Spring Lake Watershed Plan

July 2008

Spring Lake Watershed Committee Members:

Lee Calvert, Chairman
Jon Bowman, Vice-Chairman
Alice Henry, Secretary
Jim Bessler
Walter Burnett
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Mission Statement

The mission of the Spring Lake Watershed Committee is "improve the water quality of Spring Lake while sustaining recreational, agricultural, municipal, and residential resources".

Introduction

The McDonough County Soil and Water Conservation District hosted the first informational public meeting to address issues of water quality of Spring Lake, December 18, 2006. A number of local residents, landowners and representatives from several organizations attended including:

- The La Moine River Ecosystem Partnership
- Association of Illinois Soil and Water Conservation Districts (AISWCD)
- Macomb Public Works Department
- Environmentally Concerned Citizens of Macomb
- Western Prairie Audubon Society

It was agreed at this meeting a group should be formed to address water quality problems at Spring Lake. At this meeting a planning committee was formed to investigate water quality issues and put together a plan to address the problems.

On February 15, 2007, the 10-person Spring Lake Watershed Committee had its first meeting. The committee discussed the purpose for a watershed plan and what is involved in putting a plan together. At this meeting the committee came up with a mission statement and elected officers to head the committee. Officers for the committee: Lee Calvert, Chairman; Jon Bowman, Vice-Chairman; Alice Henry, Secretary.

On March 22, 2007, the committee held a Spring Lake Watershed Based Planning Public Information Meeting to go over the scope of the plan. The planning committee held a meeting on May 24, 2007 to begin developing problem statements.

The technical committee first met on June 21, 2007 to solicit technical help for the watershed plan. Members of the technical committee were asked to provide input and submit technical analysis on the problem statements developed by the planning committee.

On both October 25 and November 20, 2007 the planning committee met and worked on problem statements, goals/objectives and action items.

On December 13, 2007 the planning committee met to make last minute changes to the plan and approved the draft plan for submission.

Table 1. Spring Lake Watershed Technical Committee.

Name	Affiliation
Richard Ferguson	McDonough County Farm Bureau
Ray Peterson	Macomb Park District
Jim Nelson	Assoc. of Soil & Water Conserv. Dist.
Barrie McVey	IDNR Forestry
Lee Calvert	Farmer
Loretta Ortiz-Ribbing	U of I extension
Alice Henry	McDonough County Board
Chuck Ehlschlaeger	Western Illinois University
Jonathan Heerbooth	West Prairie School District
Jim Bessler	City of Macomb
Walter Burnett	City of Macomb
Jeff Boeckler	IDNR
Beau Thomas	NRCS Soil Conservationist
Sue Phelps	NRCS Soil Conservation Technician
Dana Walker	La Moine River Ecosystem Partnership
Roger Windhorn	NRCS Soil Scientist/Geologist
Scott McConnell	Western Illinois University
Ken Russell	IDNR District Fisheries Biologist

Watershed Description

General Overview

The Spring Lake Watershed is located in McDonough County in West Central Illinois and is part of the Spring Creek Watershed (Hydrologic Unit Code 071300100305). Spring Creek (DGLA 01) and two unnamed tributaries flow into Spring Lake. The watershed encompasses 13,700 acres or 21.4 square miles and is entirely within McDonough County. The Town of Sciota (population 58) and West Prairie High School both fall within the boundaries of the watershed. Using United States 2000 Census data we estimate there are about 150 people living in the Spring Lake Watershed which accounts for about 80 households.

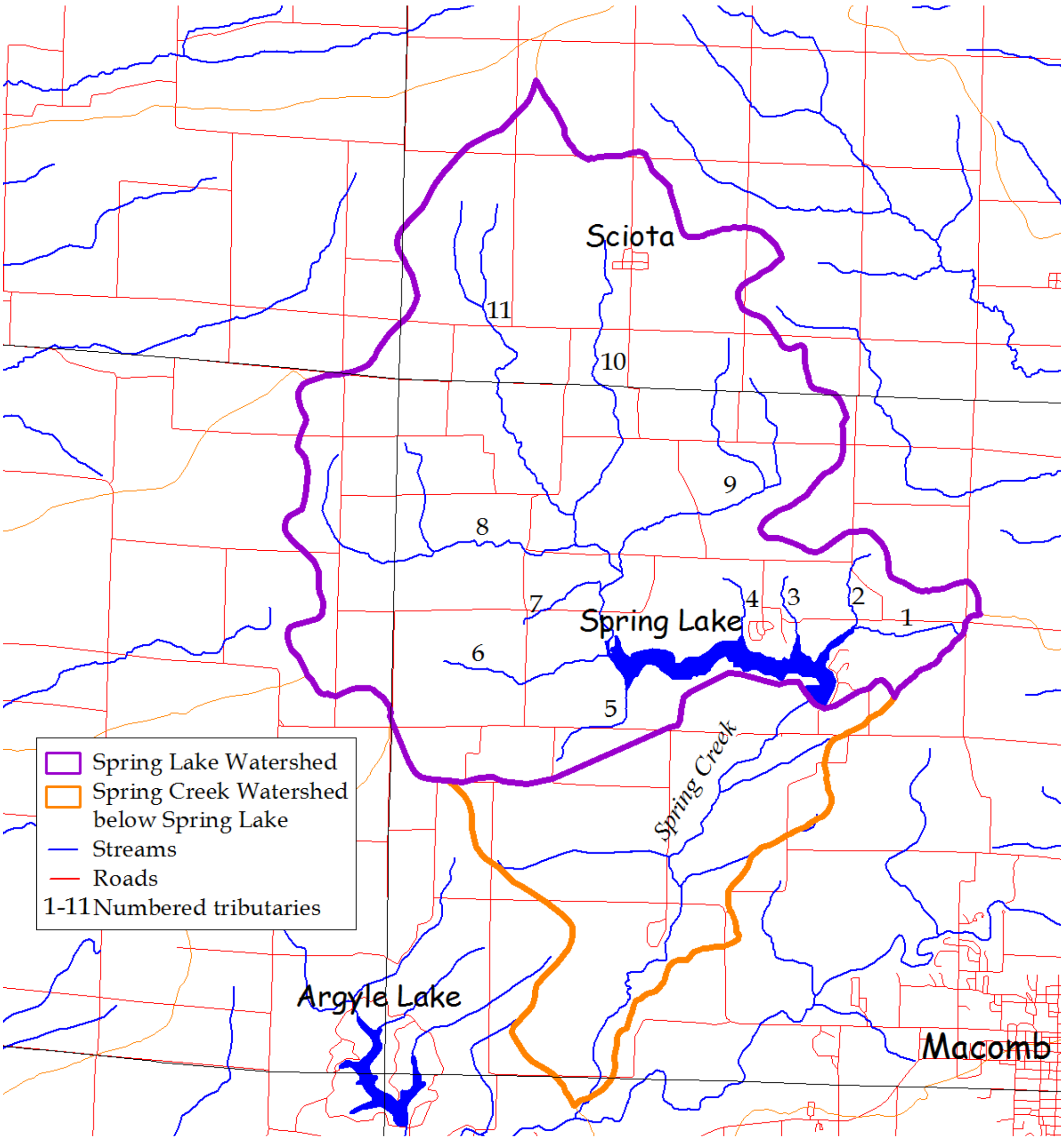


Figure 1. Spring Lake Watershed Map.

Spring Lake (IEPA waterbody ID. RDR) has a surface area of 236.8 acres. The lake itself falls within the City of Macomb; however, most of the watershed is unincorporated. Two subdivisions fall within Spring Lake, Spring View (Macomb), and Melwood Estates (unincorporated).

The overall topography of the watershed is flat or gently rolling former prairie landscape which is now dominated by row crops. There is a small amount of steep terrain adjacent to Spring Lake and its main tributaries. The 11 tributaries to Spring Lake are currently unnamed on United States Geologic Survey topographic maps. For identification purposes we have we have numbered the tributaries 1 through 11 (figure 1).

After exiting Spring Lake water from Spring Lake Watershed continues on down Spring Creek flowing into the East Fork of the La Moine River which in turn flows into the La Moine River which then flows into the Illinois River which runs into the Mississippi River and empties into the Gulf of Mexico.

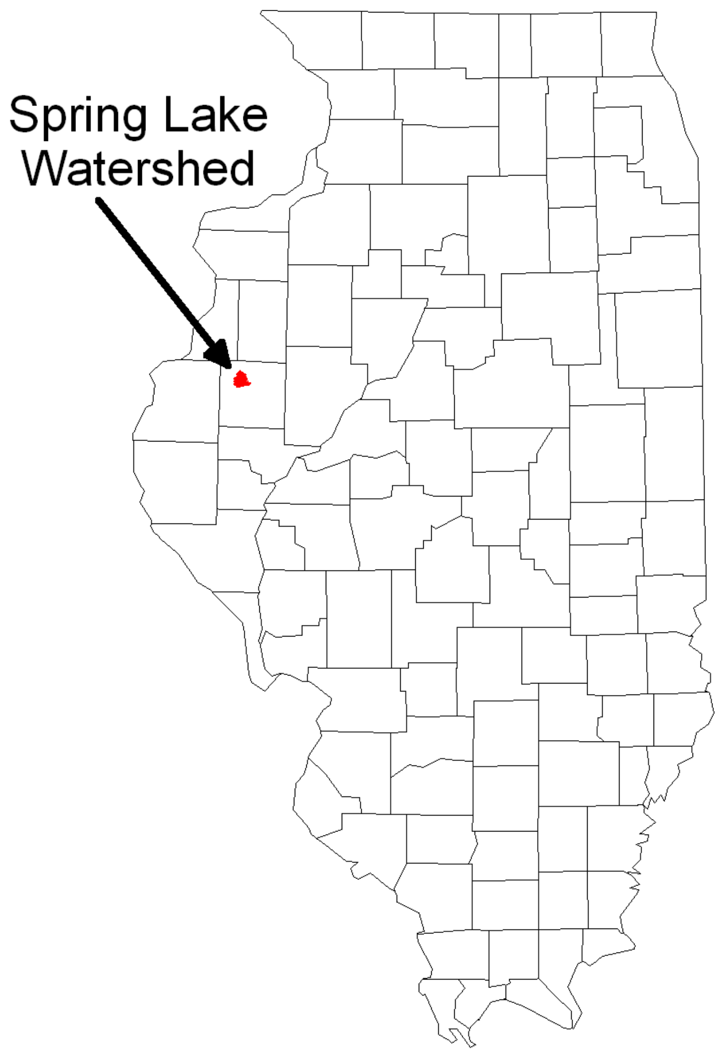


Figure 2: Location of Spring Lake Watershed.

Human Use

Spring Lake is the primary water source for the City of Macomb, Colchester, Bardolph and Tennessee.

Crop production is the dominant land use for the Spring Lake Watershed. Three quarters of the watershed, or 10,300 acres (76%), are used for the production of crops. The primary crops in the watershed are corn and soybean and are generally rotated on a yearly basis. We estimate there are about 26 farms in the watershed given the 2002 National Agriculture Statistics Service estimates 752 farms in McDonough County and the watershed comprises 3.4 percent of county. The average farm size in the county is 432 acres with almost all full time farmers in the watershed.

The remaining lands include 1,300 acres in grassland (9%), 1,450 acres in woodland and bottomland forests (11%), and 631 acres for all other uses (5%).

Spring Lake Park (1,085 acres), which includes Spring Lake and associated Lakeview Nature Center (operated by the Macomb Park District) provides the public with numerous recreational opportunities including, fishing, boating, camping, picnicking, hiking and biking trails, bird watching, and many other outdoor activities.

Boat ramp and docks at Spring Lake

There is one IEPA permitted waste point source in the watershed. The source, West Prairie High School (NPDES Permit No. IL0053619), is located in Sciota Township about one half mile south of the town of Sciota.

The one major road in the watershed is Illinois Rt 9 which crosses the northern portion of our watershed along an east-west heading.

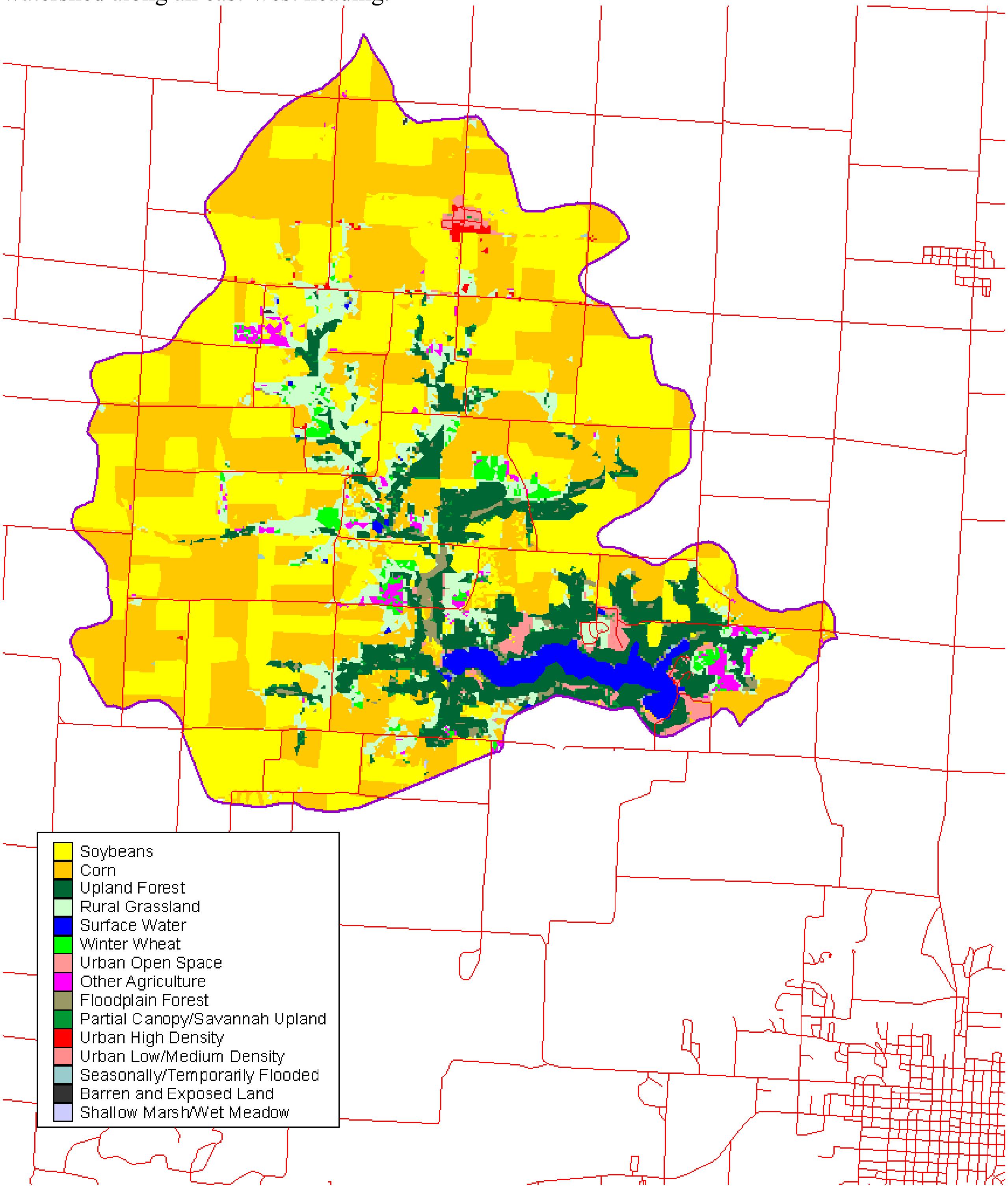


Figure 3. Land cover map of Spring Creek / Spring Lake Watershed.

Construction of Spring Lake

Spring Lake is located 4 miles northwest of Macomb and was originally constructed in 1927 for the purpose of supplying water to the city of Macomb. High rates of siltation reduced the storage capacity of the lake, which in turn led to the construction of a second dam downstream in 1968, expanding the lake to its present size.

Watershed History

In 1983, the McDonough County Soil and Water Conservation District put together a Spring Lake Watershed Plan under the National Environmental Policy Act of Public Law 566 funding (McDonough County Soil and Water Conservation District 1983). The goal of this plan was:

- accelerate the application of conservation practices in order to reduce soil degradation caused by sheet and rill erosion
- reduce sediment delivery to the lake
- improve water quality in the lake
- provide upland wildlife habitat enhancement.

Soil loss and water quality issues were addressed by proposing conservation projects such as conservation tillage systems, grass waterways, grade stabilization structures, terraces, diversions, critical area treatments, land use conversion, field borders, livestock exclusion, and wildlife habitat management. This plan outlined the program which provided funding to willing landowners in order to implement conservation practices. Landowners enrolling in the program were responsible for approximately 32 percent of the construction cost.

Over the life of the program, 1983 to 1997, 59 landowner contracts were implemented within the watershed. These contracts funded included.

- 54 acres of grassed waterways
- 75,000 feet of terraces
- 25 grade stabilization structures
- 73 water and sediment control basins
- 52 diversions
- 62 acres of crop to pasture conversion
- 3,600 acres of conservation tillage
- 174 acres of contouring.

Spring Lake Spillway

Table 2 Spring Lake PL 566 Watershed Plan Goals and accomplishments*

Conservation Practice	Plan Goals (recommended alternative)	Practices Implemented	Percent Accomplished
Conservation Tillage System	5,017 ac	3,600 ac	72%
Terraces and Outlets[1]	150,000 ft	126,550 ft	84%
Land Conversion	146 ac	62 ac	42%
Critical Area Treatment	80 ac	None	0%
Contouring	620 ac	174 ac	28%
Grassed Waterways	70 ac	54 ac	77%
Grade Stabilization Structures	30	25	83%
Field Borders[2]	24 ac	None	0%
Wildlife Habitat Management[2]	80 ac	None	0%
Livestock Exclusion[2]	80 ac	None	0%
WASCAB	Included in Terraces and Outlets	73	
Diversions	Included in Terraces and Outlets	52	

* Data from Wells 1998 and Mc Donough County SWCD Staff.

[1] WASCAB's and Diversions were included in the plan goals under Terraces and Outlets. We used an average of 350 and 500 liner feet per practice respectively to calculate amount implemented.

[2] Cost share funding was not available.

Watershed Activities

Lake View Nature Center located just east of Spring Lake encompasses over 350 acres and is the primary source of environmental education in Spring Lake Park. The center is staffed daily by the Macomb Park District and provides year-round environmental educational opportunities. Each year the center offers nearly 100 educational programs generally geared towards elementary and middle school aged students. Examples of programs include "Exploring the Pond", "Discover the Spillway", "Nature Photography Workshop", and a "Study of Woodpeckers". In addition, the staff leads nature walks throughout the year for both children and adults. Other features of the nature center include a prairie restoration, native butterfly garden, a bluebird trail with 46 boxes, and three day camps held each summer for elementary school children.

The La Moine River Ecosystem Partnership is a grassroots watershed organization whose coverage includes the Spring Lake Watershed. The partnership is a collaboration of more than 25 organizations and dozens of landowners and residents committed to the protection, restoration, and stewardship of the La Moine River Watershed and adjacent areas. Over a three-year timeframe, 2004 to 2006, the partnership put together an integrated watershed management plan. The formation of this plan included input from citizens, landowners, and local organizations, through public planning meetings, outreach efforts, focus groups, landowner and resident surveys. In addition, the plan included extensive data analysis and technical review. With this information the La Moine River Ecosystem Partnership, along with its Technical Committee, put together five goals for the La Moine River Watershed.

Goal 1. Facilitating the management, restoration, and preservation of natural communities while enhancing their biodiversity.
Goal 2. Supporting the improvement and protection of water resources.
Goal 3. Advancing efforts that contribute to a reduction in soil erosion and sedimentation.
Goal 4. Enhancing awareness of issues relating to ecosystem management and protection.
Goal 5. Promote the use of land and water resources for recreation.

More specific details, including objectives, strategies and action items, estimated costs and a projected timeline are provided in the plan available online at www.lamoineriver.org.

Since the formation of the partnership in 2001, the organization has received over $900,000 of funding (both primary and matching funds) for projects located within the La Moine River Watershed. Projects funded through the partnership include more than 200 acres of prairie/grassland and reforestation. In addition, the partnership funded and provided technical support for 22 acres of wetland restorations and 3 miles of bank stabilization. The partnership initiated a livestock management initiative which provides assistance to fence off livestock from streams and restoring stream banks with native vegetation, and watershed education outreach programs. In 2005 and 2007, the partnership offered "La Moine River Wheels for Conservation" bus tours. The bus trips invited local landowners on an educational tour of the watershed emphasizing conservation land use practices.

Other watershed educational activities:

- Macomb Earth Day Fair - Held in mid-April nearly every year since the mid 1990's. This event attracts from 400 to 1,000 people each year. The event is targeted to both children and adults with programs for all ages. The fair also includes many vendors and environmental organizations.
- Lake Fest at Argyle Lake State Park started in 2004 and is held every year during the summer. Attendance has averaged about 100 individuals each year and is geared towards children.
- Western Illinois University Environmental Summit is a yearly event which was started in the spring of 2003 by graduate students. In 2005, the Institute for Environmental Studies took the reins and expanding the summit by bringing in well known speakers and opening it up to the community. In 2008, the Institute partnered with Green Space out of Monmouth to expand and include energy conservation as a theme. Attendance for the event was estimated at 500 with an additional 50 vendors/exhibits.

Watershed Resource Inventory

Land Uses / Land Cover

Land use in the Spring Lake Watershed is dominated by row crops, primarily corn and soybean. Row crops cover 10,300 acres, 76 percent of the land cover in the watershed. Ranking a distant second, forested land covers 11 percent of the land located primarily adjacent to Spring Lake or Spring Creek. Small grain/grassland covers 9 percent of the watershed. Surface water, wetlands, other agriculture, and urban land each cover less than 3 percent of the total watershed area.

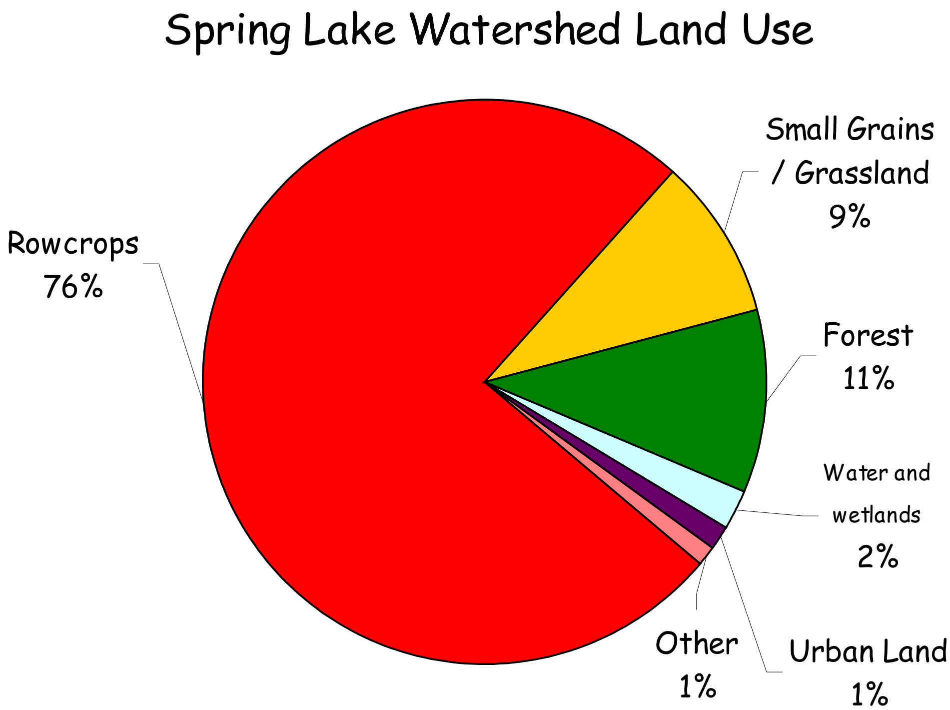


Figure 4. Land Use of Spring Lake Watershed.

In 2007, the La Moine River Ecosystem Partnership sponsored a study to identify livestock operations in the La Moine River Watershed. Sub-setting the geo-referenced data this study identified 15 small livestock operations in the Spring Lake Watershed. These operations are generally small to medium size cattle operations.

Water Resources

Surface area of water in the Spring Lake watershed comprises 294.2 acres or 2.0 percent of the land cover of the watershed. Spring Lake itself accounts for the largest portion of the surface water with a surface area of 236.8 acres. Twenty-six farm ponds account for 15.9 acres which have been constructed over the past 60 years. Spring Creek and its tributaries in the watershed account for 15 acres or 14 stream miles.

Wetlands in the Spring Lake watershed are most prevalent adjacent to Spring Creek and the intermittent tributaries along alluvial deposits. The largest wetland area is located at the extreme upper end (west end) of Spring Lake within the alluvial fan of Spring Creek as it enters the lake.

To date, no fishery inventories have been completed on Spring Creek above the lake; however, the following 18 fish species are speculated to occur: carp, creek chub, hornyhead chub, bigmouth shiner, red shiner, sand shiner, bluntnose minnow, fathead minnow, stoneroller, shorthead redhorse, white sucker, black bullhead, yellow bullhead, green sunfish, bluegill and largemouth bass (from pond overflow), johnny darter, and orange-throated darter. A fishery survey of Spring Creek above Spring Lake will be conducted in 2008 to determine a fish species list and their relative abundance.

Section 303(d) of the 1972 Clean Water Act requires States to define impaired waters and identify them on a list, which is referred to as the 303(d) list. Impaired waters are defined as waterbodies that are not meeting their designated uses.

The designated uses for the Spring Lake include: aquatic life, fish consumption, public water supply, primary contact, secondary contact, and aesthetics. IEPA found that Spring Lake does not meet the designated use for aquatic life and aesthetics. IEPA also found that for public water supply Spring Lake was fully supporting while designated use for fish consumption, primary contact and secondary contact were not assessed.

Pollutants found in Spring Lake that caused the listing include phosphorus (total), total suspended solids, and nitrogen (total). Only phosphorus has a numerical water quality standard and therefore a TMDL for phosphorus has been developed East Fork LaMoine River Watershed. TMDL Report (IEPA/BOW/07-016, August 2007).

None of the eleven tributaries that empty into Spring Lake have been monitored and are not listed as a 303(d) impaired waters.

Soil Erosion

This plan utilizes a revised version of the Universal Soil Loss Equation (RUSLE) to estimate long-term averages in annual rates of soil erosion over a period of several decades, based on precipitation, soil type, topography, crop rotation and field management practices. The equation is A = R x K x LS x C x P, where R is a constant for the study area, K and LS are provided by the soil layer, and C and P are provided by the SWCD. A is the potential average amount of annual soil loss in tons per acre per year and is comparable to "tolerable soil loss" limits.

The RUSLE is used to predict the amount of soil loss in a field from sheet or rill erosion on a single slope. It does not take into account additional soil losses from gully, wind or tillage erosion. The equation was designed to be used for selected cropping and management systems, however, the model can also be applied to non-agricultural conditions. The watershed partnership used the USLE to estimate reduction in soil loss from the application of conservation practices.

Data for soil mapping in the Spring Lake Watershed was available through the Soil Survey Geographic (SSURGO) database State. 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 (Illinois Environmental Protection Agency 2006).

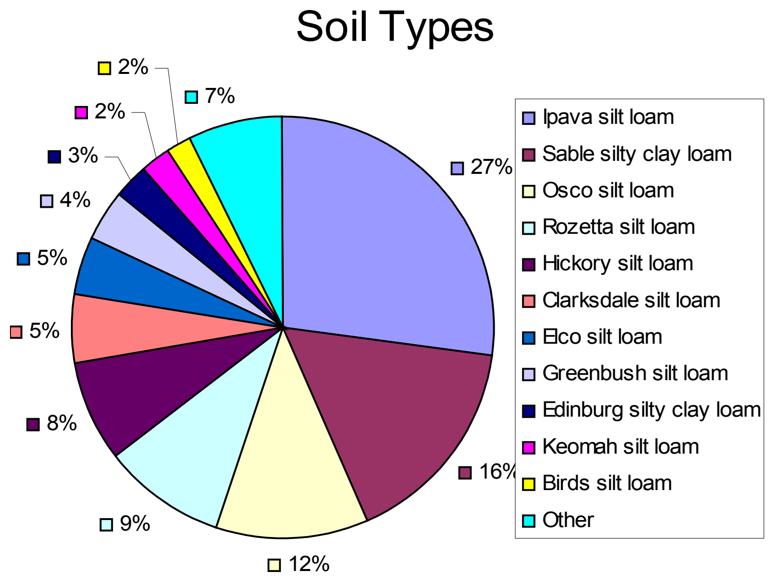
The dominant soil types in the watershed include, Ipava, Sable, Osco, Rozetta and Hickory (Table 3). Ipava Silt Loam makes up 27 percent of the watershed and is level to gently sloping, somewhat poorly drained loess soil developed under prairie vegetation. It is well suited for farming with slight to moderate potential for water erosion (McDonough County Soil and Water Conservation District 1983, Preloger 2005).

Making up 16 percent of the watershed, Sable Silty Clay Loam is a nearly level, poorly drained soil developed under prairie vegetation. It well suited for farming with seasonal wetness with ponding being the most common management problem. The soils have a low potential for water erosion (McDonough County Soil and Water Conservation District 1983, Preloger 2005).

Osco Silt Loam makes up 12 percent of the watershed. Osco soils are gently sloping well drained prairie soils found on loess covered ridges and knolls. They are well suited for farming with a moderate to severe potential for water erosion (McDonough County Soil and Water Conservation District 1983, Preloger 2005).

The K-factor of soils in the watershed range from 0.24 to 0.43 (Figure 5). The factor signifies a relative index of susceptibility of bare, cultivated soil to particle detachment and transport by rainfall and is utilized in the Revised Universal Soil Loss Equation (RUSLE). Soil K-factors of 0.4 or greater indicate soils that have high silt content and are the most erodable while soils from 0.25 to 0.4 tend to be moderately erodable. Seventeen percent of the soils in the watershed have a K-factor of > 4 and are primarily located in the forested areas adjacent to Spring Lake and Spring Creek (figure 7).

The LS factor or length slope factor represents the effect slope has on erosion which is also used in the Revised Universal Soil Loss Equation (RUSLE). Just over 55 percent of the watershed has an LS value of less then 0.5, 18 percent more has an LS of less than 1.0 but greater than 0.5. Nine percent of the watershed has an LS factor of greater than 2 and 6 percent of the land has a LS of greater than 4.



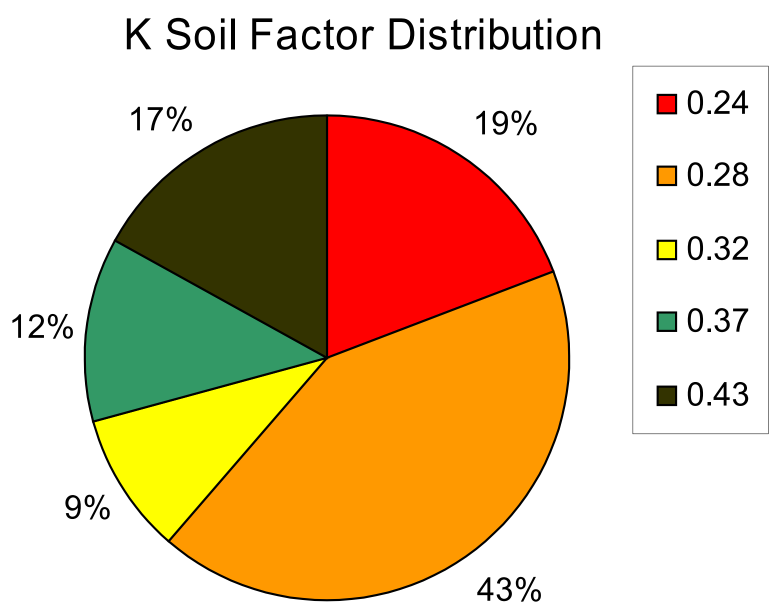


Figure 5. Soil types and K factor abundance of Spring Lake Watershed

Table 3. Soil types in the Spring Lake Watershed.

Soil ID	Soil type	Acres	Percent
259C2	Assumption silt loam, 5 to 10 percent slopes, eroded	47	0.3%
7C3	Atlas silty clay loam, 5 to 10 percent slopes, severely eroded	12	0.1%
7D3	Atlas silty clay loam, 10 to 18 percent slopes, severely eroded	42	0.3%
1334A	Birds silt loam	158	1.2%
3334A	Birds silt loamloam, 0 to 2 percent slopes, frequently flooded	107	0.8%
257A	Clarksdale silt loam, 0 to 2 percent slopes	517	3.8%
257B	Clarksdale silt loam, 2 to 5 percent slopes	213	1.6%
45A	Denny silt loam, 0 to 2 percent slopes	54	0.4%
249A	Edinburg silty clay loam, 0 to 2 percent slopes	373	2.7%
119C2	Elco silt loam, 5 to 10 percent slopes, eroded	118	0.9%
119D2	Elco silt loam, 10 to 18 percent slopes, eroded	423	3.1%
119E2	Elco silt loam, 18 to 25 percent slopes, eroded	83	0.6%
280F	Fayette silt loamloam, 18 to 35 percent slopes	36	0.3%
6C2	Fishhook silt loam, 5 to 10 percentslopes, eroded	10	0.1%
6D2	Fishhook silt loam, 10 to 18 percentslopes, eroded	107	0.8%
675B	Greenbush silt loam, 2 to 5 percent slopes	533	3.9%
8D2	Hickory silt loam, 10 to 18 percent slopes, eroded	22	0.2%
8F	Hickory silt loam, 18 to 35 percent slopes	858	6.3%
8G	Hickory silt loam, 35 to 60 percent slopes	190	1.4%
43A	Ipava silt loam, 0 to 2 percent slopes	3,736	27.3%
43B	Ipava silt loam, 2 to 5 percent slopes	2	0.0%
470C2	Keller silt loam, 5 to 10 percent slopes, eroded	159	1.2%
17A	Keomah silt loam, 0 to 2 percent slopes	186	1.4%
17B	Keomah silt loam, 2 to 5 percent slopes	120	0.9%
9017B	Keomah silt loam, terrace, 2 to 5 percent slopes	0	0.0%
549F	Marseilles silt loam, 18 to 35 percent slopes	23	0.2%
549G	Marseilles silt loam, Marseilles silt loam, 35 to 60 percent slopes	3	0.0%
802E	Orthents, loamy, hilly	24	0.2%
86B	Osco silt loam, 2 to 5 percent slopes	499	3.6%
86B2	Osco silt loam, 2 to 5 percent slopes, eroded	680	5.0%
86C2	Osco silt loam, Osco silt loam, 5 to 10 percent slopes, eroded	400	2.9%
279B	Rozetta silt loam, 2 to 5 percent slopes	893	6.5%
279C2	Rozetta silt loam, 5 to 10 percent slopes	302	2.2%
279D2	Rozetta silt loam, 10 to 18 percent slopes	95	0.7%
9279B	Rozetta silt loam, terrace, 2 to 5 percent slopes	2	0.0%
16A	Rushville silt loam 0 to 2 percent slopes	7	0.0%
68A	Sable silty clay loam, 0 to 2 percent slopes	2,207	16.1%
3284A	Tice silty clay loam, 0 to 2 percent slopes	90	0.7%
605D2	Ursa loam, 10 to 18 percent slopes, eroded	52	0.4%
3333A	Wakeland silt loam, 0 to 2 percent slopes, frequently flooded	67	0.5%
W-T	Water	251	1.8%
	Total	13,701	

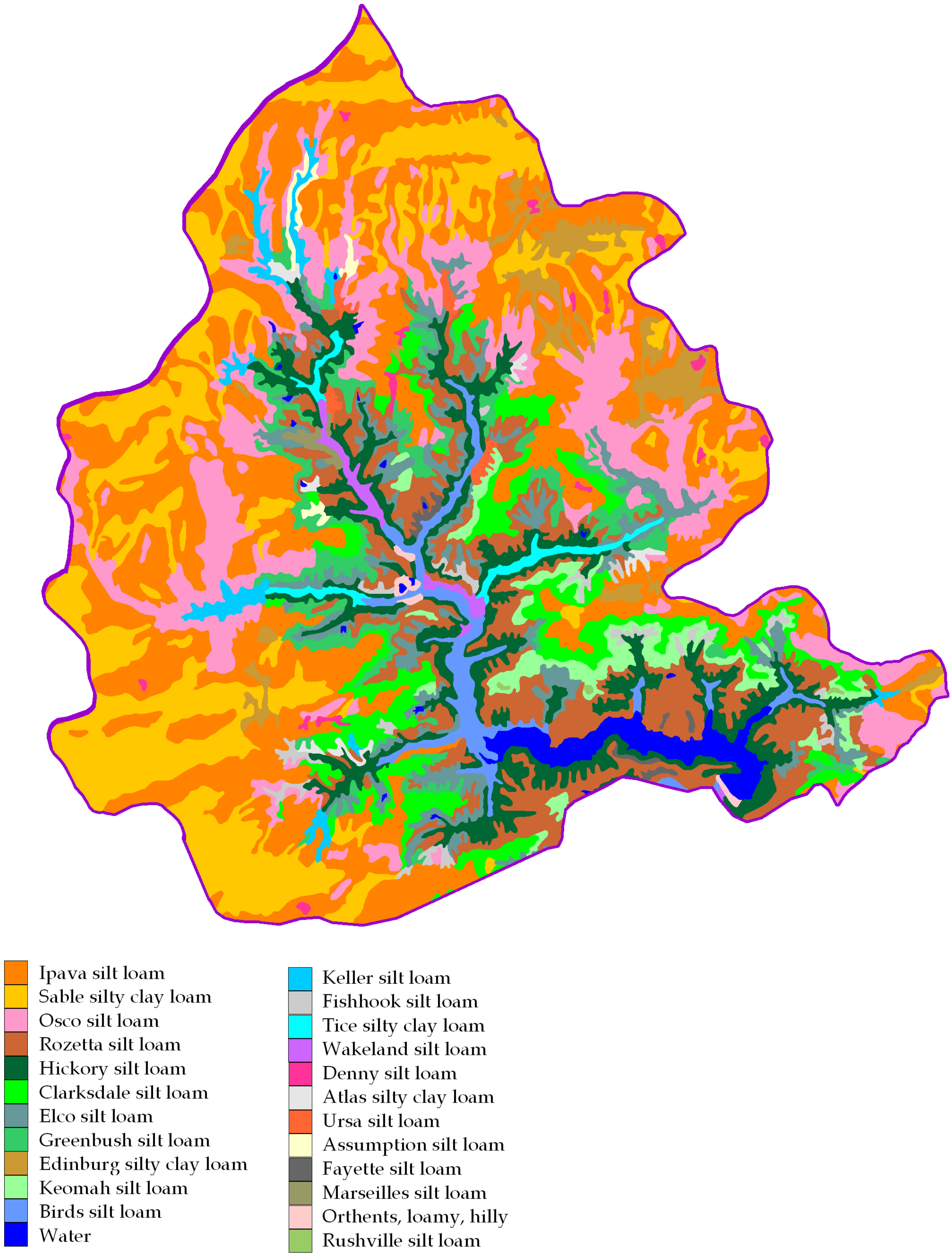


Figure 6. Soil map of Spring Lake Watershed.

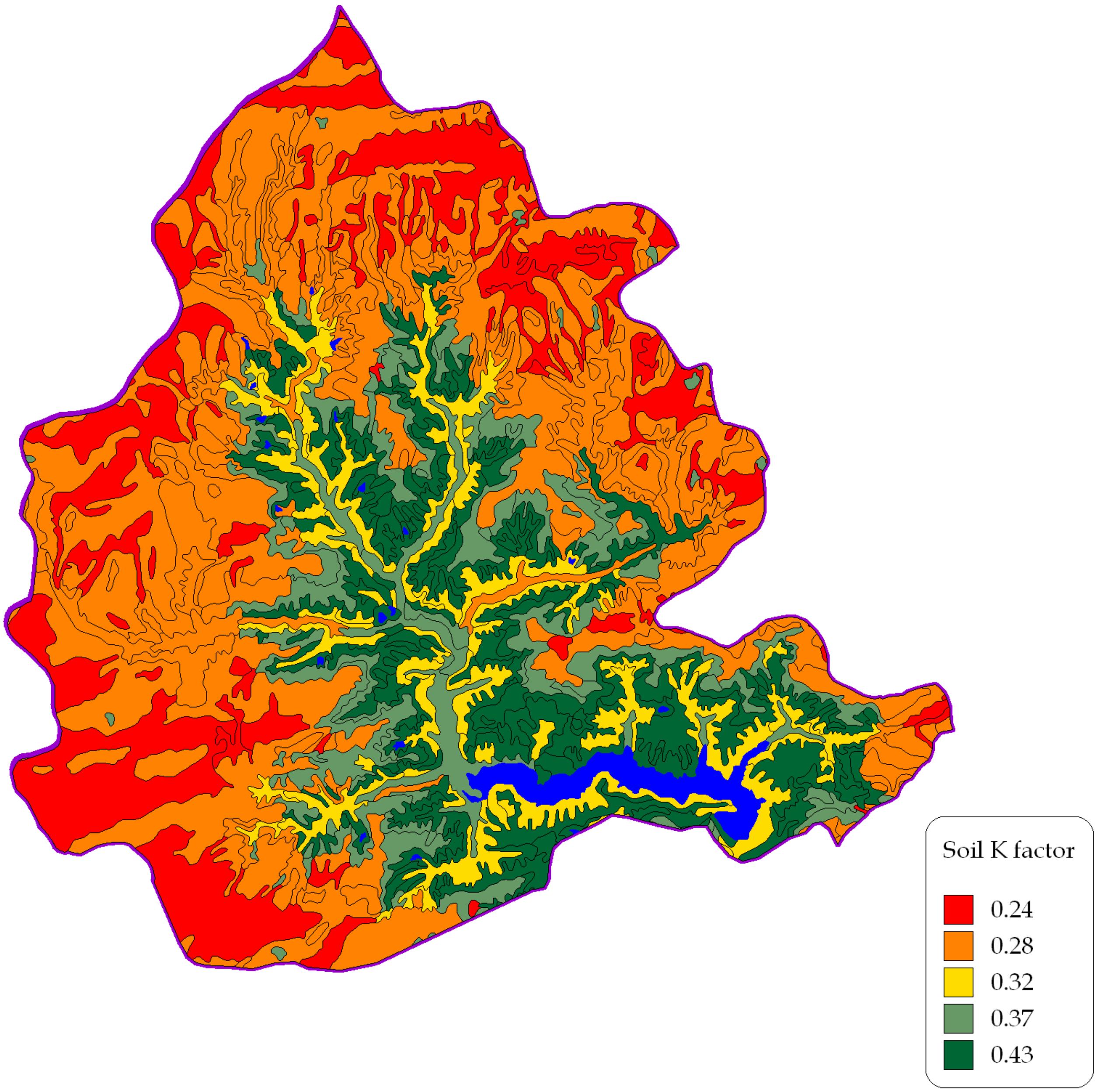


Figure 7. Soil K-factor map of Spring Lake Watershed. K-factor is soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff. It is used in the Universal Soil Loss Equation (USLE) and represents a relative index of susceptibility of bare, cultivated soil to particle detachment and transport by rainfall. The soil erodibility factor ranges in value from 0.02 to 0.69 (Goldman et al. 1986; Mitchell and Bubenzer 1980).

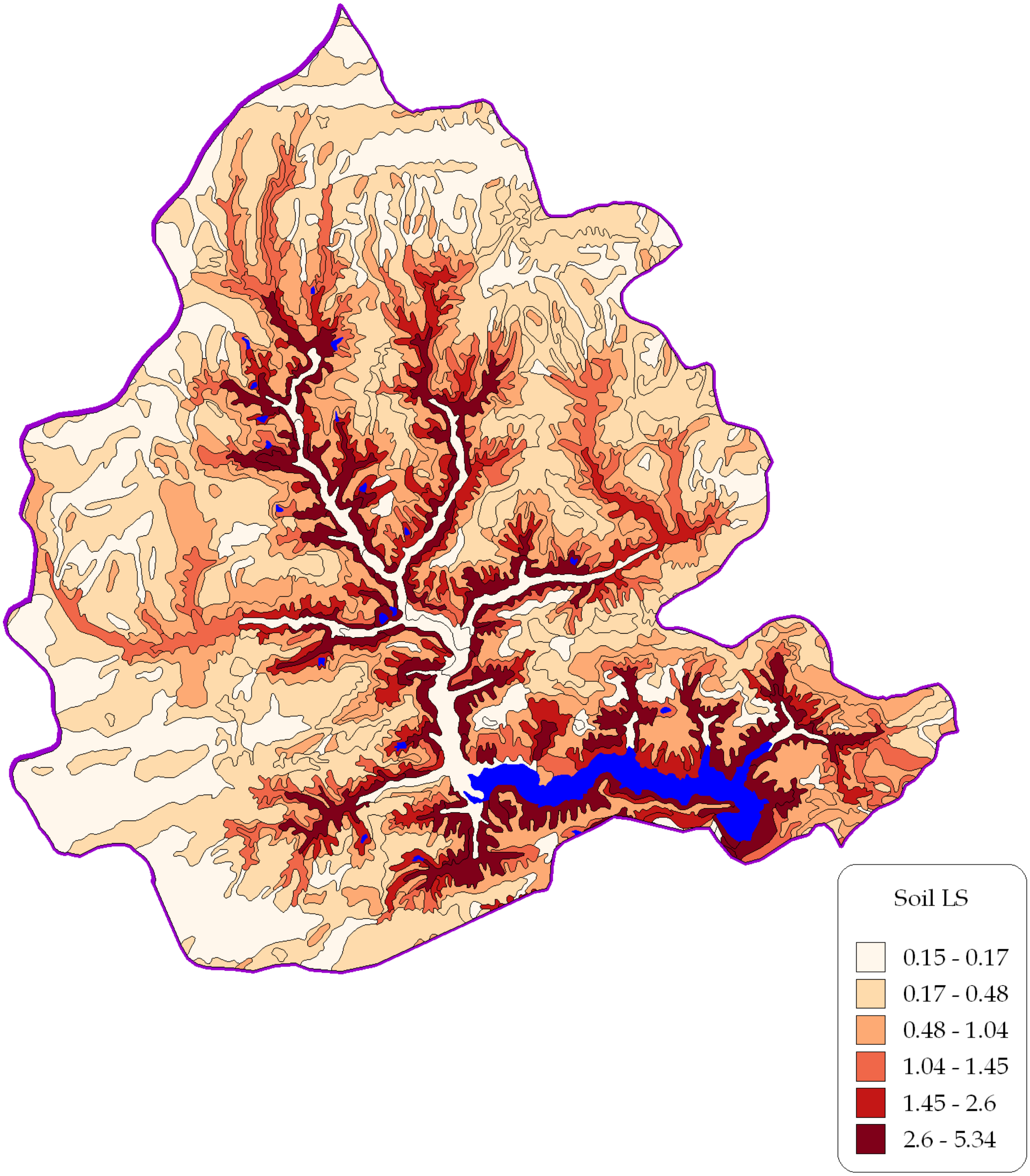


Figure 8. Soil LS map of Spring Lake Watershed. LS factors = the slope length factor L computes the effect of slope length on erosion and the slope steepness factor S computes the effect of slope steepness on erosion.

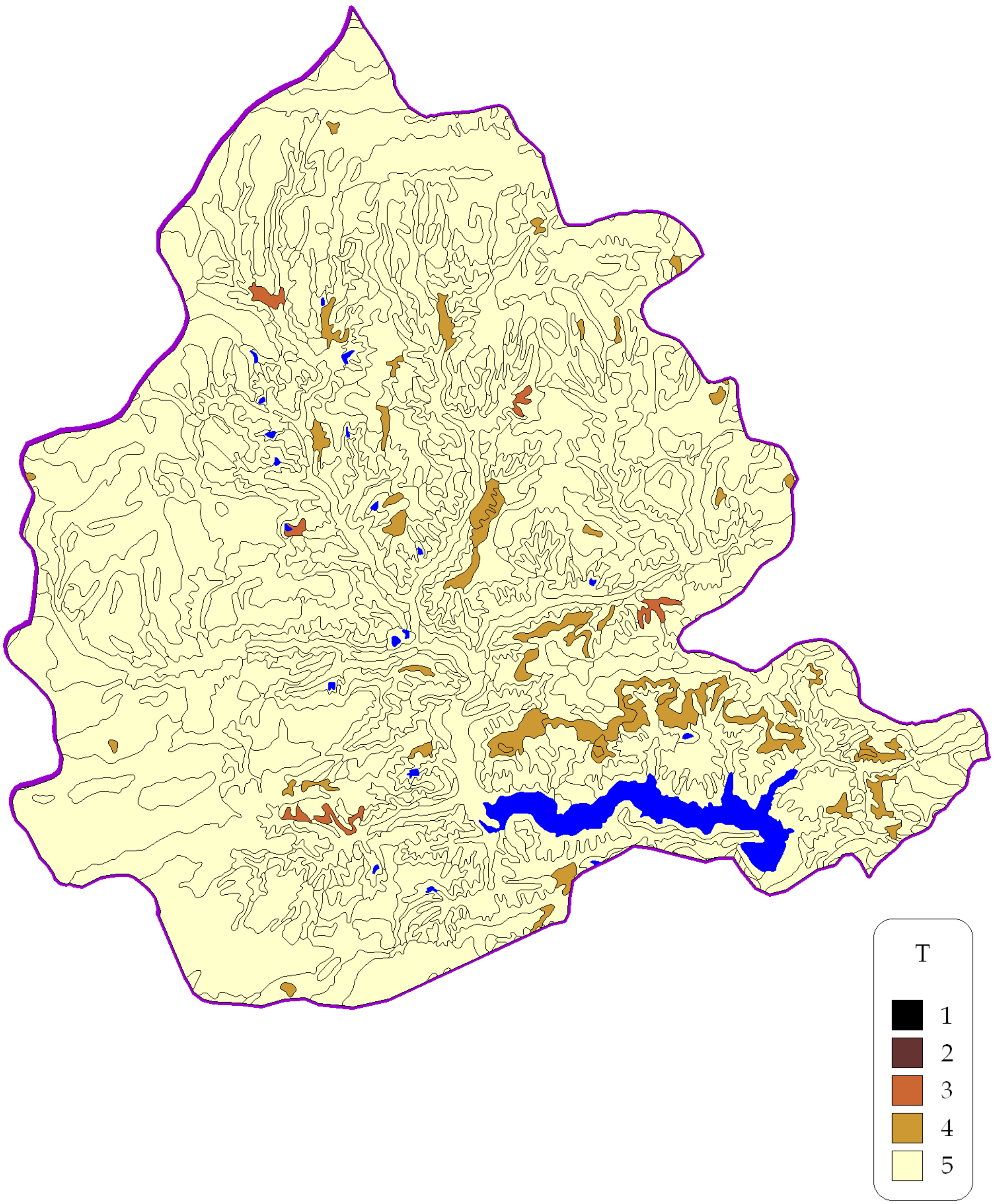


Figure 9. Tolerable soil loss map (greatest annual amount of soil in tons which can be removed before the long term natural soil fertility is negatively affected).

Water Uses

Spring Lake (RDR) is the primary municipal water source for the City of Macomb (pop. 18,558), Colchester (pop. 1,493), Bardolph (pop. 253) and Tennessee (pop. 144). These towns take an average of 2 million gallons of water a day from the lake. This accounts for approximately 70 percent of the drinking water used by these towns. The water system provides service connections to 5,860 customers and services a population of about 20,000 (Benton and Associates 2007). In addition to Spring Lake, the town water supply is supplemented by three wells that are separately treated through a reverse osmosis system. The city also has the ability to pump water from the La Moine River, however, high nitrates and the shallow pump storage area created by a low head dam that silts in on an annual basis makes pumping river water an emergency backup.

Lake Capacity

Constructed in 1927 for the purpose of supplying water to the City of Macomb, the estimated water storage capacity was 607 acre-ft. Since its construction the lake's storage capacity has steadily declined due to build up of sedimentation. A study in 1947 indicated the lake had lost about 50 percent of its capacity over the 20-year life of the lake with the volume estimated at 320 acre-ft. The study resulted in the dredging of the lake in 1951 to restore lost storage capacity to an estimated 425 acre-ft. In 1968, continuing decline in volume led to the construction of a new dam 1400 feet down stream to increase the capacity of Spring Lake. The designed capacity of the expanded lake was to be 3,000 acre-ft. In 1983, the McDonough County Soil and Water Conservation District put together a watershed plan in order to reduce the high level of sedimentation inflow into the lake. This plan led to the implementation of practices like grass waterways, conservation tillage, watershed control basins, etc. that would attempt to reduce rate of sediment buildup. This plan estimated the lake volume in 1983 at 2,608 acre-ft. (Wells 1998). In September 1996 Dennis Wells using Global Positioning System (GPS) receiver and software calculated the existing volume of the lake at 1,808 acre-ft (Wells 1998).

In 2008, Timothy Spier of Western Illinois University conducted a study of Spring Lake to determine the volume. The study was to create a bathymetric map of Spring Lake using a Global Positioning System (GPS) receiver and software to accurately calculate the lakes volume. He found the volume to be 1,929 acre-ft which was greater than the previous two studies of the lake. He points out that this was not an increase in the volume of the lake but differences in the method used to calculate total volume. In addition, he found through comparison of previous studies the west arm of Spring Lake has lost about 31 percent volume since 1997 (Spier 2008).

Geological

Like the majority of soils in Illinois, those within the Spring Lake Watershed have been largely shaped by glaciation. The two glaciers that had the largest impact upon current conditions in West Central Illinois are the Illinoian and Wisconsin glaciers. Lasting for about 350,000 years, the Illinoian Glacier ended nearly 125,000 years ago. It covered nearly all of Illinois with the exception of driftless areas in the extreme southern, southwestern, and northwestern Illinois. The retreat of the Illinoian glacier left behind a mix of unconsolidated till spread out in flat plains or flat till plains. After its retreat, many rivers and streams dissected the till plains. The Spring Lake Watershed is located on the Galesburg Plain (figure 10).

Ending about 10,000 years ago, the Wisconsin Glacier covered slightly less than half of Illinois. Extending south to Decatur and west to about Peoria the Wisconsin, it did not deposit till in West Central Illinois or the Spring Lake Watershed. However, loess (a fine silty wind blown sediment containing crystals of quarts, feldspar, mica and other minerals) from this glacial event was deposited over the West Central Illinois landscape. Loess deposits in McDonough County are between 5 and 20 feet thick (Schuberth 1996). The deposits left behind have made the upper plains of McDonough County extremely productive, however, these same soils can be susceptible to severe erosion if not managed correctly.

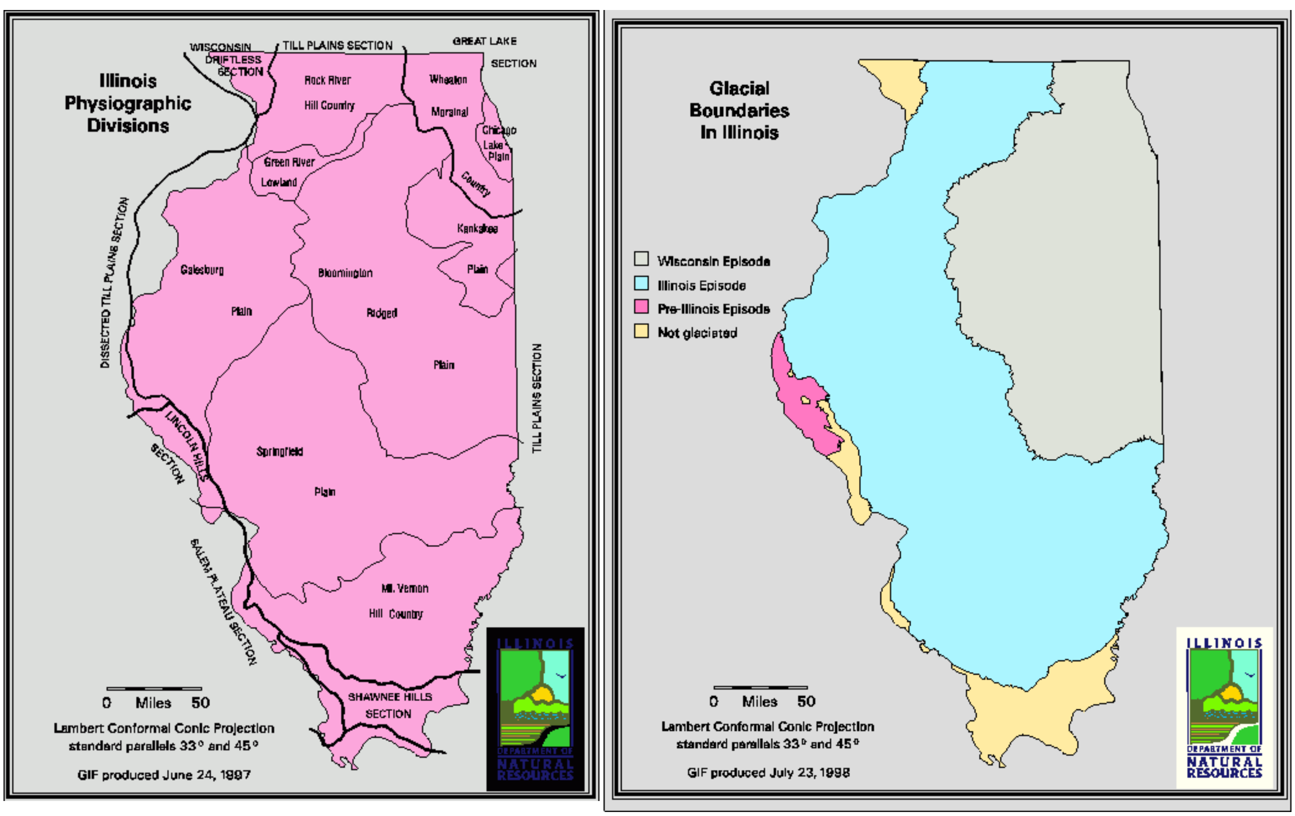


Figure 10. Glacial Boundaries and Physiographic Divisions of Illinois.

Biological

Before European settlement, the landscape of McDonough County was dominated by a mix of prairie and forest communities (Myers and Wright 1948). Generally, the prairie landscape was situated on the upland flat till plain of the county while the forest landscape was located along river and stream valleys.

Natural Community Assessment

The Spring Lake Watershed is located entirely within the Western Forest-Prairie Natural Division. Now dominated by agricultural lands, this division historically supported open woodlands with prairie on the level uplands. The Illinois Natural Areas Inventory recognizes one site, Sciota Railroad Prairie (12 acres), within the Spring Lake Watershed. Located west of the Town of Sciota, this site harbors a population of the state threatened bunchflower and is also utilized by the state threatened regal fritillary butterfly.

There are currently four basic types of natural vegetative communities found within the watershed: grassland/prairie, savanna/barrens, forest/woodlands and wetlands. Native prairie remnants in the area are characterized by tall warm season grasses such as big bluestem, Indian grass, little bluestem and prairie cordgrass and forbs (wildflowers) including prairie blazingstar, pale purple coneflower, spiderwort, compass plant, golden alexanders, cream gentian, marsh phlox and alum root.

Savanna and barrens communities are composed of many of the same grasses and forbs found within the prairies along with thickets of fire-tolerant shrubs and scattered groves of oaks and hickories. Dominant shrubs found in savanna and barrens remnants within the watershed include hazelnut, prairie willow, New Jersey tea, smooth sumac, plums and dogwoods. Principal trees found within isolated remnant groves include white oak, shingle oak and shagbark hickory.

Forest and woodland communities are generally defined as having more than 50 percent tree canopy coverage. Chief canopy trees found on dry ridges within the watershed include white oak, burr oak, shagbark hickory and pignut hickory. On mesic slopes basswood, red oak, sugar maple, and red elm compose the larger canopy trees. Within the lower slopes and along stream corridors dominant trees are hackberry, honey locust, eastern cottonwood, green ash, sycamore and silver maple.

A variety of wetland types are also found within the watershed including seeps, wet meadows, ponds, lakes and streams. Nearly all of the naturally occurring wetland habitats are found in association with Spring Lake or the tributary streams which flow to and from the larger body of water. Characteristic plants found in seeps and sedge meadows within the area include marsh marigold, Joe Pye weed, orange jewelweed, sawtooth sunflower, water horehound, winged loosestrife, dark green bulrush, water parsnip, elderberry and black willow. Submergent aquatic plants, including several species of pondweeds, provide cover for water dependent invertebrates, amphibians and young fish.

Endangered or Threatened species which utilize habitat in the watershed include Indiana bat (Federal/State Endangered), Upland Sandpiper (State Endangered), Loggerhead Shrike (State Threatened), Henslow's Sparrow (State Threatened), lined snake (State Threatened), regal fritillary (State Threatened) and bunchflower (State Threatened). With the exception of Indiana bats, which utilized mature forests, all of these listed species are associated with grassland habitats.

In 2006, Illinois Department of Natural Resources began implementing the Illinois Wildlife Action Plan. This plan involves not just an inventory of species, but a plan to address the particular needs of wildlife that are declining in the state so that populations can be stabilized and then increased. The Comprehensive Wildlife Conservation Plan is a way to make habitat management and land protection targeted at ecosystems as exciting and successful as the aforementioned restoration efforts. It's guide for future conservation efforts by outlining specific areas where limited dollars can be targeted to make positive impacts that are measurable. The plan includes species of greatest need of conservation broken down by regions including the Upper La Moine River (Table 4).

Angella Moorehouse – Natural Areas Preservation Specialist
Illinois Nature Preserves Commission

Table 4. Upper La Moine River Species of Greatest Need of Conservation from the Illinois Wildlife Action Plan.

Invertebrates

scientific name	common name	listed status
Speyeria idalia	regal fritillary	ST
Problema byssus	byssus skipper	
Papaipema birdi	moth	
Papaipema cernussata	moth	
Papaipema inquaesita	moth	
Papaipema limpida	moth	
Papaipema maritima	moth	
Papaipema necopina	moth	
Papaipema nelita	moth	
Papaipema rutila	moth	
Papaipema sciata	moth	
Papaipema silphii	moth	
Papaipema unimoda	moth	

Fish

scientific name	common name	listed status
Micropterus dolomieu	smallmouth bass	

Herps

scientific name	common name	listed status
Tropidoclonions lineatum	lined snake	ST

Birds

scientific name	common name	listed status
Ammodramus henslowii	Henslow's sparrow	ST
Ammodramus savannarum	grasshopper sparrow	
Bartramia longicauda	upland sandpiper	SE
Buteo platypterus	broad-winged hawk	
Caprimulgus vociferus	whip-poor-will	
Coccyzus americanus	yellow-billed cuckoo	
Colaptes auratus	northern flicker	
Colinus virginianus	northern bobwhite	
Dendroica cerulea	cerulean warbler	ST
Dolichonyx oryzivorus	bobolink	
Icteria virens	yellow-breasted chat	
Melanerpes erythrocephalus	red-headed woodpecker	
Oporornis formosus	Kentucky warbler	
Passerculus sandwichensis	savannah sparrow	
Scolopax minor	American woodcock	
Seiurus aurocapillus	ovenbird	
Setophaga ruticilla	American redstart	
Spiza americana	dickcissel	

Mammals

scientific name	common name	listed status
Lontra canadensis	river otter	
Microtus pinetorum	woodland vole	
Myotis sodalis	Indiana bat	FE/SE
Taxidea taxus	American badger	

Fish and game species included in the state Wildlife Action Plan for the Western Forest-Prairie Natural Division include:

- **Uplands** - northern bobwhite, white-tailed deer, wild turkey, American woodcock, fox and gray squirrel

- **Streams** - channel catfish, flathead catfish, smallmouth bass, largemouth bass, beaver, raccoon, wood duck, mallard

- **Lakes and ponds** - bluegill, largemouth bass

Woodland in Spring Lake Park

Forest Resource Assessment

A small percentage of land (12%) in the Spring Lake Watershed is forest cover. The existing woodlands are smaller tracts of upland and bottomland forest. The bottomland areas are relatively small due to the smaller drainages. Most of the woodlands have been disturbed by past grazing of livestock and hi-grade logging (the practice of taking the best trees and leaving the less desirable).

A small amount of forest management work has been done on scattered parcels throughout the watershed. These include timber stand improvement and some tree planting under state and federal programs.

There are many issues of concern regarding the forests within the watershed. Some of the issues are as follows:

- livestock grazing: increases erosion; decreases woodland quality by increasing the number of undesirable species (i.e.: honey locust, multiflora rose) and damaging the existing trees. Livestock also consume and damage young and smaller trees, thus decreasing future value.

- erosion within the wooded acres: erosion in the woods causes large gullies. Water coming off of flat agricultural fields and running into the woods can cause large gullies to form and massive loads of sediment to end up in the stream.

- low quality woodland: past mismanagement of the forest resource can cause low quality woodlands. Exotic species have taken hold (garlic mustard, autumn olive, multiflora rose, bush honeysuckle). In turn, native species are pushed out of their natural habitat. Past hi-grade logging practices have removed much of the better species and left a large amount of the less desirable species (ie: sugar maple, honey locust and osage orange)

-deer browse: over crowding of deer have led to major browse damage to planted seedlings and native seedlings in the forest. Acorns are all eaten before they can germinate.

-fragmentation: the existing woodland is fragmented due to past clearing and dividing of parcels.

Barrie McVey - IDNR District Forester
640 Argyle Park Rd.
Colchester, IL 62326

Wildlife and Wildlife Habitat Assessment

Although this areas land is used predominantly for agricultural production, the Spring Lake Watershed is home to many of the game and non-game wildlife species found throughout western Illinois. Depending on the species, some populations are poor to fair, while others are stable or even considered over abundant. The following is an assessment of the game populations.

Forest Game – white-tailed deer, Wild Turkey, and fox squirrels are the forest game species found in this watershed. The deer herd appears to be stable and/or increasing. Hunting on private property is the primary method for controlling this adaptable species population growth. At the present time, Spring Lake is serving as a refuge for deer since no legal hunting is allowed on the site. Deer are found throughout the watershed during the spring and summer months. They move into heavier woody cover as crops are harvested and the weather turns colder.

As a general rule, Wild Turkey are found near more of the heavily forested areas. They will use grasslands and pastures for brood habitat. Populations will fluctuate slightly depending on nesting success. The weather, (heavy spring rains), are a major factor in poult survival. Turkeys are hunted on private property in the watershed.

Fox squirrels are abundant in the forested areas of the watershed. At the present time, this species is under-utilized.

Upland Game – Traditional “farmland wildlife” found in the watershed include: eastern cottontail (rabbit), Ring-necked Pheasant, and Northern Bobwhite (quail). Changes in land use and farming practices have contributed to these species’ decline. However, where there is good habitat, huntable numbers exist. Brushy areas with annual weeds and row crop residue provide excellent cover for rabbit and quail. Grassland habitat found in the form of CRP land will benefit pheasant and other grassland dependant birds.

Fur bearing animals - Raccoon, striped skunk, opossum, coyote, beaver, mink, muskrat, weasels and foxes are found in varying degrees and numbers in the watershed. Species such as the raccoon are abundant and even considered a nuisance. A limited amount of trapping occurs on private property located in the watershed.

Waterfowl - In general, the watershed does not provide a significant amount of habitat for waterfowl production, nor is located in a major “flyway”. However, the common waterfowl utilizing the watershed are giant Canada Geese and Wood Duck. Geese nest near ponds and lakes and are drawn to short grassy areas for grazing. They will feed in corn and winter wheat fields in during the fall and winter. Wood Ducks utilize artificial nesting houses found on private ponds and wetlands, as well as oak-hickory timber for nesting. “Woodies” brood on small streams where insects and vegetation are abundant. The City of Macomb does allow public hunting for waterfowl on Spring Lake. Limited waterfowl hunting takes place on private property.

Habitat loss, attributed to urban and agricultural development rather than regulated hunting and trapping, determines a species success or failure. Modifications in farming practices utilized at the present time are needed in order for “farmland wildlife” to once again thrive. USDA programs encourage landowners to establish grass, legume and shrub cover to provide additional wildlife habitat within the agriculturally dominated landscape. Existing habitats are in need of various management practices including harvesting timber, rotational grazing, and exotic vegetation control. Wildlife's future in this watershed is in the hands of both the private landowners, the City of Macomb and Macomb Park District.

Kevin Oller,
District Wildlife Biologist, Illinois Department of Natural Resources
August 1st, 2007

White-tailed Deer near Spring Lake

The Fish and Aquatic Resources of the Spring Lake Watershed

The Spring Lake watershed, consisting of an area of approximately 21.4 square miles (13,700 acres), is predominately used for agricultural production. Cropland (11,355 acres) and pastureland/grassland (1,008 acres) comprise 90.2 percent of the watershed. The surface water resources of the watershed include: Spring Lake (236.8 acres), Spring Creek (2.4 miles or 3.8 acres), 10 intermittent tributaries to Spring Creek and Spring Lake (11.6 miles or 11.2 acres), 26 farm ponds (15.9 acres) and various sized wetlands adjacent to the impoundments and creeks (42.4 acres). This aquatic resource base of 294.2 acres provides habitat for numerous fish, amphibians, reptiles, and aquatic mammal species.

The original Spring Lake dam was constructed in 1927 to impound water for the City of Macomb. Due to a high watershed to lake ratio of 235 to 1, the original lake basin received vast amounts of sediment. By 1960, the lake had a maximum depth of only 13.0 feet and a size of 42.9 acres. In 1967, a new dam was built downstream from the old dam which increased the lake size to 270 acres. Due to continued high rates of sedimentation, the current Spring Lake size is 236.8 acres. The current fish species list for Spring Lake in order of abundance is as follows: gizzard shad, white crappie, bluegill, largemouth bass, carp, channel catfish, green sunfish, black bullhead, yellow bullhead, yellow bass, white sucker, muskie and hybrid striped bass. A 1985 angler survey of Spring Lake revealed that 16,965 fishing trips were made to the lake (April through September) with a total harvest of 30,387 fish. White crappie represented 67 percent of the catch.

The small streams flowing into Spring Lake consist of the permanent section or Spring Creek (2.4 miles or 3.8 acres) and 11 intermittent tributaries (11.6 miles or 11.2 acres). To date, no fishery inventories have been completed on Spring Creek above the lake, however, the following 18 fish species are speculated to occur: carp, creek chub, hornyhead chub, bigmouth shiner, red shiner, sand shiner, bluntnose minnow, fathead minnow, stoneroller, shorthead redhorse, white sucker, black bullhead, yellow bullhead, green sunfish, bluegill and largemouth bass (from pond overflow), johnny darter, and orange-throated darter. A fishery survey of Spring Creek above Spring Lake will be conducted in 2008 to determine a fish species list and their relative abundance. The fish data will then be used to develop an "Index of Biotic Integrity" for Spring Creek.

The 26 farm ponds (15.9 acres) currently in the Spring Lake watershed were built over the past 60-year period and offer an impoundment type of habitat. Some of the older ponds have "silted in" and have evolved into wetland habitats. The fish species list for the farm ponds would include any of the following: bluegill, redear, green sunfish, largemouth bass, black crappie, white crappie, channel catfish, black bullhead, yellow bullhead, and triploid grass carp.

Wetlands in the Spring Lake watershed are most prevalent adjacent to Spring Creek and the intermittent tributaries along alluvial deposits. The largest wetland area is located at the extreme upper end (west end) of Spring Lake within the alluvial fan of Spring Creek as it enters the lake.

In addition to the fish species that inhabit Spring Lake, Spring Creek, the intermittent tributaries, and the farm ponds, several species of amphibians, reptiles and aquatic mammals are also known or speculated to occur, in the Spring Lake watershed.

The list of amphibians include: tiger salamander, American toad, cricket frog, western chorus frog, plains leopard frog, southern leopard frog, bullfrog, and green frog.

The list of reptiles include: snapping turtle, painted turtle, red-eared slider turtle, spiny softshell turtle, and northern watersnake.

The list of aquatic mammals include: muskrat, beaver, otter, mink, and long-tail weasel.

No threatened or endangered species of fish, amphibian, reptile or aquatic mammal is known to exist in the Spring Lake watershed.

Aquatic resource issues of concern within the Spring Lake watershed:

(1) Spring Lake sedimentation rate.
(2) Spring Lake and Spring Creek water quality.
    (a) High rate of nutrient delivery.
    (b) High suspended solids.
    (c) Excessive algal blooms.
    (d) Periods of low dissolved oxygen.
(3) Stream bank erosion along Spring Creek and the intermittent tributaries.
(4) Non-native species introduction and control.

Submitted by: Ken Russell, District Fisheries Biologist
Illinois Dept. Natural Resources
November 21, 2007

Conservation Practices

To estimate the soil conservation farming practice used in the Spring Lake Watershed we have extrapolated the 2006 Illinois Soil Conservation Transect Survey data for McDonough County to Spring Lake Watershed. From 2000 to 2006, about 30 percent of the land in the county was farmed using no-till, 37 percent was farmed using reduced or mulch till, and 33 percent of the land was farmed using conventional tillage.

Conservation practices found in the watershed include many WASCOB (water sediment control basins), grassed waterways, and terraces. Smaller numbers of grade stabilization structures have been installed in the Spring Lake watershed along with small numbers of ponds and filter strips installed to reduce soil erosion.

Problem Statements

The Spring Lake Watershed Committee started the process of identifying watershed problems by having members listing all possible problems that may impact the water quality of Spring Lake. This list which contained 62 separate problems was then referred to the technical committee for review (**attached in appendix**). The technical committee had its first meeting on June 21, 2007. At this meeting the members/technical experts were then asked if these problems were valid, if they had information to quantify these problems, and if they could provide information and data on strategies to resolve theses problems. The members/technical experts of the technical committee were than asked to report back to the watershed committee with assignments pertaining to their field of expertise.

Members from both the technical committee and watershed committee met and helped consolidate the 62 problem statements identified by the committee into 13 problem statements ranked by priority and listed below:

High priority:

1) There is an excessive amount of phosphorus entering Spring Lake.
   a) Spring Lake exceeds the IEPA TMDL (Total Maximum Daily Load) for phosphorus. The lake phosphorus loads and waste loads are estimated at 7,564 lb/yr. This load is 145 percent greater than 3,082 lb/yr load capacity of Spring Lake.
   b) The location of high concentrations of phosphorus (entering Spring Lake) in the watershed is unknown. Knowing the locations where high concentrations of phosphorus enter the lake enables us to target our efforts.
   c) Stream bank erosion adds a significant amount of phosphorus to Spring Lake.
   d) Gully and megarill erosion adds a significant amount of phosphorus to Spring Lake
   e) Sheet and rill erosion adds a significant amount of phosphorus to Spring Lake.
   f) Gullies created by erosion in wooded areas add significant amount of phosphorus to Spring Lake.
   g) Non-functioning or poorly functioning septic systems add an unknown amount of phosphorus to Spring Lake.
2) There is an excessive amount of total suspended solids in the lake.
   a) Spring Lake exceeds the TDML for suspended solids.
   b) Refer to problem statement #1 as total suspended solids like phosphorus is linked to soil erosion.
3) There is an excessive amount of nitrogen entering Spring Lake that exceeds the TMDL for total nitrogen.
4) The decline in water storage capacity of Spring Lake. Sediment buildup as a result of soil erosion within the watershed has reduced the capacity of Spring Lake to store water. The future water needs of Macomb may not be met as Spring Lake's capacity declines, increasing demand on ground water recourses.

Medium priority:

5) Poor management of forest resources in Spring Lake Watershed.
   a) Livestock grazing has increased erosion and decreases woodland quality by increasing the number of undesirable species (e.g. honey locust, multiflora rose) and damaging native trees. Livestock also consume and damage young and smaller trees, thus decreasing future value.

b) Erosion in the woods causes large gullies. Water coming off of flat agricultural fields and running into the woods can cause large gullies to form and massive loads of sediment to end up in the stream.

c) Low quality woodland: past mismanagement of the forest resource has caused low quality woodlands. Exotic species have taken hold (garlic mustard, autumn olive, multiflora rose, bush honeysuckle). In turn, native species are pushed out of their natural habitat. Past hi-grade logging practices have removed much of the better species and left a large amount of the less desirable species (ie: sugar maple, honey locust, and osage orange)

d) The existing woodland is fragmented due to past clearing and dividing of parcels.

6) The possibility of excessive amounts of (VOC) volatile organic compounds entering the lake. VOC primarily enters the lake through the use of two cycle outboard motors and excessive amounts may contaminate Macomb's drinking water supply.

7) The quality and number of wetlands acres in the Spring Lake Watershed is inadequate.
   a) There are inadequate shallow water wetlands to filter the water coming into Spring Lake and to provide habitat for fish and wetland dependent wildlife.

8) The possibility of excessive amount of pesticides entering the lake.
   a) There is a lack of information on types and amounts of pesticide in Spring Lake

9) Excessive number of white-tailed deer in Spring Lake Watershed.
   a) The large number of white-tailed deer in the watershed has led to major browse damage to planted seedlings and native seedlings in the forest. Acorns are all eaten before they can germinate.
   b) Deer over grazing has led to a change in the species composition of forest understory.

10) Protect the fish resources by improving fish habitat in Spring Lake.

Low priority:

11) Protection of threatened and endangered species in the watershed.
   a) Inadequate knowledge of threatened and endangered species.
   b) Poor habitat in the watershed to support threatened and endangered species.

12) The protection of ground water resources in the watershed.
   a) Identify possible ground water recharge locations in the watershed.
   b) Protect those areas from contamination.

13) The water quality of Spring Lake does not meet the standards for a swimming beach.

Goals/Objectives

This plan outlines goals and objectives for the watershed to be accomplished over a five-year time frame, from 2008 to 2012 (Table 5). To improve water quality of Spring Lake the watershed committee approved the following goals and objectives.

1) Reduce total phosphorus entering Spring Lake by 3,035 lb/yr (1,377 kg/yr). The committee does not think it is feasible to reduce phosphorus entering the lake to levels below the TMDL (3,082 lb/yr) in the 5 year timeframe of the plan. As the estimated loads and waste loads are currently 7,564 lb/yr a reduction of 3,035 lb/yr is 68% of the TMDL.

A) Locate areas of higher concentrations of phosphorus in the watershed in order to target measures to protect water quality.
   1) Implement a RAP-M to quantify phosphorus entering the lake through stream bank erosion on all significant tributaries.
   2) Implement a detailed stream bank study to locate stream bank stabilization project sites in the watershed.
   3) Design and implement a watershed GIS soil phosphorus study to identify specific locations and soil types that contain high concentrations of phosphorus. This will enable the watershed to specifically target areas that contain both highly erodable soils and high concentrations of phosphorus. The study will allow the watershed to maximize phosphorus reductions and minimize cost by targeting soil erosion control.

B) Reduce stream bank erosion on 5,000 feet of highly erodable stream bank over the next five years by installing stream bank stabilization control measures. This will reduce phosphorus entering Spring Lake by 281 lb/yr*.

C) Reduce gully and megarill erosion in the watershed.
   1) Install 50 WASCOB (Water sediment control basins) structures in the watershed. This will reduce phosphorus entering Spring Lake by 400 lb/yr*.
   2) Install 20 grade stabilization projects in the watershed. This will reduce phosphorus entering Spring Lake by 20 lb/yr*.
   3) Install 40 diversion structures in the watershed. This will reduce phosphorus entering Spring Lake by 40 lb/yr*.

D) Reduce soil erosion in forested areas through the installation of 25 grade stabilization structures or brush checks. This will reduce phosphorus entering Spring Lake by 50 lb/yr*.

E) Reduce sheet and rill erosion in croplands.
   1) Encourage farmers to switch to no till farming practices with the goal of converting 1,000 acres from conventional tillage to no-till. Conversion of 1,000 acres will reduce phosphorus entering Spring Lake by an estimated 2,000 lb/yr*.
   2) Establish and maintain 1,000 feet of new grass waterways in the watershed. This will reduce phosphorus entering Spring Lake by 4 lb/yr*.
   3) Establish and maintain 20,000 feet of terrace with underground outlets in the watershed. This will reduce phosphorus entering Spring Lake by 240 lb/yr*.

F) Promote proper management of livestock waste.

G) Encourage the repair and replacement of non functioning septic systems.

* Estimated phosphorus reduction calculations were made by C2000 “erosion and sediment control practice” worksheet. More detailed estimates of phosphorus reductions will be made after the RAP-M and the detailed stream bank study are finished. Estimates for no-till conversion were in part based on 15% of the cropland in McDonough County was below T and 5 percent was more than two times below T. About one-third of the land in McDonough County is

farmed using conventional tillage, about 37 percent is farmed using reduced or mulch till, and about 30 percent is farmed using no-till.

2) Reduce the amount of suspended solids in Spring Lake to improve water quality.   The goals are the same as the goals (listed on previous page) to reduce phosphorus in the watershed.

3) Reduce nitrogen and phosphorus entering Spring Lake by encouraging landowner/farmers to implement nutrient management practices on 2,000 acres in the watershed.

4) Reduce the sedimentation rate in Spring Lake by 40 percent with the intent of extending the useful life of the reservoir to store water for the city of Macomb. The objective matches the goal to reduce phosphorus in the watershed.

5) Help landowners implement best management practices for forest/woodlands.
- A) Educate landowners about invasive and exotic species in the watershed.
- B) Help landowners manage invasive and exotic species in the watershed.
- C) Reduce soil erosion in forested areas through the installation of 25 grade stabilization structures or brush checks.
- D) Encourage landowners to develop and carry out a forest management plan.

6) Reduce the number of white-tailed deer in the watershed by promoting deer hunting in and around the watershed.

7) Conduct a study to find out if (VOC) volatile organic compounds are affecting the water quality of Spring Lake.

8) Construct 100 acres of new wetlands in the watershed with the objective of improving water quality and creating additional wildlife habitat.

9) Improve fish habitat through reducing phosphorus entering the lake.

10) Work with local, state and federal agencies in the study and protection of threatened and endangered species within Spring Lake Watershed.

11) Partner with other organizations in order to locate possible ground water recharge areas in the Spring Lake Watershed and educate residents in the importance of protecting our ground water recharge areas.

12) Develop a study to examine the types and amounts of pesticides in Spring Lake and their affect on water quality.

13) Investigate the feasibility of a swimming beach on the shore of Spring Lake.

Implementation Strategies/Alternatives

Reduce phosphorus entering Spring Lake

Implementing the following strategies to reduce phosphorus entering Spring Lake will decrease sediment entering the lake. This will have the affect of lowering the amount of suspended solids in the lake and prolong the use of the lake as a reservoir to Macomb. In addition, by implementing these strategies the fish habitat and water quality of Spring Lake will improve.

1. Spring Lake Watershed phosphorus origin and cost mitigation studies

Locate areas of higher concentrations of phosphorus and soil entering the watershed in order to target measures to protect water quality.

1) Implement a RAP-M study to quantify phosphorus entering the lake through stream bank erosion in January – March 2008.
2) In winter months of 2008-2009, implement a detailed stream bank study to locate stream bank stabilization project sites in the watershed.
3) Design and implement a watershed soil phosphorus study to identify specific locations of soil types that contain high concentrations of phosphorus in 2009 and 2010. This will enable the watershed to specifically target areas that contain both highly erodable soils and high concentrations of phosphorus. The study will allow the watershed to maximize phosphorus reductions and minimize cost by targeting soil erosion control measures. In addition, this information will give committee a resource to better estimate phosphorus reduction and an estimate of dollars required for implementation.

Watershed soil phosphorus study

In order to maximize phosphorus reductions and minimize cost we hope to implement a GIS based watershed soil phosphorus study. This study will map out concentrations of phosphorus using random soil samples across different soil types in the watershed. By matching highly erodible soils with soils that contain high concentrations of phosphorus will enable us to target soil erosion control measures.

Analysis of Erodible Soils of the Spring Lake Watershed for Total Phosphorus Content

Brief Introduction

Naturally occurring phosphorus accounts for approximately 0.28% of the weight of the Earth's crust. The typical range for total phosphorus in soils is 0.0044% to 0.131%. Most soil erosion occurs from the soil surface and usually no deeper than six inches (15 cm). Using an average of 0.068%, the total soil phosphorus expected from the surface of the soil is approximately 1,360 lbs/acre. The origin of most soil phosphorus comes from minerals that comprise the parent material of the soil such as hydroxyapatite (Ca10(PO4)6OH2), fluorapatite (Ca10(PO4)6F2), variscite (AlPO4·2H2O), and strengite (FePO4·2H2O). These minerals are essentially insoluble and dissolve only under specific chemical conditions and over very long periods of time. During the soil erosion process, soil phosphorus is predominantly carried in runoff water as these solid phase minerals.

Plants utilize only soluble phosphorus and may extract only small amounts of the total soil phosphorus content. Most crops require additional phosphorus fertilization to achieve acceptable yields. In Illinois, a 170 bushel/acre corn crop would require approximately 44lbs of phosphorus/acre; a 60 bushel/acre soybean crop would require only 28 lbs of phosphorus/acre. The amount of phosphorus required by crops is small compared to the total phosphorus content of the soil; however the insolubility of most soil phosphorus makes it unavailable for plant life.

Sampling the Erodible Soils of the Spring Lake Watershed

The erodible zones of the Spring Lake Watershed will be located using known maps of the soils of the watershed, farming data from the McDonough County Soil & Water Conservation District, and Global Positioning System (GPS) technology. Stratified random samples will be taken to ensure that areas contributing the most phosphorus to Spring Lake will be studied most intensely. The process of stratified random sampling involves breaking the study area into zones and randomly placing sampling locations ensuring each zone is adequately represented. The sampling will concentrate in areas with the highest predicted soil erosion values based on the USLE.

Analyzing the Soil Samples for Total Phosphorus

The primary problem in analyzing soils for total phosphorus is ensuring that the entire sample is completely dissolved. Dissolution of whole soils is a difficult task and requires the use of hazardous reagents and experimental conditions. One of the most common ways whole soils may be dissolved is using the Sodium Carbonate Fusion Technique. Fired and cooled crucibles are used for the fusion. Analytical weights of oven dried soil and anhydrous sodium carbonate are placed into platinum crucibles. The crucibles are heated gradually until they reach a temperature of approximately 1,000°C or 1,830°F. The fused soil-sodium carbonate sample may then be dissolved in hydrochloric acid with only gelatinous silica compounds as the only semi-solid materials left undissolved. These silica compounds have never been found to introduce error into phosphorus analysis.

The dissolved soil samples will be analyzed for total phosphorus using the Vanadomolbdophosphoric Yellow Method. The Vanadomolbdophosphoric Yellow Method is a standard phosphorus determining technique. An aliquot of the solution containing the dissolved soil will be diluted until the acid concentration is approximately 0.5 moles/liter. The diluted solutions will be treated with standard vanadomolybdate reagent and the vanadomolbdophosphoric yellow color will be allowed to develop for 15 minutes. At the end of the 15 minute development time the dissolved soil solution will be analyzed using UV-Visible spectroscopy at approximately 440 nanometers. Comparison of light absorbance of the samples to standard solutions of known phosphorus concentration will allow direct calculation of the total phosphorus content of the potentially erodible soils.

2. Stream bank stabilization

The goal is to partner with landowners along Spring Creek for the purpose of installing stream bank erosion control measures on 5,000 feet of highly to moderately erodible streambank. By providing cost share and technical assistance to landowners install stream bank erosion control on 1,000 feet per year over the next 5 years on Spring Creek. Using data from the detailed stream bank study we will target areas and landowners for erosion control.

3. Gully and megarill erosion control

1) Install 50 WASCOB (water and sediment control basins) by partnering with landowners and providing cost share and technical assistance. We hope to install 10 WASCOB's per year (2008-2012) over the next 5 years.
2) Install 20 grade stabilization projects in the watershed by partnering with landowners and providing cost share and technical assistance. We hope to install 4 grade stabilization projects per year (2008-2012) over the next 5 years.
3) Install 40 diversions in the watershed by partnering with landowners and providing cost share and technical assistance. We hope to install 8 diversions per year (2008-2012) over the next 5 years.

Intermittent stream north of Spring Lake during flood event of June 22, 2007

4. Forested gully erosion control

Assist landowners through cost share and technical assistance to install 5 grade stabilization structures or brush checks each year for the next 5 years (2008 – 2012) in the steep wooded gullies of Spring Creek and Spring Lake. Because a large portion of these gullies exist on City of Macomb land we will need to assist the city with technical assistance and cost share to install brush checks on their land.

5. Cropland sheet and rill erosion control

1) Encourage farmers to switch to no till farming practices with the goal of converting 1,000 acres from conventional tillage to no-till through incentive programs. We hope to add 200 acres of no-till to the watershed each year over 5 years (2008-2012).
2) Establish and maintain 2,000 feet of new grass waterways in the watershed by partnering with landowners and providing cost share and technical assistance. We hope to install 400ft of new grass waterways per year (2008-2012) over the next 5 years.
3) Establish and maintain 20,000 feet of new terrace with underground tile outlet watershed by partnering with landowners and providing cost share and technical assistance. We hope to install 4,000ft of new grass waterways per year (2008-2012) over the next 5 years.

Grassed waterway north of Spring Lake during flood event of June 22, 2007

6. Septic system education and replacement.

In 2009 and in 2012, present an educational workshop to local residents about septic systems. Work with low income households to fix problem septic systems by technical assistance and cost share to replace non-functioning systems.

7. Livestock waste management

Encourage producers to develop a waste management plan and provide technical assistance through the SWCD and RC&D. Promote management that reduces access of cattle to tributaries by providing alternate water sources for cattle and fencing off stream access. We will also help producers find funding through environmental quality incentives program (EQIP).

Watershed nutrient management

Develop a nutrient management incentive program to encourage landowners by providing technical assistance and financial support to implement a nutrient management plan on 2,000 acres in the watershed over the next 5 years (2008–2012). The goal is to provide an incentive and educational tool to assist producers in optimizing application of nutrients for crop production. Eligibility for the program will require producers to enroll 10 or more acres of land; the next crop planted will be either corn or sorghum and require an application of N, P, or K fertilizer.

Row-crops north of Spring Lake

Spring Lake water storage capacity

Design and implement a study to better ascertain storage capacity and sedimentation rates of Spring Lake. By comparing the volumetric data with previous studies, such as Wells 1998 and Spier 2008, we hope to generate a revised estimate of the useful life of Spring Lake as a reservoir. The study will be implemented in 2012 five years after the 2008 Spier study.

Wetland construction

Construct 100 acres of new wetland in the Spring Lake Watershed over the next 5 years with a goal of 20 acres per year (2008–2012). The construction of new wetlands above Spring Lake will slow and reduce phosphorus, sediment and other containments entering the lake. It will also provide additional habitat for aquatic and terrestrial wildlife in the watershed.

Containment analysis of Spring Lake

Design and implement a study to ascertain the impact VOC (volatile organic compounds) and pesticides have on the water quality of Spring Lake. In addition, a study of the water quality of the lake is needed to determine the feasibility of a swimming beach on the Shore of Spring Lake beginning in 2010.

Forest Management

1) Hold a workshop in 2009 to educate 25 landowners about forest management and invasive and exotic species.
2) Help 10 landowners manage invasive and exotic species in the watershed by providing technical assistance and or cost share on 100 acres.
3) Encourage 10 landowners to develop and carry out a forest management plans on 100 acres.

White-tailed deer management

1) Encourage landowners to open their land for hunting white-tailed deer in the watershed.
2) Investigate the possibility of having a white-tailed deer hunt on city property surrounding the lake.

Protection of endangered and threatened species

Work with local, state and federal agencies in the study and protection of threatened and endangered species within Spring Lake Watershed.

Ground Water

Partner with other organizations in order to locate ground water recharge areas and educate residents in the importance of protecting our ground water recharge areas. If there is a significant ground water recharge area within watershed help educate local landowners in cooperation with the McDonough County Ground Water Committee.

Implementation Committee

Establish an implementation committee for the purpose of overseeing the execution of the plan and measuring its success. The committee will consist of local residents and representatives from local organizations and governmental agencies.

Cost Summary

Implementation cost was estimated by the McDonough County Soil and Water Conservation District (SWCD) using past projects as a guideline. The total projected cost of $626,000 was based on 2007 dollars for work proposed in 2008 - 2012 (Table 5).

The overall authority responsible for the implementation of the plan will be the McDonough County Soil and Water Conservation District. The SWCD will seek help from several agencies and organizations to help implement the plan. Below is a list of agencies that will be contributing to the plans implementation.

City of Macomb – Projects involving Spring Lake including lake sedimentation survey, brush checks on city land, water quality analysis and education of residents about watersheds through the Lakeview Nature Center.

La Moine River Ecosystem Partnership – hosting workshops for exotic species control, forest management and educating residents about the importance of watershed and habitat protection.

University of Illinois Extension - Animal Systems and Pasture Management workshop and Pesticide Applicator Training Program.

Western Illinois University – GIS and technical support.

U.S. Fish and Wildlife Service – Wetland construction and technical support.

Illinois Department of Natural Resources – Technical support and possible funding.

Macomb Park District – Watershed education

McDonough County Board - Watershed education and other technical assistance

McDonough County Ground Water Committee – Provide help locating possible groundwater recharge areas in the watershed and community education and technical support about groundwater.

Sources of Funding

Funding sources will very depending on the project and availability of funds. Funding for conservation practices in agricultural areas will be focused on U.S. Department of Agriculture programs, including EQIP, Conservation 2000. In addition, we will explore funding through IEPA section 319 grant program for stream bank erosion and forested gully erosion control, and the Fish and Wildlife Service for wetland construction funding.

Possible funding sources for education and outreach program include IDNR C2000, IEPA section 319 programs, University of Illinois Extension and IEPA LEAP grant.

Private funding for watershed conservation practices such as the Prairie Rivers Network will also be explored.

Table 5. Spring Lake Watershed Committee project implementation projected costs.

Project	Unit Cost	# Units	Per Year (2008-2012)	Total Cost
Spring Lake Watershed phosphorus origin and cost mitigation studies				
RAP-M study				$0
detailed stream bank study	$9,000			$9,000
Watershed GIS soil phosphorus study	$ 25,000			$ 25,000
Stream bank stabilization	30	5000 ft	1,000 ft	$ 150,000
Gully and megarill erosion control				
WASCOB	$ 1,800	50	10	$ 90,000
Grade stabilization projects	$ 4,500	20	4	$ 90,000
Diversions	$ 1,100	40	8	$ 44,000
Forested gully erosion control				
Grade stabilization or brush checks	$ 700	25	5	$ 17,500
Cropland sheet and rill erosion control				
No-till farming program	$ 30.00	2,000 ac	400 ac	$ 60,000
Grass waterways		2,000 ft	400 ft	$ 3,000
Terrace with underground outlet	$ 3.00	20,000 ft	4,000 ft	$ 60,000
Septic system education and replacement				
Workshop	$ 500	2	2009 & 2012 yr	$ 1,000
Livestock waste management				
Landowner technical assistance	$0		As needed	$0
Watershed nutrient management	$ 12	2000	400 ac	$ 24,000
Spring Lake water storage capacity study	$ 1,000	1	2012 yr	$ 2,000
Wetland construction	$ 500	100 ac	20 ac	$ 50,000
Containment analysis of Spring Lake Study	?	1	2011 yr	?
Forest Management				
Forest management workshop	$500	1	2009 yr	$500
Landowner technical assistance and cost share				
Total				$ 626,000

Selection of Implementation Strategies/Alternatives

At this time we are unable to tell if the recommended conservation practices will reduce the phosphorus loads below the TMDL of 3,082 lbs/yr. Uncertainties such as landowner participation, uncertainties in phosphorus modeling, unknown phosphorus reductions from some conservation practices, and specific locations of high concentrations of phosphorus in the watershed make phosphorus modeling inexact.

Our phosphorus reduction calculations were made using a C2000 "erosion and sediment control practice" worksheet. We estimate that implementing the recommended practices will reduce 3,035 lbs/yr of phosphorus entering Spring Lake (table 6). This is only 68 percent of the reductions needed to meet the TMDL. However, it may be possible to meet the goal if were able to target conservation practices to maximize phosphorus reductions. This may be possible if we are able to conduct the proposed detailed stream bank study and a soil phosphorus study in the watershed.

Table 6. Spring Lake Watershed phosphorus reduction by conservation practices.

Practice	#		Estimated reduction of phosphorus lb/yr	total reduction lb/yr
WASCOB	50	structures	8	400
Stream bank stabilization	5,000	feet of bank	0.056	281
Grade stabilization	20	structures	1	20
Brush checks	25	structures	2	50
Diversions	40	structures	1	40
Terrace - underground outlet	20,000	feet		240
Grassed waterway	1,000	feet		4
Conversion to no-till	1,000	acres		2,000

Total reduction	3,035
TMDL – amount lake can support	3,082
Current loads & wasteloads documented by IEPA	7,564
Reduction needed	4,482

Implementation Timeline

The timeline for implementing the recommended practices stretches over a 5-year period from 2008 to 2012. A detailed timeline for each practice is found in Table 7 below. However, the implementation timeline will be constrained by available funding.

Table 7. Spring Lake Watershed Committee project implementation dates.

Project	Implementation Date
Spring Lake Watershed phosphorus origin and cost mitigation studies	
RAP-M study	Winter 2008
detailed stream bank study	2009
Watershed GIS soil phosphorus study	2009-10
Stream bank stabilization	2008-2012
Gully and megarill erosion control	
WASCOB	2008-2012
Grade stabilization projects	2008-2012
Diversions	2008-2012
Forested gully erosion control	
Grade stabilization or brush checks	2008-2012
Cropland sheet and rill erosion control	
No-till farming program	2008-2012
Grass waterways	2008-2012
Terrace – underground outlet	2008-2012
Septic system education and replacement	
Workshop	2009
Livestock waste management	
Landowner technical assistance	2008-2012
Watershed nutrient management	2008-2012
Spring Lake water storage capacity study	2008 & 2012
Wetland construction	2008-2012
Containment analysis of Spring Lake Study	2011
Forest Management	
Forest management workshop	2009
Landowner technical assistance and cost share	2008-2012

Table 8. Cost analysis of phosphorus reduction

Project	Unit Cost	# Units	Total Cost	P removed lb/yr	Phosphorus ratio*
Stream bank stabilization	$ 30	5000 ft	$ 150,000	281	$ 53
Gully and megarill erosion control					
WASCAB	$ 1,800	50	$ 90,000	400	$ 23
Grade stabilization projects	$ 4,500	20	$ 90,000	20	$ 450
Diversions	$ 1,100	40	$ 44,000	40	$ 110
Forested gully erosion control					
Grade stabilization or brush checks	$ 700	25	$ 17,500	50	$ 35
Cropland sheet and rill erosion control					
No-till farming program	$ 30.00	2,000	$ 60,000	2000	$ 6
Grass waterways		2000 ft	$ 3,000	4	$ 75
Terrace with underground outlet	3	20,000 ft	$ 60,000	240	$ 25
Total / Average			$ 454,500	3,035	$ 107

* Project cost per lb of phosphorus removed over a 10 year lifespan except conversion to no-till is over a 5 year lifespan

Measuring Progress/Success

This plan is a work in progress and will be revised and updated during implementation as needed. The watershed committee will have oversight of implementation of the plan and be responsible for measuring the progress of the plan success.

The following are methods for measuring the success of the plan:
1) Implementation of plan strategies by the timeline (Table 7).
2) Reduce 3,035 lb/yr of phosphorus entering the Spring Lake by 2012.
3) Reduction in sedimentation rates monitored by the lake sedimentation study.
4) Cooperation between the agencies and groups listed in this plan to meet our goals/objectives.

In addition, there are many ongoing studies by various agencies that will continue to provide input into measuring the success of the plan. These include:

1) IEPA water quality monitoring
2) City of Macomb water quality monitoring
3) IDNR fish monitoring of Spring Lake
4) SWCD soil conservation transect survey

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Appendix

Problem statements identified by the planning committee on May 24th 2007

- Gully erosion in forested areas
- Erosion in pasture areas
- Phosphorus in lake bottom
- Status of mine area
  - Is it active?
  - Reclamation
- West Prairie High School
  - Is discharge monitored
- Viability of drinking water.
- Water source
  - Capacity
  - Quality of H2O
  - Dam Conditions (safety)
- Will plan coordinate with Macomb's comprehensive plan
- Ground water.
- Septic systems
  - Where do they drain
  - How many
- Update inspections
- Construction of Rt. 336
  - Construction runoff
  - Impervious surface
  - Habitat resource degradation
- Maintenance of existing roads/impacts
- Threatened and endangered species
  - Wetlands
- Land use (Coordinate with Macomb's Comprehensive plan)
- Erosion of cropland
- Live stock
  - Pasture
  - Feedlot
  - Stream access
- Spring Lake Park
- Educational
  - Park programs
  - Other educational
  - Cost share programs
- VOC in lake from 2cycl outboards.
- Recreational impacts
  - Impacts
  - Sustainable uses
  - Supporting current uses
- Algal issues
- Nutrient management
  - Awareness of programs
- Lake View Nature Center (cooperation).

- Cooperation w/WIU and other groups.
- Wildlife impacts
  - Overpopulation of deer
  - Watering / causing erosion in streams
- Subdivision storm water runoff
  - Lawn chemicals
  - Flash storm water runoff
  - Retention/detention
- Natural gas storage facility.
  - Impacts
  - Construction
- Ground water concern.

Worksheet of possible problems identified by the watershed committee for comment by the technical committee

Spring Lake Watershed

Technical committee worksheet

Problems identified by the SLW Committee	Problem valid?	Information/data needed to identify/quantify problem	Possible Solutions	Lead committee member	Date expected
Non Point Source Pollution					
➢ Total Phosphorus					
➢ Dissolved oxygen					
➢ Suspended Solids					
➢ Total nitrogen					
➢ Excess algal growth					
➢ Stream bank erosion					
➢ Gully erosion in forested areas					
➢ Erosion in pasture areas					
➢ Erosion of cropland					
➢ Construction of Rt. 336					
▪ Construction runoff					
▪ Impervious surface					
▪ Habitat resource degradation					
➢ Maintenance of existing roads/impacts					
➢ Subdivision storm water runoff					
▪ Lawn chemicals					
▪ Flash storm water runoff					
▪ Retention/detention					
➢ Phosphorus in lake bottom					
➢ Live stock					
▪ Pasture					
▪ Feedlot					
▪ Stream access					
➢ Septic systems		.			

▪ Where do they drain		▪			
▪ How many					

Point Source Pollution

➢ West Prairie High School					
▪ Is discharge monitored		▪			
➢ Status of mine area					
▪ Is it active?					
▪ Reclamation					
➢ Natural gas storage facility.					
▪ Impacts					
▪ Construction					

Municipal Water

➢ Viability of drinking water.		▪	▪		
➢ Water source					
▪ Capacity					
▪ Quality of H2O					
▪ Dam Conditions (safety)					
➢ VOC in lake from 2cycl outboards.					

Education / Recreation

➢ Spring Lake Park					
➢ Educational					
▪ Park programs					
▪ Other educational					
▪ Cost share programs					
➢ Lake View Nature Center (cooperation).					
➢ Cooperation w/WIU and other groups.					
➢ Nutrient management			▪		
▪ Awareness of programs			▪		
➢ Recreational impacts			▪		

▪ Impacts			▪		
▪ Supporting current uses			▪		
▪ Sustainable uses			▪		

Habitat / Wildlife

➢ Wildlife impacts		▪			
▪ Overpopulation of deer					
▪ Watering / erosion in streams					
➢ Threatened and endangered species					
➢ Forest management					
➢ Wetlands					
➢ Fish Resources					

Other

➢ Will plan coordinate with Macomb's comprehensive plan					
➢ Ground water.					

University of Illinois Extension Programs and Outreach

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I. Restructure current programs for Spring Lake Watershed to focus more on:

1. **Animal Systems and Pasture Management**
   --Best management practices for grazing in pastures/feedlots and maintaining the quality of water in Spring Lake Watershed could be conducted by Dean Oswald, University of Illinois Extension Educator, Animal Systems or other Extension Animal Systems Educators. Pasture walks and other current programs currently focus on best management practices for pastures and feedlots, rotational grazing to improve pastures and reduce erosion, appropriate water availability, prevention of non-point pollution from animal sources, etc.
2. **Pesticide Applicator Training Program** Resources are available to train:
   -- Producers and residents about pesticide properties, how pesticides move in the environment, and ways to prevent movement within the Spring Lake Watershed.
   -- Producers and residents about proper use and application of pesticides and fertilizers [nitrogen (N), phosphorus (P), and potassium (K)].

II. Development of new Extension and Outreach programs directed towards the Spring Lake Watershed

Program	Audience	Education/Outreach Content
Pesticide Application and Water Quality	Agricultural Producers-Crops	Pesticide Application and Water Quality focusing on pesticide properties, how pesticides move in the environment, and ways to prevent movement within the Spring Lake Watershed. Atrazine and other pesticides can be addressed.
Soil Conservation Measures and Stream Bank Protection	Agricultural Producers-Crops	Soil conservation measures and best management practices to protect stream bank, water quality, and to prevent soil erosion and runoff from cropland.
Livestock and Pasture Management in Spring Lake Watershed	Agricultural Producers-Animals	Best management practices for livestock feedlots and pastures to prevent soil erosion, non-point pollution from animal sources, and to protect stream banks and water quality.
Turfgrass pesticide and fertilizer management and water quality.	Home Owners	Proper turf pesticide and fertilizer application and lawn management to prevent runoff into Spring Lake and preserve water quality. Appropriate timings, rates, and use of lawn pesticides and fertilizers.

Illinois soil conservation transect survey for McDonough County 2006

Percent of points surveyed with each tillage system, by year in McDonough Co.
(corn, soybeans, small grain) 1994 - 2006

	2006	2004	2002	2001	2000	1999	1998	1997	1996	1995	1994
Conventional	31.2	33.5	35.8	31.7	30.4	36.4	38.1	33.6	36.5	33.5	46.1
Reduced	19.3	20.1	19	21.2	21.2	22	22.7	21.7	23.8	26.3	20.4
Mulch	16.4	17.2	15	17.8	18.7	15	13.7	19.1	16.3	14.7	9.8
No-Till	33.1	29.2	30.2	29.3	29.1	25.8	24.6	24.6	22.7	24.8	22.7
NA/Unknown	0	0	0	0	0.6	0.8	0.9	1	0.7	0.7	1
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

PERCENT OF POINTS SURVEYED WITH INDICATED TILLAGE SYSTEMS

Corn

	Conventional	Reduced	Mulch	No-Till	Unknown	Total %
2006	47.9	21.9	13.5	16.7	0	100
2004	51.2	21.9	12	14.9	0	100
2002	52.9	19.5	10.7	16.9	0	100
2001	49	23.5	10.5	17	0	100
2000	48.7	23.2	11.5	16.4	0.2	100
1999	56.2	21.3	8.5	13.7	0.3	100
1998	56.7	22.4	8.2	12.5	0.2	100
1997	50.4	22.6	12.3	14.4	0.3	100
1996	47.6	24.7	12.8	14.7	0.2	100
1995	44.3	27.7	11	16.9	0.1	100
1994	59.6	14.6	6.9	18.8	0.1	100

Soybeans

	Conventional	Reduced	Mulch	No-Till	Unknown	Total %
2006	13.8	16.5	18.7	51	0	100
2004	14.4	17.9	22.1	45.6	0	100
2002	19.2	18	18.9	43.9	0	100
2001	14.2	18.9	24.8	42.1	0	100
2000	12.4	19.8	26	41.7	0.1	100
1999	16.4	23.2	21.9	38.3	0.2	100
1998	20.5	24	19.1	36.3	0.1	100
1997	16	22	26.3	35.3	0.4	100
1996	25.5	23.2	19.8	31.2	0.3	100
1995	24.3	25.5	17.3	32.7	0.2	100
1994	32	23.8	15.5	28.6	0.1	100

Small Grains

	Conventional	Reduced	Mulch	No-Till	Unknown	Total %
2006	21.9	17.3	25.3	35.5	0	100
2004	20.7	20.5	25.9	32.9	0	100
2002	16.5	25.2	24.3	34	0	100
2001	20.8	18.9	27.9	32.4	0	100
2000	16.9	13.2	21.9	38.2	9.8	100
1999	19.2	16.9	17.5	34.9	11.5	100
1998	21.8	15.2	17.9	33.3	11.8	100
1997	22	11.8	22.4	30.4	13.4	100
1996	15.4	20.6	22.5	32.4	9.1	100
1995	24.6	26.3	16.9	14.2	18	100

PERCENT OF POINTS SURVEYED WITH RELATIVE SOIL LOSS BY T VALUE 1994 – 2006

	<T	1-2T	>2T	Unknown	Total %
2006*	85.8	10.2	4	0	100
2004*	84.9	10.7	4.4	0	100
2002*	85	10.8	4.2	0	100
2001*	85	10.6	4.1	0.3	100
2000*	85.7	10.4	3.6	0.3	100
1999*	85.7	10.5	3.6	0.2	100
1998*	86.5	9.9	3.4	0.2	100
1997*	86.2	9.8	3.7	0.3	100
1996	76.2	14.8	6.4	2.6	100
1995	76.7	15.3	6.3	1.7	100
1994	74.1	16.7	7.1	2.1	100

Spring Lake water quality analysis by the City of Macomb

Measurements taken from July 24, 2007 to August 20, 2007

Date	site #	TDS	ORP	COND	pH	Temp	DO	Alkalinity	lake depth	secchi depth	color	surface
7/24/2007	1	157	23	267.6	8.58	30.7	11.2	100				
7/24/2007	2	156.7	48	234.5	9.17	30.8	11.9	96				
7/24/2007	3	154.1	6	241.8	9.42	31.8	11.9	90				
7/26/2007	**1**	150.7	10	234.4	9.18	27.9	12.3	84	23'	24	3	
7/26/2007	**2**	152.3	17	236.7	9.09	27.2	12.7	90	7.5'	15	14	
7/26/2007	**3**	153	17	237.7	9.11	27.2	12.5	90	2'	10	14	
8/1/2007	1	174.4	41	272	7.89	26.7	6	90	22'	22	13	
8/1/2007	2	160.6	34	250	8.22	26.9	4	86	7'	19	15	
8/1/2007	3	159.1	31	247.5	8.46	27	6.4	92	2'	10	14	
8/7/2007	1	149.5	49	234.3	9.21	31.7	18	92	22.5'	26	3	
8/7/2007	2	150.2	47	235.6	9.48	32.5	14.5	90	7'	16	15	
8/7/2007	3	150.8	49	235.8	9.27	32.6	14.2	92	2'	10	13	
8/10/2007	1	152.8	43	235.9	8.91	30.3	6.7	90	22.5'	32	13	
8/10/2007	2	153.2	44	239.6	8.95	30.5	7.5	94	7'	21	15	
8/10/2007	3	154.7	51	241.7	8.69	30.7	3.8	92	2'	10	14	
8/15/2007	1	158	49	247.2	8.86	29.4	5.9	96	22'	24	17	
8/15/2007	2	159.3	51	249.3	8.67	29.3	4.6	98	7'	19	14	
8/15/2007	3	158	50	247.3	8.86	29.4	5.7	98	1.5'	9	14	
8/23/2007	1	167.5	75	261.5	8.46	28.1	6.2	100	21.5'	26	13	16
8/23/2007	2	164.4	73	257.1	8.44	28.1	5.9	102	6.5'	16	13	10
8/23/2007	3	164.1	75	256.5	8.53	28.1	6.1	100	1'	8	14	10
8/31/2007	1	169.2	70	264.3	8.59	27.4	5.6	104	20.5'	20	8	10
8/31/2007	2	169.7	71	265	8.57	27.3	5.8	106	6.5'	14	8	10
8/31/2007	3	171.1	71	267.3	8.35	27.2	3.9	104	1'	7	8	10
9/4/2007	**3**	165.7	156	259.1	8.92	28.9	16.9	112				10
9/7/2007	**1**	175.5	52	273.2	7.84	26	2.5	108	22'	33	14	16
9/7/2007	**2**	175.3	54	273	7.73	26	2	112	6.5'	16	15	16
9/7/2007	**3**	175.6	59	273.4	7.77	26	1.9	112	10"	10	18	16
9/10/2007	**1**	177.2	84	275.6	7.67	25.5	2.5	108	22' 3"	27	13	19
9/10/2007	**2**	177.2	86	275.7	7.54	25.5	1.5	110	6' 8"	17	15	19
9/10/2007	**3**	177.3	99	276.4	7.47	25.3	1.5	112	7"	7	15	16
9/12/2007	**1**	177.2	64	275.4	8.29	25	5.4	108	22' 2"	30	13	16
9/12/2007	**2**	177	66	275.1	8.31	25.3	5.5	108	6' 7"	16	14	16
9/12/2007	**3**	177.4	69	276	8.17	25.1	4.9	110	7"	17	14	16
9/20/2007	**1**	173.2	72	269.5	9.04	25.8	14.1	110	22'	22	12	16
9/20/2007	**2**	174.5	78	271.6	8.9	25.6	12.5	108	7'	18	14	19
9/20/2007	**3**	177.1	52	274.3	8.66	25	9.4	112	6"	6	14	16

Spring Lake Watershed Problem, Objective, Implementation worksheet

Problem Statement	Goals and Objectives	Implementation Strategies

Excessive amount of phosphorus entering the lake	Reduce overall phosphorus entering the lake by 3,035 lb/yr or 68%	
	Reduce soil erosion in forested areas install 25 sediment control structures - brush checks in the next 4 years. This will reduce phosphorus entering Spring Lake by 50 lb/yr*.	Provide technical assistance and seek cost share to help landowners install sediment control structures in wooded ravines
	Reduce erosion of stream banks by installing stream bank stabilization measures on 5,000 feet of spring creek over the next 4 years. This will reduce phosphorus entering Spring Lake by 281 lb/yr*.	Provide technical assistance and cost share to help landowners install stream bank protection structures along highly erodable areas of the tributaries leading to Spring Lake
	Reduce gully and megarill erosion in the watershed by Installing a) 50 WASCAB (Water sediment control basins) structures in the watershed. b) Install 20 grade stabilization projects in the watershed. c) Install 40 diversion structures in the watershed. This will reduce phosphorus entering Spring Lake by 460 lb/yr*.	Provide technical assistance and/or cost share to help landowners to help install these practices.
	Reduce sheet and rill erosion in upland, cropland, and pasture areas by a) encouraging farmers to switch to no till farming practices and b) establishing and maintain 1,000 feet of new grass waterways, and install 20,000 feet of terraces with underground outlets. This will reduce phosphorus entering Spring Lake by 2,244 lb/yr*.	Provide technical assistance and/or cost share to help landowners to help install these practices.
	Locate and quantify areas in the watershed with excessive phosphorus entering spring lake/spring creek	1) Implement a study to locate areas in the watershed that have excessive phosphorus in soils that when erode enter spring lake/spring creek . 2) Carry out a through study of Spring Creek for the purpose of identifying specific areas of stream bank erosion.
	Encourage residents to replace non functioning septic systems.	Educate landowners
Excessive amount of suspended solids in the lake	Goals same as phosphorus goals	Strategies as phosphorus goals

Excessive amounts of nitrogen entering the lake	Reduce overall nitrogen entering lake	Use existing programs to implement Nutrient Management Plans on cropland in the Watershed. Apply for additional NMP funds from EPA's Section 319 grant program
Reduction in capacity of water storage	Reduce sediment entering the lake (goals similar to phosphorus objectives)	Strategies as phosphorus goals
	quantify the amount of storage capacity lost yearly to siltation	
Poor management of forest resources	Improve forest management on both private and public land in the watershed	Provide forest management educational opportunities to landowners (Partner with INPC, IDNR, and USFWS private lands people to come up with funding suggestions and realistic goals and imp strategies for this topic)
		Assist landowners in developing a forest management plan and finding resources to follow through the plan
Excessive number of White-tailed Deer in the watershed	Reduce the population of White-tailed Deer in the watershed	Increase White-tailed deer hunting opportunities in the watershed and surrounding area (try to talk with TAC and others to find a way to get more specific if this priority survives the ranking process)
Are excessive amounts of VOC entering lake and what affect does it have on the water quality.	Study the amount of VOC entering the lake and its effects on water quality.	Obtain funding for a study to find out if (VOC) Volatile Organic Compounds are affecting the water quality of Spring Lake.
Inadequate acres of wetlands in the watershed	Increase wetlands in the watershed by 100 acres by 2012	Work with landowners to create new wetland in the watershed. Coordinate with INPC, IDNR, USFWS private lands people, The Nature Conservancy, and Ducks Unlimited to come up with funding suggestions and imp. strategies for this topic.
Protect the fish resources of the watershed	Reduce phosphorus, nitrogen and suspended solids entering lake (addressed above)	Same as phosphorus
Protect threatened and endangered species in the watershed	Work with local, state and federal agencies in the study and protection of threatened and endangered species within Spring Lake Watershed.	Work with different organizations to help protects T&E species in the watershed
Protect ground water	Educate residents in of the importance in protecting our ground water	Partner with other organizations in order to locate ground water recharge areas and educate residents the importance of protecting our ground water recharge areas.

Excessive amounts of pesticides entering the lake	Develop a study to examine information on types and amounts of pesticide in Spring Lake.	Partner with other organizations to investigate the possibility of a study.
	Educate landowners, pesticide dealers, and homeowners on proper pesticide use on lawns and ornamentals.	Hold pesticide awareness workshop in winter of 2009. Develop info packets and have pesticide dealer give a tutorial on calibrating spray nozzles for farmers.
The water quality of Spring Lake does not meet the EPA standard for a swimming beach	Investigate problem	
Forests in watershed are highly fragmented	Reduce fragmentation of forest	Identify appropriate grant sources for education of landowners in regard to reforestation