with water. Soil hydrology can be affected by the presence of tile drainage. Field tiles are widely used in Illinois and affect the rate of water transmission by increasing field drainage. Watershed-specific practices and estimates are discussed in Section 5.

A commonly used soil attribute is the K-factor. The K-factor:

> *Indicates the susceptibility of a soil to sheet and rill erosion by water.* (The K-factor) *is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water (NRCS 2005).*

The distribution of K-factor values in the Little Indian Creek watershed range from 0.24 to 0.43. Approximately 89% of the total watershed area consists of soils with a K-factor in the 0.24-0.28 range.

Point Sources within the Little Indian Creek Watershed
There is one point source discharging in this watershed. The Village of Ashland STP is not expected to significantly contribute to the loading of manganese into the Ashland New Reservoir during make-up water pumping. The STP was assigned a WLA based on the facility's permitted discharge rate (0.15mgd) and the public water supply standard for manganese (150 ug/L). The location of the point-source discharge is shown in Figure 9-1.

9.2.1.2 Filter Strips and Riparian Buffers

Filter strips can be used as a control to reduce pollutant loads, including manganese-rich sediment, to Little Indian Creek and Ashland New Reservoir. Filter strips implemented along stream segments slow and filter sediment out of runoff and provide bank stabilization decreasing erosion and deposition. The following paragraphs focus on the implementation of filter strips in the Little Indian Creek watershed because increasing the length of stream bordered by grass filter strips will likely decrease the amount of manganese associated with sediment loading to Little Indian Creek (and ultimately, Ashland New Reservoir). Grass filter strips can remove as much as 75 percent of sediment from runoff (NCSU 2000).

Filter strip widths for the Little Indian Creek watershed were estimated based on the land slope. According to the NRCS Planning and Design Manual, the majority of sediment is removed in the first 25 percent of the width (NRCS 1994). Table 9-2 outlines the guidance for filter strip flow length by slope (NRCS 1999).

Table 9-2 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	36	54	72	90	108	117
Maximum	72	108	144	180	216	234

GIS land use data were used in conjunction with soil slope data to provide an estimate of acreage where filter strips could be installed. As discussed in Section 9.2.1.1.1, the most predominant soil types in the watershed are Hartsburg silty clay loam, Ipava silt loam, and Sable silty clay loam. Because slope values vary considerably across the

Little Indian Creek watershed, maximum values associated with 5% slopes were used for this analysis. Based on this slope value, filter strip widths of 234 feet could be incorporated into agricultural lands adjacent to the creek and its tributaries. Mapping software was then used to buffer stream segments to determine the total area found within 234 feet of tributaries in the watershed. There are approximately 824 total acres within this buffer distance. The land use data were then clipped to the buffer area to determine the amount of this land that is agricultural. Of the 824 total acres within the 234 ft buffer area, 699 acres are agricultural and could be converted to filter strips and riparian buffers. The buffer strips and associated land uses are shown in Figure 9-6. Landowners are encouraged to evaluate their land near Little Indian Creek and its tributaries and install or extend filter strips according to the NRCS guidance provided in Table 9-2 where appropriate.

9.2.1.3 Sediment Control Basins

Sediment control basins are designed to trap sediments (and the pollutants bound to the sediment) prior to reaching a receiving water. Sediment control basins are typically earthen embankments that act similarly to a terrace. The basin traps water and sediment running off cropland upslope from the structure, and reduces gully erosion by controlling flow within the drainage area. The basin then releases water slowly, which also helps to decrease streambank erosion in the receiving water. It is possible that the New Reservoir is currently functioning as a sediment control basin for the water that is then pumped to the Old Reservoir and then to the water treatment plant.

Sediment control basins are usually designed to drain an area of 30 acres or less and should be large enough to control runoff form a 10-year, 24-hour storm. Locations are determined based on slopes, tillage and crop management, and local NRCS can often provide information and advice for design and installation. Maintenance includes reseeding and fertilizing the basins in order to maintain vegetation and periodic checking, especially after large storms to determine the need for embankment repairs or excess sediment removal.

9.2.1.4 Streambank Stabilization/Erosion Control

Soil erosion is the process of moving soil particles or sediment by flowing water or wind. Eroding soil transports pollutants, such as manganese, that can potentially degrade water quality.

Following are three available approaches to stabilizing eroding banks that could, in turn, decrease nonpoint source manganese loads:

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

Stone Toe Protection uses nonerodible materials to protect the eroding banks. Meandering bends found in the Little Indian Creek 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 that 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 extent of streambank erosion in the Little Indian Creek watershed is unknown. It is recommended that further investigation be performed to determine the extent that erosion control measures could help manage nonpoint source manganese loads to the creek.

9.2.1.5 Wetlands

The use of wetlands as a structural control may be applicable to manganese reduction from the surrounding areas in the Little Indian Creek and Ashland New Reservoir watersheds. To treat loads from watershed runoff, a wetland could be constructed on the upstream end of the reservoir. Wetlands are an effective BMP for sediment 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 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 certain pollutants. 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 (Johnson, Evans, and Bass 1996; Moore 1993; USEPA 1993; Kovosic et al. 2000). Sediment or vegetation removal may be necessary if the wetland removal efficiency is lessened over time (USEPA 1993; NCSU 2000).

Guidelines for wetland design suggest a wetland to watershed ratio of 0.6 percent for sediment removal from agricultural runoff. A wetland system to treat runoff from the

Ashland New Reservoir and Little Indian Creek watersheds could be as large as 74.9 acres (Denison and Tilton 1993).

9.2.1.6 In-lake Management Measures

The Ashland New Reservoir TMDL allocated approximately 81 percent of the total allowable manganese load to internal cycling. Reduction of manganese from in-lake cycling through management strategies is necessary for attainment of the TMDL load allocation. Internal manganese loading can occur when the water above the sediments become anoxic causing the release of manganese into the water column. Internal manganese loading can also occur through release from sediments by the physical mixing and reintroduction of sediments into the water column as a result of wave action, winds, boating activity, and other means. Along with possible anoxic conditions, reintroduction of sediment into the water column through mixing may be a contributing factor to internal manganese loading in Ashland New Reservoir.

For lakes experiencing high rates of manganese inputs from bottom sediments, several management measures are available to control internal loading. Two BMP options for the control of internal loading include the installation of an aerator and dredging.

9.2.1.6.1 Aeration

Hypolimnetic (bottom water) aeration involves an aerator air-release that can be positioned at a selected depth or at multiple depths to increase oxygen transfer efficiencies in the water column and reduce internal loading by establishing aerobic conditions at the sediment-water interface. This option may be viable for Ashland New Reservoir if it is determined that fully anoxic conditions do occur periodically in the hypolimnion.

9.2.1.6.2 Dredging

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

9.3 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 may be in practice to some degree within the watershed. The discussion in the preceding sections provided information on available BMPs for 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.

9.3.1 Available Cost-Share Programs

Approximately 95 percent of the Little Indian Creek watershed and 71 percent of the Ashland New Reservoir watershed are classified as agricultural row crop and small grains land. There are several voluntary conservation programs established through the 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.

9.3.1.1 Conservation Reserve Program (CRP)

http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp
The CRP is a voluntary program for agricultural landowners. Through CRP, landowners can receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland.

The Commodity Credit Corporation (CCC) makes annual rental payments based on the agriculture rental value of the land, and it provides cost-share assistance for up to to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years.

CRP protects millions of acres of American topsoil from erosion and is designed to safeguard natural resources. By reducing water runoff and sedimentation, CRP protects groundwater and helps improve the condition of lakes, rivers, ponds, and streams. Acreage enrolled in the CRP is planted to resource-conserving vegetative covers, making the program a major contributor to increased wildlife populations in many parts of the country.

The Farm Service Agency (FSA) administers CRP, while technical support functions are provided by NRCS, USDA's Cooperative State Research, Education, and Extension Service, State forestry agencies, local soil and water conservation districts, and private sector providers of technical assistance. Producers can offer land for CRP general sign-up enrollment only during designated sign-up periods. Environmentally desirable land devoted to certain conservation practices may be enrolled at any time under CRP continuous sign-up. Certain eligibility requirements still apply, but offers are not subject to competitive bidding. Further information on CRP continuous sign-up is available in the FSA fact sheet "Conservation Reserve Program Continuous Sign-up."

To be eligible for placement in CRP, land must be either:

- Cropland (including field margins) that is planted or considered planted to an agricultural commodity 4 of the previous 6 crop years from 1996 to 2001, and which is physically and legally capable of being planted in a normal manner to an agricultural commodity; or

- Certain marginal pastureland that is suitable for use as a riparian buffer or for similar water quality purposes.

In addition to the eligible land requirements, cropland must meet one of the following criteria:

- Have a weighted average erosion index of 8 or higher;
- Be expiring CRP acreage; or
- Be located in a national or state CRP conservation priority area.

FSA provides CRP participants with annual rental payments, including certain incentive payments, and cost-share assistance:

- Rental Payments - In return for establishing long-term, resource-conserving covers, FSA provides annual rental payments to participants. FSA bases rental rates on the relative productivity of the soils within each county and the average dry land cash rent or cash-rent equivalent. The maximum CRP rental rate for each offer is calculated in advance of enrollment. Producers may offer land at that rate or offer a lower rental rate to increase the likelihood that their offer will be accepted.

- Maintenance Incentive Payments - CRP annual rental payments may include an additional amount up to $4 per acre per year as an incentive to perform certain maintenance obligations.

- Cost-share Assistance - FSA provides cost-share assistance to participants who establish approved cover on eligible cropland. The cost-share assistance can be an amount not more than 50 percent of the participants' costs in establishing approved practices.

- Other Incentives - FSA may offer additional financial incentives of up to 20 percent of the annual payment for certain continuous sign-up practices.

Conservation practices eligible for CRP funding which are recommended BMPs for this watershed TMDL include but are not limited to filter strips, grass waterways, riparian buffers, wetland restoration, and tree plantings.

9.3.1.2 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 state 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).

Illinois EPA receives federal funds through Section 319(h) of the Clean Water Act to help implement Illinois' Nonpoint Source (NPS) Pollution Management Program. The purpose of the program is to work cooperatively with local units of government and other organizations toward the mutual goal of protecting the quality of water in Illinois by controlling NPS pollution. The program emphasizes funding for implementing cost-effective corrective and preventative best management practices (BMPs) on a watershed scale; funding is also available for BMPs on a non-watershed scale and the development of information/education NPS pollution control programs.

The Maximum Federal funding available is 60 percent, with the remaining 40 percent coming from local match. The program period is two years unless otherwise approved. This is a reimbursement program.

Section 319(h) funds are awarded for the purpose of implementing approved NPS management projects. The funding will be directed toward activities that result in the implementation of appropriate BMPs for the control of NPS pollution or to enhance the public's awareness of NPS pollution. Applications are accepted June 1 through August 1.

9.3.1.3 Wetlands Reserve Program (WRP)

http://www.nrcs.usda.gov/programs/wrp/
The WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

The program offers three enrollment options:

1. *Permanent Easement* is a conservation easement in perpetuity. USDA pays 100 percent of the easement value and up to 100 percent of the restoration costs.

2. *30-Year Easement* is an easement that expires after 30 years. USDA pays up to 75 percent of the easement value and up to 75 percent of the restoration costs. For both permanent and 30-year easements, USDA pays all costs associated with recording the easement in the local land records office, including recording fees, charges for abstracts, survey and appraisal fees, and title insurance.

3. *Restoration Cost-Share Agreement* is an agreement to restore or enhance the wetland functions and values without placing an easement on the enrolled acres. USDA pays up to 75 percent of the restoration costs.

The total number of acres that can be enrolled in the program is 3,041,200 – an increase of 766,200 additional acres over the previous Farm Bill.

- Payments for easements valued at $500,000 or more will be made in at least five annual payments.
- For restoration cost-share agreements, annual payments may not exceed $50,000 per year.
- No easement shall be created on land that has changed ownership during the preceding 7 years.
- Eligible acres are limited to private and Tribal lands.

9.3.1.4 Environmental Quality Incentive Program (EQIP)

http://www.il.nrcs.usda.gov/programs/eqip/index.html
EQIP is a voluntary conservation program that provides financial and technical assistance to farmers and ranchers who face threats to soil, water, air, and related natural resources on their land. Through EQIP, the NRCS develops contracts with agricultural producers to implement conservation practices to address environmental natural resource problems. Payments are made to producers once conservation practices are completed according to NRCS requirements.

Persons engaged in livestock or agricultural production and owners of non-industrial private forestland are eligible for the program. Eligible land includes cropland, rangeland, pastureland, private non-industrial forestland, and other farm or ranch lands. Persons interested in entering into a cost-share agreement with the USDA for EQIP assistance may file an application at any time.

NRCS works with the participant to develop the EQIP plan of operations. This plan becomes the basis of the EQIP contract between NRCS and the participant. NRCS provides conservation practice payments to landowners under these contracts that can be up to 10 years in duration.

The EQIP objective to optimize environmental benefits is achieved through a process that begins with National priorities that address: impaired water quality, conservation of ground and surface water resources improvement of air quality reduction of soil erosion and sedimentation, and improvement or creation of wildlife habitat for at-risk species. National priorities include: reductions of nonpoint source pollution, such as nutrients, sediment, pesticides, or excess salinity in impaired watersheds consistent with TMDLs where available as well as the reduction of groundwater contamination and reduction of point sources such as contamination from confined animal feeding operations; conservation of ground and surface water resources; reduction of emissions, such as particulate matter, nitrogen oxides (NOx), volatile organic compounds, and ozone precursors and depleters that contribute to air quality impairment violations of National Ambient Air Quality Standards reduction in soil erosion and sedimentation from unacceptable levels on agricultural land; and promotion of at-risk species habitat conservation.

EQIP provides payments up to 75 percent of the incurred costs and income foregone of certain conservation practices and activities. The overall payment limitation is $300,000 per person or legal entity over a 6-year period. The Secretary of Agriculture may raise the limitation to $450,000 for projects of special environmental significance. Payment limitations for organic production may not exceed an aggregate $20,000 per year or $80,000 during any 6-year period for installing conservation practices.

Conservation practices eligible for EQIP funding which are recommended BMPs for this watershed TMDL include field borders, filter strips, cover crops, grade stabilization structures, grass waterways, riparian buffers, streambank shoreline protection, terraces, and wetland restoration.

The selection of eligible conservation practices and the development of a ranking process to evaluate applications are the final steps in the optimization process. Applications will be ranked based on a number of factors, including the environmental benefits and cost effectiveness of the proposal. More information regarding State and local EQIP implementation can be found at www.nrcs.usda.gov/programs/eqip.

9.3.1.5 Wildlife Habitat Incentives Program (WHIP)

http://www.il.nrcs.usda.gov/programs/whip/index.html
WHIP is a voluntary program for people who want to develop and improve wildlife habitat primarily on private lands and nonindustrial private forest land. It provides both technical assistance and cost share payments to help:

- Promote the restoration of declining or important native fish and wildlife species.
- Protect, restore, develop or enhance fish and wildlife habitat to benefit at-risk species.
- Reduce the impacts of invasive species in fish and wildlife habitat.

- Protect, restore, develop or enhance declining or impaired aquatic wildlife species habitat.

Participants who own or control land agree to prepare and implement a wildlife habitat development plan. The NRCS provides technical and financial assistance for the establishment of wildlife habitat development practices. 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.

Participants work with the NRCS to prepare a wildlife habitat development plan in consultation with the local conservation district. The plan describes the participant's goals for improving wildlife habitat, includes a list of practices and a schedule for installing them, and details the steps necessary to maintain the habitat for the life of the agreement. This plan may or may not be part of a larger conservation plan that addresses other resource needs such as water quality and soil erosion.
The NRCS and the participant enter into a cost-share agreement for wildlife habitat development. This agreement generally lasts from 5 to 10 years from the date the agreement is signed for general applications and up to 15 years for essential habitat applications. Cost-share payments may be used to establish new practices or replace practices that fail for reasons beyond the participant's control.

WHIP has a continuous sign-up process. Applicants can sign up anytime of the year at their local NRCS field office. Conservation practices eligible for WHIP funding which are recommended BMPs for this watershed TMDL include but are not limited to filter strips, field borders, riparian buffers, streambank and shoreline protection, and wetland restoration..

9.3.1.6 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).

9.3.1.7 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.

9.3.1.8 Illinois Conservation and Climate Initiative (ICCI)

The ICCI is a joint project of the State of Illinois and the Delta Institute that allows farmers and landowners to earn revenue through the sale of greenhouse gas emissions credits when they use conservation practices such as no-till, grass plantings, reforestation, or manure digesters.

The Chicago Climate Exchange (CCX®) quantifies, credits and sells greenhouse gas credits from conservation practices. The credits are aggregated, or pooled, from farmers and landowners in order to sell them to CCX® members that have made voluntary commitments to reduce their greenhouse gas contributions.

ICCI provides an additional financial incentive for farmers and landowners to use conservation practices that also benefit the environment by creating wildlife habitat and limiting soil and nutrient run-off to streams and lakes.

Many farmers and landowners are already using conservation practices eligible for carbon credits on the CCX® such as no-till farming, strip-till farming, grass plantings, afforestation/reforestation, and the use of methane digesters. To be eligible, the producer or landowner must make a contractual commitment to maintain the eligible practice through 2010. CREP and CRP land is eligible for enrollment in the ICCI as long as it meets CCX® eligibility requirements for the practice (www.illinoisclimate.org).

9.3.1.9 Local Program Information

The Farm Service Agency (FSA) administers the CRP. NRCS administers the EQIP, WRP, and WHIP. Soil and Water Conservation District (SWCD) administer the SSRP and CPP. Contact information for applicable local county NRCS and SWCD offices are listed in the Table 9-3 below.

Table 9-3 Morgan, Cass, Menard and Sangamon County USDA Service Center Contact Information

Contact	Address	Phone
Morgan County	1904 W. Lafayette Ave Jacksonville, IL 62650	217.243.1535
Cass County	652 S. Main Street Virginia, IL 62691	217.452.7781
Menard County	17781 Village Green Rd. Petersburg, IL 62675	217.632.2431
Sangamon County	2623 Sunrise Drive Springfield, IL 62703	217.241.6644

9.3.2 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 9-5 outlines the estimated cost of implementation measures in the Ashland New Reservoir and Little Indian Creek watersheds.

9.3.2.1 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. EQIP program cost documentation for Illinois for 2009 estimates $1,700/acre for wetland excavation, earthwork and native seeding.
ftp://ftp-fc.sc.egov.usda.gov/IL/farmbill/EQIPpaymnt_schdl_Tradtnl_0509.pdf

9.3.2.2 Filter Strips and Riparian Buffers

The same Illinois EQIP document was used to provide filter strip and riparian buffer cost estimates. Filter strip implementation that includes seedbed preparation and native seed was estimated at $88/acre while riparian buffers ranged from $130/acre for herbaceous cover up to $800/acre for forested buffers.
ftp://ftp-fc.sc.egov.usda.gov/IL/farmbill/EQIPpaymnt_schdl_Tradtnl_0509.pdf

9.3.2.3 Erosion/Sediment Control and Bank Stabilization Measures

Streambank and shoreline protection including stream barbs, bendway weirs, linear peaked stone toe, or full bank armor is estimated on the EQIP data sheet at $25/foot for drainage areas less than 200 square miles and $48/foot for drainage ares greater that 200 square miles. Rock/riffle stream protection is estimated at $120/foot for stream bottoms that are 10 foot or less in width. Pricing for sediment control basins varies greatly depending on size and drainage area. Some pricing information was available for WASCOBs (short earthen dam built across a drainage way that traps sediment and water for a 24 hour period). The Illinois EQIP data sheet estimates WASCOBs of 160 feet or shorter at $215, $285 for a WASCOB 161 to 220 feet in length, and $389 for a WASCOB greater than 220 feet long.

9.3.2.4 Internal Cycling

Internal cycling was identified as a source of manganese to Ashland New Reservoir. Controls of internal phosphorus cycling in lakes are costly. The in-lake controls have been converted to year 2009 dollars assuming an average annual inflation rate of 3 percent. The number and size of hypolimnetic aerators used in a waterbody depend on lake morphology, bathymetry, and hypolimnetic oxygen demand. Total cost for successful systems has ranged from $197,000 to $1.97 million (Tetra Tech 2002). USEPA (1993) reports initial costs ranging from $394,000 to $962,000 plus annual operating costs of $69,500. System life is assumed to be 20 years.

Dredging is typically the most expensive management practice averaging $9,000/acre. Although cost is high, the practice is 80 to 90 percent effective at sediment removal and will last for at least 50 years (Cortell 2002; Geney 2002).

9.3.2.5 Planning Level Cost Estimates for Implementation Measures

Cost estimates for different implementation measures are presented in Table 9-4. Cost estimates shown in Table 9-4 are the total estimated cost per acre and many costs could be reduced through cost share opportunities discussed in Section 9.3.1. 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 Illinois EPA 319 Grants are applicable to all of these practices.

Table 9-4 Cost Estimate of Various BMP Measures

Source	Program	Sponsor	BMP	Installation Estimated $
Nonpoint	CRP/CPP	NRCS and IDA	Filter strip (seeded)	$88/acre
	CRP/CPP	NRCS and IDA	Riparian Buffer	$130-$800/acre
	CRP/CPP	NRCS and IDA	WASCOBs	$215-$389 each
	SSRP	IDA	Bank Stabilization	$25-120/ft
	WRP	NRCS	Wetland	$1,700/acre
Internal Cycling			Dredging	$9,000
			Aerator	varies

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.

9.4 Monitoring Plan

The purpose of the monitoring plan for the Ashland New Reservoir and Little Indian Creek watersheds 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
- Further monitoring of the point source discharge in the watershed
- Continued ambient monitoring of the reservoir
- Further information gathering on pumping rates from Little Indian Creek to the reservoirs

- Storm-based monitoring of high flow events
- Tributary monitoring
- Erosion survey to see the extent that area erosion is contributing to sedimentation and increased manganese levels

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
- Further clarify the contributions from point sources
- 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. If aeration is used to control internal loading, site-specific data could be collected to assess the effectiveness of this management measure. In addition, sampling should be performed before and after management operations are employed to determine their effects on lake manganese levels.

IEPA monitors lakes every three years and conducts Intensive Basin Surveys every five years. Additionally, ambient sites are monitored nine times a year. Continuation of this state monitoring program will assess lake and stream water quality as improvements in the watershed are completed. Although Little Indian Creek has never been sampled by Illinois EPA, it may be considered for sampling as part of the Intensive Basin Survey monitoring program in the future. Ashland New Reservoir is scheduled to be sampled by Illinois EPA in 2010. Any available future sampling data can be used to assess whether water quality standards in the Ashland New Reservoir are being attained.

9.5 Implementation Time Line

Implementing the actions outlined in this section for the Ashland New Reservoir and Little Indian Creek watersheds 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 the reservoir 10 years or more to reach its water quality standard target. In summary, it may take up to 20 years for the reservoir to meet the applicable water quality standard.

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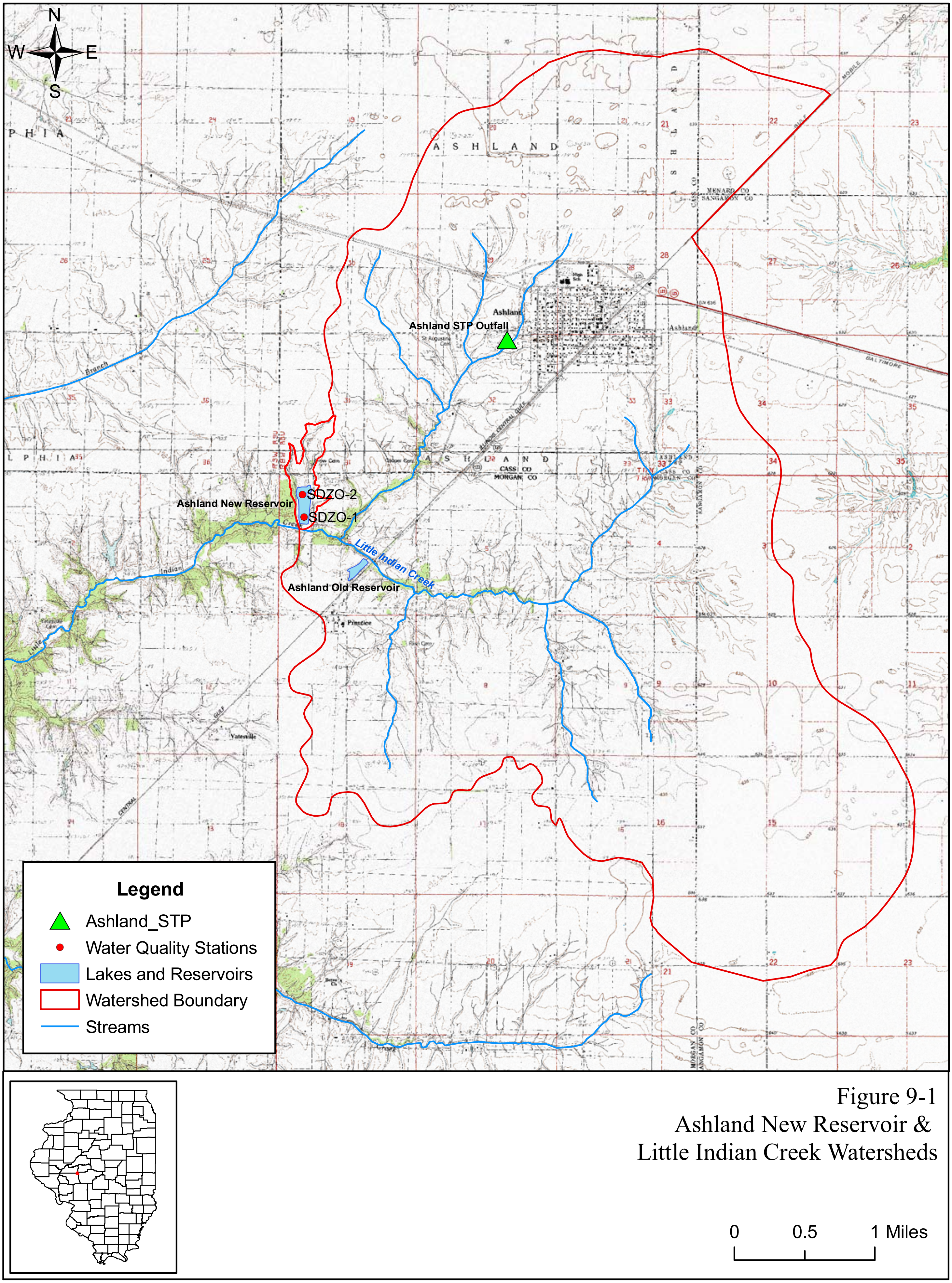

Figure 9-1
Ashland New Reservoir &
Little Indian Creek Watersheds

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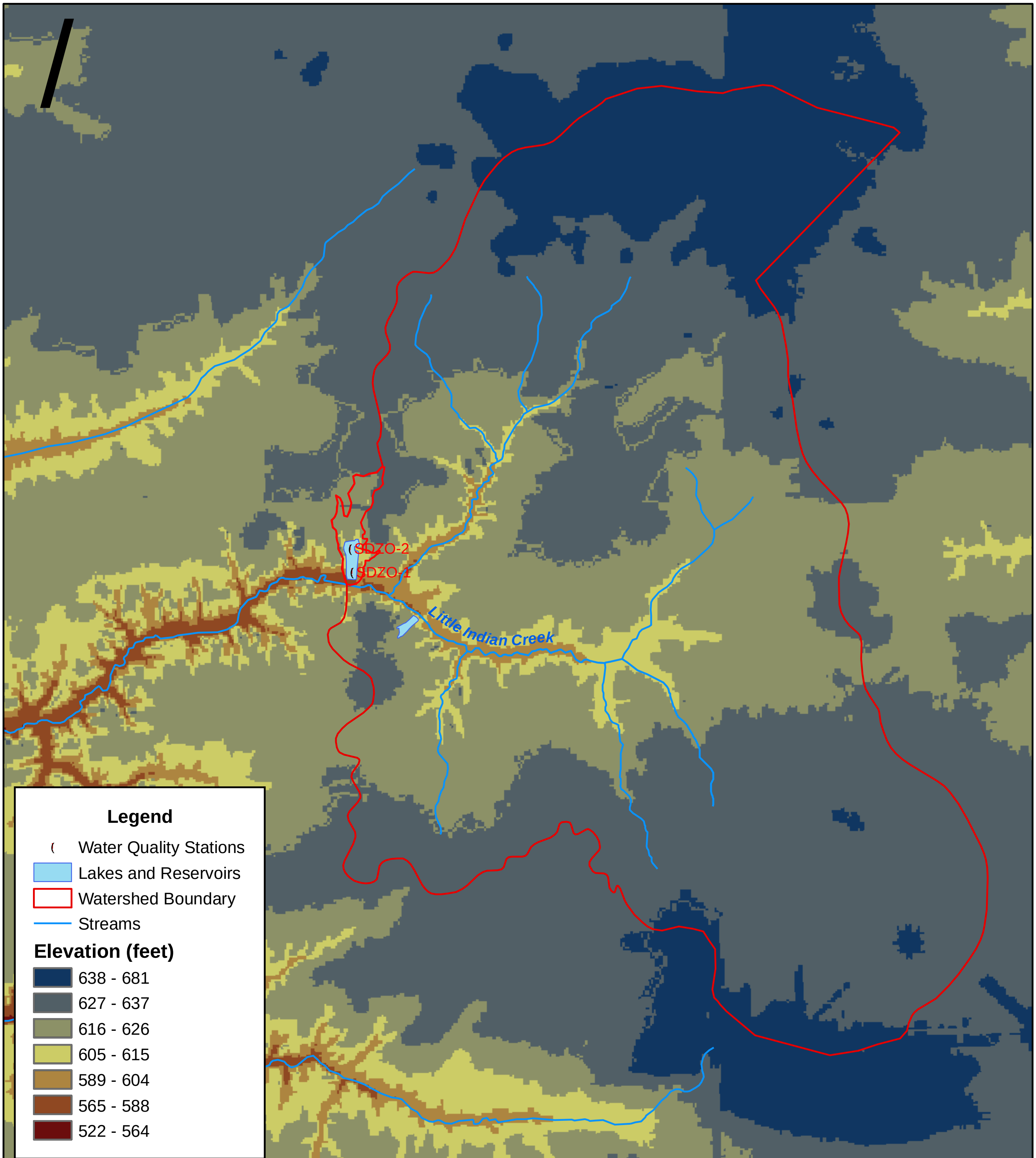
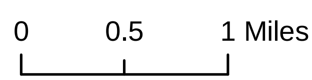


Figure 9-2
Ashland New Reservoir &
Little Indian Creek Watershed
Digital Elevation Model



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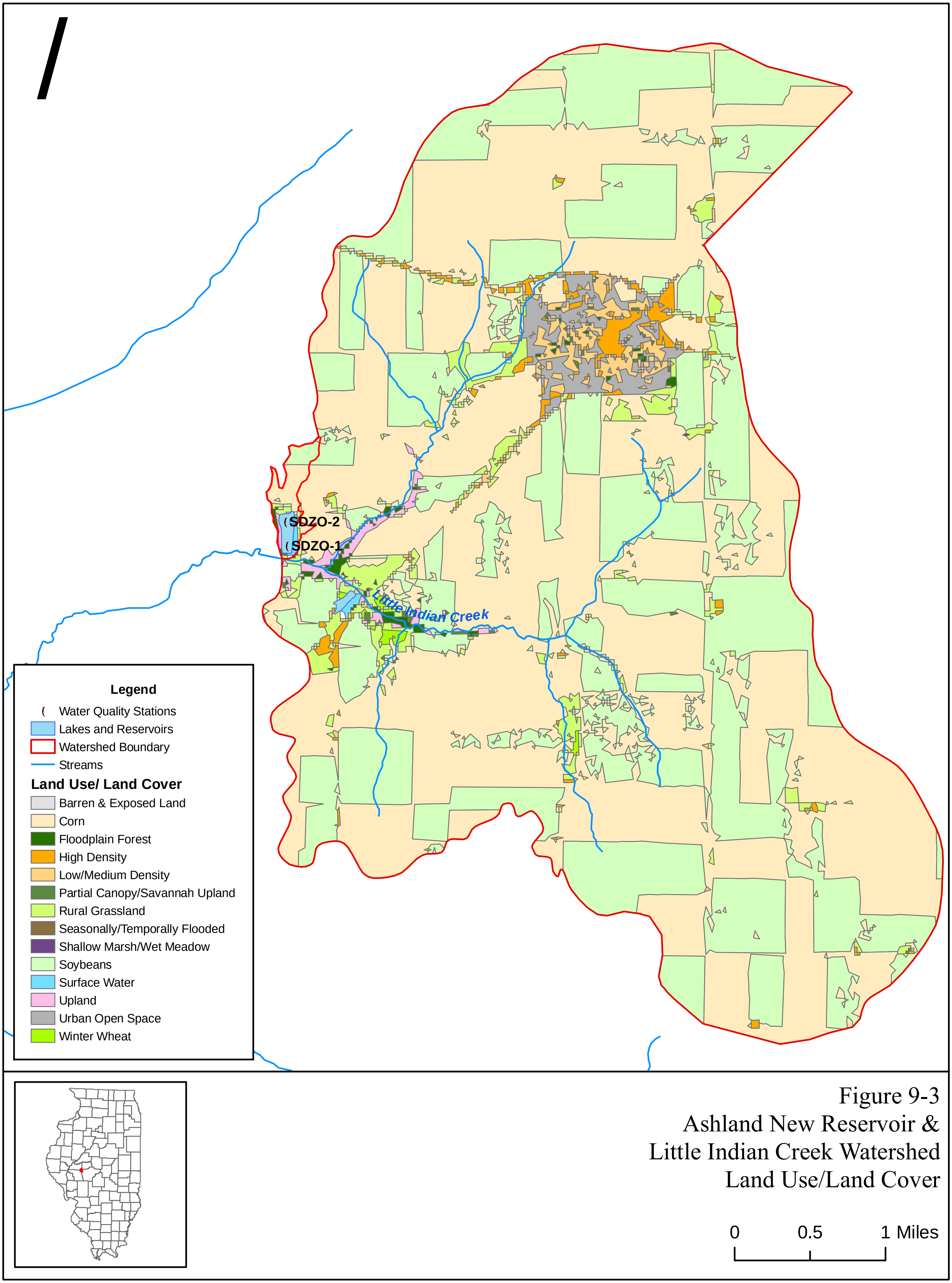

Figure 9-3
Ashland New Reservoir &
Little Indian Creek Watershed
Land Use/Land Cover

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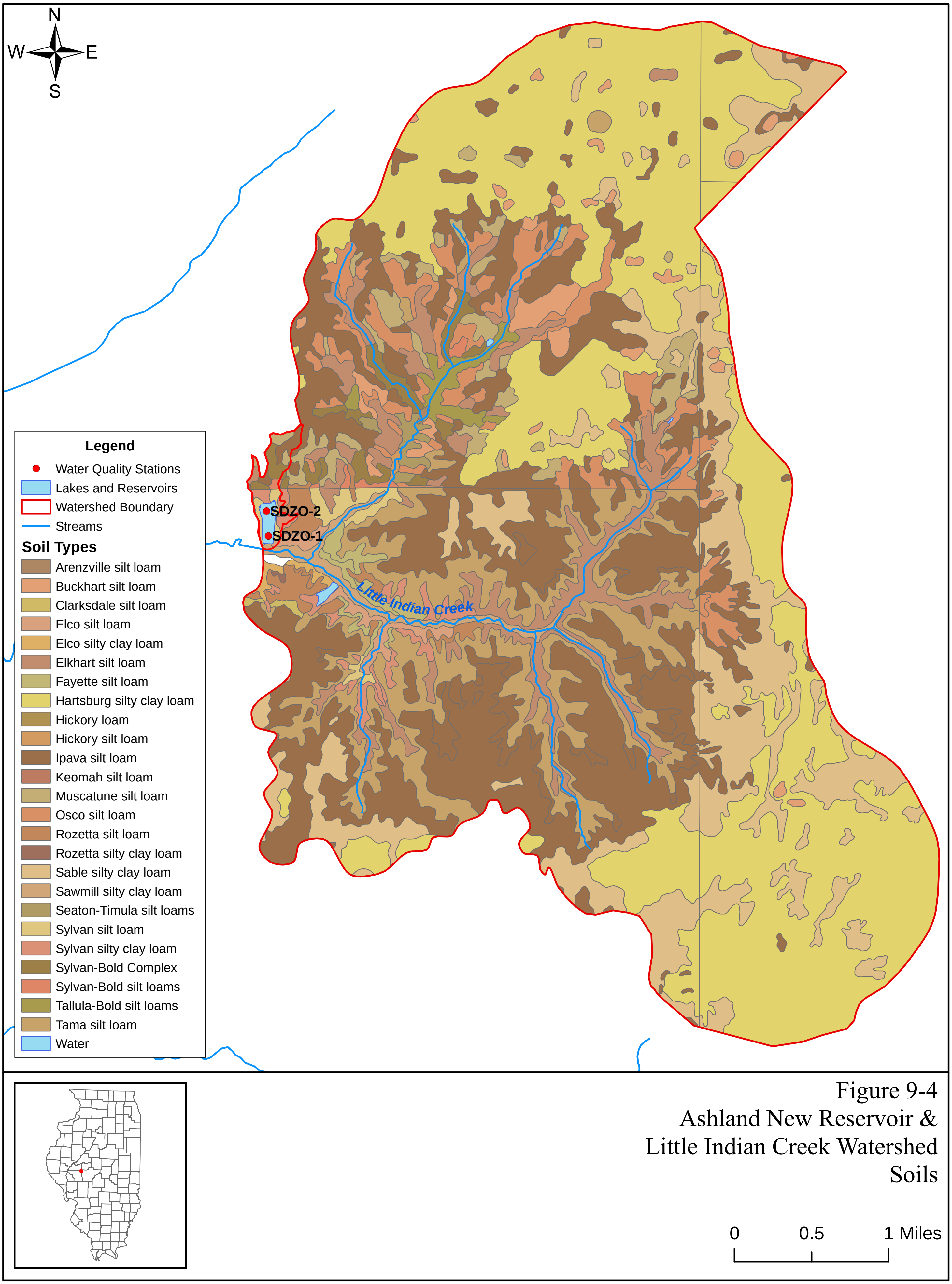

Figure 9-4
Ashland New Reservoir &
Little Indian Creek Watershed
Soils

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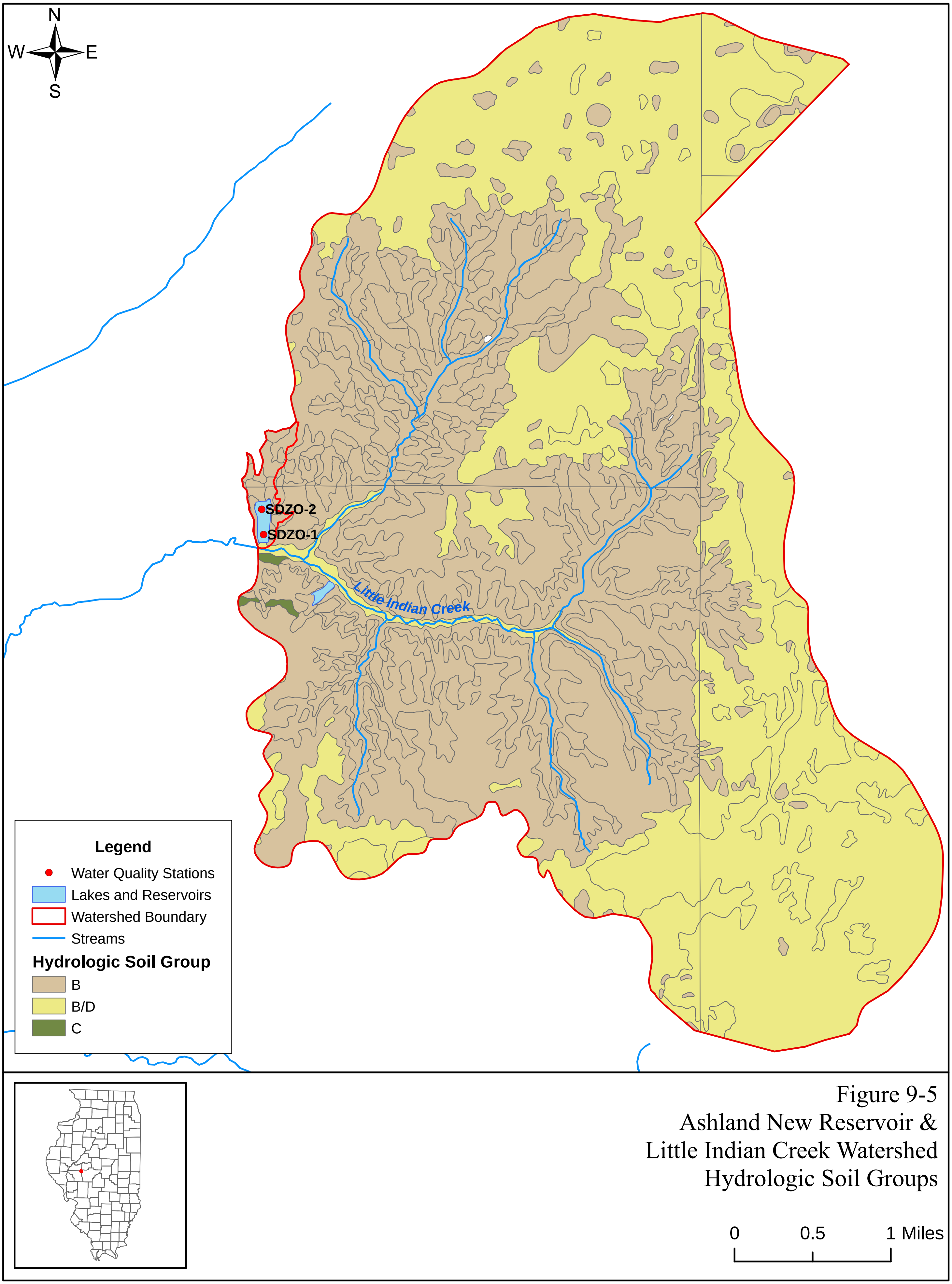

Figure 9-5
Ashland New Reservoir &
Little Indian Creek Watershed
Hydrologic Soil Groups

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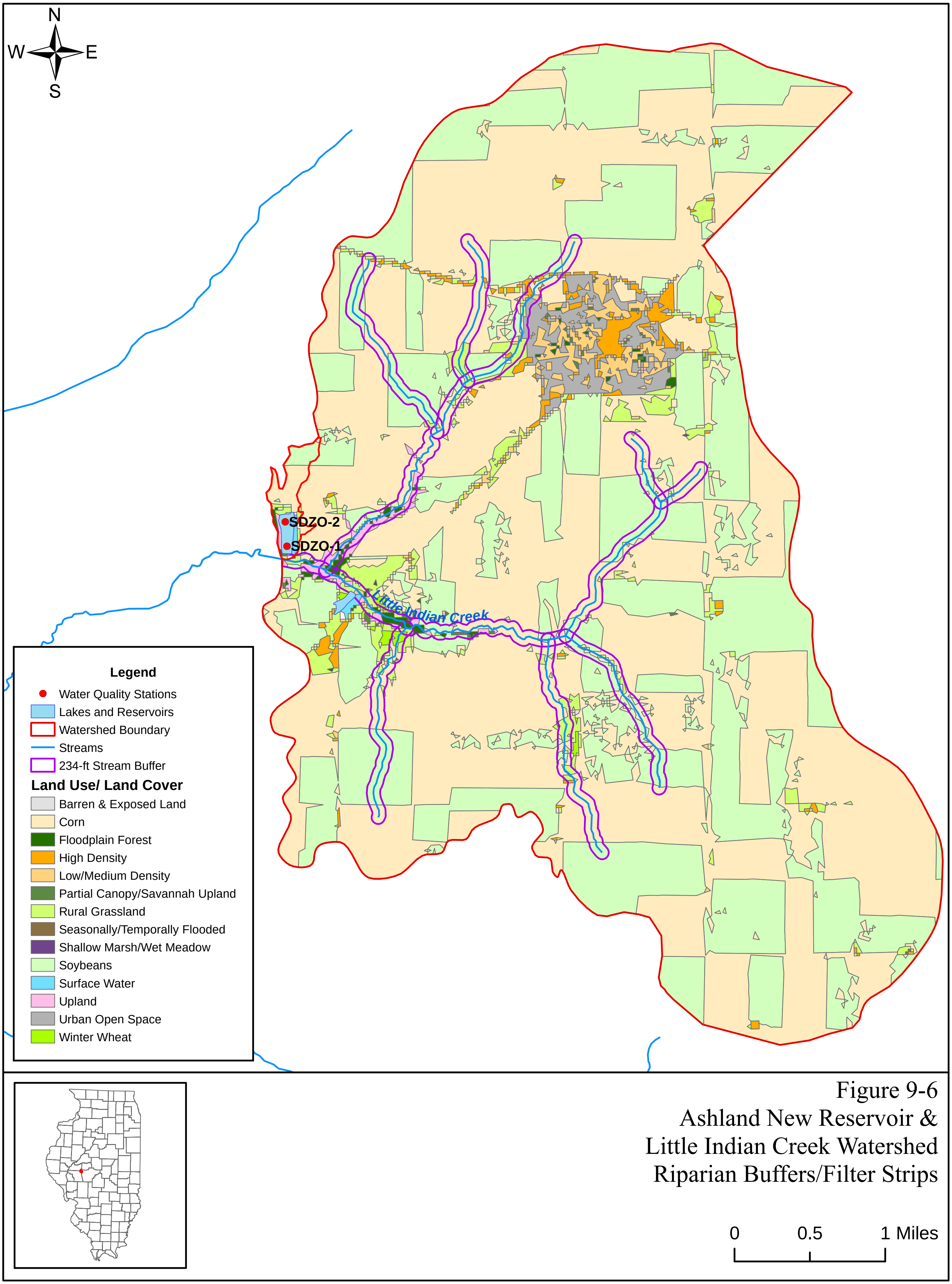

Figure 9-6
Ashland New Reservoir &
Little Indian Creek Watershed
Riparian Buffers/Filter Strips

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Section 10
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Appendix A
Land Use Categories

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File names and descriptions:

Values and class names found in the Land Cover of Illinois 1999-2000 Arc/Info GRID coverage.

Value	Class Names
0	Background
	AGRICULTURAL LAND
11	Corn
12	Soybeans
13	Winter Wheat
14	Other Small Grains & Hay
15	Winter Wheat/Soybeans
16	Other Agriculture
17	Rural Grassland
	FORESTED LAND
21	Upland
25	Partial Canopy/Savannah Upland
26	Coniferous
	URBAN & BUILT-UP LAND
31	High Density
32	Low/Medium Density
35	Urban Open Space
	WETLAND
41	Shallow Marsh/Wet Meadow
42	Deep Marsh
43	Seasonally/Temporally Flooded
44	Floodplain Forest
48	Swamp
49	Shallow Water
	OTHER
51	Surface Water
52	Barren & Exposed Land
53	Clouds
54	Cloud Shadows

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Appendix B
Soil Characteristics

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SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL137	1	19D3	1672122	0.803809	B	0.37	0.37	Sylvan silty clay loam, 10 to 15 percent slopes, severely eroded
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	280C2	1672140	26.3979	B	0.43	0.43	Fayette silt loam, 5 to 10 percent slopes, eroded
IL137	1	119D2	1672111	17.1859	B	0.43	0.43	Elco silt loam, 10 to 18 percent slopes, eroded
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	280D2	1672141	18.6738	B	0.43	0.43	Fayette silt loam, 10 to 18 percent slopes, eroded
IL137	1	8.00E+02	1672181	7.14091	C	0.37	0.37	Hickory loam, 15 to 30 percent slopes, eroded
IL137	1	279B	1672136	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL137	1	119D3	1672112	13.0163	B	0.37	0.37	Elco silty clay loam, 10 to 18 percent slopes, severely eroded
IL137	1	119D3	1672112	13.0163	B	0.37	0.37	Elco silty clay loam, 10 to 18 percent slopes, severely eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	279B	1672136	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	279B	1672136	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	279C2	1672137	3.78846	B	0.37	0.37	Rozetta silt loam, 5 to 10 percent slopes, eroded
IL137	1	279C3	1672138	2.24341	B	0.43	0.43	Rozetta silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	19D3	1672122	0.803809	B	0.37	0.37	Sylvan silty clay loam, 10 to 15 percent slopes, severely eroded
IL137	1	280C2	1672140	26.3979	B	0.43	0.43	Fayette silt loam, 5 to 10 percent slopes, eroded
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	W	1672189	1.11517			<Null>	Water
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	119D2	1672111	17.1859	B	0.43	0.43	Elco silt loam, 10 to 18 percent slopes, eroded
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	36C2	1672152	11.4047	B	0.37	0.37	Tama silt loam, 5 to 10 percent slopes, eroded
IL137	1	280C2	1672140	26.3979	B	0.43	0.43	Fayette silt loam, 5 to 10 percent slopes, eroded
IL137	1	280C2	1672140	26.3979	B	0.43	0.43	Fayette silt loam, 5 to 10 percent slopes, eroded
IL137	1	257A	1672132	2.8822	C	0.37	0.37	Clarksdale silt loam, 0 to 2 percent slopes
IL137	1	279B	1672136	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL137	1	36B	1672151	638.77002	B	0.28	0.28	Tama silt loam, 2 to 5 percent slopes
IL137	1	257A	1672132	2.8822	C	0.37	0.37	Clarksdale silt loam, 0 to 2 percent slopes
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL137	1	36B	1672151	638.77002	B	0.28	0.28	Tama silt loam, 2 to 5 percent slopes
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	36B	1672151	638.77002	B	0.28	0.28	Tama silt loam, 2 to 5 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	279B	1672136	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL137	1	280C2	1672140	26.3979	B	0.43	0.43	Fayette silt loam, 5 to 10 percent slopes, eroded
IL137	1	279C2	1672137	3.78846	B	0.37	0.37	Rozetta silt loam, 5 to 10 percent slopes, eroded
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	280C2	1672140	26.3979	B	0.43	0.43	Fayette silt loam, 5 to 10 percent slopes, eroded
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	19D2	1672121	9.11699	B	0.37	0.37	Sylvan silt loam, 10 to 15 percent slopes, eroded
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	19D3	1672122	0.803809	B	0.37	0.37	Sylvan silty clay loam, 10 to 15 percent slopes, severely eroded
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

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IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	244	1672131	7.0993	B/D	0.28	0.28	Hartsburg silty clay loam
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	244	1672131	7.0993	B/D	0.28	0.28	Hartsburg silty clay loam
IL137	1	43B	1672158	9.03486	B	0.28	0.28	Ipava silt loam, 2 to 5 percent slopes
IL137	1	244	1672131	7.0993	B/D	0.28	0.28	Hartsburg silty clay loam
IL137	1	244	1672131	7.0993	B/D	0.28	0.28	Hartsburg silty clay loam
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	244	1672131	7.0993	B/D	0.28	0.28	Hartsburg silty clay loam
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	244	1672131	7.0993	B/D	0.28	0.28	Hartsburg silty clay loam
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	36B	1672151	638.77002	B	0.28	0.28	Tama silt loam, 2 to 5 percent slopes
IL137	1	19D2	1672121	9.11699	B	0.37	0.37	Sylvan silt loam, 10 to 15 percent slopes, eroded

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL137	1	36B	1672151	638.77002	B	0.28	0.28	Tama silt loam, 2 to 5 percent slopes
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	279B	1672136	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL137	1	279B	1672136	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	19D2	1672121	9.11699	B	0.37	0.37	Sylvan silt loam, 10 to 15 percent slopes, eroded
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	19C3	1672120	7.28097	B	0.37	0.37	Sylvan silty clay loam, 5 to 10 percent slopes, severely eroded
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	279B	1672136	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL137	1	567C2	1672169	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL137	1	107	1672110	99.044998	B/D	0.28	0.28	Sawmill silty clay loam
IL137	1	43A	1672157	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL137	1	68	1672171	3.3982	B/D	0.28	0.28	Sable silty clay loam
IL137	1	19D2	1672121	9.11699	B	0.37	0.37	Sylvan silt loam, 10 to 15 percent slopes, eroded
IL137	1	W	1672189	1.11517			<Null>	Water
IL017	1	244A	731159	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	705B	740295	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL017	1	36C2	262781	11.4047	B	0.37	0.37	Tama silt loam, 5 to 10 percent slopes, eroded
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes

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AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	705B	740295	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	705B	740295	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL017	1	705B	740295	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	705B	740295	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	36C2	262781	11.4047	B	0.37	0.37	Tama silt loam, 5 to 10 percent slopes, eroded
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	705B	740295	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	36C2	262781	11.4047	B	0.37	0.37	Tama silt loam, 5 to 10 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	965D2	262830	73.656303	B	0.32	0.32	Tallula-Bold silt loams, 10 to 18 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	962D2	780783	6.39028	B	0.43	0.43	Sylvan-Bold silt loams, 10 to 18 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	244A	731159	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL017	1	244A	731159	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL017	1	W	1444914	1.11517			<Null>	Water
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes

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AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL017	1	965D2	262830	73.656303	B	0.32	0.32	Tallula-Bold silt loams, 10 to 18 percent slopes, eroded
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	962C3	262826	6.38114	B	0.37	0.37	Sylvan-Bold Complex, 5 to 10 percent slopes, severely eroded
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	3078A	731143	3.09992	B	0.43	0.43	Arenzville silt loam, 0 to 2 percent slopes, frequently flooded
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	943F	262824	29.278	B	0.43	0.43	Seaton-Timula silt loams, 18 to 35 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	965F	262831	3.83686	B	0.32	0.32	Tallula-Bold silt loams, 18 to 35 percent slopes
IL017	1	W	1444914	1.11517			<Null>	Water
IL017	1	943F	262824	29.278	B	0.43	0.43	Seaton-Timula silt loams, 18 to 35 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	705B	740295	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	8F	709148	5.60405	B	0.32	0.32	Hickory silt loam, 18 to 35 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	36C2	262781	11.4047	B	0.37	0.37	Tama silt loam, 5 to 10 percent slopes, eroded
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	705B	740295	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	705A	729339	2.39816	B	0.28	0.28	Buckhart silt loam, 0 to 2 percent slopes
IL017	1	68A	262791	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	962C3	262826	6.38114	B	0.37	0.37	Sylvan-Bold Complex, 5 to 10 percent slopes, severely eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL017	1	51B	729342	2.37616	B	0.28	0.28	Muscatune silt loam, 2 to 5 percent slopes
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	279B	731321	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL017	1	962D2	780783	6.39028	B	0.43	0.43	Sylvan-Bold silt loams, 10 to 18 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	43A	262783	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL017	1	943F	262824	29.278	B	0.43	0.43	Seaton-Timula silt loams, 18 to 35 percent slopes
IL017	1	962D3	262827	22.598801	B	0.37	0.37	Sylvan-Bold complex, 10 to 18 percent slopes, severely eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	567C2	737750	7.82286	B	0.37	0.37	Elkhart silt loam, 5 to 10 percent slopes, eroded
IL017	1	962C3	262826	6.38114	B	0.37	0.37	Sylvan-Bold Complex, 5 to 10 percent slopes, severely eroded
IL017	1	962D2	780783	6.39028	B	0.43	0.43	Sylvan-Bold silt loams, 10 to 18 percent slopes, eroded
IL017	1	962D2	780783	6.39028	B	0.43	0.43	Sylvan-Bold silt loams, 10 to 18 percent slopes, eroded
IL017	1	962C3	262826	6.38114	B	0.37	0.37	Sylvan-Bold Complex, 5 to 10 percent slopes, severely eroded
IL017	1	279B	731321	3.20087	B	0.43	0.43	Rozetta silt loam, 2 to 5 percent slopes
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL017	1	962D2	780783	6.39028	B	0.43	0.43	Sylvan-Bold silt loams, 10 to 18 percent slopes, eroded
IL017	1	86B	729340	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	705B	199350	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	86B	199352	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	244A	199312	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	705B	199350	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	244A	199312	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	86B	199352	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	244A	199312	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	705B	199350	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL167	1	705B	199350	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL167	1	705B	199350	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL167	1	705B	199350	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL167	1	244A	199312	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	86B	199352	40.6726	B	0.28	0.28	Osco silt loam, 2 to 5 percent slopes
IL167	1	244A	199312	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL167	1	86C2	199284	4.43757	B	0.37	0.37	Osco silt loam, 5 to 10 percent slopes, eroded
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	244A	199312	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	244A	199312	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL167	1	43A	199353	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL167	1	705B	199350	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL167	1	68A	199290	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes
IL129	1	68A	638900	3.14682	B/D	0.24	0.24	Sable silty clay loam, 0 to 2 percent slopes

SSURGO Soil Data for Ashland New Reservoir and Little Indian Creek Watersheds

AREASYMBOL	SPATIALVER	MUSYM	MUKEY	Acres	HdroGRP	Kwfact	kffact	MUNAME
IL129	1	244A	1404565	2158.1899	B/D	0.24	0.24	Hartsburg silty clay loam, 0 to 2 percent slopes
IL129	1	43A	1406221	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL129	1	705B	1406154	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL129	1	43A	1406221	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL129	1	43A	1406221	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL129	1	43A	1406221	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL129	1	43A	1406221	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL129	1	705B	1406154	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes
IL129	1	43A	1406221	1.89071	B	0.28	0.28	Ipava silt loam, 0 to 2 percent slopes
IL129	1	705B	1406154	0.470161	B	0.28	0.28	Buckhart silt loam, 2 to 5 percent slopes

Appendix C
Water Quality Data

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StationCode	Matrix	SampleDate	Analyte	Result	ResultUnits	SampleDepth	SampleDepthUnits
SDZO-1	Water	4/17/2006	Dissolved Oxygen	9.6	mg/L	1	ft
SDZO-1	Water	4/17/2006	Dissolved Oxygen	9.6	mg/L	3	ft
SDZO-1	Water	4/17/2006	Dissolved Oxygen	9.6	mg/L	5	ft
SDZO-1	Water	4/17/2006	Dissolved Oxygen	9.6	mg/L	7	ft
SDZO-1	Water	4/17/2006	Dissolved Oxygen	7.3	mg/L	9	ft
SDZO-1	Water	4/17/2006	Dissolved Oxygen	1.9	mg/L	11	ft
SDZO-1	Water	4/17/2006	Dissolved Oxygen	0.4	mg/L	13	ft
SDZO-1	Water	4/17/2006	Dissolved Oxygen	0.3	mg/L	15	ft
SDZO-1	Water	4/17/2006	Dissolved Oxygen	1.1	mg/L	16	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	10	mg/L	0	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	10.2	mg/L	1	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	10.1	mg/L	3	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	9.8	mg/L	5	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	10	mg/L	7	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	9.9	mg/L	9	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	8.9	mg/L	11	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	4.9	mg/L	13	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	1.4	mg/L	15	ft
SDZO-1	Water	7/5/2006	Dissolved Oxygen	0.7	mg/L	16	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	6.8	mg/L	0	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	6.2	mg/L	1	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	6.2	mg/L	3	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	5.6	mg/L	5	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	5.6	mg/L	7	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	4.6	mg/L	9	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	1.2	mg/L	11	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	0.1	mg/L	13	ft
SDZO-1	Water	8/8/2006	Dissolved Oxygen	0.1	mg/L	15	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	6.7	mg/L	0	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	5.3	mg/L	1	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	4.8	mg/L	3	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	4.6	mg/L	5	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	4.6	mg/L	7	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	4.5	mg/L	9	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	4.5	mg/L	11	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	4.4	mg/L	13	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	1.4	mg/L	15	ft
SDZO-1	Water	8/30/2006	Dissolved Oxygen	0.7	mg/L	17	ft
SDZO-1	Water	4/17/2006	Manganese	33	ug/l	13	ft
SDZO-1	Water	7/5/2006	Manganese	39	ug/l	13	ft
SDZO-1	Water	8/8/2006	Manganese	530	ug/l	13	ft
SDZO-1	Water	8/30/2006	Manganese	120	ug/l	13	ft
SDZO-1	Water	4/17/2006	Temperature	18.3	degC	1	ft
SDZO-1	Water	4/17/2006	Temperature	18.3	degC	3	ft
SDZO-1	Water	4/17/2006	Temperature	18.3	degC	5	ft
SDZO-1	Water	4/17/2006	Temperature	18.3	degC	7	ft
SDZO-1	Water	4/17/2006	Temperature	17.5	degC	9	ft
SDZO-1	Water	4/17/2006	Temperature	13.4	degC	11	ft
SDZO-1	Water	4/17/2006	Temperature	12.9	degC	13	ft
SDZO-1	Water	4/17/2006	Temperature	12.5	degC	15	ft
SDZO-1	Water	4/17/2006	Temperature	12.4	degC	16	ft
SDZO-1	Water	7/5/2006	Temperature	26.8	degC	0	ft
SDZO-1	Water	7/5/2006	Temperature	26.8	degC	1	ft
SDZO-1	Water	7/5/2006	Temperature	26.8	degC	3	ft
SDZO-1	Water	7/5/2006	Temperature	26.8	degC	5	ft
SDZO-1	Water	7/5/2006	Temperature	26.8	degC	7	ft
SDZO-1	Water	7/5/2006	Temperature	26.7	degC	9	ft
SDZO-1	Water	7/5/2006	Temperature	26.6	degC	11	ft
SDZO-1	Water	7/5/2006	Temperature	25.8	degC	13	ft
SDZO-1	Water	7/5/2006	Temperature	24.9	degC	15	ft
SDZO-1	Water	7/5/2006	Temperature	23.9	degC	16	ft

StationCode	Matrix	SampleDate	Analyte	Result	ResultUnits	SampleDepth	SampleDepthUnits
SDZO-1	Water	8/8/2006	Temperature	28.5	degC	0	ft
SDZO-1	Water	8/8/2006	Temperature	28.6	degC	1	ft
SDZO-1	Water	8/8/2006	Temperature	28.6	degC	3	ft
SDZO-1	Water	8/8/2006	Temperature	28.6	degC	5	ft
SDZO-1	Water	8/8/2006	Temperature	28.6	degC	7	ft
SDZO-1	Water	8/8/2006	Temperature	28.6	degC	9	ft
SDZO-1	Water	8/8/2006	Temperature	28.2	degC	11	ft
SDZO-1	Water	8/8/2006	Temperature	26.6	degC	13	ft
SDZO-1	Water	8/8/2006	Temperature	24.9	degC	15	ft
SDZO-1	Water	8/30/2006	Temperature	24.6	degC	0	ft
SDZO-1	Water	8/30/2006	Temperature	24.6	degC	1	ft
SDZO-1	Water	8/30/2006	Temperature	24.7	degC	3	ft
SDZO-1	Water	8/30/2006	Temperature	24.7	degC	5	ft
SDZO-1	Water	8/30/2006	Temperature	24.7	degC	7	ft
SDZO-1	Water	8/30/2006	Temperature	24.7	degC	9	ft
SDZO-1	Water	8/30/2006	Temperature	24.7	degC	11	ft
SDZO-1	Water	8/30/2006	Temperature	24.7	degC	13	ft
SDZO-1	Water	8/30/2006	Temperature	22.4	degC	15	ft
SDZO-1	Water	8/30/2006	Temperature	20.5	degC	17	ft
SDZO-1	Water	04/21/99	Depth	0	ft		
SDZO-1	Water	04/21/99	Depth	1	ft		
SDZO-1	Water	04/21/99	Depth	3	ft		
SDZO-1	Water	04/21/99	Depth	5	ft		
SDZO-1	Water	04/21/99	Depth	7	ft		
SDZO-1	Water	04/21/99	Depth	9	ft		
SDZO-1	Water	04/21/99	Depth	11	ft		
SDZO-1	Water	04/21/99	Depth	13	ft		
SDZO-1	Water	04/21/99	Depth	15	ft		
SDZO-1	Water	04/21/99	Depth	17	ft		
SDZO-1	Water	04/21/99	Depth	19	ft		
SDZO-1	Water	04/21/99	Depth	21	ft		
SDZO-1	Water	06/03/99	Depth	0	ft		
SDZO-1	Water	06/03/99	Depth	1	ft		
SDZO-1	Water	06/03/99	Depth	3	ft		
SDZO-1	Water	06/03/99	Depth	5	ft		
SDZO-1	Water	06/03/99	Depth	7	ft		
SDZO-1	Water	06/03/99	Depth	9	ft		
SDZO-1	Water	06/03/99	Depth	11	ft		
SDZO-1	Water	06/03/99	Depth	13	ft		
SDZO-1	Water	06/03/99	Depth	15	ft		
SDZO-1	Water	06/03/99	Depth	17	ft		
SDZO-1	Water	06/03/99	Depth	19	ft		
SDZO-1	Water	06/03/99	Depth	20	ft		
SDZO-1	Water	06/03/99	Depth	21	ft		
SDZO-1	Water	06/03/99	Depth	22	ft		
SDZO-1	Water	07/12/99	Depth	0	ft		
SDZO-1	Water	07/12/99	Depth	1	ft		
SDZO-1	Water	07/12/99	Depth	3	ft		
SDZO-1	Water	07/12/99	Depth	5	ft		
SDZO-1	Water	07/12/99	Depth	7	ft		
SDZO-1	Water	07/12/99	Depth	9	ft		
SDZO-1	Water	07/12/99	Depth	11	ft		
SDZO-1	Water	07/12/99	Depth	13	ft		
SDZO-1	Water	07/12/99	Depth	15	ft		
SDZO-1	Water	07/12/99	Depth	17	ft		
SDZO-1	Water	07/12/99	Depth	19	ft		
SDZO-1	Water	08/05/99	Depth	0	ft		
SDZO-1	Water	08/05/99	Depth	1	ft		
SDZO-1	Water	08/05/99	Depth	3	ft		
SDZO-1	Water	08/05/99	Depth	5	ft		
SDZO-1	Water	08/05/99	Depth	7	ft		

StationCode	Matrix	SampleDate	Analyte	Result	ResultUnits	SampleDepth	SampleDepthUnits
SDZO-1	Water	08/05/99	Depth	9	ft		
SDZO-1	Water	08/05/99	Depth	11	ft		
SDZO-1	Water	08/05/99	Depth	13	ft		
SDZO-1	Water	08/05/99	Depth	15	ft		
SDZO-1	Water	08/05/99	Depth	17	ft		
SDZO-1	Water	08/05/99	Depth	18	ft		
SDZO-1	Water	08/05/99	Depth	19	ft		
SDZO-1	Water	08/05/99	Depth	20	ft		
SDZO-1	Water	10/21/99	Depth	0	ft		
SDZO-1	Water	10/21/99	Depth	1	ft		
SDZO-1	Water	10/21/99	Depth	3	ft		
SDZO-1	Water	10/21/99	Depth	5	ft		
SDZO-1	Water	10/21/99	Depth	7	ft		
SDZO-1	Water	10/21/99	Depth	9	ft		
SDZO-1	Water	10/21/99	Depth	11	ft		
SDZO-1	Water	10/21/99	Depth	13	ft		
SDZO-1	Water	10/21/99	Depth	15	ft		
SDZO-1	Water	10/21/99	Depth	16	ft		
SDZO-1	Water	04/21/99	Dissolved Oxygen	10.6	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	10.2	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.9	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.9	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.9	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.8	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.7	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.6	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.6	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.6	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9.5	mg/L		
SDZO-1	Water	04/21/99	Dissolved Oxygen	9	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	8.5	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	8.4	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	8.4	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	8.3	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	8.3	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	8.3	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	8.1	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	5.6	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	4	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	1.7	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	0.1	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	0.1	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	0	mg/L		
SDZO-1	Water	06/03/99	Dissolved Oxygen	0	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	7.1	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	7.1	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	7	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	7	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	6.9	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	6.9	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	6.9	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	7	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	7	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	7	mg/L		
SDZO-1	Water	07/12/99	Dissolved Oxygen	6.6	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6.5	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6.4	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6.3	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6.2	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6.1	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6.1	mg/L		

StationCode	Matrix	SampleDate	Analyte	Result	ResultUnits	SampleDepth	SampleDepthUnits
SDZO-1	Water	08/05/99	Dissolved Oxygen	6	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6.1	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	6	mg/L		
SDZO-1	Water	08/05/99	Dissolved Oxygen	5.9	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8.1	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8.1	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8.6	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8	mg/L		
SDZO-1	Water	10/21/99	Dissolved Oxygen	8.1	mg/L		
SDZO-1	Water	4/21/1999	Manganese	15K	ug/l	11	
SDZO-1	Water	6/3/1999	Manganese	51	ug/l	11	
SDZO-1	Water	7/12/1999	Manganese	31	ug/l	9	
SDZO-1	Water	8/5/1999	Manganese	40	ug/l	9	
SDZO-1	Water	10/21/1999	Manganese	37	ug/l	9	
SDZO-1	Water	04/09/2003	Manganese	50	ug/l		
SDZO-1	Water	06/02/2003	Manganese	24	ug/l		
SDZO-1	Sediment	07/03/2003	Manganese	750	mg/kg		
SDZO-1	Water	4/21/1999	Phosphorus as P	0.021	mg/L	1	
SDZO-1	Water	4/21/1999	Phosphorus as P	0.023	mg/L	11	
SDZO-1	Water	4/21/1999	Phosphorus as P	0.033	mg/L	21	
SDZO-1	Water	6/3/1999	Phosphorus as P	0.012	mg/L	1	
SDZO-1	Water	6/3/1999	Phosphorus as P	0.013	mg/L	11	
SDZO-1	Water	6/3/1999	Phosphorus as P	0.009	mg/L	20	
SDZO-1	Water	7/12/1999	Phosphorus as P	0.012J	mg/L	1	
SDZO-1	Water	7/12/1999	Phosphorus as P	0.011	mg/L	9	
SDZO-1	Water	7/12/1999	Phosphorus as P	0.011	mg/L	19	
SDZO-1	Water	8/5/1999	Phosphorus as P	.003K	mg/L	1	
SDZO-1	Water	8/5/1999	Phosphorus as P	.003K	mg/L	9	
SDZO-1	Water	8/5/1999	Phosphorus as P	.003K	mg/L	18	
SDZO-1	Water	10/21/1999	Phosphorus as P	0.044	mg/L	1	
SDZO-1	Water	10/21/1999	Phosphorus as P	0.044	mg/L	9	
SDZO-1	Water	10/21/1999	Phosphorus as P	0.043	mg/L	16	
SDZO-1	Water	06/02/2003	Phosphorus as P	0.029	mg/l		
SDZO-1	Water	06/02/2003	Phosphorus as P	0.031	mg/l		
SDZO-1	Water	06/02/2003	Phosphorus as P	0.027	mg/l		
SDZO-1	Sediment	07/03/2003	Phosphorus as P	448	mg/kg		
SDZO-1	Water	07/03/2003	Phosphorus as P	0.013	mg/l		
SDZO-1	Water	07/03/2003	Phosphorus as P	0.017	mg/l		
SDZO-1	Water	07/03/2003	Phosphorus as P	0.147	mg/l		
SDZO-1	Water	08/05/2003	Phosphorus as P	0.045	mg/l		
SDZO-1	Water	08/05/2003	Phosphorus as P	0.017	mg/l		
SDZO-1	Water	08/05/2003	Phosphorus as P	0.013	mg/l		
SDZO-1	Water	04/21/99	Temperature	12.6	deg C		
SDZO-1	Water	04/21/99	Temperature	12.5	deg C		
SDZO-1	Water	04/21/99	Temperature	12.3	deg C		
SDZO-1	Water	04/21/99	Temperature	12.2	deg C		
SDZO-1	Water	04/21/99	Temperature	12.2	deg C		
SDZO-1	Water	04/21/99	Temperature	12.2	deg C		
SDZO-1	Water	04/21/99	Temperature	12.2	deg C		
SDZO-1	Water	04/21/99	Temperature	11.9	deg C		
SDZO-1	Water	04/21/99	Temperature	11.6	deg C		
SDZO-1	Water	04/21/99	Temperature	11.6	deg C		
SDZO-1	Water	04/21/99	Temperature	11.5	deg C		

StationCode	Matrix	SampleDate	Analyte	Result	ResultUnits	SampleDepth	SampleDepthUnits
SDZO-1	Water	04/21/99	Temperature	11.5	deg C		
SDZO-1	Water	06/03/99	Temperature	22.2	deg C		
SDZO-1	Water	06/03/99	Temperature	22.2	deg C		
SDZO-1	Water	06/03/99	Temperature	22.2	deg C		
SDZO-1	Water	06/03/99	Temperature	22.1	deg C		
SDZO-1	Water	06/03/99	Temperature	22.1	deg C		
SDZO-1	Water	06/03/99	Temperature	22.1	deg C		
SDZO-1	Water	06/03/99	Temperature	21.9	deg C		
SDZO-1	Water	06/03/99	Temperature	20	deg C		
SDZO-1	Water	06/03/99	Temperature	18.5	deg C		
SDZO-1	Water	06/03/99	Temperature	16.6	deg C		
SDZO-1	Water	06/03/99	Temperature	15.1	deg C		
SDZO-1	Water	06/03/99	Temperature	14.6	deg C		
SDZO-1	Water	06/03/99	Temperature	13.9	deg C		
SDZO-1	Water	06/03/99	Temperature	13.6	deg C		
SDZO-1	Water	07/12/99	Temperature	26.8	deg C		
SDZO-1	Water	07/12/99	Temperature	26.8	deg C		
SDZO-1	Water	07/12/99	Temperature	26.9	deg C		
SDZO-1	Water	07/12/99	Temperature	26.8	deg C		
SDZO-1	Water	07/12/99	Temperature	26.8	deg C		
SDZO-1	Water	07/12/99	Temperature	26.8	deg C		
SDZO-1	Water	07/12/99	Temperature	26.9	deg C		
SDZO-1	Water	07/12/99	Temperature	26.9	deg C		
SDZO-1	Water	07/12/99	Temperature	26.9	deg C		
SDZO-1	Water	07/12/99	Temperature	26.9	deg C		
SDZO-1	Water	07/12/99	Temperature	26.7	deg C		
SDZO-1	Water	08/05/99	Temperature	28.7	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.8	deg C		
SDZO-1	Water	08/05/99	Temperature	28.7	deg C		
SDZO-1	Water	08/05/99	Temperature	28.7	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-1	Water	10/21/99	Temperature	14	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-1	Water	10/21/99	Temperature	13.9	deg C		
SDZO-2	Water	4/17/2006	Dissolved Oxygen	9.7	mg/L	0	ft
SDZO-2	Water	4/17/2006	Dissolved Oxygen	9.7	mg/L	1	ft
SDZO-2	Water	4/17/2006	Dissolved Oxygen	9.5	mg/L	3	ft
SDZO-2	Water	4/17/2006	Dissolved Oxygen	9.5	mg/L	5	ft
SDZO-2	Water	4/17/2006	Dissolved Oxygen	9	mg/L	7	ft
SDZO-2	Water	4/17/2006	Dissolved Oxygen	7.3	mg/L	9	ft
SDZO-2	Water	7/5/2006	Dissolved Oxygen	10.4	mg/L	0	ft
SDZO-2	Water	7/5/2006	Dissolved Oxygen	10.5	mg/L	1	ft
SDZO-2	Water	7/5/2006	Dissolved Oxygen	10.7	mg/L	3	ft
SDZO-2	Water	7/5/2006	Dissolved Oxygen	10.6	mg/L	5	ft
SDZO-2	Water	7/5/2006	Dissolved Oxygen	10.6	mg/L	7	ft
SDZO-2	Water	7/5/2006	Dissolved Oxygen	10.3	mg/L	9	ft

StationCode	Matrix	SampleDate	Analyte	Result	ResultUnits	SampleDepth	SampleDepthUnits
SDZO-2	Water	7/5/2006	Dissolved Oxygen	10.1	mg/L	11	ft
SDZO-2	Water	8/8/2006	Dissolved Oxygen	6.2	mg/L	0	ft
SDZO-2	Water	8/8/2006	Dissolved Oxygen	6.2	mg/L	1	ft
SDZO-2	Water	8/8/2006	Dissolved Oxygen	5.9	mg/L	3	ft
SDZO-2	Water	8/8/2006	Dissolved Oxygen	5.8	mg/L	5	ft
SDZO-2	Water	8/8/2006	Dissolved Oxygen	5.5	mg/L	7	ft
SDZO-2	Water	8/8/2006	Dissolved Oxygen	5.6	mg/L	9	ft
SDZO-2	Water	8/8/2006	Dissolved Oxygen	5.3	mg/L	10	ft
SDZO-2	Water	8/30/2006	Dissolved Oxygen	4.3	mg/L	0	ft
SDZO-2	Water	8/30/2006	Dissolved Oxygen	3.4	mg/L	1	ft
SDZO-2	Water	8/30/2006	Dissolved Oxygen	3.2	mg/L	3	ft
SDZO-2	Water	8/30/2006	Dissolved Oxygen	3.1	mg/L	5	ft
SDZO-2	Water	8/30/2006	Dissolved Oxygen	3	mg/L	7	ft
SDZO-2	Water	8/30/2006	Dissolved Oxygen	3	mg/L	9	ft
SDZO-2	Water	8/30/2006	Dissolved Oxygen	1.7	mg/L	11	ft
SDZO-2	Water	4/17/2006	Temperature	18.2	degC	0	ft
SDZO-2	Water	4/17/2006	Temperature	18.2	degC	1	ft
SDZO-2	Water	4/17/2006	Temperature	18	degC	3	ft
SDZO-2	Water	4/17/2006	Temperature	17.8	degC	5	ft
SDZO-2	Water	4/17/2006	Temperature	17.6	degC	7	ft
SDZO-2	Water	4/17/2006	Temperature	15.7	degC	9	ft
SDZO-2	Water	7/5/2006	Temperature	26.8	degC	0	ft
SDZO-2	Water	7/5/2006	Temperature	26.9	degC	1	ft
SDZO-2	Water	7/5/2006	Temperature	26.8	degC	3	ft
SDZO-2	Water	7/5/2006	Temperature	26.8	degC	5	ft
SDZO-2	Water	7/5/2006	Temperature	26.8	degC	7	ft
SDZO-2	Water	7/5/2006	Temperature	26.7	degC	9	ft
SDZO-2	Water	7/5/2006	Temperature	26.7	degC	11	ft
SDZO-2	Water	8/8/2006	Temperature	28.5	degC	0	ft
SDZO-2	Water	8/8/2006	Temperature	28.5	degC	1	ft
SDZO-2	Water	8/8/2006	Temperature	28.5	degC	3	ft
SDZO-2	Water	8/8/2006	Temperature	28.5	degC	5	ft
SDZO-2	Water	8/8/2006	Temperature	28.5	degC	7	ft
SDZO-2	Water	8/8/2006	Temperature	28.5	degC	9	ft
SDZO-2	Water	8/8/2006	Temperature	28.5	degC	10	ft
SDZO-2	Water	8/30/2006	Temperature	24.3	degC	0	ft
SDZO-2	Water	8/30/2006	Temperature	24.3	degC	1	ft
SDZO-2	Water	8/30/2006	Temperature	24.3	degC	3	ft
SDZO-2	Water	8/30/2006	Temperature	24.3	degC	5	ft
SDZO-2	Water	8/30/2006	Temperature	24.3	degC	7	ft
SDZO-2	Water	8/30/2006	Temperature	24.3	degC	9	ft
SDZO-2	Water	8/30/2006	Temperature	24.1	degC	11	ft
SDZO-2	Water	04/21/99	Depth	0	ft		
SDZO-2	Water	04/21/99	Depth	1	ft		
SDZO-2	Water	04/21/99	Depth	3	ft		
SDZO-2	Water	04/21/99	Depth	5	ft		
SDZO-2	Water	04/21/99	Depth	7	ft		
SDZO-2	Water	04/21/99	Depth	9	ft		
SDZO-2	Water	04/21/99	Depth	11	ft		
SDZO-2	Water	04/21/99	Depth	13	ft		
SDZO-2	Water	06/03/99	Depth	0	ft		
SDZO-2	Water	06/03/99	Depth	1	ft		
SDZO-2	Water	06/03/99	Depth	3	ft		
SDZO-2	Water	06/03/99	Depth	5	ft		
SDZO-2	Water	06/03/99	Depth	7	ft		
SDZO-2	Water	06/03/99	Depth	9	ft		
SDZO-2	Water	06/03/99	Depth	11	ft		
SDZO-2	Water	06/03/99	Depth	13	ft		
SDZO-2	Water	06/03/99	Depth	15	ft		
SDZO-2	Water	07/12/99	Depth	0	ft		
SDZO-2	Water	07/12/99	Depth	1	ft		

StationCode	Matrix	SampleDate	Analyte	Result	ResultUnits	SampleDepth	SampleDepthUnits
SDZO-2	Water	07/12/99	Depth	3	ft		
SDZO-2	Water	07/12/99	Depth	5	ft		
SDZO-2	Water	07/12/99	Depth	7	ft		
SDZO-2	Water	07/12/99	Depth	9	ft		
SDZO-2	Water	07/12/99	Depth	11	ft		
SDZO-2	Water	07/12/99	Depth	13	ft		
SDZO-2	Water	08/05/99	Depth	0	ft		
SDZO-2	Water	08/05/99	Depth	1	ft		
SDZO-2	Water	08/05/99	Depth	3	ft		
SDZO-2	Water	08/05/99	Depth	5	ft		
SDZO-2	Water	08/05/99	Depth	7	ft		
SDZO-2	Water	08/05/99	Depth	9	ft		
SDZO-2	Water	08/05/99	Depth	11	ft		
SDZO-2	Water	08/05/99	Depth	13	ft		
SDZO-2	Water	10/21/99	Depth	0	ft		
SDZO-2	Water	10/21/99	Depth	1	ft		
SDZO-2	Water	10/21/99	Depth	3	ft		
SDZO-2	Water	10/21/99	Depth	5	ft		
SDZO-2	Water	10/21/99	Depth	7	ft		
SDZO-2	Water	10/21/99	Depth	9	ft		
SDZO-2	Water	04/21/99	Dissolved Oxygen	9.9	mg/L		
SDZO-2	Water	04/21/99	Dissolved Oxygen	10.1	mg/L		
SDZO-2	Water	04/21/99	Dissolved Oxygen	9.9	mg/L		
SDZO-2	Water	04/21/99	Dissolved Oxygen	9.9	mg/L		
SDZO-2	Water	04/21/99	Dissolved Oxygen	9.9	mg/L		
SDZO-2	Water	04/21/99	Dissolved Oxygen	9.9	mg/L		
SDZO-2	Water	04/21/99	Dissolved Oxygen	9.6	mg/L		
SDZO-2	Water	04/21/99	Dissolved Oxygen	9.6	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	8.7	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	8.7	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	8.6	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	8.7	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	8.7	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	8.6	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	9.1	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	8.4	mg/L		
SDZO-2	Water	06/03/99	Dissolved Oxygen	7.7	mg/L		
SDZO-2	Water	07/12/99	Dissolved Oxygen	8.2	mg/L		
SDZO-2	Water	07/12/99	Dissolved Oxygen	8.2	mg/L		
SDZO-2	Water	07/12/99	Dissolved Oxygen	8.1	mg/L		
SDZO-2	Water	07/12/99	Dissolved Oxygen	7.7	mg/L		
SDZO-2	Water	07/12/99	Dissolved Oxygen	7.4	mg/L		
SDZO-2	Water	07/12/99	Dissolved Oxygen	6.9	mg/L		
SDZO-2	Water	07/12/99	Dissolved Oxygen	6.8	mg/L		
SDZO-2	Water	07/12/99	Dissolved Oxygen	6.2	mg/L		
SDZO-2	Water	08/05/99	Dissolved Oxygen	7	mg/L		
SDZO-2	Water	08/05/99	Dissolved Oxygen	7.2	mg/L		
SDZO-2	Water	08/05/99	Dissolved Oxygen	7.1	mg/L		
SDZO-2	Water	08/05/99	Dissolved Oxygen	7.1	mg/L		
SDZO-2	Water	08/05/99	Dissolved Oxygen	7.3	mg/L		
SDZO-2	Water	08/05/99	Dissolved Oxygen	7.4	mg/L		
SDZO-2	Water	08/05/99	Dissolved Oxygen	6.2	mg/L		
SDZO-2	Water	08/05/99	Dissolved Oxygen	4.5	mg/L		
SDZO-2	Water	10/21/99	Dissolved Oxygen	8.6	mg/L		
SDZO-2	Water	10/21/99	Dissolved Oxygen	8.6	mg/L		
SDZO-2	Water	10/21/99	Dissolved Oxygen	8.5	mg/L		
SDZO-2	Water	10/21/99	Dissolved Oxygen	8.6	mg/L		
SDZO-2	Water	10/21/99	Dissolved Oxygen	8.5	mg/L		
SDZO-2	Water	10/21/99	Dissolved Oxygen	8.4	mg/L		
SDZO-2	Water	4/21/1999	Phosphorus as P	0.016	mg/L	1	
SDZO-2	Water	6/3/1999	Phosphorus as P	0.009	mg/L	1	

StationCode	Matrix	SampleDate	Analyte	Result	ResultUnits	SampleDepth	SampleDepthUnits
SDZO-2	Water	7/12/1999	Phosphorus as P	0.008	mg/L	1	
SDZO-2	Water	8/5/1999	Phosphorus as P	0.041	mg/L	1	
SDZO-2	Water	10/21/1999	Phosphorus as P	0.044	mg/L	1	
SDZO-2	Water	04/21/99	Temperature	12.7	deg C		
SDZO-2	Water	04/21/99	Temperature	12.5	deg C		
SDZO-2	Water	04/21/99	Temperature	12.4	deg C		
SDZO-2	Water	04/21/99	Temperature	12.3	deg C		
SDZO-2	Water	04/21/99	Temperature	12.3	deg C		
SDZO-2	Water	04/21/99	Temperature	12.3	deg C		
SDZO-2	Water	04/21/99	Temperature	12.3	deg C		
SDZO-2	Water	04/21/99	Temperature	12.1	deg C		
SDZO-2	Water	06/03/99	Temperature	22.3	deg C		
SDZO-2	Water	06/03/99	Temperature	22.3	deg C		
SDZO-2	Water	06/03/99	Temperature	22.3	deg C		
SDZO-2	Water	06/03/99	Temperature	22.2	deg C		
SDZO-2	Water	06/03/99	Temperature	22.2	deg C		
SDZO-2	Water	06/03/99	Temperature	22.1	deg C		
SDZO-2	Water	06/03/99	Temperature	21.9	deg C		
SDZO-2	Water	06/03/99	Temperature	20.4	deg C		
SDZO-2	Water	06/03/99	Temperature	18.8	deg C		
SDZO-2	Water	07/12/99	Temperature	27.2	deg C		
SDZO-2	Water	07/12/99	Temperature	27.2	deg C		
SDZO-2	Water	07/12/99	Temperature	27.2	deg C		
SDZO-2	Water	07/12/99	Temperature	27	deg C		
SDZO-2	Water	07/12/99	Temperature	26.9	deg C		
SDZO-2	Water	07/12/99	Temperature	26.8	deg C		
SDZO-2	Water	07/12/99	Temperature	26.7	deg C		
SDZO-2	Water	07/12/99	Temperature	26.6	deg C		
SDZO-2	Water	08/05/99	Temperature	28.8	deg C		
SDZO-2	Water	08/05/99	Temperature	28.8	deg C		
SDZO-2	Water	08/05/99	Temperature	28.8	deg C		
SDZO-2	Water	08/05/99	Temperature	28.8	deg C		
SDZO-2	Water	08/05/99	Temperature	28.8	deg C		
SDZO-2	Water	08/05/99	Temperature	28.8	deg C		
SDZO-2	Water	08/05/99	Temperature	28.6	deg C		
SDZO-2	Water	08/05/99	Temperature	28.1	deg C		
SDZO-2	Water	10/21/99	Temperature	14.4	deg C		
SDZO-2	Water	10/21/99	Temperature	14.4	deg C		
SDZO-2	Water	10/21/99	Temperature	14.4	deg C		
SDZO-2	Water	10/21/99	Temperature	14.4	deg C		
SDZO-2	Water	10/21/99	Temperature	14.3	deg C		
SDZO-2	Water	10/21/99	Temperature	14.2	deg C		

Appendix D
Water Quality Model Files

Model Files Available By Request
Contact IEPA at (217) 782-3362

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Appendix E
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 through August 26, 2009 postmarked, including those from the August 12, 2007 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 Ashland New Reservoir watershed 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 Ashland New Reservoir (SDZO) and Little Indian Creek, located in Morgan County. The Little Indian Creek watershed encompasses an area of approximately 11,000 acres (17 square miles). Land use in the watershed is predominately agriculture. Ashland New Reservoir consists of 13.5 surface acres and is currently used as a water source for the Village of Ashland. The water body is listed on the Illinois EPA 2008 Section 303(d) List as being impaired for manganese. 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 developed for manganese. The Illinois EPA contracted with CDM to prepare a TMDL report for the Ashland New Reservoir/Little Indian Creek watershed.

Public Meetings

Public meetings were held at the Ashland Village Office on November 12, 2008 and August 12, 2009. The Illinois EPA provided public notice for both meetings by placing display ads in the Cass County Star Gazette. 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 31 individuals and organizations were also sent the public notice by first class mail. The draft TMDL Report was available for review at the Ashland Village Office, and also on the Agency's web page at http://www.epa.state.il.us/public-notices/

A public meeting started at 6:30 p.m. on Wednesday, August 12, 2009. It was attended by approximately 12 people and concluded at 7:20 p.m. with the meeting record remaining open until midnight, August 26, 2009.

Questions and Comments

1. Illinois Department of Natural Resource's Office of Water Resources performed a flood study for the Village. The watershed boundary for Little Indian Creek in the draft Stage 3 TMDL report does not agree with the boundary as drawn by IDNR.

   Response: Illinois EPA has received the watershed boundary map from IDNR and has updated the watershed maps found in Section 9 of the final TMDL Report accordingly.

2. The Village is working with Cass County Rural Water District and North Morgan Water Coop to provide drinking water to the village. It is anticipated that the Village will cease to use the Ashland New Reservoir as a Public Water Supply by the end of 2011.

   Response: Thank you for your comment.