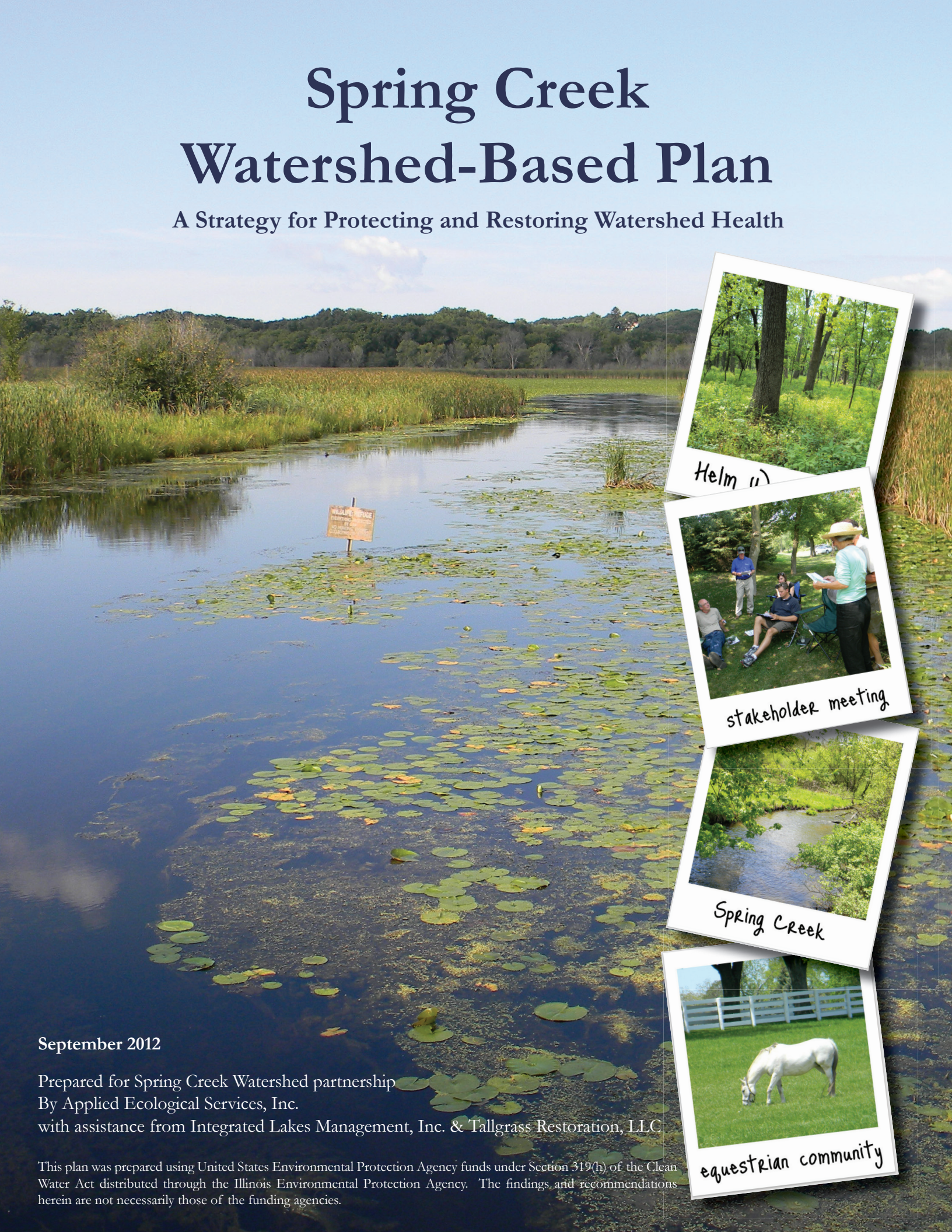
Spring Creek Watershed-Based Plan

A Strategy for Protecting and Restoring Watershed Health



September 2012

Prepared for Spring Creek Watershed partnership
By Applied Ecological Services, Inc.
with assistance from Integrated Lakes Management, Inc. & Tallgrass Restoration, LLC

This plan was prepared using United States Environmental Protection Agency funds under Section 319(h) of the Clean Water Act distributed through the Illinois Environmental Protection Agency. The findings and recommendations herein are not necessarily those of the funding agencies.

SPRING CREEK WATERSHED-BASED PLAN

McHenry, Lake, Kane, and Cook Counties, Illinois

A Strategy for Protecting and Restoring Watershed Health

September, 2012

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The Spring Creek Watershed partnership (SCW) played an important role in providing input on watershed goals & objectives, various planning approaches, and input on plan development. The partnership consists of representatives from Dundee Township, U.S. Fish & Wildlife Service (USFWS), Barrington Area Council of Governments (BACOG), Friends of the Fox River (FOFR), Friends of Spring Creek Forest Preserve, Citizens for Conservation (CFC), Forest Preserve District of Cook County (FPDCC), and Village's of Carpentersville, South Barrington, Fox River Grove, and Barrington Hills.

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Applied Ecological Services, Inc. (AES) was hired to author the Spring Creek Watershed-Based Plan. Steve Zimmerman acted as AES's Project Ecologist/Manager. Melisa Bernard, AES GIS Analyst, provided GIS analysis and maps. John Roll, AES Environmental Engineer, estimate pollutant loading and reductions. Jarrett Cellini, AES Staff Ecologist, assisted with various planning tasks. In addition, AES teamed with Tallgrass Restoration, LLC (Tallgrass) and Integrated Lakes Management, Inc. (ILM) to perform an inventory of streams, lakes, ponds, and wetlands. Doug DeWitt of Tallgrass and Sandy Kubillus of ILM led this effort.

Several individuals provided specific planning assistance and/or input. Anna Paul, GIS Analyst intern with BACOG, provided open space identification and mapping information. Kurt Thomsen Ph. D., PG, Principal and Hydrogeologist with KOT Environmental Consulting, Inc. provided groundwater recharge information. SCW intern Karen Rogulja provided GIS support. SCW Assistant Watershed Coordinator Cecily Cunz worked closely with the Watershed Coordinator by planning, attending, and recording minutes at all SCW meetings. Cecily also assisted with the watershed inventory and designed the layout for the report cover and Executive Summary. Photos included in the plan were taken by Steve Zimmerman or Cecily Cunz unless otherwise noted. Additional support was provided by Mark Munro, Baird and Warner, Troy Wiseman, ILT Vignocchi, Cowhey Gudmundson, Leder, Inc., and Lake County Stormwater Management Commission.

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Village of Barrington Hills: Bob Kosin, Sarah Kenney, Elaine Ramesh
Village of South Barrington: Mark Masciola
Village of Carpentersville: Jamie Rott, Scott Marquardt
Village of Fox River Grove: Joanna Colletti
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APPENDIX D. Pollutant Load & Pollutant Load Reductions

APPENDIX E: Spring Creek Watershed Stakeholders & Partners

APPENDIX F. Funding Opportunities

1.0 INTRODUCTION

1.1 Spring Creek Watershed Setting

Each of us lives in a watershed or area of land drained by a river or stream system (Figure 1). Despite this relatively simple definition, a watershed is actually a complex interaction between ground, water, vegetation, climate, people, and animals. Other elements such as nutrient rich agricultural and urban stormwater runoff, impervious surfaces, altered stormwater flows, and erosion are all detrimental to the health of watersheds with increasing human development. Depending on size, watersheds are also called basins, sub-basins, subwatersheds, or Subwatershed Management Units (SMUs), also known as catchments.

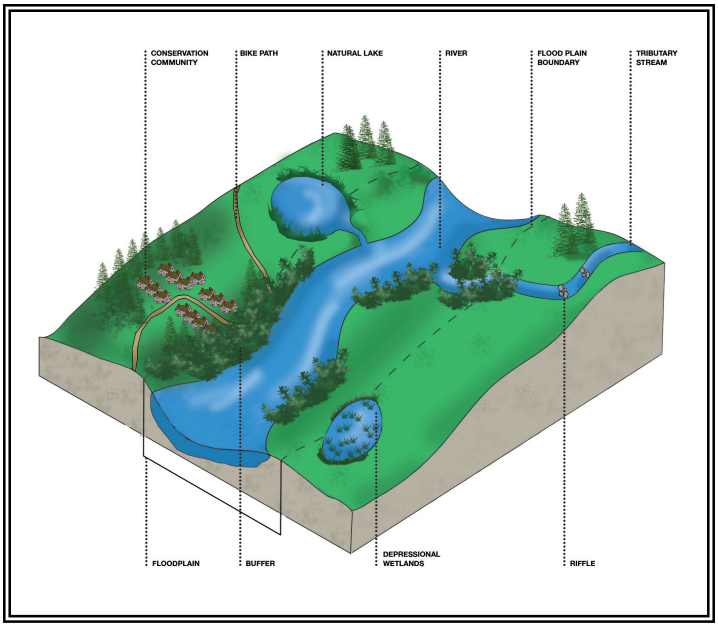


Figure 1. Hypothetical Watershed Setting.

The Spring Creek Watershed is located in northeast Illinois in portions of McHenry, Lake, Kane, and Cook Counties (Figure 2). Spring Creek and its numerous small tributaries drain approximately 26.9 square miles (17,239 acres) of land surface. The watershed is a subwatershed of the Upper Fox River Basin that drains portions of Jefferson, Kenosha, Racine, Walworth, and Waukesha counties in Wisconsin and McHenry, Lake, Kane, and Cook Counties in Illinois. The Lower Fox River Basin extends south and west through DeKalb, DuPage, Grundy, Kendall, LaSalle, Lee, and Will Counties, Illinois. The Fox River joins the Illinois River in Ottawa, Illinois. From there the Illinois River flows southwest through central Illinois before joining the Mississippi River north of St. Louis, Missouri.

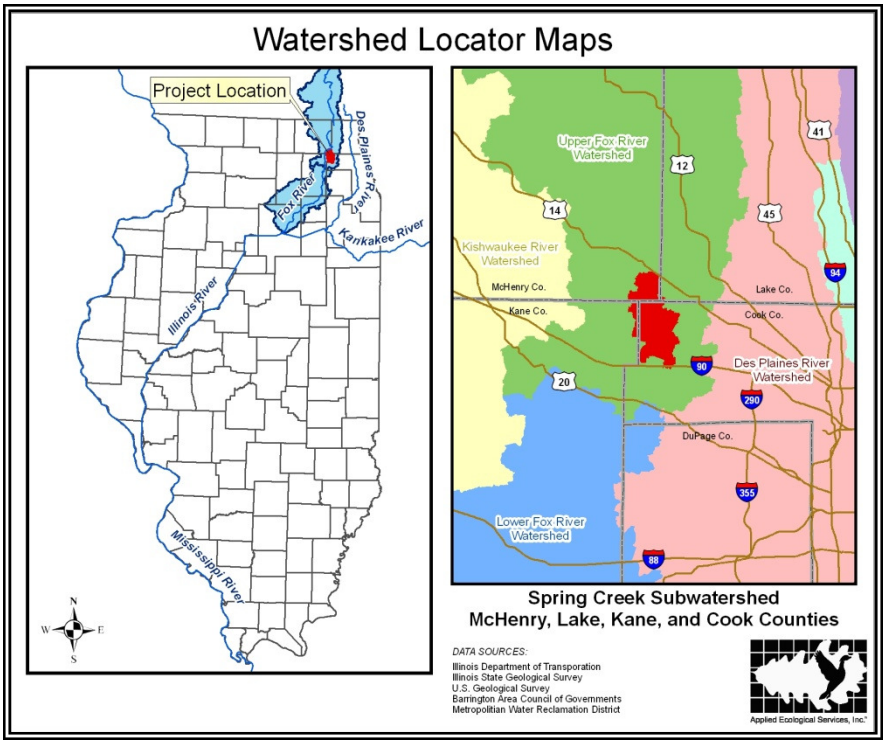


Figure 2. Watershed Locator Maps.

Pre-European settlement ecological communities in the Spring Creek watershed were balanced ecosystems exhibiting a diversity of plants and wildlife. The mosaic of prairie, oak savanna, and wetlands were largely maintained and shaped by frequent fires ignited by both lightning and the Native Americans that inhabited the area. Herds of bison and elk also helped maintain the landscape by grazing. During these times most of the water that fell as precipitation was absorbed in upland prairie and savanna communities or within the extensive wetlands that existed along stream corridors; any additional water slowly seeped into Spring Creek.

Ecological conditions changed drastically and quickly following European settlement in the mid 1800's. Large scale fires no longer occurred and bison and elk were extirpated. The majority of prairie and savanna was removed and drain tiles were installed throughout wet areas as farming became the primary land use in the early 1900's. Residential and commercial development followed which led to additional alteration and fragmentation of the natural landscape as landowners converted property to meet individual needs and roads were constructed across the watershed creating impervious surfaces that no longer allow precipitation to infiltrate into the ground.

As humans alter the landscape, streams suffer from compounding and interconnected side effects caused by urban development such as streambank erosion, invasive species establishment, degraded in-stream habitat, nutrient inputs from improper land management, and sediment deposition. Many of these side effects lead to poor water quality.

Spring Creek watershed currently maintains large expanses of both private and public open space. Most of this open space or 75% of the watershed is located within the community of Barrington Hills and is comprised of large residential lots and land owned by Cook County Forest Preserve District. Development pressure is most abundant in the southern portion of the watershed where recent residential and commercial development has occurred in South Barrington and Hoffman Estates. Smaller portions of older residential developments are found in Carpentersville, East Dundee, and Algonquin on the far west side of the watershed and in Fox River Grove in the northern tip of the watershed.

It is important to note that Spring Creek is not listed by the Illinois EPA as impaired in the most recent 2010 Illinois Integrated Water Quality Report and Section 303d List. In fact, Spring Creek is known as one of the highest quality streams in the area. Credit for this can be given to the private open space, equestrian lifestyle, and other agrarian land uses as well as support from local policy makers and the low-density development that defines the majority of the watershed. Future land use changes and development pressure could change that and local policy should be designed to encourage the continued good practices already in use.

1.2 Scope, Purpose, and Project Approach

In early 2011, Spring Creek Watershed partnership (SCW), using Citizens for Conservation (CFC) as its fiscal agent, received Illinois EPA funding through Section 319 of the Clean Water Act to produce a comprehensive "Watershed-Based Plan" for the Spring Creek watershed that meets requirements as defined by the United States Environmental Protection Agency (USEPA). Ultimately, the intent of 319 funding is to develop and implement Watershed-Based Plans designed

to achieve state water quality standards. In May 2011, SCW/CFC hired Applied Ecological Services, Inc. (AES) to develop the plan.

The primary scope of this project is the development of an ecologically-based watershed management plan for the Spring Creek watershed that focuses on protecting and improving water quality by reducing Nonpoint Source Pollution as the primary goal. Secondary goals include protection and enhancement of natural areas/open space, improving aquatic and terrestrial habitat, reduction in structural flooding, increased communication among stakeholders, and implementation of watershed education strategies.

The primary purpose of this plan is to spark interest and give stakeholders a better understanding of the Spring Creek watershed to promote and initiate plan recommendations that will accomplish the goals and objectives of the plan. This report was produced by implementing a comprehensive watershed planning approach with input from stakeholders and analysis of complex watershed issues by Ecologists, GIS Specialists, and Environmental Engineers.

SCW held regular, public meetings throughout 2011 and into 2012 to guide the watershed planning process and to encourage participation of stakeholders to develop planning and support for watershed improvement projects and programs. Information gathered during the planning process and interests, issues, and opportunities identified by SCW were addressed and incorporated into the watershed plan. The plan incorporates scientific, economic and practical rational for maintaining and improving open space to meet the majority of the goals and objectives in the plan and emphasizes entering into relationships with public, private, and non-profit entities to manage these properties to maximize watershed benefits. In addition, ideas and recommendations in this plan are designed to be updated through adaptive management that will strengthen the plan over time as additional information becomes available.

1.3 USEPA Watershed-Based Plan Requirements

In October 2003, USEPA released watershed protection guidance entitled "Nonpoint Source Program and Grant Guidelines for States and Territories." (USEPA 2008) The document was created to ensure that Section 319 funded projects make progress towards restoring waters impaired by nonpoint source pollution. AES consulted this document as well as Chicago Metropolitan Agency for Planning's (CMAP) "Guidance for Developing Watershed Implementation Plans in Illinois" (CMAP 2007) to create this Watershed-Based Plan. Having a Watershed-Based Plan will allow Spring Creek watershed stakeholders to access 319 Grant funding for management measures recommended in the plan. Under the USEPA guidance, nine "Elements" are required in order for a plan to be considered a Watershed-Based Plan. The nine Elements are as follows:

Element A: Identification of the causes and sources or groups of similar sources of pollution that will need to be controlled to achieve the pollutant load reductions estimated in the watershed-based plan;

Element B: Estimate of the pollutant load reductions expected following implementation of the management measures described under Element C below;

Element C: Description of the non-point source management measures that will need to be implemented to achieve the load reductions estimated under Element B above and an identification of the critical areas in which those measures will be needed to implement the plan;

Element D: Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement the plan;

Element E: Public information/education component that is designed to change social behavior;

Element F: Plan implementation schedule;

Element G: Description of interim, measurable milestones;

Element H: Set of criteria that can be used to determine whether pollutant loading reductions are being achieved over time;

Element I: Monitoring component to evaluate the effectiveness of the implementation efforts over time.

1.4 Planning Process

Watershed Stakeholder Planning Committee

The Spring Creek watershed planning process was initiated in September 2010 when Spring Creek Watershed partnership (SCW) invited all relevant watershed stakeholders to participate on a watershed plan steering committee. This committee met 4 times prior to hiring Applied Ecological Services, Inc. to assist in developing the watershed plan. The committee met 13 times during the planning process. The committee generally consisted of representatives from municipalities, townships, state and federal agencies, non profit organizations, and watershed residents.

SCWP meeting at Hidden Pond Estate

The SCW played an important role in developing goals and objectives for the watershed and identified problem areas and opportunities. Meetings were initiated by the Watershed Coordinator (Schumm Consulting, LLC.) and generally covered one or more watershed topics. Most meetings were devoted to development of goals and objectives, watershed impairments, watershed characteristics and assessment findings, and Action Plan items. A list of the meetings is included in Table 1. Meeting minutes are included in Appendix 1.

Table 1. Spring Creek Watershed partnership meeting schedule.

Date	Agenda	Topic(s)
Sept. 21, 2010	EPA protocol & Stakeholders	Summary of what is needed in EPA approved watershed plan & list of current and potential stakeholders
Dec. 8, 2010	SCW structure & fiscal agent	Appropriate structure of SCW discussed and CFC agreement to act as fiscal agent for group
Jan. 21, 2011	EPA grant award details; Technical Committee; contracts	EPA preliminary work plan; Technical Committee participation and roles; Contracts between CFC and Technical Committee
Mar. 23, 2011	Plan for Contracting work; Coordinator contract; Education Plan	Committee discussed how to select Consultant; Watershed Coordinator contract approved; First steps in Education Plan discussed
May 10, 2011	Consultant contract & details; Goals & Objectives	AES awarded Consultant contract and details of proposal discussed; fundraising efforts discussed; Develop preliminary goals & objectives
June 22, 2011	Consultant update; GIS data; Fundraising & budget; Goals & Objectives	AES updated committee on current status of project; GIS outstanding needs were discussed; Fundraising efforts update; Goals & Objectives were refined.
July 21, 2011	Meeting held in field; Consultant update; GIS data; Fundraising; Quarterly report; Goals & Objectives	AES updated committee on current status of land use and changes; Fundraising efforts update; Content of Illinois EPA quarterly report; Stakeholder input on land use and verification; water quality data requested.
August 17, 2011	Consultant update; Potential Impairment Sources; Fundraising	AES updated committed on status of wetlands & SMUS then held discussion to identify potential sources of impairments in the watershed
September 27, 2011	Corps Drain Tile Project in SCVFP; Tom Huddleston Drain Tile Presentation; Consultant update; Fundraising	Robbie Sliwinski and Tom Huddleson presented the proposed Corps projects and drain tile survey within SCVFP. AES updated stakeholders on progress of SMUs, wetland restoration, and impervious cover.
October 26, 2011	Discuss Corps Drain Tile Project in SCVFP; Consultant update; Fundraising & Outreach	AES presented results of BMP inventory by displaying stream reach/characteristics maps and location of assessed detention basins, lakes, and wetlands. Discussion was held regarding long term maintenance of detentions and other natural areas.
November 16, 2011	Review of Project Goals & Causes of Pollution; Fundraising Efforts	AES presented chart of causes and sources of pollution for approval. Updated goals/objectives were reviewed and approved by stakeholders.
January 17, 2012	Consultant Update; Upcoming Educational Events; Fundraising Efforts	AES presented pollutant loading model results, Green Infrastructure Network Plan, and Critical Areas
February 15, 2012	Fundraising Update; Project Updates; Upcoming Events	AES presented the Watershed Action Plan and explained how stakeholders can use the plan to obtain grant funding. The planning committee discussed the upcoming fundraising event at Sanfilippo Estate.

1.5 Using the Watershed-Based Plan

The information provided in this Watershed-Based Plan is a tool to be used by any stakeholder including elected officials, federal/state/county/municipal staff, and the general public to identify and take actions related to watershed issues. The Plan is a "living" document that can be revised and/or modified by stakeholders as needed in the future. This section of the report summarizes what the user can expect to find in each major section of the Watershed-Based Plan. The best section to review if stakeholders are most interest in becoming involved is Section 5.0, where suggested projects, costing and impacts are listed.

Section 2.0: Goals and Objectives
This section of the report contains the Spring Creek Watershed partnership's mission and Goals identified by watershed stakeholders. The goals address 1) surface and groundwater resources, 2) natural areas/open space, 3) flood damage reduction, 4) aquatic and terrestrial habitat, 5) stakeholder communication, and 6) watershed education. In addition, "measurable objectives" were developed for each goal so that progress toward meeting each goal can be measured in the future.

Section 3.0: Watershed Characteristics, Problems, & Opportunities
The overall condition of the Spring Creek watershed is examined in this section. This section includes assessments of the geology, climate, pre-European settlement ecological communities, topography, soils, jurisdictions/demographics, land use, transportation, impervious cover impacts, open space (green infrastructure), drainage system (stream, lakes, wetlands, floodplain), groundwater recharge, water quality, and pollutant loading. Resulting analysis of this data led to identification of causes and sources of watershed impairment and set the stage for identifying watershed actions.

Section 4.0: Causes & Sources of Watershed Impairment
This section of the plan includes a compilation of causes and sources of watershed impairment identified in Section 3.0 as well as impairments identified by watershed stakeholders. The basis for each impairment is then examined more closely and "Impairment Reduction Targets" developed based on the data. Finally, "Critical Areas" are identified and potential Management Measures are assigned to each and an estimate is created for the pollutant removal expected. As required by USEPA, all or portions of USEPA *Elements A, B, & C* are addressed in this section.

Section 5.0: Management Measures Action Plan
A "Management Measure Action Plan" is included in Section 5.0 to provide stakeholders with action items for watershed-wide improvements and direct stakeholders towards specific sites in the watershed where measures can be implemented resulting in the greatest watershed benefits.

The Action Plan is divided into a Programmatic Action Plan and a Site Specific Action Plan. Action recommendations are presented in table format with references to entities that would provide consulting, permitting, or other services needed to implement specific measures. The tables also outline project priority, implementation schedule, sources of technical and financial assistance, and cost estimates. The Programmatic Action Plan recommends action items with general applicability throughout the watershed whereas the Site Specific Action Plan identifies specific sites where recommended measures would reduce impairments. In addition, a watershed-wide table is included to summarize Total Units (size/length), Total Cost, and Total Estimate of Pollutant Load Reduction if all the recommendations in the Site Specific Action Plan and Education Plan are implemented. This section of the report addresses all or portion of USEPA's *Elements C & D.*

Section 6.0: Information/Education Plan
This section of the plan is designed to address USEPA *Element E* by providing an Information/ Education component to enhance public understanding and to encourage early and continued participation in selecting, designing, and implementing watershed recommendations provided in the Watershed-Based Plan. This is accomplished by providing a matrix that outlines each recommended education action, target audience, package or vehicle for implementing the action, who will lead the effort, and what the expected outcome or behavior change will be.

Sections 7.0 & 8.0: Plan Implementation & Measuring Plan Progress/Success
These sections specifically address USEPA *Elements F, G, H, and I.* A list of key stakeholders, watershed improvement projects, description of the implementation schedule, and discussion of potential funding sources in included under two monitoring components:

1. "Water Quality Monitoring Plan" that includes specific locations and methods where future sampling should occur and a set of "Criteria" that can be used to determine whether pollutant load reduction targets are being achieved over time.
2. "Report Cards" for each plan goal used to measure milestones and to determine if management measures are being implemented on schedule, how effective they are at achieving plan goals, and need for adaptive management if milestones are not being met.

Sections 9.0 & 10.0: Glossary of Terms & Literature Cited
Definitions or descriptions for many of the technical words or agencies that the user may find useful when reading or using the document is found in the Glossary of Terms (Section 10.0). Section 11.0 includes a list of mostly scientific literature that was cited throughout the report.

Appendix
The Appendix to this report is located on the attached CD. It contains original raw data, methodologies, inventory data, and other technical information referenced in the report.

1.6 Prior Studies and Work

Various studies have been completed describing and analyzing conditions within the Spring Creek watershed. This Watershed-Based Plan uses existing data to analyze and summarize work that has been completed by others and integrates new data and information. A list of known studies is summarized below. A complete reference is located in the Appendix.

1. In 2010, Metropolitan Water Reclamation District of Greater Chicago (MWRD) completed the "Detailed Watershed Plan for the Poplar Creek Watershed Study Area: Volume 1". This plan addresses stormwater problem areas, evaluates watershed conditions using hydrologic and hydraulic (H&H) models, estimates damages associated with stormwater, and evaluates potential solutions to regional stormwater problems.

2. Municipal comprehensive plans are available for the Village of Algonquin (2008), Village of Barrington Hills (2008), Village of Carpentersville (2007), Village of Fox River Grove (2007), and Hoffman Estates (2007).

3. The Army Corps of Engineers is currently completing plans to implement large scale water resource related projects within Spring Creek Valley Forest Preserve including removing drain tiles to restore wetlands, filling old channels created by farmers, restoring stream channels/banks, and restoring riparian areas by removing invasive species and introducing natives.

4. In 1999 McHenry County Conservation District (MCCD) biologists completed an "Ecological Evaluation of Spring Creek Forest Preserve". The study includes a thorough ecological and biological analysis of the northern 1,500-acre portion of the preserve. The study looks specifically at plant species/communities, breeding birds, and fish community occurring in Spring Creek. MCCD also performed a fish survey within Spring Creek in 1996.

5. In 2004 a group of citizen volunteers and ecologists began ecological restoration of large portions of Spring Creek Valley Forest Preserve.

6. Friends of the Fox River completed a stream assessment study near the sewage treatment plant in Fox River Grove in 2001-2011. Water chemistry, macroinvertebrates, mussels, plants, and stream dimensions were all examined.

7. Illinois Department of Natural Resources (IDNR) completed various studies of Spring Creek dated back to the 1940's, 60's, and 70's when fish and mussels were sampled. More recently the IDNR has conducted mussel surveys in 1988, 1993, 1994, 1995, and fish surveys in 1994, and 2002.

8. IDNR RiverWatch volunteers sampled the aquatic macroinvertebrate community at one location (Site # R0204101) within the Spring Creek watershed in 2001, 2002, 2003, and 2009. A Macroinvertebrate Biotic Index (MBI) score was calculated to evaluate the biological health and water quality.

9. Existing McHenry, Lake, Kane, and Cook Counties Geographic Information System (GIS) data for the Spring Creek watershed was obtained and used to analyze various data related to wetlands, soils, land use, and other relevant information.

10. The Village of Barrington Hills collected water quality samples at two locations along Spring Creek from 2009-2011 as part of their NPDES Phase II requirements.

10.0 GLOSSARY OF TERMS

100-year floodplain: A 100-year flood is a flood that has a 1-percent chance of being equaled or exceeded in any given year. A base flood may also be referred to as a 100-year storm and the area inundated during the base flood is called the 100-year floodplain.

303(d): The Federal Clean Water Act requires states to submit a list of impaired waters to the USEPA for review and approval using water quality assessment data from the Section 305(b) Water Quality Report. States are then required to develop total maximum daily load analyses (TMDLs) for waterbodies on the 303(d) list.

305(b): The Illinois 305(b) report is a water quality assessment of the state's surface and groundwater resources that is compiled by the Illinois EPA as a report to the USEPA as required under Section 305(b) of the Clean Water Act.

ADID wetlands: Wetlands that were identified through the Advanced Identification (ADID) process to identify wetlands that should be protected because of their high functional value. The three primary functions evaluated were:

1. Ecological value based on wildlife habitat quality and plant species diversity;
2. Hydrologic functions such as stormwater storage value and/or shoreline/bank stabilization value; and
3. Water quality values such as sediment/toxicant retention and/or nutrient removal/transformation function.

Applied Ecological Services Inc. (AES): A broad-based ecological consulting, contracting, and restoration firm that was founded in 1978. The company consists of consulting ecologists, engineers, landscape architects, planners, and contracting staff. The mission of AES is to bring wise ecological decisions to all land use activities.

Aquatic habitat: Structures such as stream substrate, woody debris, aquatic vegetation, and overhanging vegetation that is important to the survival of fish and macroinvertebrates.

Base Flood Elevation (BFE): The elevation delineating the level of flooding resulting from the 100-year flood frequency elevation. (See also **Floodplain**.)

Base flow: The flow that a perennially flowing stream reduces to during the dry season. It is often supported by groundwater seepage into the channel.

Bedrock: The solid rock that underlies loose material, such as soil, sand, clay, or gravel.

Biodiversity: The variety of organisms (plants, animals and other life forms) that includes the totality of genes, species and ecosystems in a region.

Bio-infiltration (rain gardens): Excavated depressional areas where stormwater runoff is directed and allowed to infiltrate back into groundwater rather than allowing to runoff. Infiltration areas are planted with appropriate vegetation.

Biological Oxygen Demand (BOD): The amount of dissolved oxygen that is required by microscopic organism (e.g. bacteria) to decompose organic matter in waterbodies.

Biological Stream Characterization (BSC): A multi-tiered stream quality classification based primarily on the attributes of lotic (living in moving water) fish communities. The predominant stream quality indicator used in this process is the Index of Biotic Integrity (IBI), comprised of 12 metrics, which form a basis for describing the health or integrity of the fish community. When insufficient fishery data are available for calculating an IBI value, BSC criteria allow the use of sport fishing information or macroinvertebrate data to rate streams. BSC provides a uniform process of characterizing streams statewide and is used by a variety of sources for stream protection, restoration and planning efforts.

Bioengineering (or Soil Bioengineering): Techniques for stabilizing eroding or slumping stream banks that rely on the use of plants and plant materials such as live willow posts, brush layering, coconut logs and other "greener" or "softer" techniques. This is in contrast to techniques that rely on creating "hard" edges with riprap, concrete and sheet piling (metal and plastic).

Center for Watershed Protection (CWP): Non-profit 501(c)3 corporation founded in 1992 that provides local governments, activists, and watershed organizations around the country with the technical tools for protecting some of the nation's most precious natural resources such as streams, lakes and rivers.

Certified Community: A municipality that is certified to enforce the provisions of local stormwater ordinances. The municipality's designated Enforcement Officer enforces the provisions in the Ordinance.

Channelized stream: A stream that has been artificially straightened, deepened, or widened to accommodate increased stormwater flows, to increase the amount of adjacent land that can be developed or used for urban development, agriculture or for navigation purposes. In addition to being unsightly, channelized streams have a uniform gradient, no riffle and pool development, no meanders (curves) and very steep banks. The vegetation is frequently removed and replaced with riprap, concrete or other hard surfaces. During low flow periods in the summer, many channelized streams have low dissolved oxygen levels, in part due to shallow, slow-moving water. Under these conditions, they provide poor habitat for fish or other stream organisms such as benthic macroinvertebrates.

Conservation development: A development designed to protect open space and natural resources for people and wildlife while at the same time allowing building to continue. Conservation design developments designate half or more of the buildable land area as undivided permanent open space.

Conservation easement: The transfer of land use rights without the transfer of land ownership. Conservation easements can be attractive to property owners who do not want to sell their land now, but would support perpetual protection from further development. Conservation easements can be donated or purchased.

Clean Water Act (CWA): The CWA is the basic framework for federal water pollution control and has been amended in subsequent years to focus on controlling toxics and improving water quality in areas where compliance with nationwide minimum discharge standards is insufficient to meet the CWA's water quality goals.

Debris Jam: Natural and man-made debris including leaves, logs, lumber, trash and sediment.

Designated Use: EPA requirements that states and authorized Indian Tribes specify appropriate water uses to be achieved and protected. Appropriate uses are identified by taking into consideration the use and value of the water body for public water supply, for protection of fish, shellfish, and wildlife, and for recreational, agricultural, industrial, and navigational purposes. In designating uses for a water body, States and Tribes examine the suitability of a water body for the uses based on the physical, chemical, and biological characteristics of the water body, its geographical setting and scenic qualities, and economic considerations. Each water body does not necessarily require a unique set of uses. Instead, the characteristics necessary to support a use can be identified so that water bodies having those characteristics can be grouped together as supporting particular uses.

Detention basin: A man-made structure for the temporary storage of stormwater runoff with controlled release during or immediately following a storm.

Digital Elevation Model (DEM): Regularly spaced grid of elevation points used to produce elevation maps.

Dissolved oxygen (DO): The amount of oxygen in water, usually measured in milligrams/liter.

Downcutting: The action of a stream to deepen itself, often as a result from channelization.

Ecosystem: An ecological community together with its environment, functioning as a unit.

Erosion: Displacement of soil particles on the land surface due to water or wind action.

European settlement: A period in the early 1800's when European settlers moved across the United States in search of better lives. During this movement, much of the historical communities were altered for farming and other types of development.

Federal Emergency Management Agency (FEMA): Government agency within the Department of Homeland Security that responds to, plans for, recovers from, and mitigates against disasters/emergencies, both natural and man-made.

Fee in lieu: Defined by the Corps and EPA as a payment "to a natural resource management entity for implementation of either specific or general wetland or other aquatic resource development projects" for projects that "do not typically provide compensatory mitigation in advance of project impacts."

Flash hydrology/flooding: A quickly rising and falling overflow of water in stream channels that is usually the result of increased amounts of impervious surface in the watershed.

Flood problem area (FPA): One or more buildings, roads or other infrastructure in one location that are repeatedly damaged by flooding.

Floodplain (100-year): Land adjoining the channel of a river, stream, watercourse, lake or wetland that has been or may be inundated by floodwater during periods of high water that exceed normal bank-full elevations. The 100-year floodplain has a probability of 1% chance per year of being flooded.

Floodproofing: Any combination of structural and non-structural additions, changes or adjustments to structures or property which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and contents.

General Use Water Quality Standards (State): The Illinois Pollution Control Board (IPCB), a sister Agency to the Illinois EPA, develops water quality standards in Illinois. These standards serve to protect aquatic life, human health or wildlife, although wildlife based derived criteria have not yet been derived.

Geographic Information System (GIS): A computer-based approach to interpreting maps and images and applying them to problem-solving.

Glacial Drift: Earth and rocks which have been transported by moving ice or land ice.

Global Positioning System (GPS): Satellite mapping systems that enables locators and mapping to be created via satellite.

Grassland: An area such as a prairie or a meadow with grass or grass-like vegetation.

Green infrastructure: An interconnected network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas; greenways, parks and other conservation lands, farms, and forests of conservation value; and wilderness and other open spaces that support native species, maintain natural ecological processes, sustain air and water resources and contribute to the health and quality of life.

Groundwater recharge: Primary mechanism for aquifer replenishment which ensures future sources of groundwater for commercial and residential use.

Headwaters: Upper reaches of tributaries in a drainage basin.

Hydraulic and Hydrologic modeling: Engineering analysis that predicts expected flood flows and flood elevations based on land characteristics and rainfall events.

Hydric soil: Soil units that are wet frequently enough to periodically produce anaerobic conditions, thereby influencing the species composition or growth, or both, of plants on those soils.

Hydrologic Soil Groups (HSG): Soils are classified by the Natural Resource Conservation Service into four Hydrologic Soil Groups based on the soil's runoff potential. The four Hydrologic Soils Groups are A, B, C and D. A's generally have the smallest runoff potential and Ds the greatest.

Hydrology: The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Hydrophytic vegetation: Plant life growing in water, soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content; one of the indicators of a wetland.

Illinois Department of Natural Resources (IDNR): A government agency established to manage, protect and sustain Illinois' natural and cultural resources; provide resource-compatible recreational opportunities and to promote natural resource-related issues for the public's safety and education.

Illinois Department of Transportation: The Illinois Department of Transportation focuses primarily on the state's policies, goals and objectives for Illinois' transportation system and provides an overview of the department's direction for the future.

Illinois Environmental Protection Agency (Illinois EPA): Government agency established to safeguard environmental quality, consistent with the social and economic needs of the State, so as to protect health, welfare, property and the quality of life.

Illinois Natural Areas Inventory (INAI): A survey conducted by the Illinois Department of Natural Resources to catalogue high quality natural areas, threatened and endangered species and unique plant, animal and geologic communities for the purpose of maintaining biodiversity.

Illinois Nature Preserves: State-protected areas that are provided the highest level of legal protection, and have management plans in place.

Illinois Pollution Control Board (IPCB): An independent agency created in 1970 by the Environmental Protection Act. The Board is responsible for adopting Illinois' environmental regulations and deciding contested environmental cases.

Impervious Cover/Surface: An area covered with solid material or that is compacted to the point where water cannot infiltrate underlying soils (e.g. parking lots, roads, houses, patios, swimming pools, tennis courts, etc.). Stormwater runoff velocity and volume can increase in areas covered by impervious surfaces.

Impervious Cover Model: Simple urban stream classification model based on impervious cover and stream quality. The classification system contains three stream categories, based on the percentage of impervious cover that predicts the existing and future quality of streams based on the measurable change in impervious cover. The three categories include sensitive, impacted, and non-supporting.

Index of Biotic Integrity (IBI): The IBI is based on fish surveys with the rating dependent on the abundance and composition of the fish species in a stream. Fish communities are useful for assessing stream quality because fish represent the upper level of the aquatic food chain and therefore reflect conditions in the lower levels of the food chain. Fish population characteristics are dependent on the physical habitat, hydrologic and chemical conditions of the stream, and are considered good indicators of overall stream quality because they reflect stress from both

chemical pollution and habitat perturbations. For example, the presence of fish species that are intolerant of pollution are an indicator that water quality is good. The IBI is calculated on a scale of 12 to 60, the higher the score the better the stream quality.

Infiltration: That portion of rainfall or surface runoff that moves downward into the subsurface soil.

Invasive vegetation/plant: Plant species that are not native to an area and tend to out-compete native species and dominate an area (e.g. European buckthorn or garlic mustard).

Macroinvertebrates: Invertebrates that can be seen by the unaided eye (macro). Most benthic invertebrates in flowing water are aquatic insects or the aquatic stage of insects, such as stonefly nymphs, mayfly nymphs, caddisfly larvae, dragonfly nymphs and midge larvae. They also include such things as clams and worms. The presence of benthic macroinvertebrates that are intolerant of pollutants is a good indicator of good water quality.

Macroinvertebrate Biotic Index (MBI): Method used to rate water quality using macroinvertebrate taxa tolerance to organic pollution in streams. The method detects change in biological systems that result from the actions of human society. The MBI is very similar to the IBI except it is based on sampling macroinvertebrates (insects, worms etc.) that live in the stream rather than fish. The MBI scale is from 1 to 10, with 1 being the highest stream quality indicator and 10 being the worst. A MBI less than 5 on the 2004 revised scale indicates a good macroinvertebrate population. As with fish, the presence of pollution-intolerant macroinvertebrate species is an indicator of good water quality. Since macroinvertebrates are less mobile than fish, the MBI is a good index to evaluate upstream/downstream impacts of point source discharges.

Management Measure: non-structural practices such as site planning and design aimed to reduce stormwater runoff and avoid adverse development impacts - or structural practices that are designed to store or treat stormwater runoff to mitigate flood damage and reduce pollution. Some BMPs used in urban areas may include stormwater detention ponds, restored wetlands, vegetative filter strips, porous pavement, silt fences and biotechnical streambank stabilization.

Marsh: An area of soft, wet, low-lying land, characterized by grassy vegetation and often forming a transition zone between water and land.

Meander (stream): A sinuous channel form in flatter river grades formed by the erosion on one side of the channel (pools) and deposition on the other (point bars).

Mitigation: Measures taken to eliminate or minimize damage from development activities, such as construction in wetlands or Regulatory Floodplain filling, by replacement of the resource.

National Wetland Inventory (NWI): U.S. Fish and Wildlife Service study that provides information on the characteristics, extent, and status of U.S. wetlands and deepwater habitats and other wildlife habitats.

Native vegetation/plants: Plant species that have historically been found in an area.

Natural community: an assemblage of plants and animals interacting with one another in a particular ecosystem

Nonpoint source pollution (NPS or NPSP): Refers to pollutants that accumulate in waterbodies from a variety of sources including runoff from the land, impervious surfaces, the drainage system and deposition of air pollutants.

National Pollutant Discharge Elimination System (NPDES Phase II): Clean Water Act law requiring smaller communities and public entities that own and operate an MS4 to apply and obtain an NPDES permit for stormwater discharges. Permittees at a minimum must develop, implement, and enforce a stormwater program designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable. The stormwater management program must include these six minimum control measures:

1. Public education and outreach on stormwater impacts
2. Public involvement/participation
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction stormwater management in new development and redevelopment
6. Pollution prevention/good housekeeping for municipal operations

Nutrients: Substances needed for the growth of aquatic plants and animals such as phosphorous and nitrogen. The addition of too many nutrients (such as from sewage dumping and over fertilization) will cause problems in the aquatic ecosystem through excess algae growth and other nuisance vegetation.

Open Space: Any land that is not developed and is often set aside for conservation or recreation purposes. It can be either protected or unprotected. Protected open space differs from unprotected in that it is permanently preserved by outright ownership by a body chartered to permanently save land, or by a permanent deed restriction such as a conservation easement. Open space is important to a watershed's hydrology, habitat, water quality, and biodiversity.

Outwash: Sand and gravel deposits removed or washed out from a glacier.

Partially Open Parcel: Parcels that have been developed to some extent, but still offer some opportunities for open space and Best Management Practice (BMP) implementation. They typically include private residences with acreage exceeding the surrounding minimum zoning, partly developed industrial sites, or institutions (churches, schools, etc.) with extensive grounds.

Point source pollution: Refers to discharges from a single source such as an outfall pipe conveying wastewater from an industrial plant or wastewater treatment facility.

Pollutant load: The amount of any pollutant deposited into waterbodies from point source discharges, combined sewer overflows, and/or stormwater runoff.

Pool: A location in an active stream channel usually located on the outside bends of meanders, where the water is deepest and has reduced current velocities.

Prairie: A type of grassland characterized by low annual moisture and rich black soil characteristics.

Preventative measures: Actions that reduce the likelihood that new watershed problems such as flooding or pollution will arise, or that those existing problems will worsen. Preventative techniques generally target new development in the watershed and are geared toward protecting existing resources and preventing degradation.

Regulatory floodplain: Regulatory Floodplains may be either riverine or non-riverine depressional areas. Projecting the base flood elevation onto the best available topography delineates floodplain boundaries. A floodprone area is Regulatory Floodplain if it meets any of the following descriptions:

1. Any riverine area inundated by the base flood where there is at least 640 acres of tributary drainage area.
2. Any non-riverine area with a storage volume of 0.75 acre-foot or more when inundated by the base flood.
3. Any area indicated as a Special Flood Hazard Area on the FEMA Flood Insurance Rate Map expected to be inundated by the base flood located using best available topography.

Regulatory floodway: The channel, including on-stream lakes, and that portion of the Regulatory Floodplain adjacent to a stream or channel as designated by the Illinois Department of Natural Resources-Office of Water Resources, which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more that a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10% increase in velocities. Where interpretation is needed to determine the exact location of the Regulatory Floodway boundary, the IDNR-OWR should be contacted for the interpretation.

Remedial measures: Used to solve known watershed problems or to improve current watershed conditions. Remedial measures include retrofitting drainage system infrastructure such as detention basins and stormsewer outfalls to improve water quality, adjust release rates, or reduce erosion.

Remnant: a small fragmented portion of the former dominant vegetation or landscape which once covered the area before being cleared for human land use.

Retrofit: Refers to modification to improve problems with existing stormwater control structures such as detention basins and conveyance systems such as ditches and stormsewers. These structures were originally designed to improve drainage and reduce flood risk, but they can also be retrofitted to improve water quality.

Ridge: A line connecting the highest points along a landscape and separating drainage basins or small-scale drainage systems from one another.

Riffle: Shallow rapids, usually located at the crossover in a meander of the active channel.

Riparian: Referring to the riverside or riverine environment next to the stream channel, e.g., riparian, or streamside, vegetation.

Runoff: The portion of rain or snow that does not percolate into the ground and is discharged into streams by flowing over the ground instead.

Savanna: A type of woodland characterized by open spacing between its trees and by intervening grassland.

Section 319: see U.S. Environmental Protection Agency Section 319.

Sediment: Soil particles that have been transported from their natural location by wind or water action.

Sedimentation: The process that deposits soils, debris and other materials either on other ground surfaces or in bodies of water or watercourses.

Sensitive resource: Ecological features of the landscape that are determined to be critical due to their uniqueness, scarcity, function or value, and sensitivity to human impacts.

Stakeholders: Individuals, organizations, or enterprises that have an interest or a share in a project. (see also Watershed Stakeholders).

Stormwater management: A set of actions taken to control stormwater runoff with the objectives of providing controlled surface drainage, flood control and pollutant reduction in runoff.

Stormsewershed: An area of land whose stormwater drains into a common storm sewer system.

Stream corridor: The area of land that runs parallel to a stream.

Stream reach: A stream segment having fairly homogenous hydraulic, geomorphic and riparian cover and land use characteristics (such as all ditched agriculture or all natural and wooded). Reaches generally should not exceed 2,000 feet in length.

Streambank stabilization: Techniques used for stabilizing eroding streambanks.

Stream monitoring: Chemical, biological and physical monitoring used to identify the causes and sources of pollution in the river and to determine the needs for reduction in pollutant loads, streambank stabilization, debris removal and habitat improvement.

Substrate (stream): The composition of the bottom of a stream such as clay, silt or sand.

Subwatershed: Any drainage basin within a larger drainage basin or watershed.

Subwatershed Management Unit (SMU): Small unit of a watershed or subwatershed that is delineated and used in watershed planning efforts because the effects of impervious cover are easily measured, there is less chance for confounding pollutant sources, boundaries have fewer political jurisdictions, and monitoring/mapping assessments can be done in a relatively short amount of time.

Swale: A vegetated channel, ditch or low-lying or depressional tract of land that is periodically inundated by conveying stormwater from one point to another. Swales are often used in natural drainage systems instead of stormsewers.

Threatened and Endangered Species (T&E): An "endangered" species is one that is in danger of extinction throughout all or a significant portion of its range. A "threatened" species is one that is likely to become endangered in the foreseeable future.

Till: A heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders deposited directly by and underneath a glacier without stratification.

Terminal moraines: A ridge-like accumulation of till and other types of drift that was produced at the outer margin or farthest advance, of a retracting glacier.

Topography: The relative elevations of a landscape describing the configuration of its surface.

Total dissolved solids (TDS): A measure of the dissolved solids in water sample.

Total suspended solids (TSS): The organic and inorganic material suspended in the water column and greater than 0.45 micron in size.

Treatment Train: Several BMPs used together to improve water quality, infiltration and reduce sedimentation.

Turbidity: Refers to the clarity of the water, which is a function of how much material including sediment is suspended in the water.

United States Environmental Protection Agency Section 319 (Section 319): Section 319 of the Clean Water Act encourages and funds nonpoint source pollution control projects (any indirect pollution, like runoff, stormwater discharge, road salt, sediment, etc.) or NPS reduction at the source.

United States Geological Survey (USGS): Government agency established in 1879 with the responsibility to serve the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

United States Army Corps of Engineers (USACE): Federal group of civilian and military engineers and scientists that provide services to the nation including planning, designing, building and operating water resources and other Civil Works projects. These also include navigation, flood control, environmental protection, and disaster response.

USDA TR55 Document: A single event rainfall-runoff hydrologic model designed for small watersheds and developed by the USDA, NRCS, and EPA.

Urban runoff: Water from rain or snow events that runs over surfaces such as streets, lawns, parking lots and directly into storm sewers before entering the river rather than infiltrating the land upon which it falls.

Vegetated buffer: An area of vegetated land to be left open adjacent to drainageways, wetlands, lakes, ponds or other such surface waters for the purpose of eliminating or minimizing adverse impacts to such areas from adjacent land areas.

Vegetated swale: An open channel drainageway used along residential streets and highways to convey stormwater and filter pollutants in lieu of conventional storm sewers.

Watershed: An area confined by topographic divides that drains to a given stream or river. The land area above a given point on a waterbody (river, stream, lake, wetland) that contributes runoff to that point is considered the watershed.

Watershed stakeholder: A person who has a personal, professional, legal or economic interest in the watershed and the outcome of the watershed planning process.

Watershed partner(s): Watershed stakeholders who take an active role in the watershed management planning process and implementing the watershed plan.

Waters of the United States (WOUS): For the purpose of this Ordinance the term Waters of the United States refers to those water bodies and wetland areas that are under the U. S. Army Corps of Engineers jurisdiction.

Watershed Vulnerability Analysis: Rapid planning tool for application to watersheds and subwatersheds that estimates future and impervious cover and provides guidance on factors that might alter the initial classification or diagnosis of a watershed or subwatershed.

Wetland: A wetland is considered a subset of the definition of the Waters of the United States. Wetlands are land that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation adapted for life in saturated soil conditions (known as hydrophytic vegetation). A wetland is identified based upon the three attributes: 1) hydrology, 2) hydric soils and 3) hydrophytic vegetation.

2.0 GOALS AND OBJECTIVES

2.1 Spring Creek Watershed partnership Mission

The Spring Creek Watershed partnership (SCW) is comprised of watershed stakeholders dedicated to the preservation, protection, and improvement of the Spring Creek watershed.

The SCW's mission is to realize a long-term vision for a healthy watershed and engaged citizenry. The partnership's primary goal is to educate while building partnerships for projects to improve water quality, maintain water supply, preserve ecosystems and restore wetlands, prairies, and other natural features for current and future generations.

2.2 Watershed Goals and Objectives

Six goals were established for the Spring Creek watershed to address the issues and opportunities raised by the SCW stakeholders. Objectives assigned to each goal are intended to be measurable where appropriate so that the SCW can assess future progress made toward each goal. Note: goals and objectives are not listed by order of importance.

- **Goal A:** Protect, enhance, and monitor surface water quality and groundwater resources to meet Illinois EPA water quality standards that fully support designated uses.

  Surface Water Objectives:
  1) Identify, implement, and monitor management measures (Best Management Practices (BMPs)) that address "Critical" and other high priority nonpoint source pollutant loading areas.
  2) Retrofit existing stormwater management systems and design new systems within developed areas to specifically improve water quality and create wildlife habitat.
  3) Use alternative to road salt.
  4) Pursue significant phosphorus use reduction in the watershed.
  5) Identify opportunities for drain tile modification to improve water quality.
  6) Use manure composting and support education on manure management to reduce potential nutrient runoff.
  7) Identify and replace failing septic systems.
  8) Illinois EPA/IDNR begin monitoring Spring Creek as part of Intensive River Basin Survey program, monitor major lakes via the Illinois Volunteer Lake Monitoring Program, and continue RiverWatch and Friends of Fox River programs.

  Ground Water Objectives:
  9) Protect open space and monitor shallow aquifer water quality and supply in important recharge areas.

- **Goal B:** Identify and protect important natural areas/open space and provide appropriate passive recreational benefits.

  Objectives:
  1) Permanently protect all sites with high quality natural areas or threatened and endangered species through private or public land protection tools.
  2) Identify buffer parcels for potential acquisition, conservation easements, and restoration adjacent to existing forest and nature preserves and other sites with high quality natural areas and/or threatened and endangered species.
  3) Identify and protect open space that provides important green infrastructure corridor connections and provide passive recreation opportunities.
  4) Adopt conservation and/or low density design standards for all new development or redevelopment.

- **Goal C:** Reduce existing structural flood damage and ameliorate potential flooding where flooding threatens structures and infrastructure.

  Objectives:
  1) Inventory undeveloped non-protected floodplain and protect as open space.
  2) Reconnect channelized stream reaches to historic floodplain where feasible.
  3) Implement multi-objective stormwater management measures (BMPs) within important open space and new developments that help reduce runoff and flashy stream flows through infiltration of rainwater.
  4) Manage and maintain existing constructed storm water management systems.
  5) Manage and maintain existing natural depressional storage, wetlands, streams, and riparian areas.
  6) Inventory existing and potential structural flood damage areas and mitigate as needed.

- **Goal D:** Improve aquatic and terrestrial habitat to encourage balanced ecosystems.

  Objectives:
  1) Improve habitat in channelized stream reaches using natural design approaches.
  2) Restore native riparian buffers along stream reaches identified as having poor buffer quality.
  3) Improve habitat in degraded upland (terrestrial) communities by removing non-native plants, replacing with native plant species, and reintroducing fire via controlled burns.
  4) Encourage development and implementation of management plans for natural areas.
  5) Encourage native plantings in stakeholder landscapes.
  6) Require future developers to protect sensitive natural areas both during and after construction, restore degraded natural areas, then donate natural areas and naturalized stormwater management systems to a public agency or conservation organization for long term management with dedicated funding.
  7) Disable drain tiles where appropriate to restore historic natural hydrological processes.
  8) Reduce streambed sedimentation resulting from known problem areas.

- **Goal E:** Increase communication and coordination among municipal decision-makers and other stakeholders within the watershed.

  Objectives:
  1) Encourage governing bodies to adopt the Spring Creek Watershed-Based Plan.
  2) Encourage municipalities, counties, land use authorities, and stakeholders to participate in Spring Creek Watershed partnership.
  3) Encourage amendments of municipal comprehensive plans, codes and ordinances to include watershed plan goals and objectives.
  4) Encourage local policy makers to utilize the plan as guidance for new or amended policies.
  5) Encourage municipal policy that protects groundwater supply and quality.
  6) Encourage and support stakeholder efforts to implement recommended actions within the watershed plan.

- **Goal F:** Foster appreciation and stewardship of the watershed through education.

  Objectives:
  1) Educate the public on water supply, infiltration, potential contamination, groundwater recharge and nonpoint source pollution issues and the link between how property owners manage the land.
  2) Provide watershed stakeholders with an education plan that promotes the knowledge, skills, and motivation needed to take action on implementing the watershed plan.
  3) Educate the public on the benefits of native plants, a balanced ecosystem, and natural area restoration.
  4) Identify open space parcels adjacent to public facilities such as schools that would be appropriate for outdoor education.
  5) Install environmental interpretation/education signage at access points throughout public open space.
  6) Develop recommendations for education and alternatives to phosphorus use.
  7) Develop recommendations for education and alternatives to road & other pavement salt use.
  8) Educate homeowners how to best maintain septic systems.
  9) Educate equestrian community about "Best Equestrian Practices".

3.0 WATERSHED CHARACTERISTICS, PROBLEMS, AND OPPORTUNITIES

3.1 Geology & Climate

Geology

The terrain of the Midwestern United States was created over thousands of years as glaciers advanced and retreated during the Pleistocene Era or "Ice Age". Some of these glaciers were a mile or more thick. The Illinoian glacier extended to southern Illinois between 300,000 and 125,000 years ago. It is largely responsible for the flat, farm-rich areas in the central portion of the state that were historically prairie. Only the northeastern part of Illinois was covered by the most recent glacial event known as the Wisconsin Episode that began approximately 70,000 years ago and ended around 14,000 years ago (Figure 3). During this period the earth's temperature warmed and the ice slowly retreated leaving behind moraines and glacial ridges where it stood for long periods of time (Hansel 2005). A tundra-like environment covered by spruce forest was the first ecological community to colonize after glaciers retreated. As temperatures continued to rise, tundra was replaced by cool moist deciduous forests and eventually by oak-hickory forests, oak savannas, marshes, fens, seeps, and prairies.

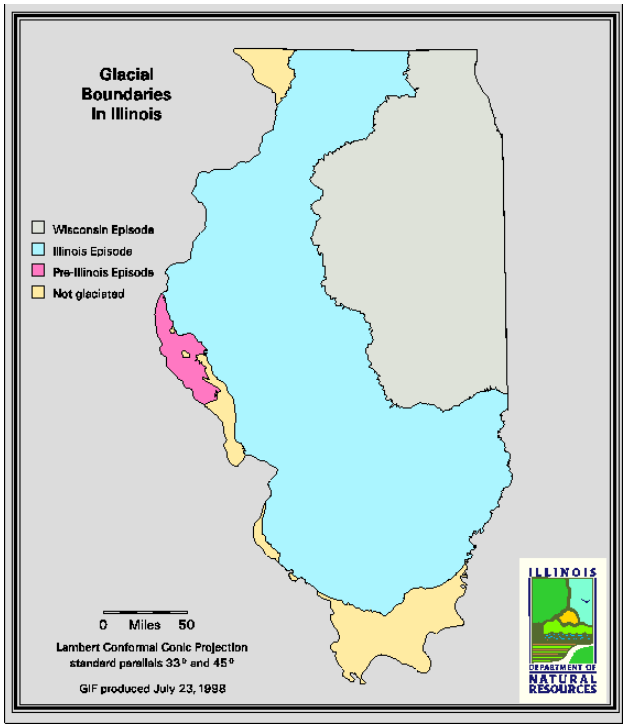


Figure 3. Glacial Episodes in Illinois.

The nearby Fox River was formed at the end of the Wisconsin glaciation as a stream at the edge of the Valparaiso Moraine system and an older moraine to the west. Spring Creek watershed is part of this Valparaiso Moraine system, which created the picturesque rolling hills and valleys found there today (Hansel 2005). The composition of the soil in the Spring Creek watershed is also a remnant of the ancient ice movement. Above the bedrock lies a layer of deposits left behind from the glaciers, consisting of clay, silt, sand, and limestone cobble.

Climate

The northern Illinois climate can be described as temperate with cold winters and warm summers where great variation in temperature, precipitation, and wind can occur on a daily basis. Lake Michigan does influence the study area to some degree but not as much as areas immediately adjacent, south, and east of the lake where it reduces the heat of summer and buffers (warms) the cold of winter. Surges of polar air move southward or tropical air move northward causing daily and seasonal temperature fluctuations. The action between these two air masses fosters the development of low-pressure centers that generally move eastward and frequently pass over Illinois, resulting in abundant rainfall. Prevailing winds are generally from the west, but are more persistent and blow from a northerly direction during winter.

The National Climatic Data Center (NCDC) provides an excellent summary of climate statistics including normals and extremes for sites in Illinois that were selected based on length of record and completeness of data. The NCDC has compiled average temperature and precipitation data from the past 30 years and daily extremes since 1923. Data collected in nearby Barrington, Illinois best represents the climate and weather patterns experienced in the Spring Creek watershed.
The winter months are cold, averaging 22° F, winter lows average 14° F. The coldest temperature on record is -16° F recorded on January 11, 1979. Summers are warm, averaging 70° F, summer highs average 80° F. The highest recorded temperature, 103° F occurred in July 2000.

Fairly typical for the Midwest, the current climate of the Spring Creek watershed consists of an average rainfall of 36 inches and average snowfall of 33 inches. According to data collected in Barrington, the most precipitation received in one month is 13.20 inches. This occurred in August 2007, breaking the previous record of 9.63 inches which occurred in September of 1986. The least amount of precipitation received in one month (0.0 inches) occurred in February of 1990. The one-day maximum precipitation (4.17 inches) occurred on September 23, 1986.

3.2 Pre-European Settlement Ecological Communities & Changes

An ecological community is made up of all living things in a particular ecosystem and is usually named by its dominant vegetation type. The original public land surveyors that worked for the office of U.S. Surveyor General in the early and mid 1800's mapped and described natural and man-made features and vegetation while creating the "rectangular survey system" for mapping and sale of western public lands of the United States (Daly & Lutes et. al., 2011) We know by interpreting survey notes and hand drawn Federal Township Plats of Illinois (1804-1891) that a complex interaction existed between several ecological communities including prairies, savannas, and wetlands prior to European settlement in the 1830's. The surveyors described the northern portion of the Spring Creek watershed as "Timber" dominated by oaks while the southern portion of the watershed was described mostly as "Prairie" with smaller islands of timber (Figure 5).

Pre-European settlement prairie-savanna landscape

This mixture of "Prairie" and "Timber" as an ecological community was widely described in the mid 1800's as the surveyors and early settlers moved west out of the heavily forested eastern portion of the United States and encountered a much more open environment that ecologists now refer to as "Savanna". In the Midwest the term savanna is generally used to describe an ecosystem that was

Pre-European settlement savanna community

historically part of a larger complex bordered by prairies of the west and deciduous forests of the east. Oak dominated savannas were the communities in the middle of this prairie-forest continuum and were maintained by frequent natural fires, fires ignited by Native Americans, and grazing by bison and elk. These processes renewed the prairie, savanna, and wetland communities. Fires ultimately removed dead plant material, exposing the soils to early spring sun, and returning nutrients to the soil. Scattered among the savanna were meandering stream corridors and low wet depressions consisting of fen wetlands, wet prairie, sedge meadow, and marsh.

During pre-European settlement times most of the water that fell as precipitation was absorbed in upland prairie and savanna communities and within the extensive wetlands that existed along stream corridors. Infiltration and absorption of water was so great that many of the defined stream channels seen today were likely sedge and grass-dominated swales exhibiting excellent water quality.

European settlement resulted in drastic changes to the fragile ecological communities. Fires rarely occurred and large tracts of savanna were cleared, prairies were tilled for farmland or developed, wetlands were drained, and many streams were channelized. Today, remnants of once healthy ecological communities exist in the Spring Creek watershed but most are degraded. Most areas that were once healthy oak savanna in the northern portion of the watershed have shifted to either degraded oak woodland communities invaded by honeysuckle, buckthorn, and low quality native species (Figure 4) or retain an oak canopy component but have been cleared in the understory and planted to manicured turf grass in residential areas. In both cases oak regeneration is nearly non-existent.

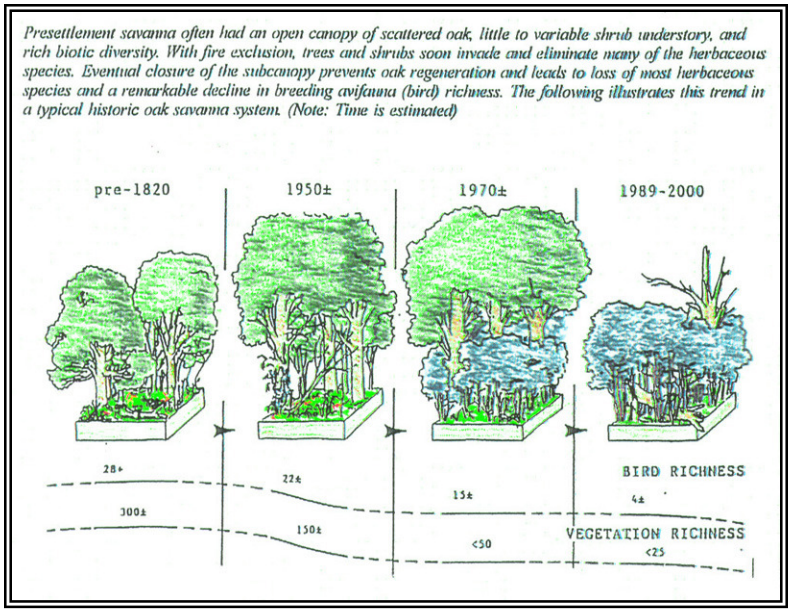


Figure 4. Change in savanna over time.

The earliest aerial photographs of this area were taken in 1939 (Figure 6) and depict the Spring Creek watershed when early farming was the primary land use but before residential and commercial

development seen today. The 1939 aerial provides a snapshot of conditions that more closely resemble the pre-European settlement prairie and savanna landscape. As seen in the photo much of the "Timber" described in the northern half of the watershed during the original land survey was logged to create farmland. However, small remnants remained along ridge lines adjacent to the Spring Creek and several of its tributaries. Upon close examination, the open character of the remaining savanna is still recognizable in 1939. The southern half of the watershed where prairie once existed appears to be comprised almost entirely of farmland.

Degraded overgrown savanna/second growth woodland

Figure 7 shows a 2010 aerial image of the Spring Creek Watershed. The most obvious changes can be seen along the perimeter of the entire watershed where residential, commercial, and retail development is common. The central and south-central portions of the watershed are now Cook County Forest Preserves and surrounding areas that were mostly farmed prior to the 1950's are now mostly large lot residential within Barrington Hills, where equestrian and other agrarian uses are practices including organic farming, native landscaping and animal husbandry. Also of interest are the now overgrown savanna areas and expanding degraded second growth woodlands throughout the watershed. The Village of Barrington Hills has compiled a historical aerial inventory of Spring Creek Valley Forest Preserve and other areas within the Village from 1939 to 2005 that clearly show the change from savanna to degraded/second growth woodland. It also shows the change from farming to residential and other land uses throughout the watershed. The images can be views at the following: http://www.youtube.com/user/vbh1957#p/a/u/2/KQuiAXVkiR8.

With degraded ecological conditions comes the opportunity to implement ecological restoration to improve the condition of the Spring Creek Watershed. Present day knowledge of how pre-European settlement ecological communities formed and evolved provides a general template for developing present day natural area restoration and management plans. One of the primary goals of this watershed plan is to identify, protect, restore, and manage natural areas. With this in mind, it is important to note that the processes that shaped the historic landscape, such as intense fire and bison grazing have largely been removed or greatly altered and the condition of most ecological communities has been degraded in some way by human activities. In most cases, pristine conditions that once existed can no longer be completely restored. Thus, we are left to manage remnants and to restore and manage degraded ecosystems back to a sustainable state.

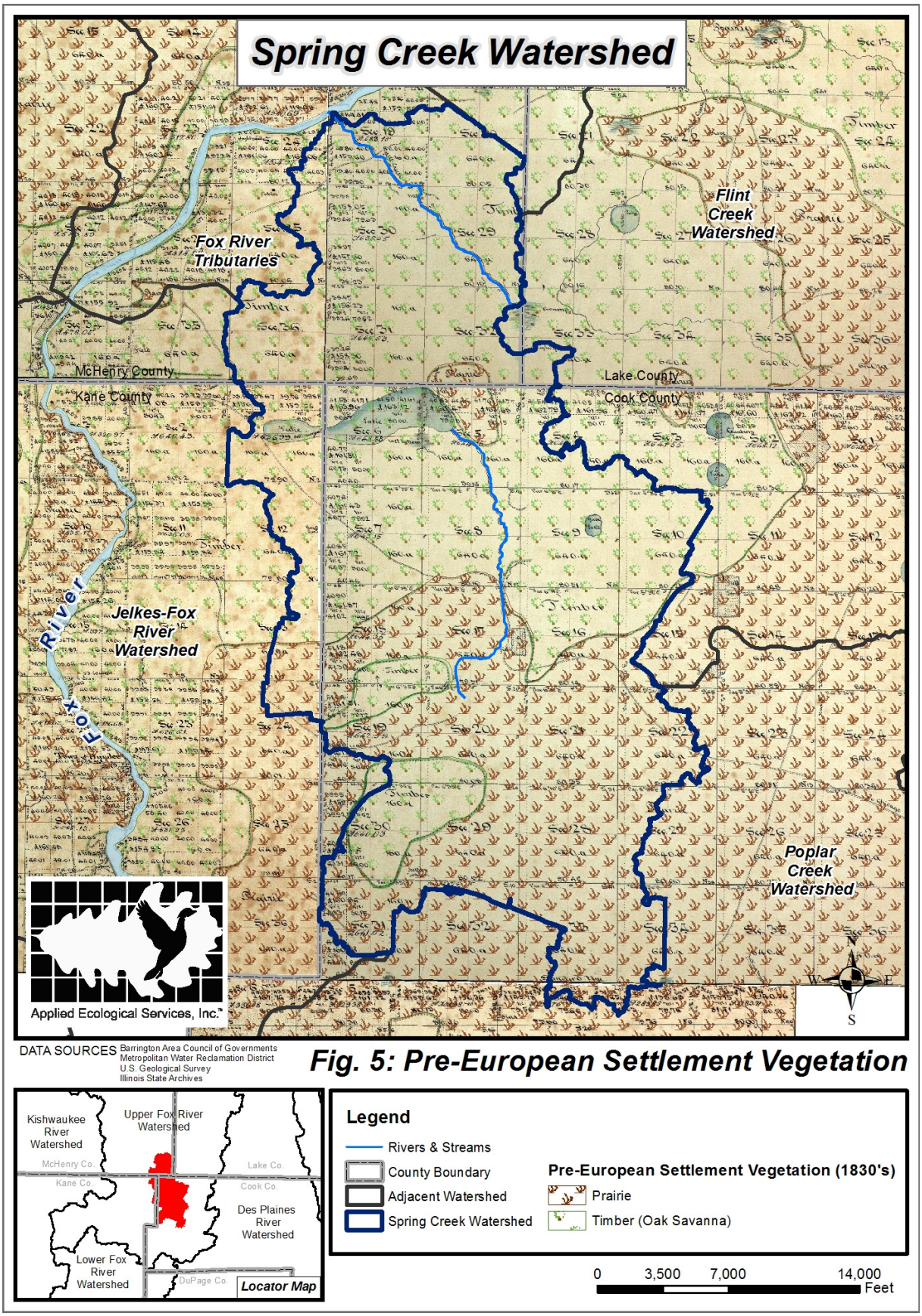


Fig. 5: Pre-European Settlement Vegetation

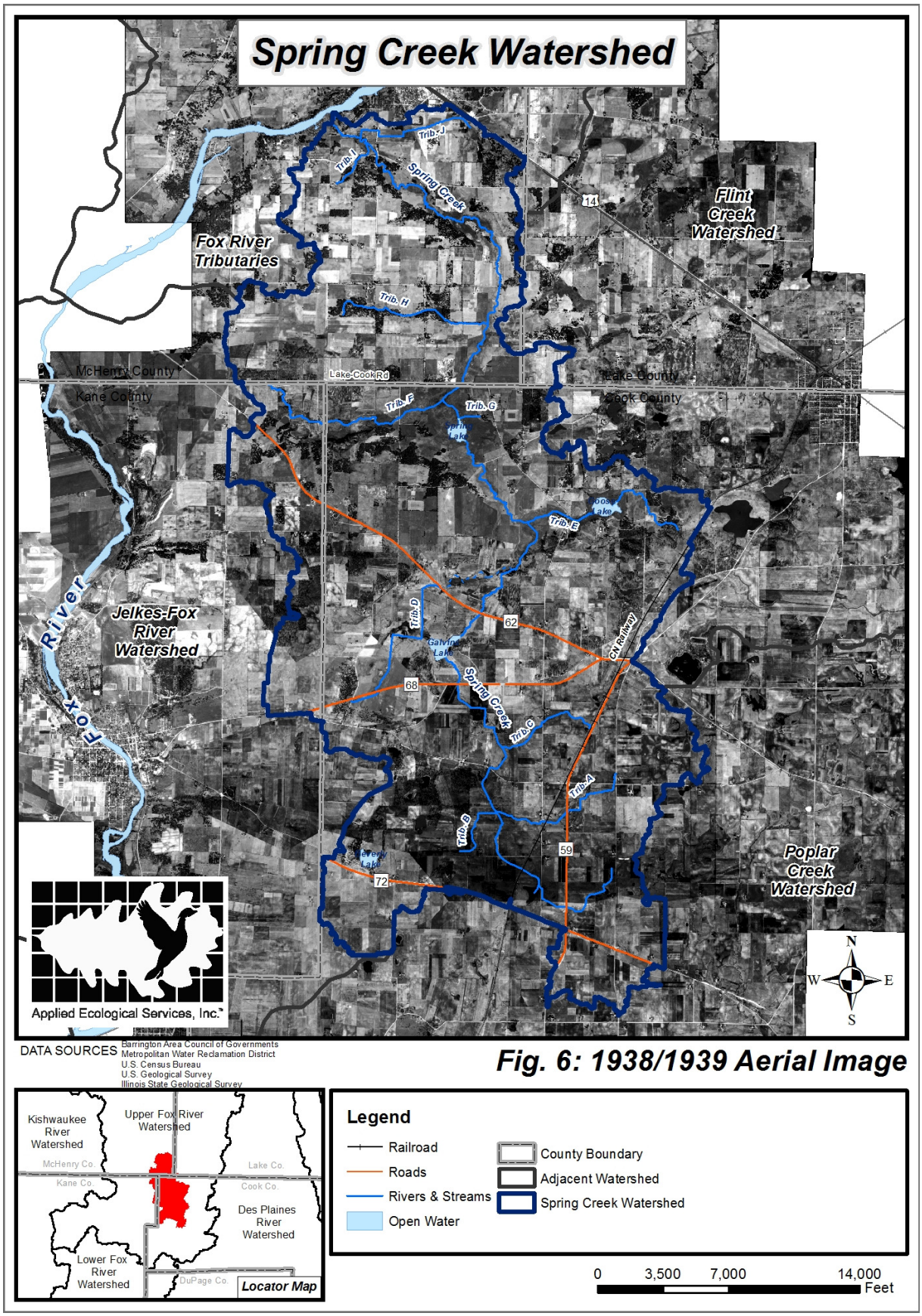


Fig. 6: 1938/1939 Aerial Image

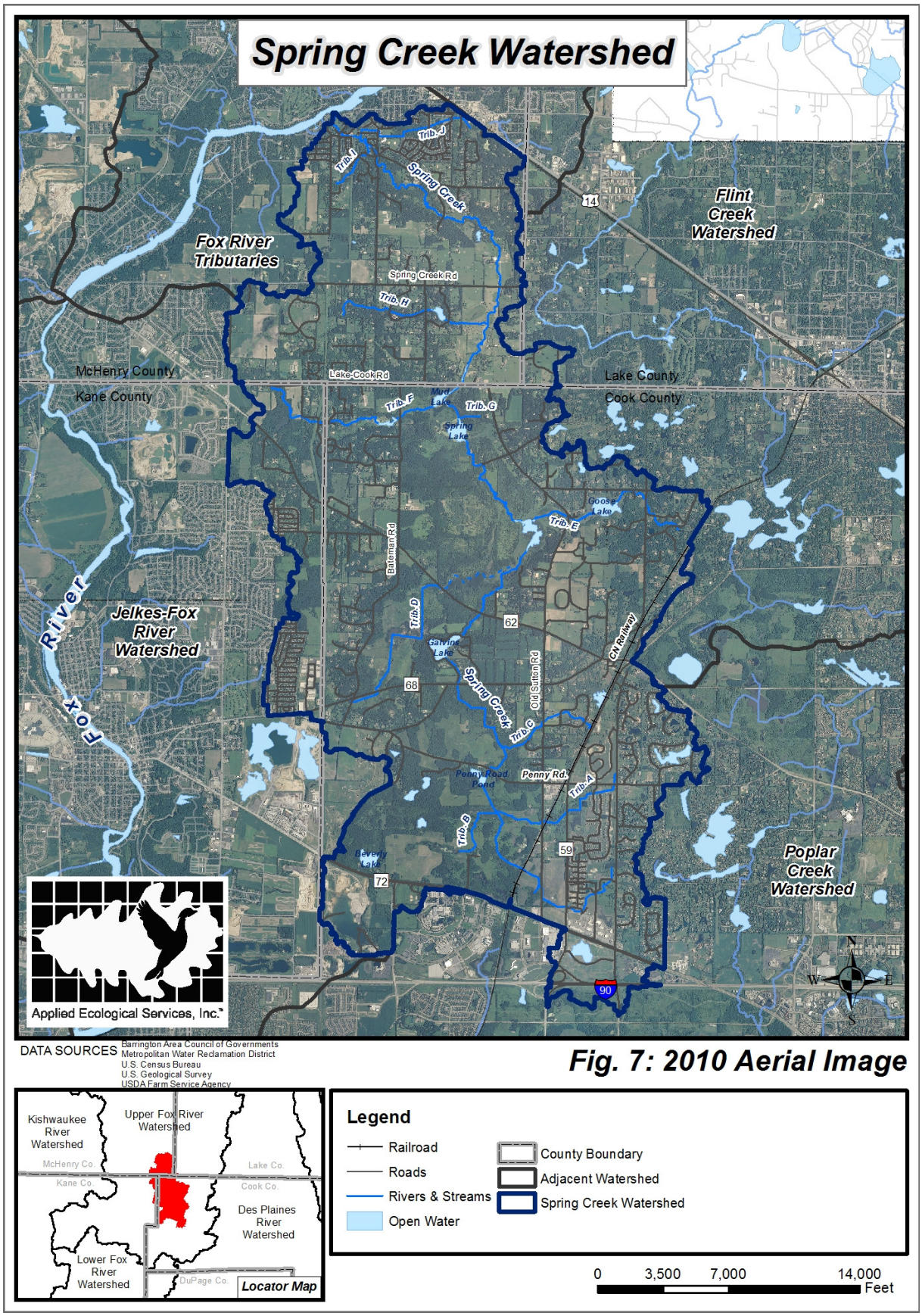


Fig. 7: 2010 Aerial Image

3.3 Topography, Watershed Boundary, & Subwatershed Management Units

Topography & Watershed Boundary

The Wisconsin glacier that retreated 14,000 years ago formed the topography and generally defined the Spring Creek watershed boundary. Topography refers to elevations of a landscape that describe the configuration of its surface and ultimately defines watershed boundaries. And, the specifics of watershed planning can not begin until a watershed boundary is clearly defined.

The Spring Creek watershed boundary was spliced together using a variety of the most up-to-date and accurate data and methods available. First, Metropolitan Water Reclamation District of Greater Chicago's (MWRD) data for the Cook County portion of the Spring Creek watershed boundary that was created as a result of the "Detailed Watershed Plan for Poplar Creek Watershed" (MWRD 2010) was used. The Kane County portion of the watershed was obtained from Gewalt Hamilton & Associates, Inc. who used various USGS control points as refinements. The remainder of the watershed boundary in McHenry and Lake Counties was derived from available 2-foot topography data. Finally, the Village of Carpentersville provided stormsewer information that slightly altered the watershed boundary within a development on the west side of the watershed. The refined watershed boundary was then input into a GIS model (Arc Hydro) that generated a Digital Elevation Model (DEM) of the watershed (Figure 8).

The Spring Creek watershed drains from south to north and eventually to the Fox River within the municipality of Fox River Grove. The highest point in the watershed (948 feet above sea level) is not in the southern tip of the watershed as one might expect but rather along the top of a ridge on the west side of the watershed. As expected, the lowest point (731 feet above sea level) is where Spring Creek enters the Fox River. The difference in the highest and lowest points reflects a 217 foot change in elevation. As seen on the DEM (Figure 8) the southern third of the watershed is relatively flat while the northern two-thirds contains a variety of ridge lines along the clearly defined Spring Creek valley.

Spring Creek Valley near Old Sutton/Donlea Roads

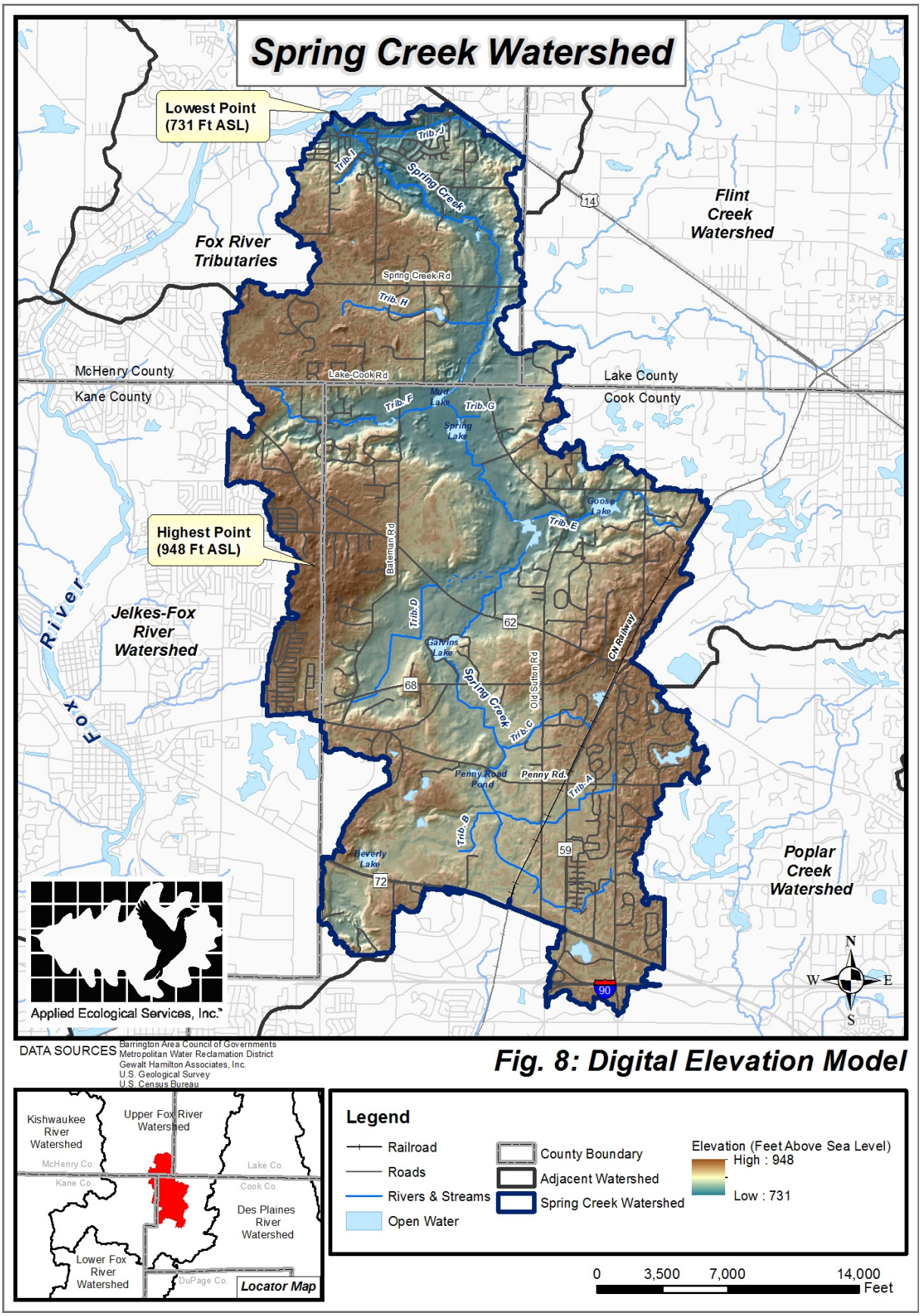


Fig. 8: Digital Elevation Model

Subwatershed Management Units (SMUs)

The Center for Watershed Protection (CWP) is a leading watershed planning agency and has defined appropriate watershed and subwatershed sizes to meet watershed management goals. In 1998, the CWP released the "Rapid Watershed Planning Handbook" (CWP 1998) as a guide to be used by watershed planners when addressing issues within urbanizing watersheds. The CWP defines a watershed as an area of land that drains anywhere from 10 to 100 square miles. The Spring Creek watershed drains 26.9 square miles. Broad assessments of conditions such as soils, wetlands, and water quality are often evaluated at the watershed level and provide some information about the overall condition. However, a more detailed look at smaller drainage areas must be completed to find specific problem areas or "Critical Areas".

To address issues at a smaller scale, a watershed can be divided into smaller subwatersheds called Subwatershed Management Units (SMUs). The Spring Creek watershed contains 17 SMUs as delineated using the Digital Elevation Model (DEM). This size allows for detailed analysis and better recommendations for site specific Best Management Practices (BMPs). Table 2 presents each SMU and acreage within the watershed. Figure 9 depicts the location of each SMU boundary delineated within the larger Spring Creek watershed.

Table 2. Subwatershed Management Units and acreage.

SMU #	Total Acres	Total Square Miles
SMU 1	1,357	2.1
SMU 2	1,189	1.8
SMU 3	1,113.8	1.7
SMU 4	305.9	0.5
SMU 5	746.3	1.2
SMU 6	1,436.8	2.2
SMU 7	2,093.2	3.3
SMU 8	951.9	1.5
SMU 9	941.3	1.5
SMU 10	1,301.1	2.0
SMU 11	2,203.2	3.4
SMU 12	608.7	0.9
SMU 13	874.9	1.4
SMU 14	1,184.2	1.8
SMU 15	260.7	0.4
SMU 16	416.4	0.6
SMU 17	254	0.4
Totals	**17,239**	**26.9**

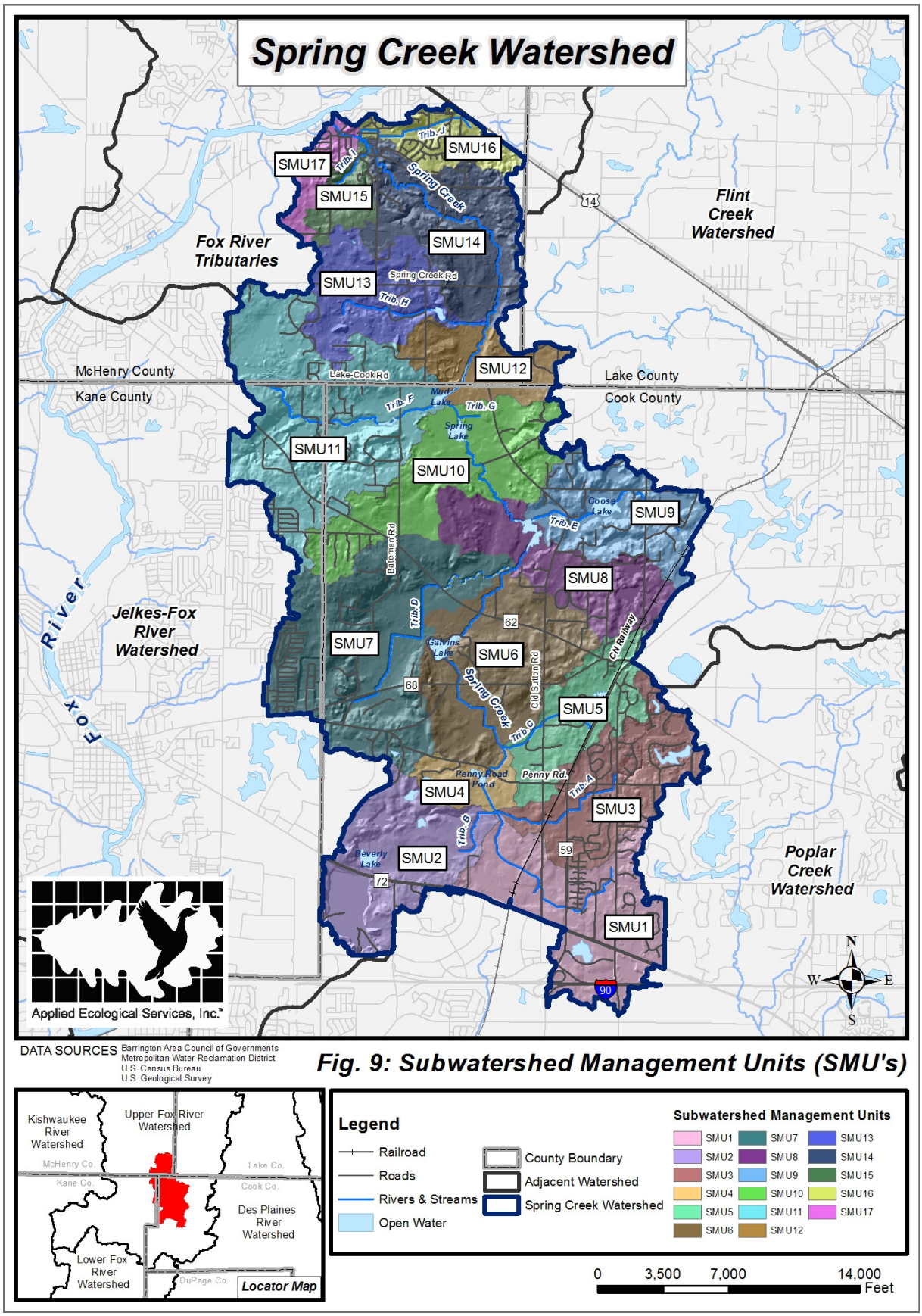


Fig. 9: Subwatershed Management Units (SMU's)

3.4 Hydric Soils, Soil Erodibility, & Hydrologic Soil Groups

Deposits left by the Wisconsin glaciation 14,000 years ago are the raw materials of present soil types. These raw materials include till (debris) and outwash. A combination of physical, biological, and chemical variables such as topography, drainage patterns, climate, and vegetation, have interacted over centuries to form the complex variety of soils found in the watershed. Most soils formed with wetland, savanna, forest, and prairie vegetation. The most up to date Natural Resources Conservation Services' (NRCS) soils information for McHenry, Lake, Kane, and Cook Counties was used to map the soil types including the extent of hydric soils, soil susceptibility to erosion, and infiltration capacity of soils in the Spring Creek watershed.

Soil properties are a key component to consider when designing and implementing Best Management Practices (BMPs). Some soils that are saturated for extended periods throughout the year become what are called "Hydric Soils" because they generally hold water or infiltrate water very slowly. These soils provide the key to wetland restoration potential. Often, drain tiles are found in areas that exhibit hydric soil but because the water is diverted, wetlands that were once present no longer exist. This is the case with many of the wetlands that once existed within Spring Creek Valley Forest Preserve. By breaking these tiles, wetland hydrology can generally be restored and a wetland created. A wetland inventory and discussion of wetland restoration sites is included in Section 3.12.

Soils also exhibit differences in erodibility depending on their composition and slope. Erodibility of soils is especially important on construction sites where improper installation or maintenance of erosion control devices can lead to sediment creating turbid water within the stream.

Soils also exhibit different infiltration capabilities and have been classified to fit what are known as "Hydrologic Soil Groups". Knowing how a soil will hold water ultimately affects the type and location of infiltration BMPs such as wetland restorations and detention basins. More importantly however is the link between hydrologic soil groups and groundwater recharge areas. Groundwater Recharge is discussed in detail in Section 3.13.

Hydric Soils

Hydric soils are important because they indicate the presence of existing wetlands or drained wetlands where restoration may be possible. Wetland restoration opportunities in the watershed are discussed in detail in Section 3.12. Historically, wetland soils formed over poorly drained clay material associated with wet prairies, marshes, and other wetlands and accumulated organic matter from decomposing surface vegetation. Table 3 and Figure 10 list acreages and map the location of hydric and non-hydric soils in the watershed respectively. Hydric soils comprise 4,007 acres or 23% of the watershed. 12,648 acres or 73% of the watershed is comprised of upland soils. The remaining 584 acres (4%) of the watershed is not classified (water & urban land (Beverly gravel quarry)).

Table 3. Percent coverage of hydric soils and non-hydric soils within the watershed.

Soil	Total Area (acres)	Percentage of Watershed
Hydric Soil	4,007	23%
Non-Hydric Soil	12,648	73%
Not Classified (Water & Urban Land)	584	4%
Totals	**17,239**	**100%**

Soil Erodibility

Soil erosion is the process whereby soil is removed from its original location by flowing water, wave action, wind, and other factors. Sedimentation is the process that deposits eroded soils on other ground surfaces or in bodies of water such as streams and lakes. Soil erosion and sedimentation reduces water quality by increasing total suspended solids (TSS) in the water column and by carrying attached pollutants such as phosphorus, nitrogen, and hydrocarbons. When soils settle in streams and lakes they change the course and floodplain of the stream and often blanket rock, cobble, and sandy substrates needed by fish and macroinvertebrates for habitat, food, and reproduction.

A highly erodible soils map was created by selecting soils with particular attributes such as soil type and the percent slope on which a soil is located. It is important to map highly erodible soils because they represent areas that have the highest potential to degrade water quality during farm tillage and development. Based on the mapping, 5,010 acres (29%) of the watershed exhibits highly erodible soils (Figure 11). Fortunately, most of these soils are located along ridges in the northern two-thirds of the watershed in areas that are currently within forest preserve land or large lot residential where little large scale earth moving is expected. It is also important to note that several of the currently farmed areas and equestrian sites contain highly erodible soils that are susceptible to erosion in early spring and late fall. Therefore, soil erosion and sediment control practices should be emphasized on remaining agricultural lands and equestrian areas. One option for farmers is to convert highly erodible areas to vegetative cover under the USDA NRCS's Conservation Reserve Program (CRP). Under this program farmers receive an annual rental payment for the term of the multi-year contract.

It is also important to address highly erodible soils in relation to trails within preserves, overgrazed woodlands, and areas covered by invasive buckthorn and/or honeysuckle.

Noteworthy- NPDES and County Ordinances

National Pollution Discharge Elimination System (NPDES) Phase II Stormwater Regulations were implemented by the Illinois EPA in 2003 to address potential erosion on all construction sites in the state that disturb greater than one acre. The regulations specifically require developers to issue a Notice of Intent (NOI) to begin construction, create a Stormwater Pollution Prevention Plan (SWPPP) to control erosion during construction, and submit a Notice of Termination (NOT) when the site is stabilized. NPDES regulations require that a Designated Erosion Control Inspector conduct site visits on a weekly basis and after every 0.5-inch or greater rain event to monitor the construction site and work with the developer to implement erosion control practices.

All of the counties comprising the watershed (Lake, McHenry, Kane, & Cook) have taken additional steps to control erosion on construction sites. All counties have adopted stormwater management ordinances that address erosion and sedimentation as part of the overall stormwater management plan for a site.

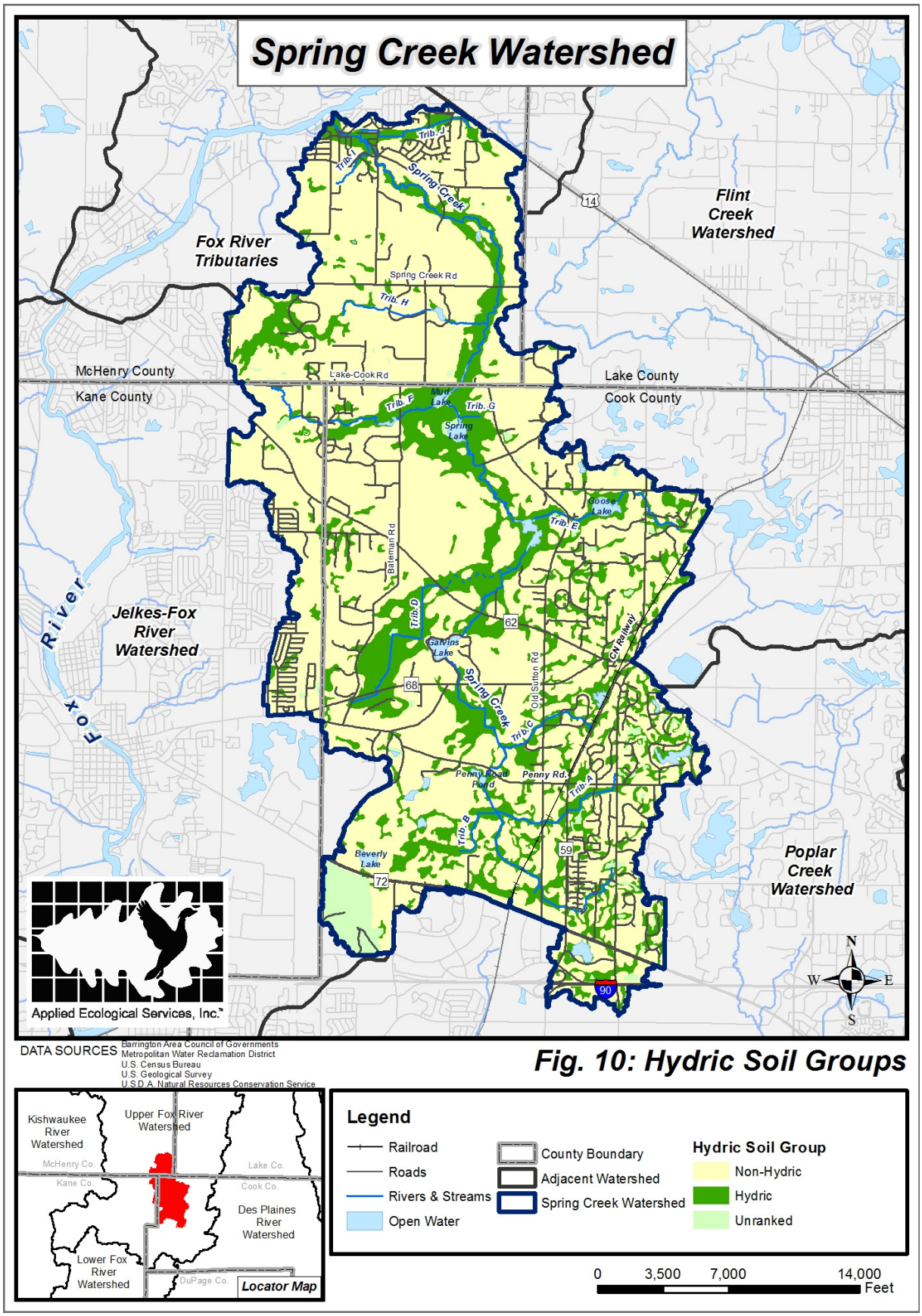


Fig. 10: Hydric Soil Groups

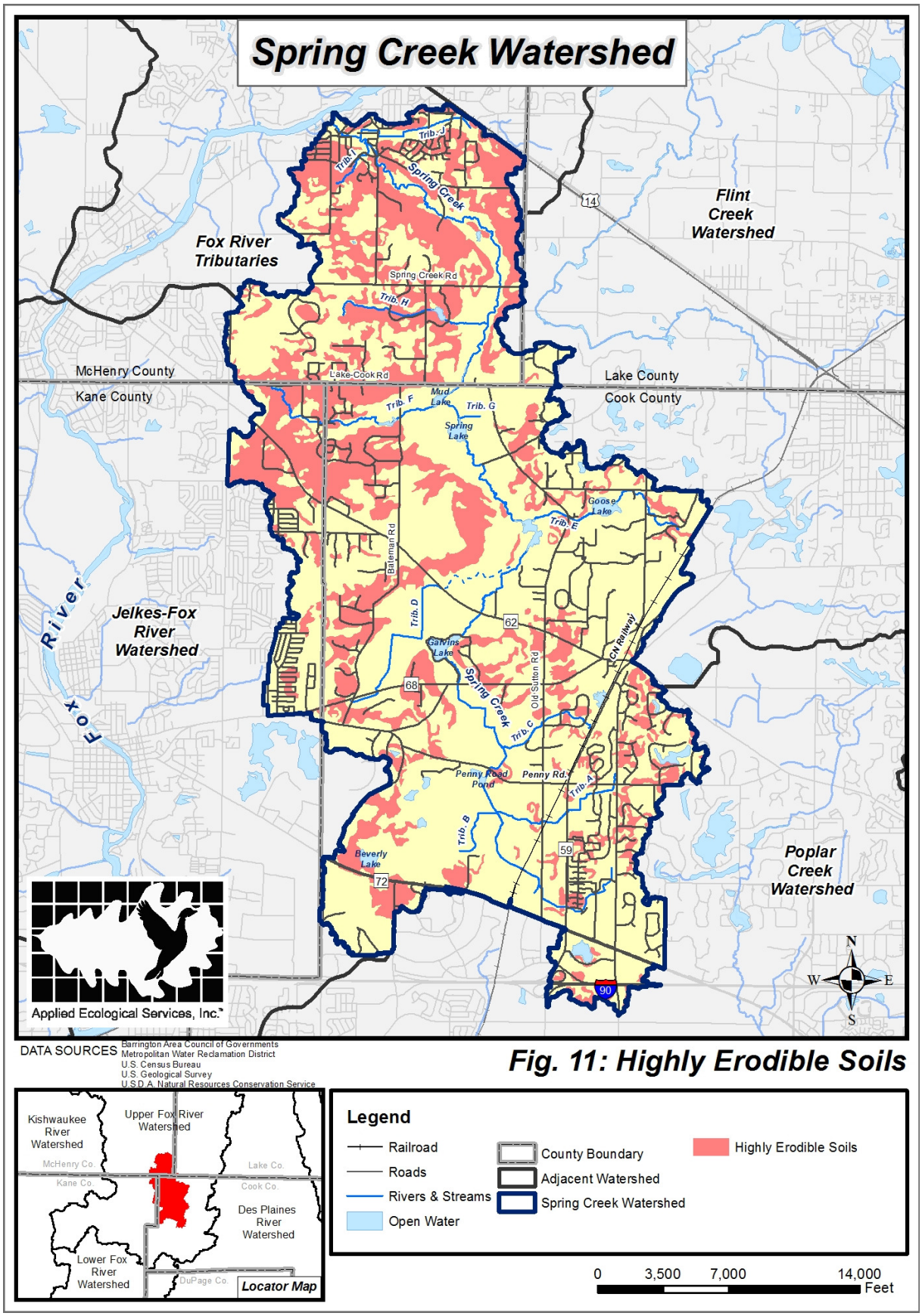


Fig. 11: Highly Erodible Soils

Hydrologic Soil Groups

Hydrologic Soil Groups (HSGs) are based on a soil's infiltration and transmission (permeability) rates and are used primarily by engineers to estimate runoff potential related to how development sites should be designed and constructed to control stormwater runoff. HSG's are classified into four primary categories; A, B, C, and D, and three dual classes, A/D, B/D, and C/D. The characteristics of these groups are included in Table 4. Note: dual hydrologic groups *(A/D, B/D, or C/D)* are classified differently. The first letter is for artificially drained areas and the second is for undrained areas. Only soils that are rated D in their natural condition are assigned to dual classes.

Table 4. Hydrologic Soil Groups and their corresponding attributes.

HSG	Soil Texture	Drainage Description	Runoff Potential	Infiltration Rate	Transmission Rate
A	Sand, Loamy Sand, or Sandy Loam	Well to Excessively Drained	Low	High	High
B	Silt Loam or Loam	Moderately Well to Well Drained	Moderate	Moderate	Moderate
C	Sandy Clay Loam	Somewhat Poorly Drained	High	Low	Low
D	Clay Loam, Silty Clay Loam, Sandy Clay Loam, Silty Clay, or Clay	Poorly Drained	High	Very Low	Very Low

Management Measures are often recommended based on infiltration and permeability rates of a particular HSG. The HSG categories and their corresponding soil texture, drainage description, runoff potential, infiltration rate, and transmission rate are shown in Table 4. Figure 12 depicts the location of each HSG found in the watershed while Table 5 summarizes the acreage and percent of watershed for each HSG. Poorly drained areas (Groups C, C/D and D) account for about 37% of the watershed. These are found almost exclusively on the southeast half of the watershed. Excessively and moderately drained (Group A, A/D, B, and B/D) areas make up an additional 59% of the watershed. The majority of these soils are found in the northwest half of the watershed. Urban areas (gravel quarry) and open water comprise the remaining 4% of the watershed.

Table 5. Hydrologic Soil Groups including acreage and percent of watershed.

Hydrologic Soil Group	Total Acreage	Percent of Watershed
A	1.8	0.01%
A/D	780	4.5%
B	8,006	46.4%
B/D	1,461	8.5%
C	4,819	28%
C/D	1,549	9.0%
D	38	0.01%
Open Water & Urban Land	584	4%
Totals	**17,239**	**100%**

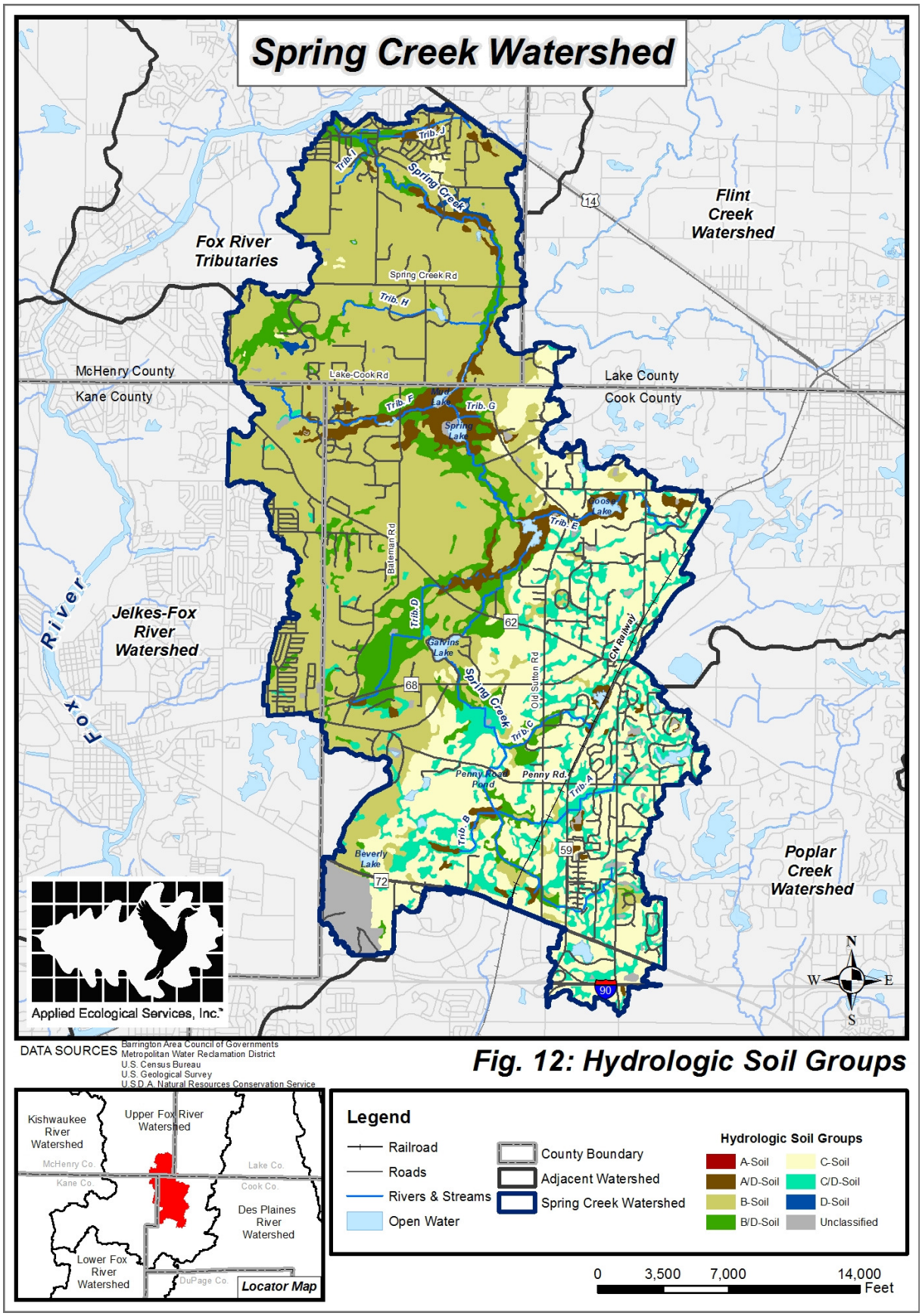


Fig. 12: Hydrologic Soil Groups

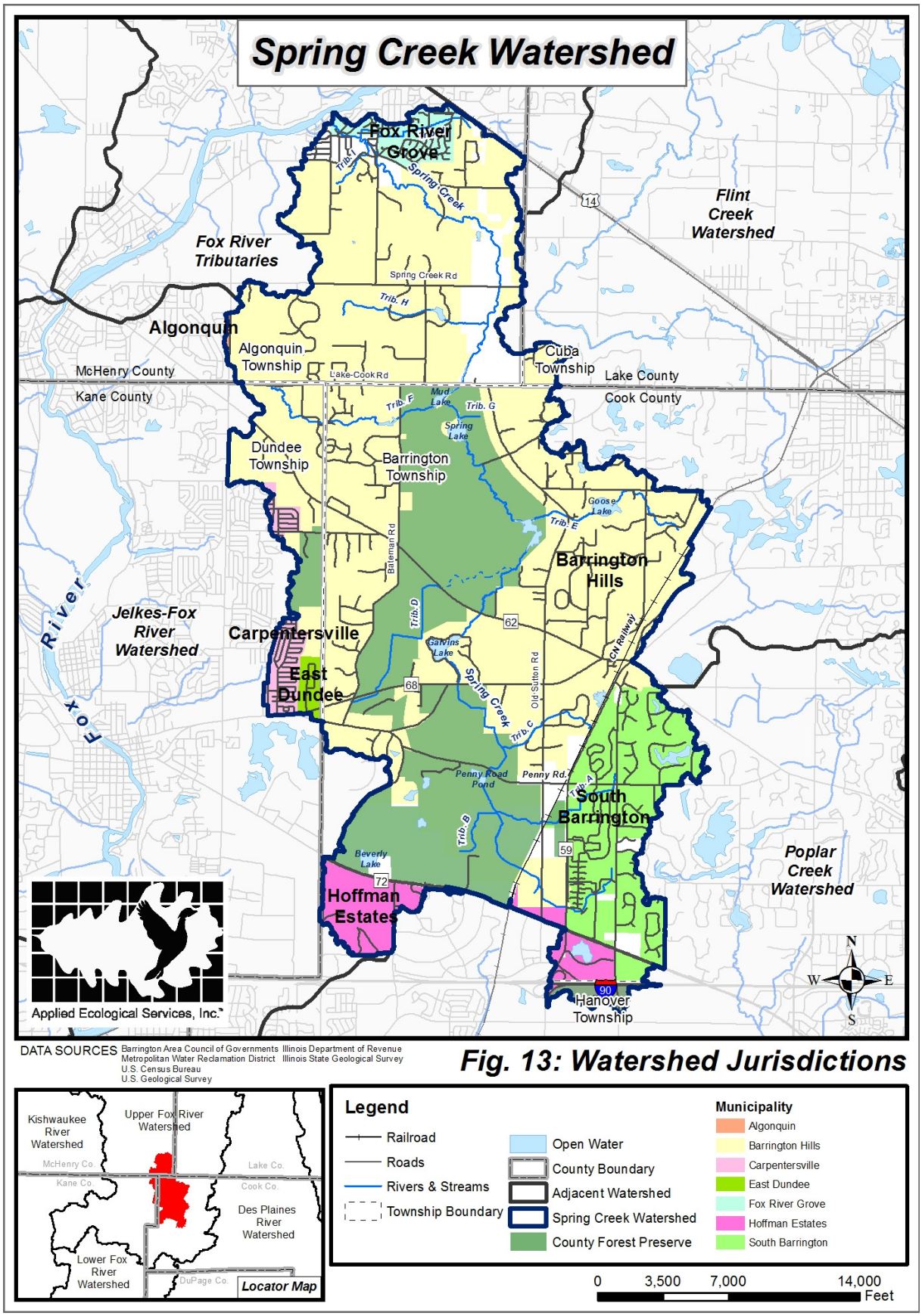
3.5 Watershed Jurisdictions, Roles & Responsibilities

The Spring Creek watershed contains portions of 4 counties, 5 townships, 7 municipalities, and 2 unincorporated areas (Table 6, Figure 13). The majority of the watershed is located in Cook County (11,776 acres/68%) and McHenry County (4,106 acres/24%). Kane County (1,255 acres/7%) and Lake County (102 acres/1%) occupy the remaining area. 90% of the watershed falls within a municipality. The municipality of Barrington Hills occupies most of the watershed (12,588 acres/73%) followed by South Barrington (1,568 acres/9%). Municipalities of Algonquin, Carpentersville, East Dundee, Fox River Grove, and Hoffman Estates combine to occupy 1,405 acres/9% of the watershed. The remaining 10% falls within unincorporated areas in Barrington Township (1,036 acres/6%) and Algonquin Township (641 acres/4%). Cook and Kane County Forest Preserve Districts also have significant holdings that overlap with Barrington Hills.

Table 6. County, township, municipal, and unincorporated jurisdictions.

Jurisdiction	Acres	% of Watershed
County	**17,239**	**100%**
Cook	11,776	68%
Kane	1,255	7%
Lake	102	1%
McHenry	4,106	24%
Township	**17,239**	**100%**
Algonquin Township	4,104	24%
Barrington Township	11,654	67%
Cuba Township	100	1%
Dundee Township	1,267	7%
Hanover Township	114	1%
Municipalities	**15,561**	**90%**
Algonquin	12	0%
Barrington Hills	12,588	73%
Carpentersville	265	2%
East Dundee	107	1%
Fox River Grove	305	2%
Hoffman Estates	716	4%
South Barrington	1,568	9%
Unincorporated Areas	**1,677**	**10%**
Unincorporated Algonquin Twp.	641	4%
Unincorporated Barrington Twp.	1,036	6%
Forest Preserve Districts	4,233	**25%**
Cook County	4,000	23%
Kane County	233	1%

Source: Illinois State Geological Survey


Spring Creek Watershed
Fox River Grove
Spring Creek
Trib. A
Flint Creek Watershed
Fox River Tributaries
Spring Creek Rd
Trib. H
Algonquin
Algonquin Township
Lake-Cook Rd
Cuba Township
McHenry County
Kane County
Lake County
Cook County
Trib. F
Mud Lake
Trib. G
Spring Lake
Dundee Township
Barrington Township
Goose Lake
Trib. E
Bateman Rd
Barrington Hills
Jelkes-Fox River Watershed
Fox River
Carpentersville
Trib. D
62
Cahins Lake
CN Railway
East Dundee
68
Spring Creek
Old Sutton Rd
Trib. C
Penny Road Pond
Penny Rd.
Trib. A
South Barrington
Trib. B
59
Beverly Lake
72
Poplar Creek Watershed
Hoffman Estates
90
Hanover Township
N
W
E
S
Applied Ecological Services, Inc.
DATA SOURCES Barrington Area Council of Governments Illinois Department of Revenue
Metropolitan Water Reclamation District Illinois State Geological Survey
U.S. Census Bureau
U.S. Geological Survey
Fig. 13: Watershed Jurisdictions
Kishwaukee River Watershed
Upper Fox River Watershed
McHenry Co.
Lake Co.
Kane Co.
Cook Co.
Des Plaines River Watershed
Lower Fox River Watershed
DuPage Co.
Locator Map
Legend
Railroad
Roads
Rivers & Streams
Township Boundary
Open Water
County Boundary
Adjacent Watershed
Spring Creek Watershed
County Forest Preserve
Municipality
Algonquin
Barrington Hills
Carpentersville
East Dundee
Fox River Grove
Hoffman Estates
South Barrington
0
3,500
7,000
14,000
Feet

Jurisdictional Roles and Responsibilities

Many types of natural resources throughout the United States are protected to some degree under federal, state, and/or local law. In the Chicagoland region, the U.S. Army Corps of Engineers (USACE) and surrounding counties regulate wetlands through Section 404 of the Clean Water Act and local Stormwater Ordinances respectively. The U.S. Fish and Wildlife Service (USFWS), Illinois Department of Natural Resources (IDNR), Illinois Nature Preserves Commission (INPC), and Forest Preserve Districts protect natural areas and threatened and endangered species. Local municipalities also have codes that address other natural resource issues. Watershed protection in McHenry, Lake, Kane, and Cook Counties is primarily the responsibility of county and city level government.

Land development affecting water resources (rivers, streams, lakes, isolated wetlands, and floodplains) is regulated by the USACE when "Waters of the U.S." are involved. These types of waters include any wetland or stream/river that is hydrologically connected to navigable waters. The USACE primarily regulates filling activities and requires buffers or wetland mitigation for developments that impact wetlands.

Land development in each county is regulated by stormwater ordinances including the McHenry County Stormwater Management Ordinance (amended March 15, 2011), Lake County Watershed Development Ordinance (amended October 10, 2006), Kane County Stormwater Ordinance (amended January 1, 2005), and Cook County Stormwater Management Ordinance (effective February 15, 2007). Most of these ordinances are enforced by either county agencies or by "Certified Communities". Barrington Hills is currently in the process of becoming a certified community to administer the Lake County Watershed Development Ordinance. The Village of Algonquin, East Dundee, and Carpentersville are certified in Kane County to administer the Kane County Stormwater Ordinance. Hoffman Estates and South Barrington will be required to follow the Cook County Stormwater Management Ordinance but are not considered certified communities. Fox River Grove is the only community that does not apply a county ordinance.

Water resources on unincorporated land within McHenry, Lake, Kane, and Cook Counties are ultimately regulated by the McHenry County Department of Planning and Development, Lake County Planning, Building and Development Office, Water Resources Division of the Kane County Development & Resource Management Department, or Cook County Department of Building and Zoning respectively. Unincorporated areas include 641 acres in Algonquin Township and 1,036 acres in Barrington Township. Development affecting water resources in these townships must be reviewed by the respective agencies listed above. It is important to note that McHenry County passed the "Conservation Design Standards and Procedures" in February 2008. This could affect future development of unincorporated areas in Algonquin Township.

Other governments and private entities with watershed jurisdictional or technical advisory roles include the USFWS, IDNR, and INPC, Kane and Cook County Forest Preserve Districts (FPDs), County Board Districts, and the McHenry, Lake, Kane, and Cook Soil and Water Conservation Districts (SWCDs). The USFWS, IDNR, INPC, and FPDs play a critical role in natural resource protection, particularly for rare or high quality habitat and threatened and endangered species. They protect and manage land that often contains wetlands, lakes, ponds, and streams. County Boards oversee decisions made by respective county governments and therefore have the power to override or alter policies and regulations. The SWCDs provide technical resource assistance to the public and other regulatory agencies. Although the SWCDs have no regulatory authority, they influence

watershed protection through soil and sediment control and pre and post-development site inspections.

Municipalities in the watershed may or may not provide additional watershed protection above and beyond existing watershed ordinances under local Village Codes. Most Village Codes provide ordinances covering businesses regulations, building regulations, zoning regulations, new subdivision regulations, stormwater management, streets, utilities, landscaping/restoration, tree removal, etc. Municipal codes present opportunities for outlining and requiring recommendations in this plan such as conservation and/or low density development, Special Service Area (SSA) or watershed protection fees, and use of native trees and plants in landscapes.

Planning, Policy and Regulation

Planning, policy, and regulation are the foundation of watershed protection, because the process sets the minimum standards for development that occurs or is proposed to occur in the vicinity of water resources. It is hoped that recommendations from this watershed plan would be referenced in future comprehensive plans and implemented in ordinances. In many cases, Village Codes also lay the foundation for the types of trees that can be removed from sites as well as what types of plant communities and species that can be replanted. Stormwater Ordinances are the primary preventative measure that McHenry, Lake, Kane, and Cook Counties currently use to standardize for the respective county the requirements that proposed developments must meet. Regulation or implemented Village Code and Stormwater Ordinances fall in the hands of local municipalities or County agencies. It is up to these enforcing bodies to communicate effectively and discuss often the problems with how ordinance language is interpreted and amendments that may help clarify certain regulations.

Planning/zoning guidance provides another level of watershed and natural resource protection. Most planning and zoning guidance is in the form of local floodplain or zoning ordinances that regulate onsite land use practices to ensure adequate floodplain, wetland, stream, lake, pond, soil, and other natural resource protection. Zoning ordinances and overlay districts in particular define what type of development is allowed and where it can be located relative to natural resources. Other examples of planning/zoning forms of resource protection include riparian and wetland buffers, impervious area reduction, open space/greenway dedication, conservation easements and conservation and/or low density development.

To improve the impact of planning/zoning guidance on water resource protection, there needs to be improved coordination and communication between county and local government. Watershed development regulations should be made very clear to local enforcement officers; local planners and zoning boards should consider revisions to local ordinances that address watershed, subwatershed, and/or site-specific natural resource issues. For example, communities with less impervious development now should revise their zoning ordinances sooner rather than later in order to adequately prevent the types of development that contribute to flooding, degrade wildlife habitat, and reduce water quality. Several recommended regulatory changes are included in Programmatic Measures Action Plan (Section 5.0)

3.6 Watershed Demographics

The Chicago Metropolitan Agency for Planning (CMAP) provides a 2040 regional framework plan for the greater Chicagoland area to plan more effectively with growth forecasts. CMAP's 2010 to 2040 forecasts of population, households, and employment was used to project how these attributes will impact the Spring Creek watershed. CMAP develops these forecasts by first generating region wide estimates for population, households, and employment then meets with local governments to determine future land development patterns within each jurisdiction.

Table 7 includes CMAP's population, households, and employment forecast changes between 2010 and 2040 for the Spring Creek watershed area. The data is generated by Township, Range, and quarter Section and is depicted on Figures 14-16. Note: AES used GIS to overlay the Spring Creek watershed boundary onto CMAP's quarter Section data. If any part of a quarter Section fell inside the watershed boundary, the statistics for the entire quarter Section were included in the analysis.

The combined population of the watershed is expected to increase from 27,786 in 2010 to 37,254 by 2040, a 34% increase. The highest population increase is expected in the southwest corner of the watershed within Hoffman Estates and also in the far west portion of the watershed along outlying Carpentersville/East Dundee and southwest of Route 62 in Barrington Hills. Some growth is also forecasted in Fox River Grove in the far northern portion of the watershed.

The southwest corner of the watershed in Hoffman Estates currently contains a quarry owned and operated by Beverly Materials LLC that will be remediated into residential and retail development according to Hoffman Estates future land use plans (Village of Hoffman Estates 2007). The western area of the watershed, southwest of Route 62 in Barrington Hills, is currently open space but is expected to become residential according comprehensive plans for Barrington Hills (Barrington Hills 2008). Population growth in Fox River Grove is expected to include additional residential homes in future years. Very little change in population is expected throughout much of Barrington Hills and South Barrington. Only areas that are currently agricultural within Barrington Hills may become residential in the future. In addition, projected household change generally follows change in population. The combined number of households in the watershed is expected to increase from 8,404 in 2010 to 11,421 by 2040, a 40% increase.

Employment change is expected to increase from 5,693 jobs in 2010 to14,616 by 2040, a 157% increase. Nearly all employment change is predicted in the southern portion of the watershed along Route 72. Sutton Crossing is a retail/commercial development currently being constructed between Route 72 and Interstate 90. The area showing increased employment growth north of Route 72 is currently agricultural but located in a prime retail/commercial area. The remaining employment growth is expected when Beverly Quarry is converted to a mixed residential/retail development.

Table 7. CMAP 2010 data and 2040 forecast data.

Data Category	2010	2040	Change (2010-2040)
Population	27,786	37,254	9,467
Household	8,404	11,421	3,017
Employment	5,693	14,616	8,923

Source: Chicago Metropolitan Agency for Planning 2040 Forecasts

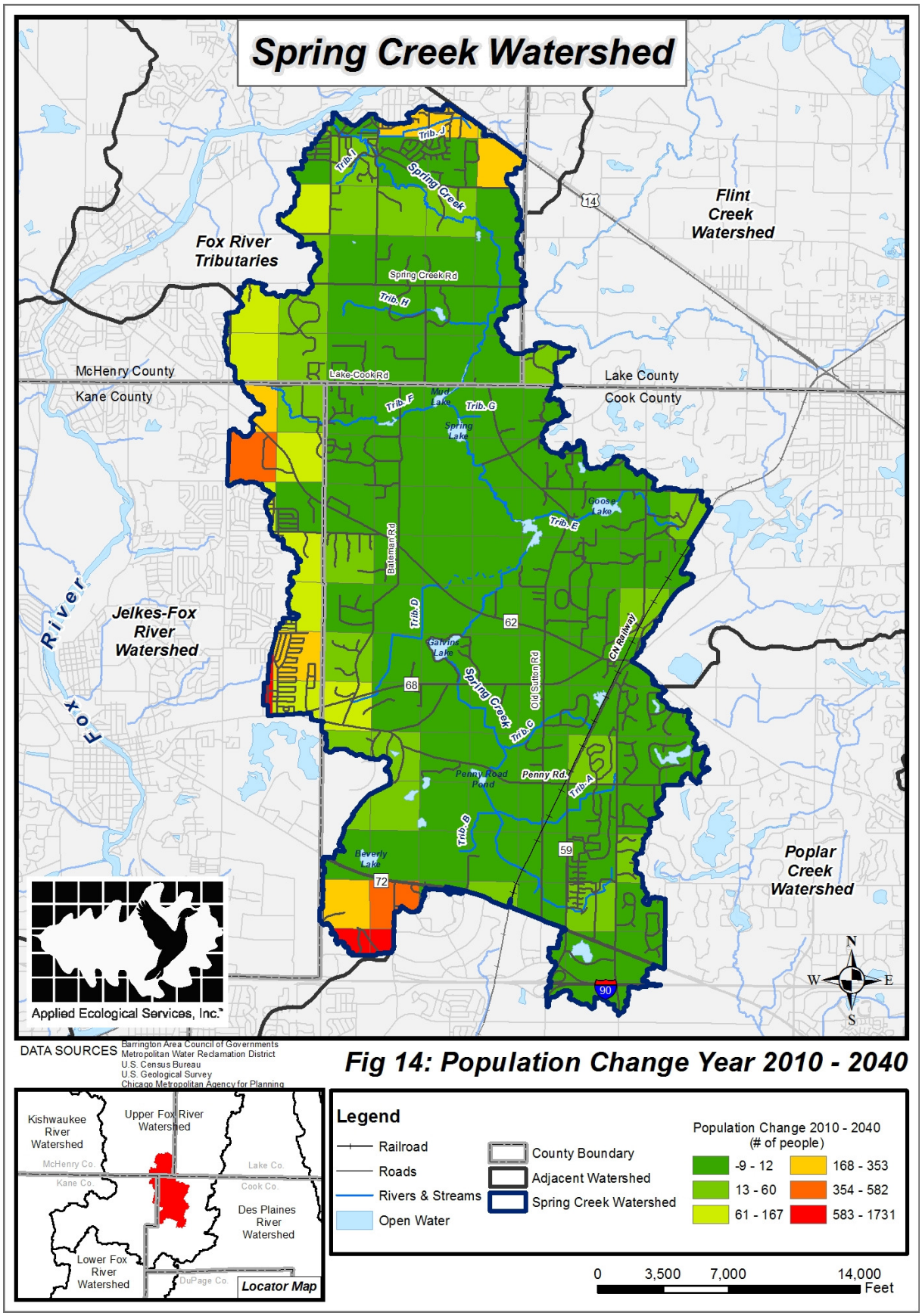


Fig 14: Population Change Year 2010 - 2040

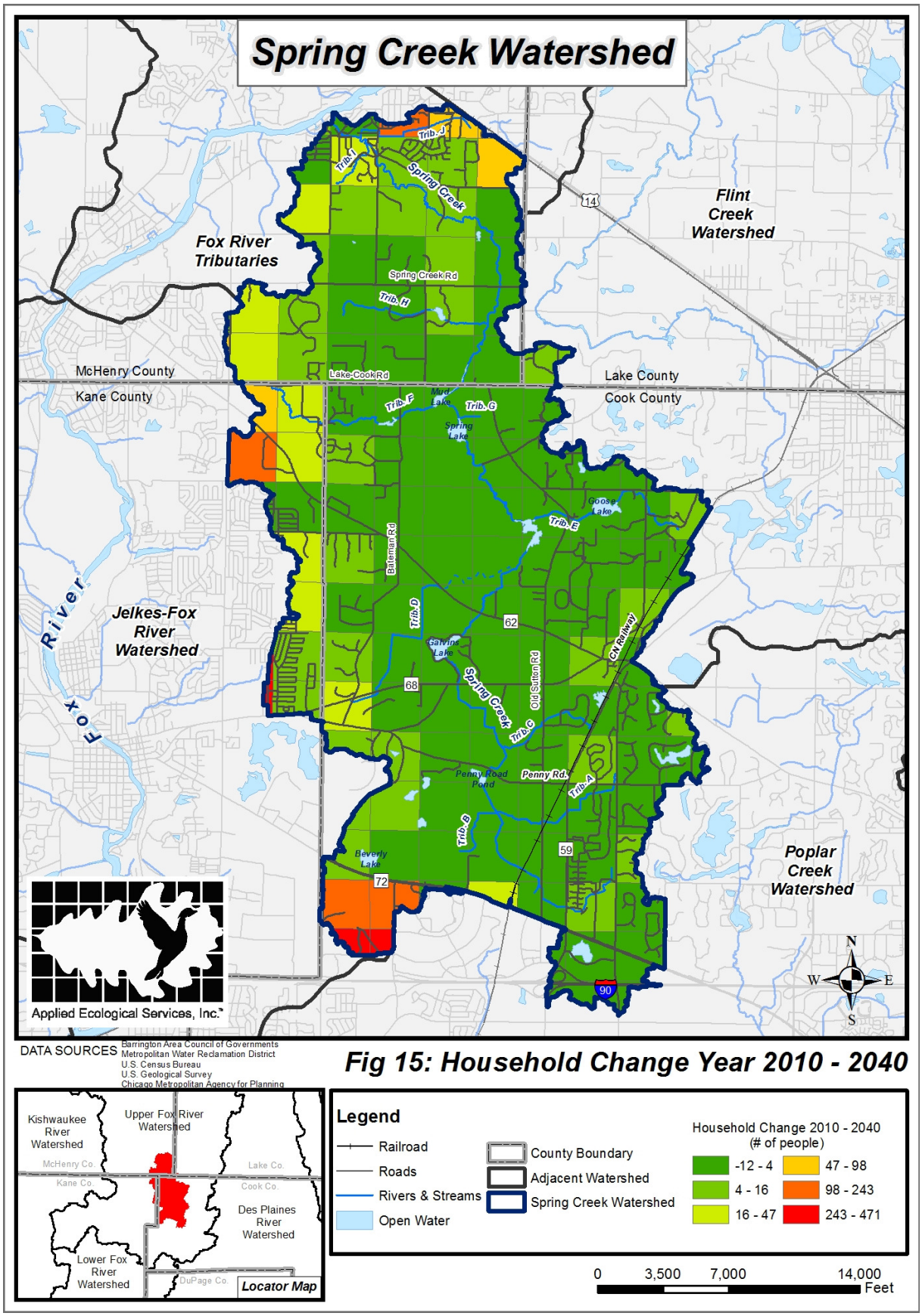


Fig 15: Household Change Year 2010 - 2040

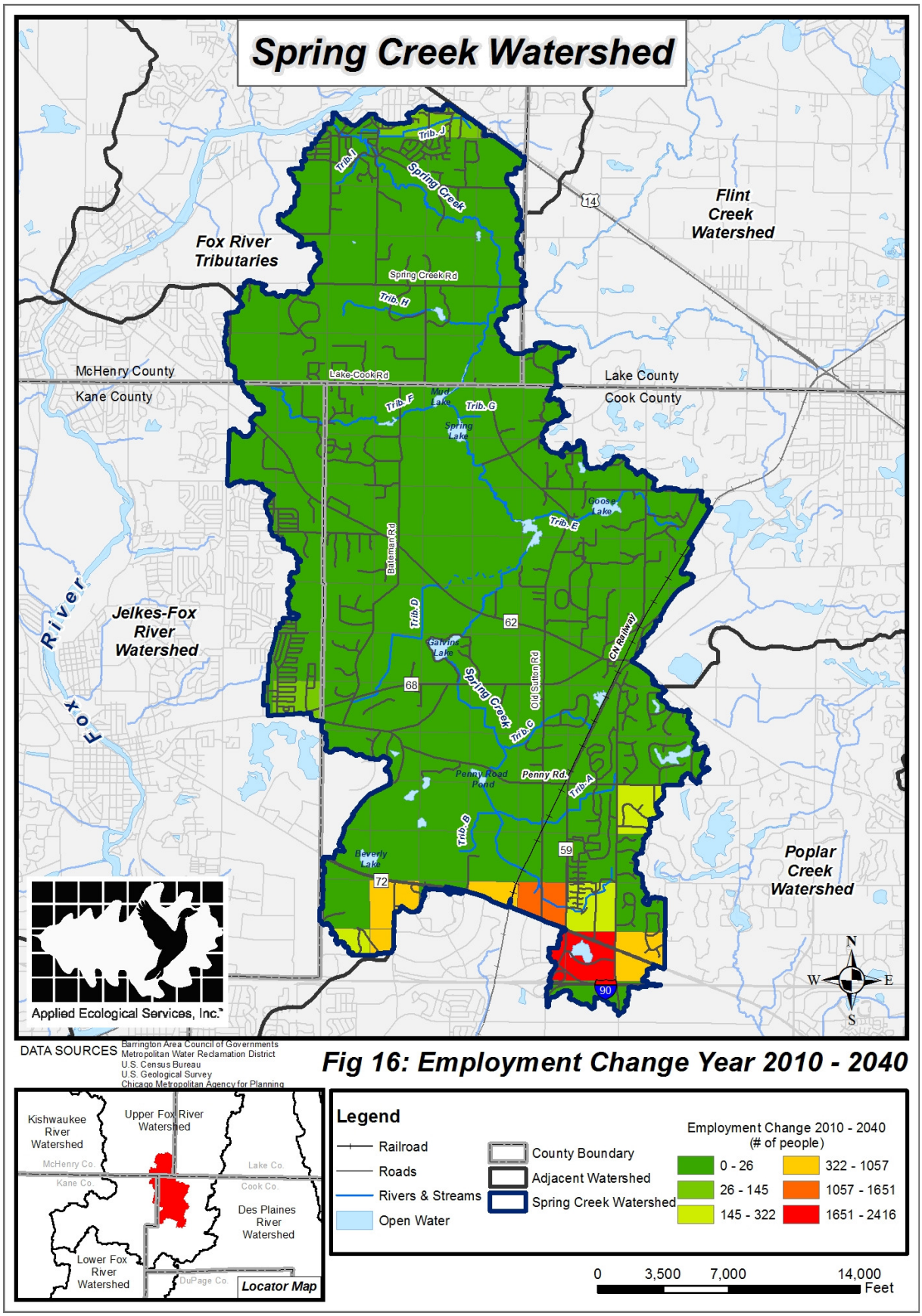


Fig 16: Employment Change Year 2010 - 2040

3.7 Existing & Future Land Use/Land Cover

Existing (2011) Land Use/Land Cover

Spring Creek watershed land use/land cover data was derived through several processes. First, 2005 Chicago Metropolitan Agency for Planning (CMAP 2005) land use/land cover data was obtained and mapped in GIS. Next, 2010 USDA aerial photography of the watershed was overlaid on CMAP data so that discrepancies could be corrected. In addition, watershed stakeholders were allowed to recommend changes at the July 21, 2011 stakeholder meeting. Finally, uncertainties in land uses and cover types were field verified and corrected if needed to produce the 2011 land use/land cover data and map for the Spring Creek watershed (Table 8; Figure 17).

CMAP Land Use/Land Cover Definitions:

Agricultural: Land use that includes out-buildings and barns, row & field crops and fallow field farms and pasture, includes dairy and other livestock agricultural processing. Also includes nurseries, greenhouses, orchards, tree farms, and sod farms.

Cemetery: Land use that includes associated chapels and mausoleums.

Construction-Residential: Scraped earth/construction activity indicating construction of residential property.

Construction-Retail/Office: Scraped earth/construction activity indicating construction of retail/office property.

Equestrian Facilities: Land use that includes boarding, training and breeding facilities, with associated pastures and buildings.

Forest and Grassland: Land cover that includes all private and some public property that has not been developed for any human purpose and undeveloped and unused land areas. Also includes bands of vacant forested land or grassland along streams (riparian corridors).

Government and Institutional: Land use that includes medical facilities, educational facilities, religious facilities, and others.

Industrial: Land use that includes industrial, warehousing and wholesale trade, such as mineral extraction, manufacturing and processing, warehousing and distribution centers for wholesale, associated parking areas, truck docks, etc.

Multifamily Residential: Land use that includes multifamily residences. These include duplex and townhouse units, apartment complexes, retirement complexes, mobile home parks, trailer courts, condominiums, cooperatives, and associated parking.

Single Family Residential: Land use that includes single family homes and farmhouses and immediate residential area around them.

Office Space: Land use that includes office campuses and research parks defined as non-manufacturing and characterized by large associated manicured landscape.

Public & Private Open Space: Land cover that includes parks, arboretums, botanical gardens, golf courses, and others such as bike trails through open space, etc.

Retail/Commercial: Land use that includes shopping malls and their associated parking, single structure office/hotels, urban mix (retail trade like lumber yards, department stores, grocery stores, gas stations, restaurants, etc.) and hotels/motels.

Transportation: Land use that includes railroads, rail rapid transit and associated stations, rail yards, linear transportation such as streets and highways, and airport transportation.

Utility/Waste Facility: Land use that includes telephone, radio and television towers, dishes, gas, sewage pipeline, ComEd rows, waste water facilities, etc.

Water: Land cover that includes rivers, streams and canals, lakes, reservoirs, and lagoons.

Wetland: Land cover that includes all wetlands on public and private land. In some situations, wetlands are mapped under a different land cover category. This sometimes occurs on open space areas and vacant forest and grassland classifications.

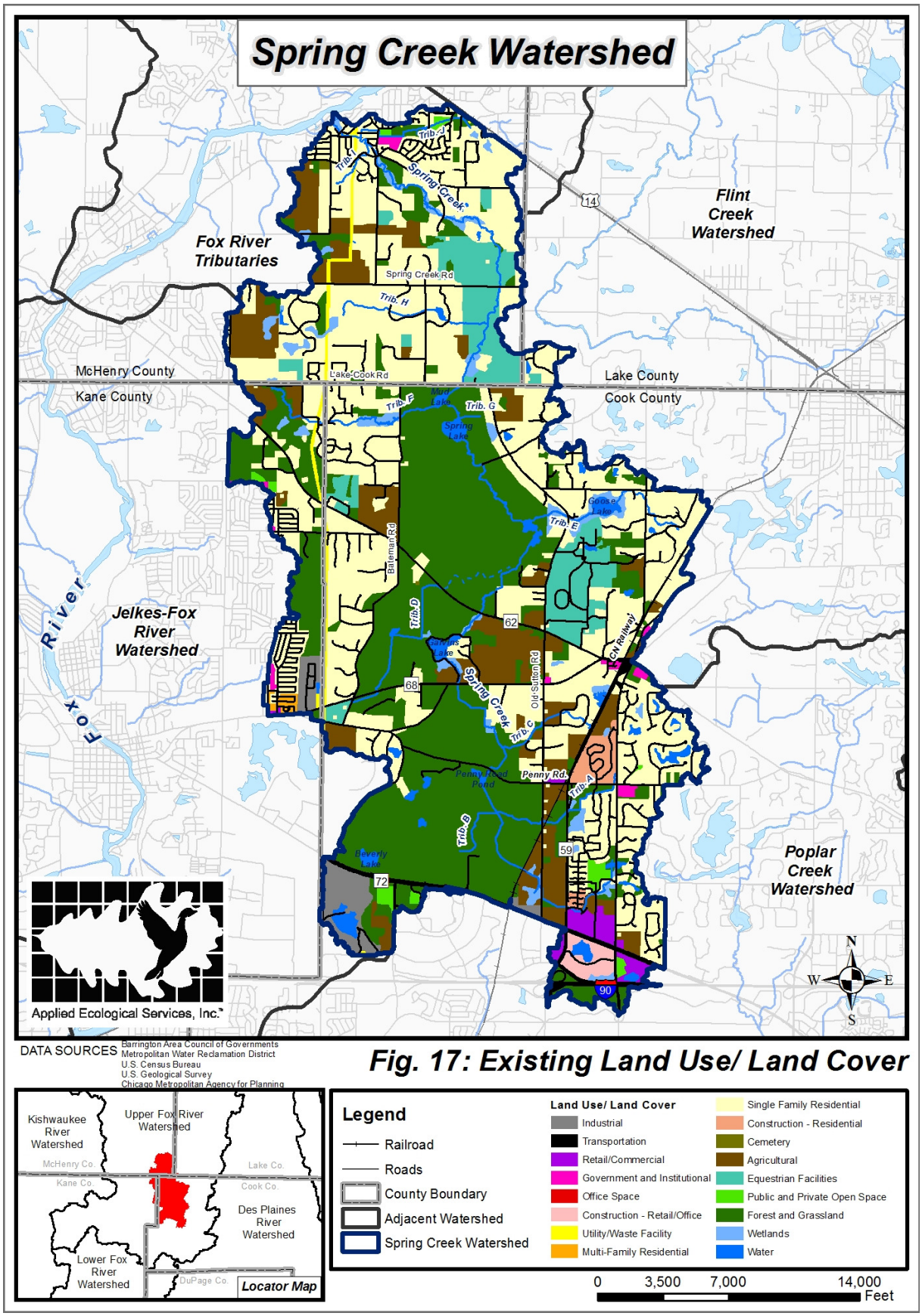
Table 8. 2011 land use/land cover classifications and acreage.

Land Use	Area (acres)	% of Watershed
Agricultural	1,578.7	9.2%
Cemetery	9.0	0.05%
Construction-Residential	141.2	0.8%
Construction-Retail/Office	92.8	0.5%
Equestrian Facilities	961.3	5.6%
Forest and Grassland	5,353.9	31.1%
Government and Institutional	71.8	0.4%
Industrial	293.9	1.6%
Multifamily Residential	23.2	0.1%
Single Family Residential	6,723.0	39.0%
Office Space	3.3	0.02%
Public & Private Open Space	106.5	0.6%
Retail/Commercial	144.9	0.8%
Transportation	911	5.3%
Utility/Waste Facilities	147.6	0.9%
Water	331.6	1.9%
Wetlands	364.8	2.1%
Total	**17,239**	**100%**

Single family residential (which includes small areas of Carpentersville, and Fox River Grove, as well as 73% of the watershed of Barrington Hills with 5-acre minimum lot sizes) comprises the most acreage in the watershed (6,723 acres; 39%) followed by forest & grassland (5,353.9 acres; 31.1%) then agricultural (1,578.7 acres; 9.2%). Most of the residential area is located within 5+ acre parcels within the Village of Barrington Hills. The majority of forest and grassland is included in Kane and Cook County Forest Preserves. Agriculture is scattered throughout the watershed with large parcels remaining in the northwest, central, and southeast.

Other common land uses/cover types include equestrian (961.3 acres; 5.6%), transportation (911 acres; 5.3%), wetlands (364.8 acres; 3.1%), water (331.6 acres; 1.9%), and industrial (293.9 acres; 1.6%). Note: the wetland land cover class only includes areas not included in other land use/cover classes and therefore does not accurately compare to the McHenry and Kane County Wetland Inventory and National Wetland Inventory acreage described in Section 3.12.

Total open and partially open space comprised of agricultural lands, equestrian, utility corridors, water resources, forest/grassland, and public/private open space is approximately 8,844.4 acres or 51% of the watershed. Total developed land including residential, commercial, industrial, government/ institutional, office space, cemetery, and transportation accounts for approximately 8,394.6 acres or 49% of the watershed. It is important to note that the Forest Preserve District of Cook County has identified corporate areas including the Sears Center, Prairie Stone, and IDOT holding along Route 72 as "Critical" pollutant contributors to the headwater areas of Tributary B within Spring Creek Valley Forest Preserve.


Spring Creek Watershed
Fox River Tributaries
Flint Creek Watershed
McHenry County
Kane County
Lake County
Cook County
Jelkes-Fox River Watershed
Poplar Creek Watershed
Fox River
Spring Creek
Spring Creek Rd
Lake-Cook Rd
Bateman Rd
Old Sutton Rd
Penny Rd.
Penny Road Pond
Mud Lake
Spring Lake
Goose Lake
Beverly Lake
Trib. A
Trib. B
Trib. C
Trib. D
Trib. E
Trib. F
Trib. G
Trib. H
CN Railway
14
62
68
59
72
90
N
S
E
W
Applied Ecological Services, Inc.
DATA SOURCES
Barrington Area Council of Governments
Metropolitan Water Reclamation District
U.S. Census Bureau
U.S. Geological Survey
Chicago Metropolitan Agency for Planning
Fig. 17: Existing Land Use/ Land Cover
Kishwaukee River Watershed
Upper Fox River Watershed
McHenry Co.
Lake Co.
Kane Co.
Cook Co.
Des Plaines River Watershed
Lower Fox River Watershed
DuPage Co.
Locator Map
Legend
Railroad
Roads
County Boundary
Adjacent Watershed
Spring Creek Watershed
Land Use/ Land Cover
Industrial
Transportation
Retail/Commercial
Government and Institutional
Office Space
Construction - Retail/Office
Utility/Waste Facility
Multi-Family Residential
Single Family Residential
Construction - Residential
Cemetery
Agricultural
Equestrian Facilities
Public and Private Open Space
Forest and Grassland
Wetlands
Water
0
3,500
7,000
14,000
Feet

Future Land Use/Land Cover Predictions

Information on predicted future land use/land cover for the watershed was obtained from municipal comprehensive plans where available (Village of Barrington Hills 2008; Village of Carpentersville 2007; Village of Fox River Grove 2007; Village of Hoffman Estates 2007; and Village of Algonquin 2008. No future land use mapping was available from the Village of South Barrington and East Dundee. Available data was analyzed and GIS used to map predicted land use/land cover changes. The results are summarized in Table 9 and depicted on Figure 18.

Table 9 compares existing land use/land cover to predicted future land use/land cover. The greatest loss of a current land use/land cover classes occurs on agricultural land (-1,289.4 acres; -7.5%), forest & grassland (-960.3 acres; -5.4%), residential and retail-office sites currently under construction (-234 acres; -1.3%), industrial (-190.6 acres; -1.1%), and public & private open space (-9.4 acres; 0.2%).

Conversely, single family residential development is predicted to increase the most (+1,408.7 acres; 8.2%) and occur within areas that are currently agriculture, public & private open space, and forest & grassland. Other significant increases in land use/land cover are predicted to occur with retail-residential mixed use (+342.6 acres; +0.2%), office-retail-residential mixed use (+182.4 acres; +1.1%), office-retail mixed use (+91.8 acres; +0.5%), and retail-commercial (+85 acres; +0.5%).

Predicted land use/land cover changes occur primarily in the southern portion of the watershed within the Villages of Hoffman Estates and Barrington Hills and unincorporated Barrington Township. Much of this area along the Route 72 corridor was recently developed to retail and commercial. Additional retail-commercial-office development is currently under construction at "Sutton Crossing" located between Route 72 and Interstate 90. It is also important to note that Beverly Gravel Quarry, located south of Route 72 in the far southwest tip of the watershed, is slated to become mixed residential-retail in the future. This accounts for the 190.6 acre decrease in industrial use compared to current conditions.

Finally, the proposed Longmeadow Parkway road expansion would enter the Spring Creek watershed on its west side and connect up with Route 62. This expansion will likely impact many wetlands along its route across the Fox River and wetland mitigation will be required by the Corps of Engineers and/or Counties involved. Section 3.12 of this plan identifies potential wetland restoration/mitigation sites in the watershed. A nearly 40 acre potential wetland mitigation site (site # 1)is located just north of Lake-Cook Road in the northwest portion of the watershed and is located within the same subwatershed where Longmeadow Parkway is proposed to enter Spring Creek watershed.

Table 9. 2011 and predicted future land use/land cover, including percent change for each land use/land cover class.

Land Use/Land Cover	Current Area (acres)	Current % of Watershed	Predicted Area (acres)	Predicted % of Watershed	Change (acres)	Change (%)
Agricultural	1,578.7	9.2	289.3	1.7	-1,289.4	-7.5
Cemetery	9.0	0.05	9.0	0.05	0	0
Construction-Residential	141.2	0.8	0.0	0	-141.2	-0.8
Construction-Retail/Office	92.8	0.5	0.0	0	-92.8	-.05
Equestrian Facilities	961.3	5.6	961.3	5.6	0	0
Forest and Grassland	5,353.9	31.1	4,393.6	25.5	-960.3	-5.4
Government and Institutional	71.8	0.4	71.8	0.4	0	0
Industrial	293.9	1.6	83.3	0.5	-190.6	-1.1
Multifamily Residential	23.2	0.1	23.2	0.1	0	0
Single Family Residential*	6,723.0	39.0	8,131.7	47.2	+1,408.7	+8.2
Office Space	3.3	0.02	3.3	0.02	0	0
Office-Retail Mixed Use	0	0	91.8	0.5	+91.8	+0.5
Office-Retail-Residential Mixed Use	0	0	182.4	1.1	+182.4	+1.1
Public & Private Open Space	106.5	0.6	77.2	0.4	-29.4	-0.2
Retail/Commercial	144.9	0.8	229.1	1.3	+85	+0.5
Retail-Residential Mixed Use	0	0	342.6	2.0	+342.6	+2.0
Transportation	911	5.3	911	5.3	0	0
Utility/Waste Facilities	147.6	0.9	147.6	0.9	0	0
Water	331.6	1.9	331.6	1.9	0	0
Wetlands	364.8	2.1	364.8	2.1	0	0

*Single-family residential includes small pocket of high density in Carpentersville and Fox River Grove and the majority of single family homes on 5-acre lot minimums in Barrington Hills (73%). Future changes in development patterns would severely impact water quality as homes in this region depend upon well and septic for water supply and disposal.

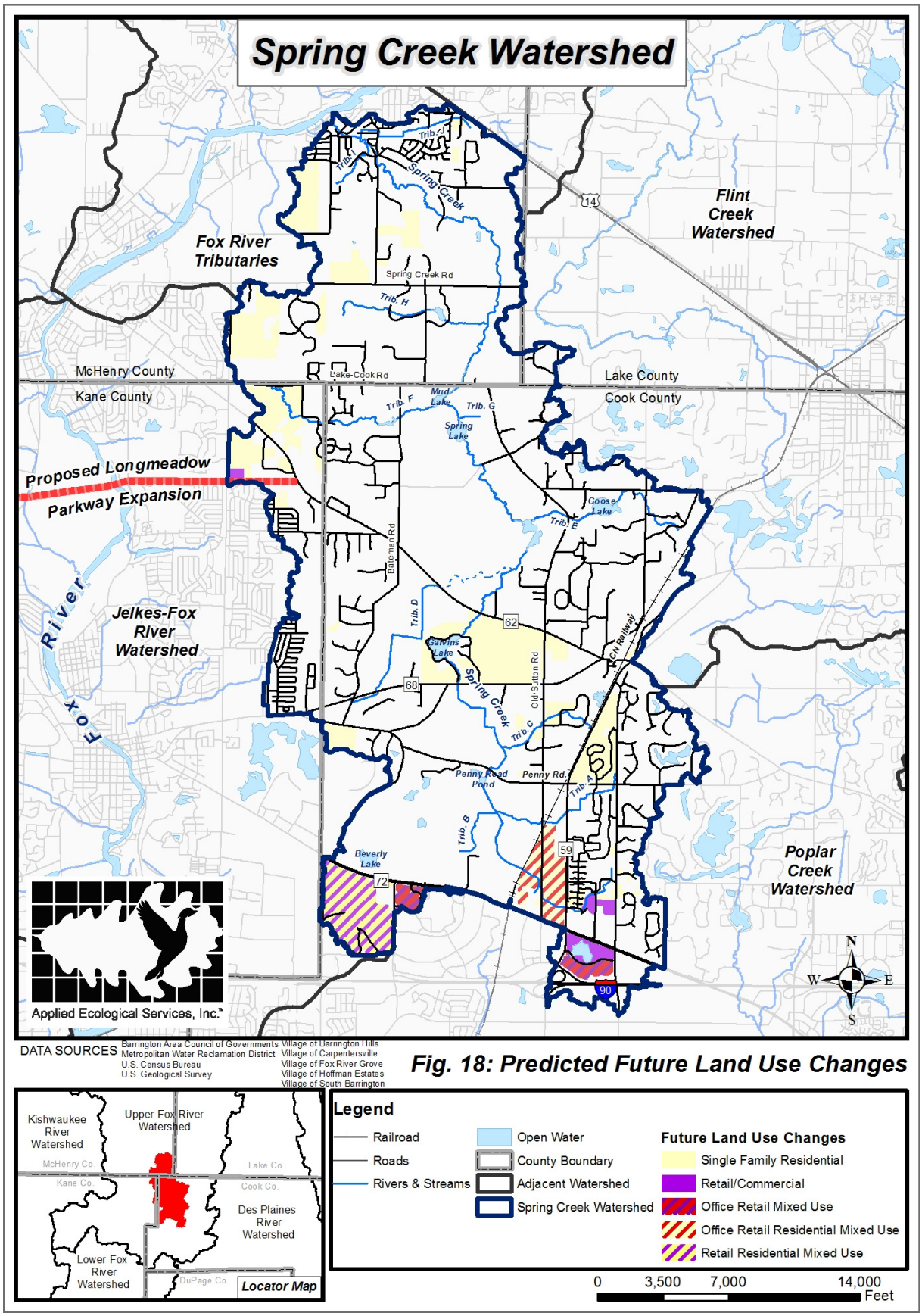


Fig. 18: Predicted Future Land Use Changes

3.8 Transportation Network

Roads

Major roads that are present in the Spring Creek watershed include State Roads 59, 62, 68, 72 and US Interstate 90 (Figure 19). Illinois Route 59 is located in the southeast portion of the watershed and runs north-south between US Interstate 90 and Illinois Route 62/68. On the eastern portion of the watershed Illinois Route 68 and 62 is the same road but splits going west. Illinois Route 68 runs east-west in the watershed, where to the east it runs between the Villages of Barrington and South Barrington and to the west it ends in East Dundee where it meets Route 72. Illinois Route 62 runs northwest from where 62 and 68 are connected heading to the Village of Algonquin. In the southern portion of the watershed, Illinois Route 72 runs east-west between the towns of East Dundee and Hoffman Estates. In the southeast corner of the watershed, US Interstate 90 runs east-west through a fairly short stretch of the watershed. US Interstate 90 provides heavy traffic throughout Chicago and its surrounding suburbs. Illinois Route 59 is the only junction along US Interstate 90 that is in the Spring Creek watershed.

Also of interest are the unique scenic roads that traverse Barrington Hills and provide an important environmental character. Barrington Hills Comprehensive Plan (Village of Barrington Hills 2008) stresses the importance of preserving the character of these roadways by considering their importance in any planning and execution of roadway and subdivision improvements and maintenance.

Scenic Braeburn Road

Railroads

The Canadian National Railway (CN) was purchased from Elgin, Joliet & Eastern Railway Company (EJ&E) in 2009 by Canadian National Railway Company. The railway runs across the southeast portion of the Spring Creek watershed (Figure 19) and skirts the perimeter of the Chicago area, running from Waukegan, Illinois to Gary, Indiana. Along the way it crosses or connects with every other railroad going into Chicago. This rail line came into existence in December 1888 and has been used primarily to transport steel products to the Chicago land area. Since its purchase in 2009, the CN has reported increased freight traffic throughout the US, allowing some railway traffic to bypass the congested rail system of the City of Chicago.

The Village of Barrington Hill's Comprehensive Plan (Village of Barrington Hills 2008) outlines real concerns about CN. These include more traffic back-ups, slow moving and potentially derailing trains, noise pollution, and higher risk from pollutants from stormwater runoff and potential contamination from derailments/spills that could enter the groundwater and/or stream systems in adjacent Spring Creek Valley Forest Preserve.

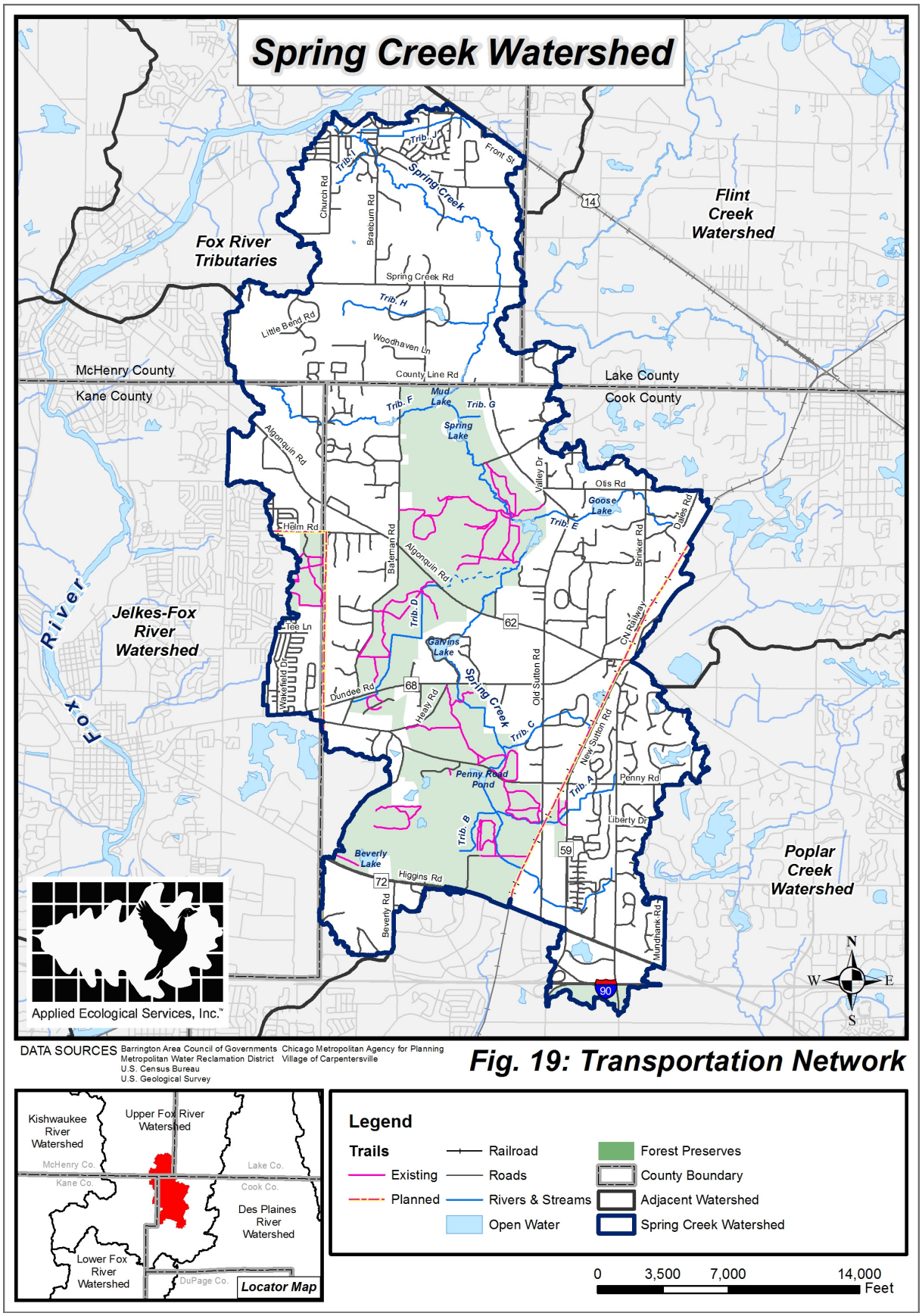


Fig. 19: Transportation Network

CMAP Trails

The Chicago Metropolitan Agency for Planning (CMAP) adopted the Regional Greenways and Trails Implementation Program in 1992 followed by updates in 1997 and 2009. The program's plan identifies existing major open space and trails, recommendations for revised and new greenway and trail linkages, stream corridors as greenway linkages, location of existing Illinois Natural Area Inventory Sites (INAI) and other natural areas, and identifies commuter rail lines that can provide access to trails and greenways. CMAP's proposed trails within the watershed are shown on Figure 19. A primary regional trail, one that makes critical links and interconnections, called EJ&E Corridor is proposed to be built along the CN railroad throughout the entire watershed. Another primary regional trail that is on the edge of the watershed, along Illinois Route 14/Union Pacific-Metra Northwest Line, is proposed to be extended south of Illinois Route 22 still following Illinois Route 14. The name of this trail is the Route 14 Corridor Bike Path. A regional trail named County Line Corridor is a proposed regional trail that will run along the north end of Helm Woods and turn south eventually reconnecting with the EJ&J Corridor trail outside of the Spring Creek watershed. These trails are all what CMAP refers to as Land-Based Greenways, as opposed to Water-Based Greenways or On Street Routes.

Forest Preserve and Other Trails

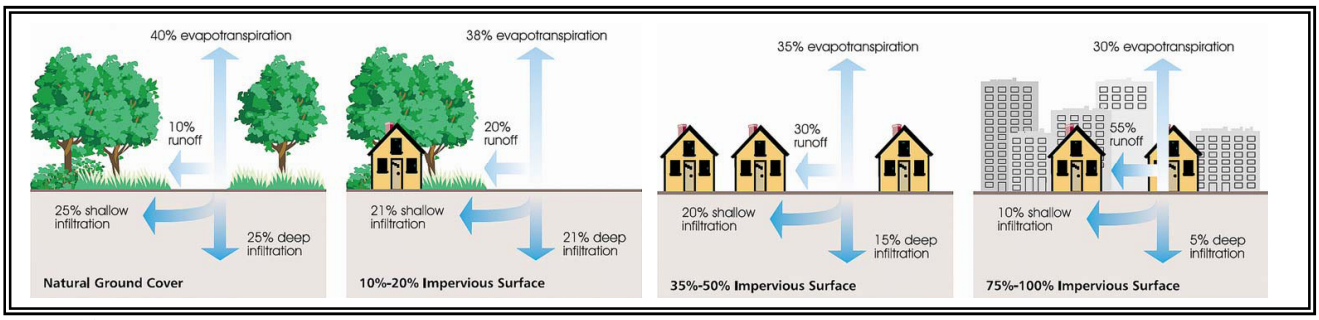
Cook County Forest Preserve and Kane County Forest Preserve Districts both have existing preserves within the Spring Creek watershed. These areas are described in more detail in Section 3.11. Cook County owns the Spring Creek Valley Forest Preserve, Spring Creek Nature Preserve, and the Poplar Creek Forest Preserve. The Spring Creek Valley Forest Preserve occupies the most land of any preserve within the watershed and is the only preserve in Cook County that has trails within the watershed. Kane County Forest Preserve District manages Helm Woods in the western portion of the watershed. This preserve also has an established trail system. These existing trails can be seen on Figure 19.

Horse crossing sign near intersection of Spring Creek Road & Spring Creek Lane.

While not depicted on the transportation map, there is an extensive trail system spanning some 210 miles throughout Barrington Hills and the Spring Creek watershed that is used for equestrian riding. Since 1937 these trails have been maintained by the Riding Club of Barrington Hills. The Riding Club had its beginnings in the 1920's when the area was mostly farmed and cattle grazed. The private equestrian trail system is a unique feature which helps to attract and retain equestrians who require low density land use practices for their purposes. As such, the private trail system is an asset which ultimately aids the watershed in ensuring low stressors to the local ecosystems. Some of these trails are public, many of them connecting with forest preserve foot trails, and others are private. A map of the known equestrian trail network that exists within the Village of Barrington Hills can be obtained from the Village's Comprehensive Plan and/or Riding Club of Barrington Hills.

3.9 Impervious Cover Impacts

Imperviousness is generally defined as the sum of roads, parking lots, sidewalks, rooftops, and other surfaces of an urban landscape that prevent infiltration of precipitation (Scheuler 1994). Imperviousness is an indicator used to measure the impacts of urban land uses on water quality, hydrology and flows, flooding/depressional storage, and habitat related to streams. Based on studies and other background data, Scheuler (1994) and the Center for Watershed Protection (CWP) developed an Impervious Cover Model used to classify streams within subwatersheds into three quality categories: Sensitive, Impacted, and Non-Supporting (Table 10). In general, Sensitive subwatersheds have less than 10% impervious cover, stable channels, good habitat, good water quality, and diverse biological communities whereas streams in Non-Supporting subwatersheds generally have greater than 25% impervious cover, highly degraded channels, degraded habitat, poor water quality, and poor-quality biological communities. In addition, runoff over impervious surfaces collects pollutants and warms the water before it enters a stream. As a result, biological communities shift from sensitive species to ones that are more tolerant of pollution and hydrologic stress.



Source: The Federal Interagency Stream Restoration Working Group, 1998 (Rev. 2001).

Figure 20. Relationship between impervious surfaces, evapotransporation, & Infiltration.

Table 10. Impervious categories and descriptions based on the CWP's Impervious Cover Model.

Category	% Impervious Cover	Subwatershed Description
Sensitive	10% or less	Generally exhibits very little impervious cover (≤10%), stable stream channels, excellent habitat, good water quality, and diverse biological communities.
Impacted	Greater than 10% and less than 25%	Generally possesses moderate impervious cover (11-25%), and somewhat degraded stream channels, altered habitat, decreasing water quality, and fair-quality biological communities.
Non-Supporting	Greater than 25%	Generally has high impervious cover (>25%), and highly degraded stream channels, degraded habitat, poor water quality, and poor-quality biological communities.

Source: (Zielinski 2002)

The following paragraphs describe the implications of increasing impervious cover:

Water Quality Impacts
Impervious surfaces accumulate pollutants and affects water quality in lakes, rivers, streams, and wetlands by increasing nonpoint source pollutant loading and water temperatures. During a storm event, pollutants such as nutrients (nitrogen and phosphorus), metals, oil/grease, and bacteria are delivered to water bodies. According to monitoring and modeling studies, increased imperviousness is directly related to increased urban pollutant loads (Schueler 1994). Furthermore, impervious surfaces can increase stormwater runoff temperature as much as 12 degrees compared to vegetated areas (Galli, 1990). According to the Illinois Pollution Control Board (IPCB), water temperatures exceeding 90°F (32.2°C) can be lethal to aquatic fauna and can generally occur during hot summer months.

Hydrology and Flows Impacts
Hydrology and flows are altered by the amount of impervious cover in a watershed because higher impervious cover translates to greater runoff volumes. If unmitigated, high runoff volumes can result in higher floodplain elevations (Schueler 1994). In fact, studies have shown that even relatively low percentages of imperviousness (5% to 10%) can cause peak discharge rates to increase by a factor of 5 to 10, even for small storm events. Impervious areas come in two forms: 1) disconnected and 2) directly connected. Disconnected impervious areas are represented primarily by rooftops, so long as the rooftop runoff does not get funneled to impervious driveways or a stormsewer system. Significant portions of runoff from disconnected surfaces usually infiltrate into soils more readily than directly connected impervious areas such as parking lots that typically end up as stormwater runoff directed to a stormsewer system that discharges directly to a waterbody.

Flooding and Depressional Storage Impacts
Flooding is an obvious consequence of increased flows resulting from increased impervious cover. As stated above, increased impervious cover leads to higher water levels, greater runoff volumes, and high floodplain elevations. Higher floodplain elevations usually result in more flood problem areas. Furthermore, as development increases, wetlands and other open space decrease. A loss of these areas increases flows because wetlands and open space typically soak up and capture rainfall and release it slowly to streams and lakes. Detention basins can and do minimize flooding in highly impervious areas by regulating the discharge rate of stormwater runoff, but detention basins do not reduce the overall increase in runoff volume.

Habitat Impacts
Increased impervious cover negatively impacts stream habitat and its biological communities. When a stream receives more severe and frequent runoff volumes compared to historical conditions, channel dimensions often respond through the process of erosion by widening, downcutting, or both, thereby enlarging the channel to handle the increased flow. Channel instability leads to a cycle of streambank erosion and sedimentation resulting in physical habitat degradation (Schueler 1994). Streambank erosion is one of the leading causes of sediment suspension and deposition in streams leading to turbid conditions that may result in undesirable changes to aquatic life (Waters 1995). Sediment deposition alters habitat for aquatic plants and animals by filling interstitial spaces in substrates important to macroinvertebrates and some fish species. Physical habitat degradation also occurs when high and frequent flows result in loss of riffle-pool complexes. Booth and Reinelt (1993) found that a threshold in habitat quality exists at approximately 10% to 15% imperviousness.

Impervious Cover Estimate & Future Vulnerability

In 1998, the Center for Watershed Protection (CWP) published the Rapid Watershed Planning Handbook. This document introduced rapid assessment methodologies for watershed planning. The CWP released the Watershed Vulnerability Analysis as a refinement of the techniques used in the Rapid Watershed Planning Handbook (Zielinski 2002). The vulnerability analysis focuses on existing and predicted impervious cover as the driving forces impacting potential stream quality within a watershed. It incorporates the Impervious Cover Model described above to classify Subwatershed Management Units (SMUs).

AES used a modified *Vulnerability Analysis* to compare each SMU's vulnerability to projected land use changes across the Spring Creek watershed. Three steps were used to generate a vulnerability ranking of the SMUs. The results are used to make recommendations in the Action Plan related to curbing the negative effects of predicted land use changes on the watershed. The three steps are listed below and described in detail in the following pages:

1. Initial classification of SMUs based on existing (2011) land use/land cover and impervious cover;
2. Future classification of SMUs based on predicted land use/land cover and impervious cover,
3. Vulnerability Ranking of SMUs based on changes in impervious cover.

Step 1: Initial Classification

The first step in the vulnerability analysis involves an initial classification of each SMU based on existing (2011) measured impervious cover. Calculating existing (2011) and predicted impervious cover in the Spring Creek watershed begins with an analysis of land use/land cover. Existing (2011) impervious cover is calculated by assigning an impervious cover percentage for each land use/land cover category based upon the U.S. Department of Agriculture's (USDA) Technical Release 55 (TR55). TR55 provides estimates of impervious cover based on land use categories. GIS analysis is used to estimate the percent impervious cover for each Subwatershed Management Unit (SMU) in the watershed using existing and predicted land use/land cover data. Each SMU then receives an initial classification (Sensitive, Impacted, or Non-Supporting) based on percent of existing impervious cover (Table 11; Figure 21).

Six SMUs are classified as Sensitive, 9 as Impacted, and 2 as Non-Supporting. The majority of the Sensitive SMUs are located in the central portion of the watershed in areas comprised of forest preserve and large lot residential within Barrington Hills. Impacted SMUs are generally located in areas with mixed medium & large lot residential, equestrian, and agricultural land uses. The two Non-Supporting SMUs (SMUs 1 & 16) are located in the far southeast corner and northern border of the watershed in heavily developed areas comprised mostly of retail, commercial, and/or small single family residential lots.

Table 11. Existing & predicted impervious cover for Subwatershed Management Units (SMUs).

SMU #	Step 1: Existing Impervious %	Step 2: Predicted Impervious %	Percent Change	*Impervious Classification	Step 3: Vulnerability
SMU1	27%	34%	8%	Non-Supporting	Medium
SMU2	16%	23%	7%	Impacted	High
SMU3	19%	22%	3%	Impacted	Medium
SMU4	0%	0%	0%	Sensitive	Low
SMU5	22%	23%	1%	Impacted	Medium
SMU6	5%	7%	2%	Sensitive	Low
SMU7	11%	12%	0%	Impacted	Low
SMU8	8%	8%	0%	Sensitive	Low
SMU9	9%	9%	0%	Sensitive	Low
SMU10	4%	4%	0%	Sensitive	Low
SMU11	8%	9%	2%	Sensitive	Medium
SMU12	12%	12%	0%	Impacted	Low
SMU13	13%	13%	1%	Impacted	Low
SMU14	14%	15%	0%	Impacted	Low
SMU15	23%	25%	2%	Impacted	Medium
SMU16	31%	31%	0%	Non-Supporting	Low
SMU17	23%	25%	2%	Impacted	Medium

*No change in impervious classification occurred between existing and predicted conditions for all SMUs

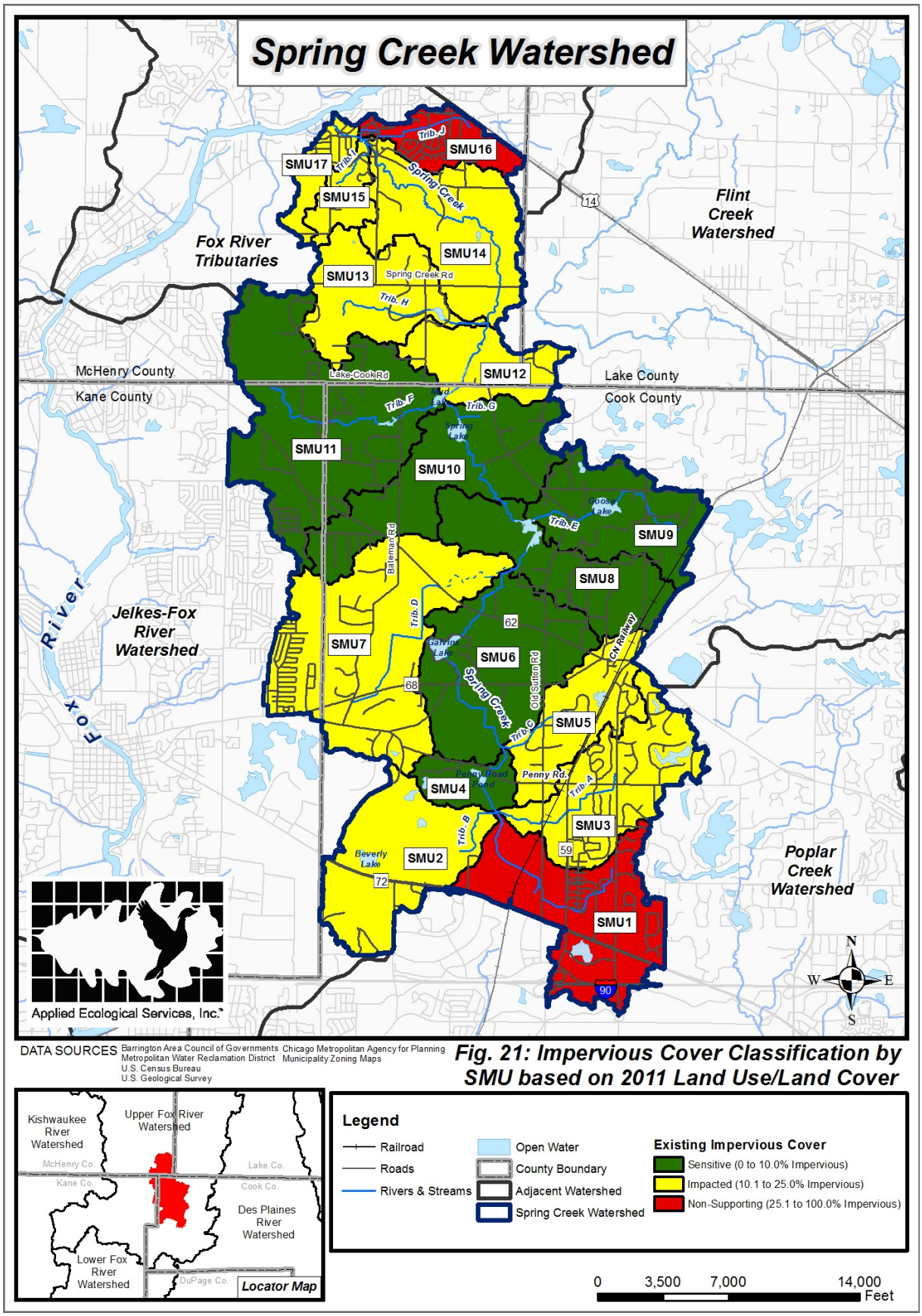


Fig. 21: Impervious Cover Classification by SMU based on 2011 Land Use/Land Cover

Step 2: Future Classification
Predicted impervious cover was evaluated during the second step of the vulnerability analysis. For this study, projected imperviousness was based on future land use/zoning maps found in municipal comprehensive plans. Like the initial classification, a predicted classification of Sensitive, Impacted, or Non-Supporting was assigned to each SMU. This step is important because it identifies Sensitive and some Impacted SMUs that are most vulnerable to future development pressure. None of the 17 SMUs changed impervious classification compared to existing (2011) conditions despite several predicted land use changes in the southern, central, and northwest portions of the watershed. Figure 21depicts percent change in impervious cover for each SMU from existing to predicted land use conditions. SMUs 1 & 2, located in the southern portion of the watershed, are expected to see additional retail, commercial, and residential land use changes and therefore are predicted to change the most. SMUs 3, 5, 6, 11, 13, 15, and 17 are also expected to see some future residential development primarily in areas that are currently agricultural.

Step 3: Vulnerability Ranking
The vulnerability of each SMU to predicted future land use changes was determined by considering the following questions:

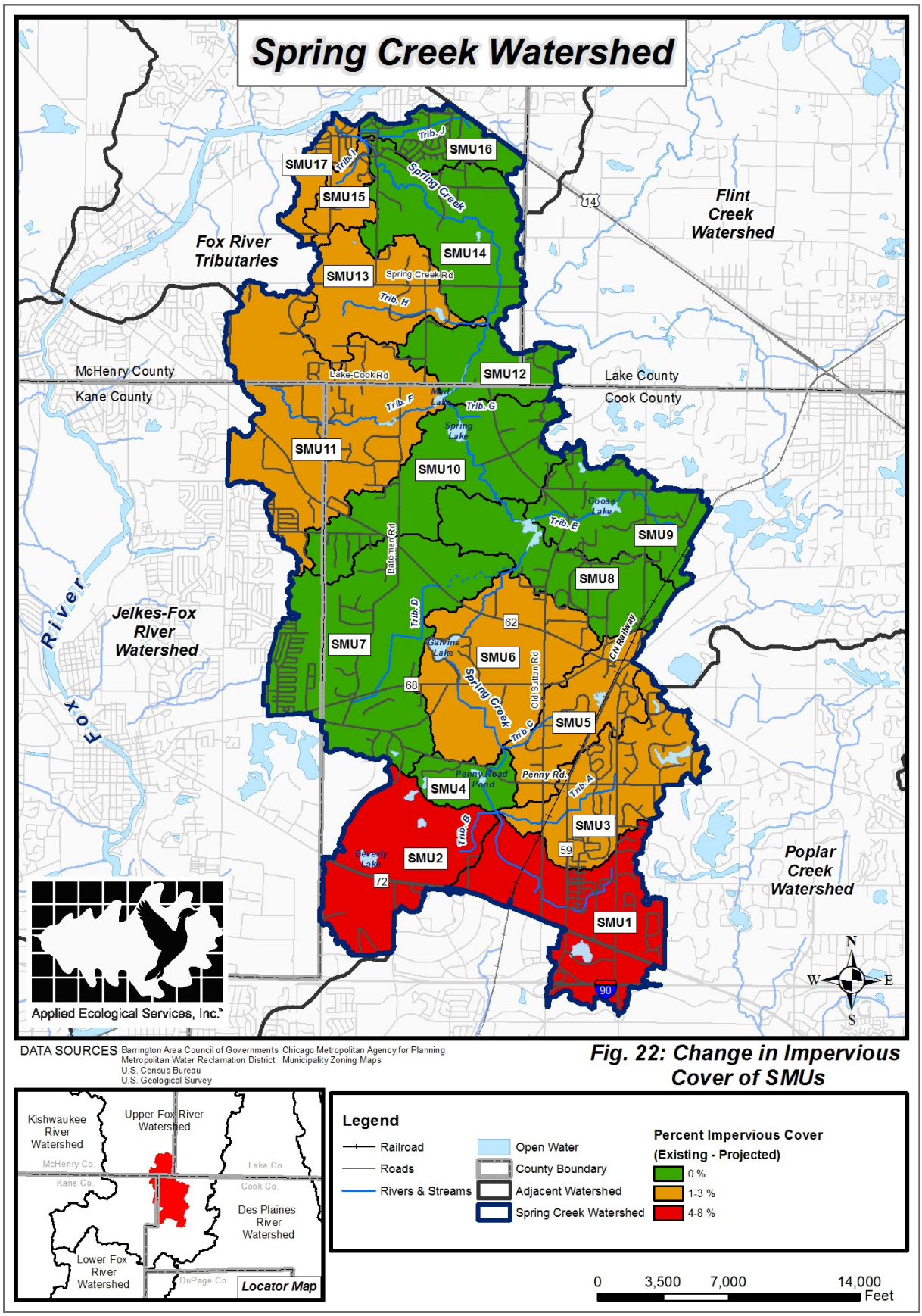
1. Will the SMU classification change? (e.g. shift from sensitive to impacted);
2. Does the SMU classification come close to changing (within 2%)? (e.g. future impervious cover is predicted at 9.0%);
3. What is the absolute change in impervious cover from existing to projected conditions? (e.g. a SMU that increases by 10% is more vulnerable than a SMU that increase only 1%)

A vulnerability of low, medium, or high was assigned to each SMU based on the following:

Low = no change in classification, <2% change in impervious cover;
Medium = classification close to changing (within 2%) and/or 3-5% change in impervious cover;
High = classification change or close to changing (within 2%) and >5% change in impervious cover.

The vulnerability analysis resulted in 1 High, 6 Medium, and 10 Low ranked SMUs (Table 11; Figure 23.) SMU 2 was the only SMU ranked as highly vulnerable to future problems associated with impervious cover because it was close to changing from Impacted to Non-Supporting and showed an increase of over 5% impervious cover based on predicted land use changes. SMUs 1, 3, 5, 11, 15, and 17 were all moderately vulnerability because they are predicted to come close to changing classification but have less than 5% predicted increase in impervious cover. The remainder of the SMUs are not considered vulnerable to predicted land use changes based on the established criteria.

In addition, the Forest Preserve District of Cook County (FPDCC) considers SMU 11 a critical area to protect against the potential impacts of future development as this SMU drains via Tributary F into Mud Lake, part of the Spring Lake Nature Preserve within Spring Creek Valley Forest Preserve. Two large areas that are currently agricultural but slated for future development within SMU 11 are considered "Priority Protection Areas" (see Section 4.0). Conservation development and/or low impact design standards are recommended for these parcels when/if developed. The FPDCC also recommends more protection, easement agreements, and other Management Measures for SMUs 6, 7, and 9.



DATA SOURCES Barrington Area Council of Governments Chicago Metropolitan Agency for Planning
Metropolitan Water Reclamation District Municipality Zoning Maps
U.S. Census Bureau
U.S. Geological Survey

Fig. 22: Change in Impervious Cover of SMUs

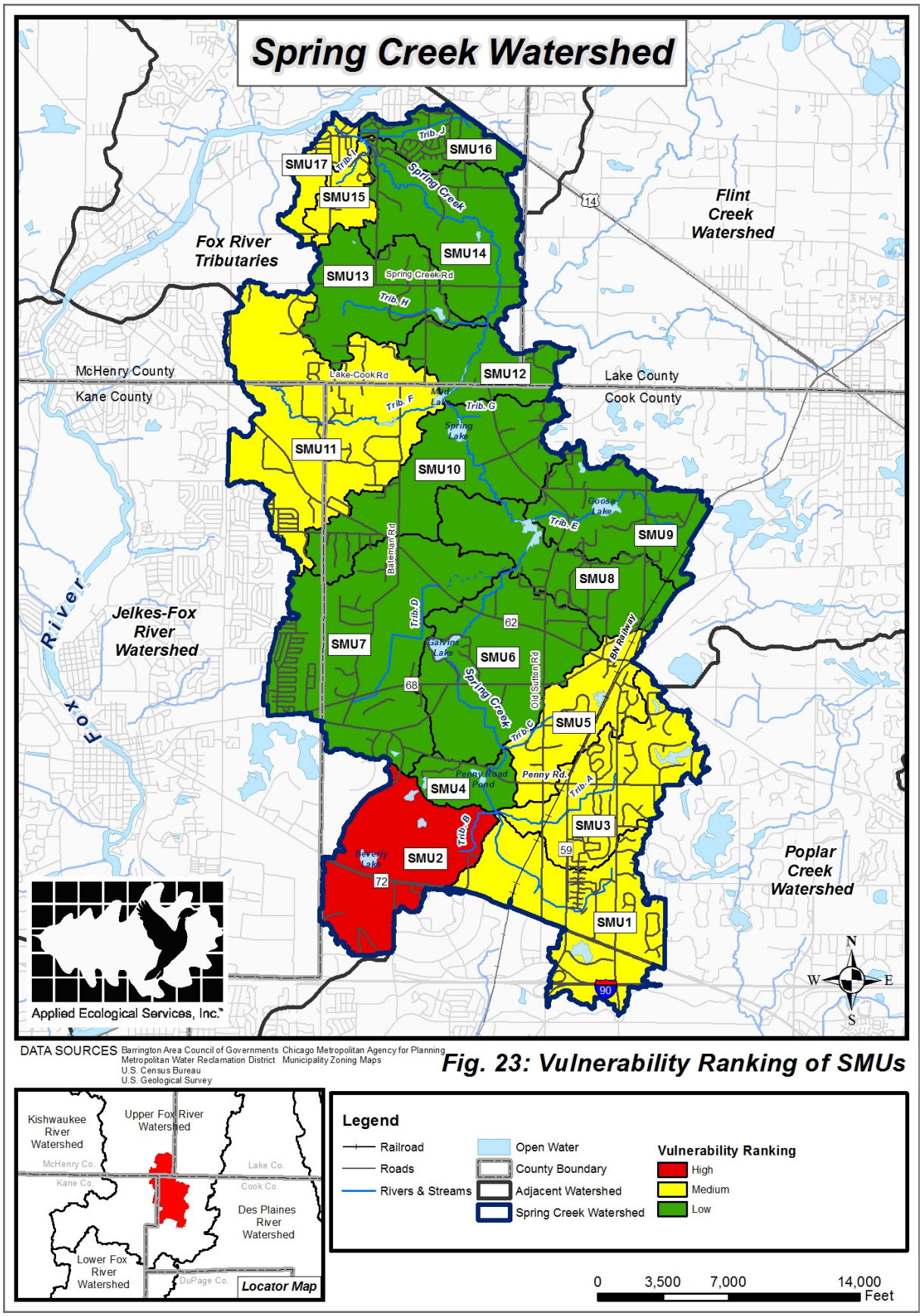


Fig. 23: Vulnerability Ranking of SMUs

3.10 Open Space Inventory, Prioritization, & Green Infrastructure Network Plan

A primary objective of the watershed planning process is to examine open space in the Spring Creek watershed and determine how this open space best fits into a "Green Infrastructure Network" which is best defined as an interconnected network of natural areas and other open space that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife (Benedict 2006). Natural areas such as wetlands, woodlands, prairie, natural features such as streams, as well as working lands such as farms can be considered components of a Green Infrastructure Network. Green infrastructure can also include portions of developed areas like naturalized detention basins and buffers.

A three step process was used to create a Green Infrastructure Network plan for the Spring Creek watershed. Step one involved inventorying parcel based open space. Second, open space was prioritized based on a set of criteria important to green infrastructure. Finally, prioritized open space, smaller linking parcels, ecologically significant areas, and stakeholder recommendations were combined to form the network.

For this study, "open space" is generally defined as any parcel that is not developed such as a forest preserve district owned parcel. Other parcels are classified as "partially open". These parcels are generally private but are large enough and with minimal development to offer potential open space opportunities. Parcels that are mostly built out are considered "developed". Agricultural land is also classified as partially open.

Open space is either protected or unprotected. Protected open space differs from unprotected in that it is permanently preserved by outright ownership by a body chartered to permanently preserve land, or by a permanent deed restriction such as a conservation easement.

Open and Partially Open Parcels

There are 4,665 parcels of land in the Spring Creek watershed. Of these, 203 "open space" parcels (26% of watershed) and 1,081 "partially open" parcels (50% of watershed) were identified totaling 76% of the watershed area is open space (Table 12, Figure 24). Developed parcels account for another 20% of the watershed area. Open space parcels average nearly 22 acres in size while partially open parcels are nearly 8.1 acres. A closer look at Figure 24 indicates that most of the open space is located in protected natural areas such as Spring Creek Valley Forest Preserve, Helm Woods Forest Preserve, Foxmoor Park, and Poplar Creek Forest Preserve. Other open space is located along a Commonwealth Edison utility easement and private land.

Table 12. Summary of open and partially open parcels.

Parcel Type	Parcels (n)	Area (acres)	Average Size (acres)	% of Watershed
Closed (Developed)	3,381	3,472	1.0	20%
Open Space	203	4,470	22.0	26%
Partially Open Space	1,081	8,753	8.1	50%
Totals	**4,665**	**16,558**	**3.5**	**96%**

***** 4% of watershed (681 acres) is unclassified parcels - mostly roads

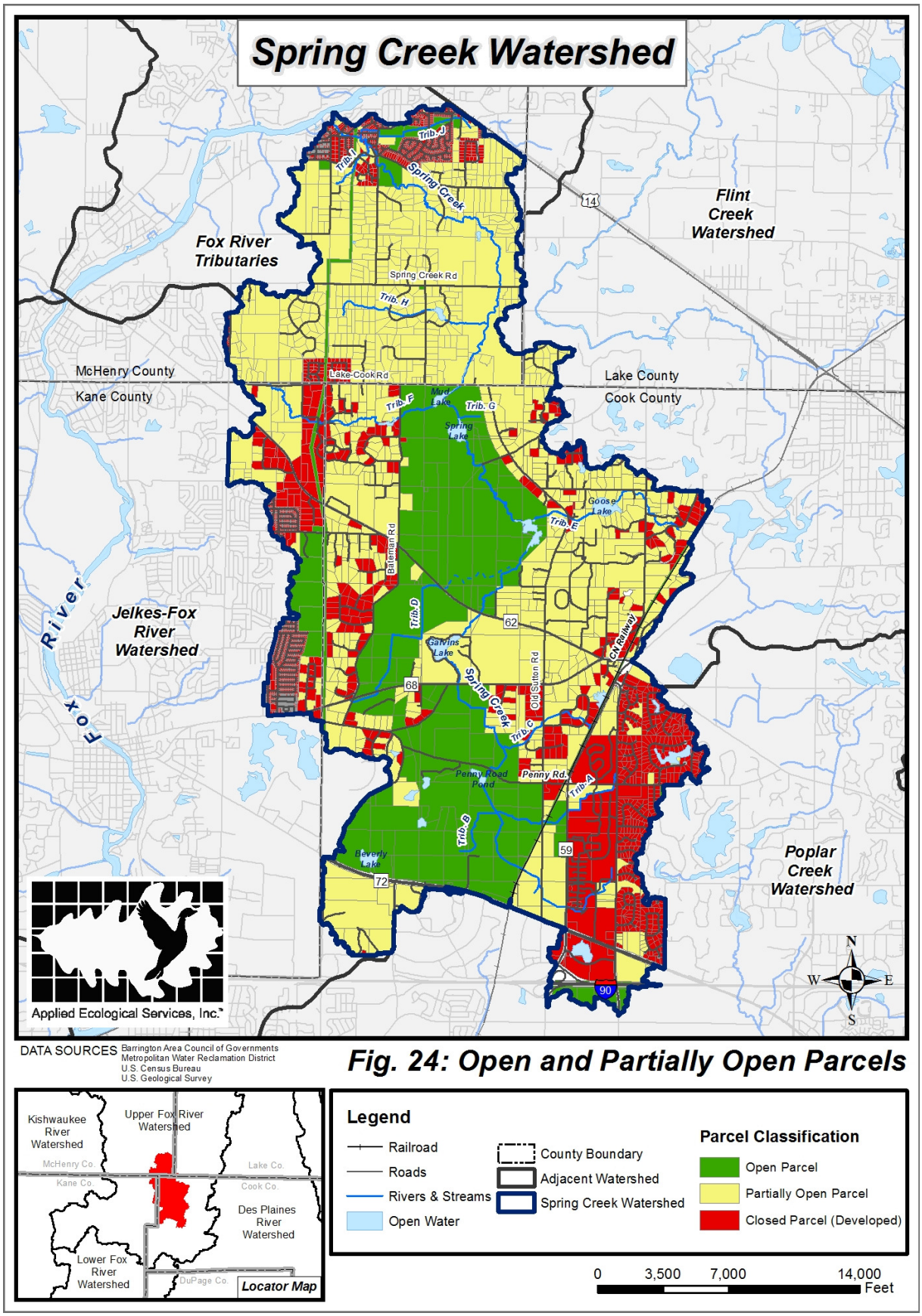


Fig. 24: Open and Partially Open Parcels

Public/Private Ownership of Open and Partially Open Parcels

The public or private ownership of each open and partially open parcel was determined from available parcel data. Publicly owned parcels include those owned by federal, state, county, or municipal government, the forest preserve districts of Kane and Cook Counties, park districts, school districts, and townships. Private ownership types include homeowners/business associations, land trusts, commercial, residential, private clubs, religious, universities, and utilities.

The amount of publicly owned land in the watershed is important because it reduces land acquisition fees for implementation of management measures such as conservation, riparian corridor protection, and stormwater retrofitting. Recommended Management Measures in the Action Plan that are located on public parcels are generally higher priority than similar projects located on private land.

Table 13 includes a summary of public versus private ownership for open and partially open parcels, and Figure 25 depicts the location of these parcels. 158 parcels combine to equal 4,229 acres of publicly owned open space (25% of the watershed). Partially open public land such as parks with ball fields consists of 21 parcels totaling 94 acres (<1% of the watershed). As expected, most of the public open space is located in protected natural areas such as Spring Creek Valley Forest Preserve, Helm Woods Forest Preserve, Foxmoor Park, and Poplar Creek Forest Preserve. (These charts are for informational purposes only and accuracy is not guaranteed.)

Table 13. Public versus private ownership of open and partially open parcels.

Parcel Type	Parcels (n)	Area (acres)	Average size (acres)	% of Watershed
Open				
Private	45	241	5.4	1%
Public	158	4,229	26.8	25%
Partially Open				
Private	1,060	8,659	8.2	50%
Public	21	94	4.4	<1%
Totals	**1,284**	**13,223**	**10.3**	**76%**

***** 4% of watershed (681 acres) is unclassified parcels - mostly roads

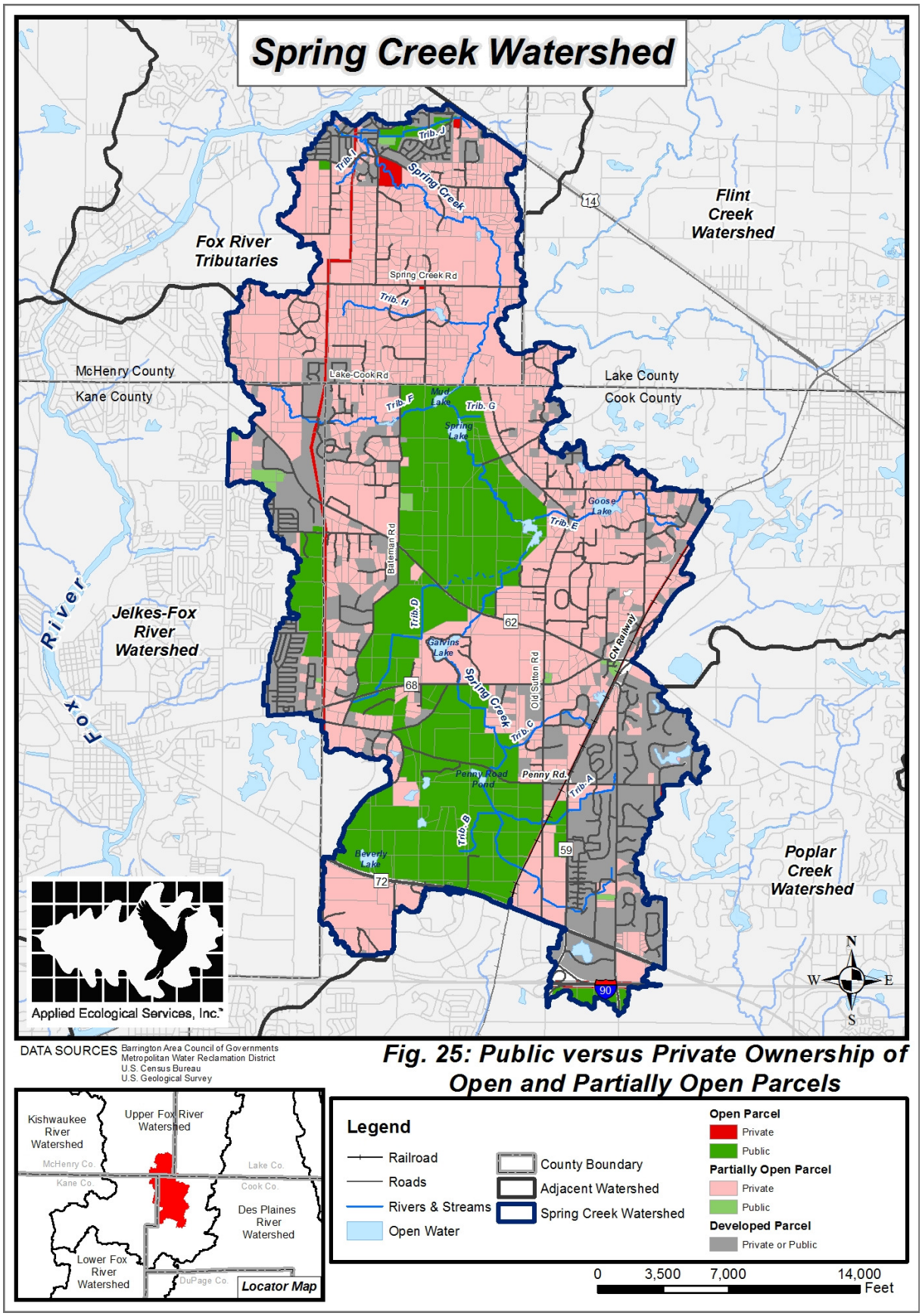


Fig. 25: Public versus Private Ownership of Open and Partially Open Parcels

Protected Status of Open and Partially Open Parcels

Preservation of open space in the Spring Creek watershed is critical to maintaining and expanding green infrastructure and is an important component of sustaining water quality, hydrological processes, ecological function, and the general quality of life for both animals and people. Without preservation, open space can be converted to other land uses in the future. Of the 13,223 acres of open and partially open space in the watershed, 4,230 acres (25%) are open and protected, and 498 acres (3%) are partially open and protected (Table 14, Figure 26). The majority of protected open and partially open parcels include forest preserve districts, township and village open space, and equestrian areas. Incorporation of unincorporated land areas for equestrian and agricultural use would provide greater protection of the watershed.

Because the loss of existing open and partially open space to other land uses poses a significant threat to watershed resources, opportunities to acquire and preserve additional open space will be extremely important in the next 10-20 years. Figure 26 identifies several large partially open space parcels that are currently not protected. Many of these areas abut existing protected open space such as those around Spring Creek Valley Forest Preserve and Helm Woods Forest Preserve. While most of these surrounding areas are single family residential that are unlikely to be acquired and redeveloped, there are agricultural lands that could be acquired in the future. By protecting or preserving these parcels, existing protected open space and greenways can be expanded.

Table 14. Protected versus unprotected status of open and partially open parcels.

Parcel Type	Parcels (n)	Area (acres)	% of Watershed
Open			
Unprotected	44	240	<1%
Protected	159	4,230	25%
Partially Open			
Unprotected	1,041	8,255	48%
Protected	40	498	3%
Totals	**1,284**	**13,223**	**76%**

***** 4% of watershed (681 acres) is unclassified parcels - mostly roads

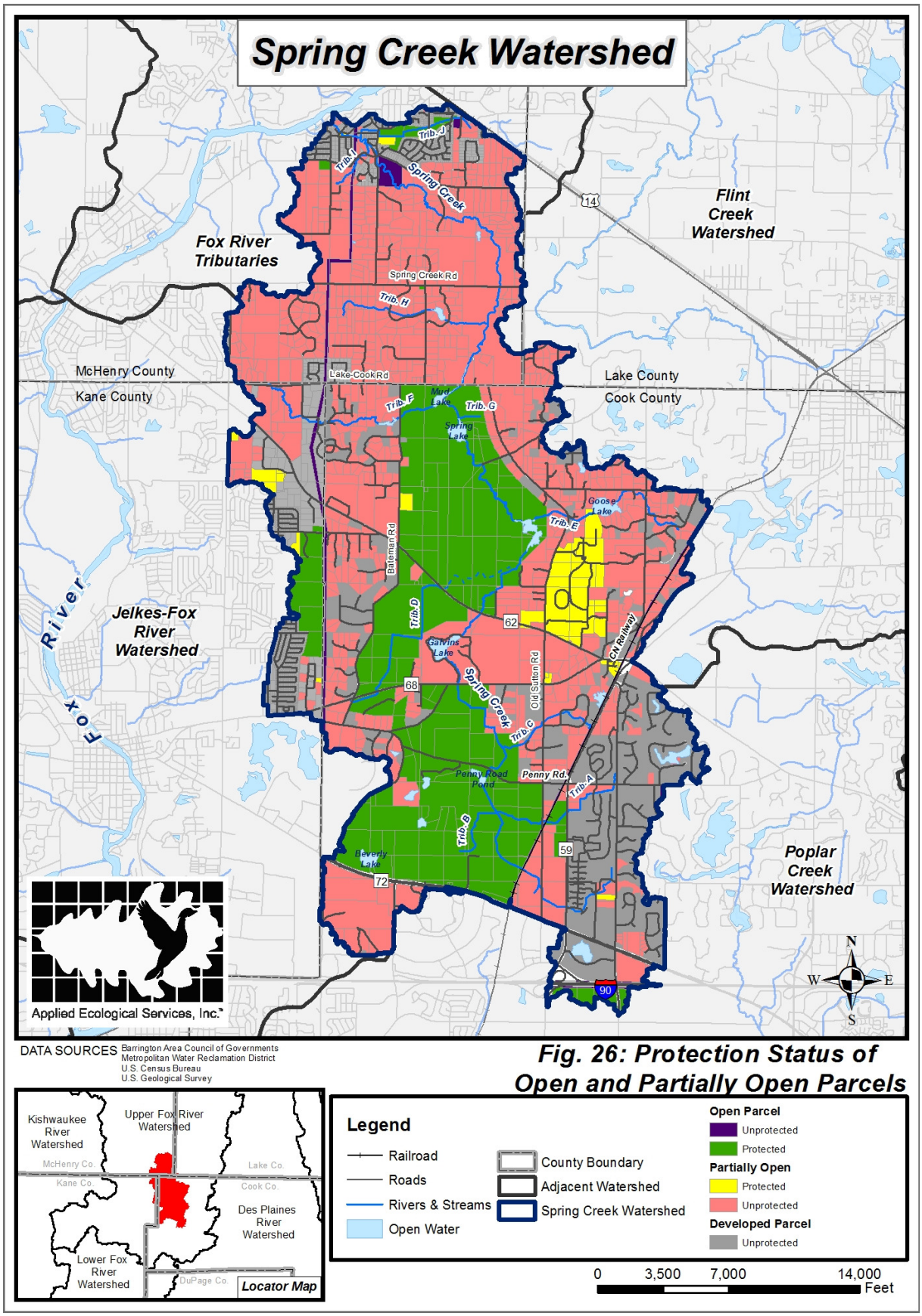


Fig. 26: Protection Status of Open and Partially Open Parcels

Open Space Parcel Prioritization

Prioritizing open and partially open parcels is the second step in forming a Green Infrastructure Network plan for the Spring Creek watershed. This step includes applying 11 prioritization criteria important to green infrastructure via a GIS analysis (Table 15). If an open or partially open parcel met a criterion it received one point; if the parcel did not meet that criterion, it did not receive a point. This process was repeated for each open and partially parcel and for all criteria. The total points received for each parcel were summed to determine parcel importance within the Green Infrastructure Network. Parcels with the highest number of points are more important to green infrastructure than parcels that met fewer criteria.

The combined possible total of points any one parcel can accumulate is 11 (11 of 11 total criteria met). The highest total value received by a parcel in the weighting process was 9 (having met 9 of the 11 criteria). After completion of the prioritization, parcels were categorized as "High Priority", "Medium Priority", or "Low Priority" based on point totals. Parcels meeting 6-9 of the criteria are designated High Priority for inclusion into the Green Infrastructure Network while parcels meeting 4-5 criteria are designated Medium Priority. Parcels with a combined value of 1-3 are categorized as Low Priority. Parcels with a score of 0 are not considered a priority.

Table 15. Criteria used to prioritize parcels for a Green Infrastructure Network.

Green Infrastructure Criteria
1. Open or partially open parcels that intersect 100-year floodplain and inundation areas
2. Open or partially open parcels within 0.5-miles of any headwater stream
3. Open or partially open parcels that intersect a wetland
4. Open or partially open parcels that intersect a high quality (ADID) wetland
5. Open or partially open parcels that intersect a potential wetland restoration site
6. Open or partially open parcels that are within 100 feet of a watercourse or lake
7. Open or partially open parcels equal to or greater than 5 acres
8. Open or partially open parcels in a "Highly Vulnerable" Land Use/Land Cover SMU
9. Open or partially open parcels adjacent to or including Forest Preserves/Nature Preserves and other privately or publicly protected open space
10. Open or partially open parcels that intersect "Critical", "Important", or "Moderate" groundwater recharge areas
11. Open or partially open parcels that intersect existing or planned trails

Figure 27 depicts the results of the parcel prioritization. An obvious correlation can be seen between High Priority and Medium Priority open or partially open parcels and their relation to Spring Creek and its tributaries. Nearly all the open space adjacent to or including Spring Creek is High Priority while most of the open space surrounding the tributaries is at least Medium Priority. Low Priority parcels generally fall outside the vicinity of Spring Creek and its tributaries.

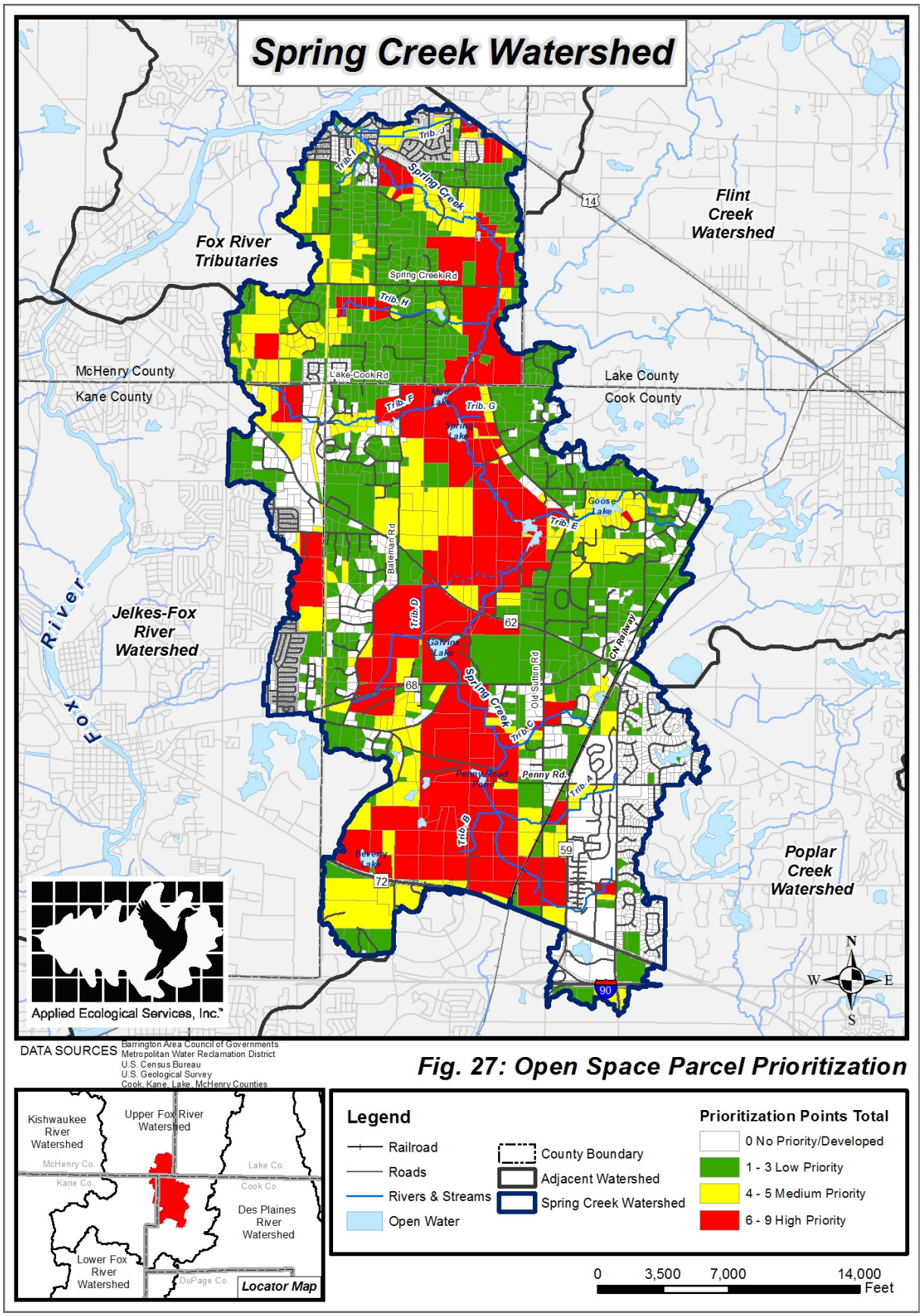


Fig. 27: Open Space Parcel Prioritization

Green Infrastructure Network Plan

So far, two of the three steps required to create a Green Infrastructure Network plan have been completed. The final step involves the actual creation of the network using prioritized open space, linking smaller parcels, ecologically significant areas, information gathered during the watershed characteristics inventory, and stakeholder recommendations. County and regional wide green infrastructure plans generally feature stream corridors, wetlands, floodplain, buffers, and other natural components. The green infrastructure network created for this watershed study captures all the natural components but at the parcel level. This is important because creation of green infrastructure involves protection of land through acquisition, regulation, or incentives and is almost always done at the parcel level.

Perhaps the most important aspect of green infrastructure planning is that it helps communities identify and prioritize conservation opportunities and plan development in ways that optimize the use of land to meet the needs of people and nature (Benedict 2006). It does this by providing a framework for future growth that pre-identifies areas not suitable for development or green infrastructure where development is suitable but should follow conservation or low impact design.

Green infrastructure plan implementation involves three steps:

1) Identification of a Green Infrastructure Network
2) Protection of unprotected green infrastructure parcels through acquisition, regulation, conservation easements and/or incentives
3) Long term ecological management of green infrastructure

Step one or identification of a Green Infrastructure Network for Spring Creek watershed has been completed as part of this watershed study (Figure 28). The network is a system of *Hubs*, *Links*, and *Sites* comprised of ecologically significant areas, private and public protected parcels, large unprotected parcels, and smaller unprotected residential parcels. Hubs generally consist of the largest, highest quality, least fragmented ecologically significant areas such as ADID wetlands. All of Spring Creek Valley Forest Preserve, and small piece of Poplar Creek Forest Preserve in Cook County and Helm Woods Forest Preserve in Kane County are considered hubs. Links are generally formed by private/unprotected parcels along many of the tributaries to Spring Creek. These links are extremely important because they provide biological conduits between hubs. Links also provide potential opportunities for trail connections between hubs. Sites are generally smaller than hubs and in many cases are not connected to the larger green infrastructure network but still provide important ecological and social values.

Protection of unprotected parcels is the second green infrastructure planning step and occurs via three tools; 1) acquisition, 2) regulation, and/or 3) incentives. The simplest form of acquisition is through outright purchase or donations but can also occur through conservation easements and land trusts. Protection of land through state and federal regulation covers natural features such as wetlands or threatened and endangered species/important habitat. Local regulation protection occurs by enforcing stormwater, zoning, comprehensive plans, and subdivision ordinances. Keeping with the current low-density land use patterns, and the inclusion of equestrian trails, separate from other trail use types, where appropriate would help protect the watershed. Regulatory action can also come in the form of Special Service Area assessments and Development Impact Fees. Land protection through incentives usually occurs on smaller private lands. Some incentives include landowner recognition/rewards, tax incentives, or benefits for farms through the Conservation

Reserve Program. A more detailed list of the tools and methods for protecting green infrastructure are included in Table 16.

Table 16. Tools for protection of green infrastructure.

Tool	Method of Implementation
Land Acquisition	Outright purchase Conservation easements Donations Land trusts
Regulation	Buffer or landscape ordinance Comprehensive plans Development Impact Fee Mitigation and mitigation banking Special Service Area assessment Stormwater regulations Subdivision ordinances Zoning Wetland permitting T&E species and habitats
Incentives	Management agreements Landowner recognition and rewards Tax incentives Technical assistance from local agencies Conservation Reserve Program

Source: Benedict 2006.

A green infrastructure network can only be realized by planning efforts of local municipalities, forest preserve districts, developers, private land owners, and other stakeholders. Each governing community and major stakeholder groups in the watershed should follow the recommended process below to initiate and implement the green infrastructure plan for Spring Creek watershed.

1) Identify and designate a lead person to serve as an open space plan "coordinator" and meet with other stakeholderse to plan for future green infrastructure.
2) Include all green infrastructure parcels in community comprehensive plans and development review maps.
3) Create zoning overlay and update development ordinances to require conservation and/or low impact development design on all green infrastructure parcels.
4) Require Development Impact Fees and/or Special Service Area taxes for all new development to help fund future management of green infrastructure.
5) Identify unprotected green infrastructure buffer parcels adjacent to existing forest and nature preserves and other sites with high quality natural areas then protect and implement long term management.
6) Work with private land owners along stream and tributary corridors to protect and manage their land. An excellent source for riparian area management information is the "Riparian Area Management: A Citizen's Guide" produced by the Lake County Stormwater Management Commission and included in Appendix C of this report.
7) Use the Green Infrastructure Network to identify and create new trails and trail connections.

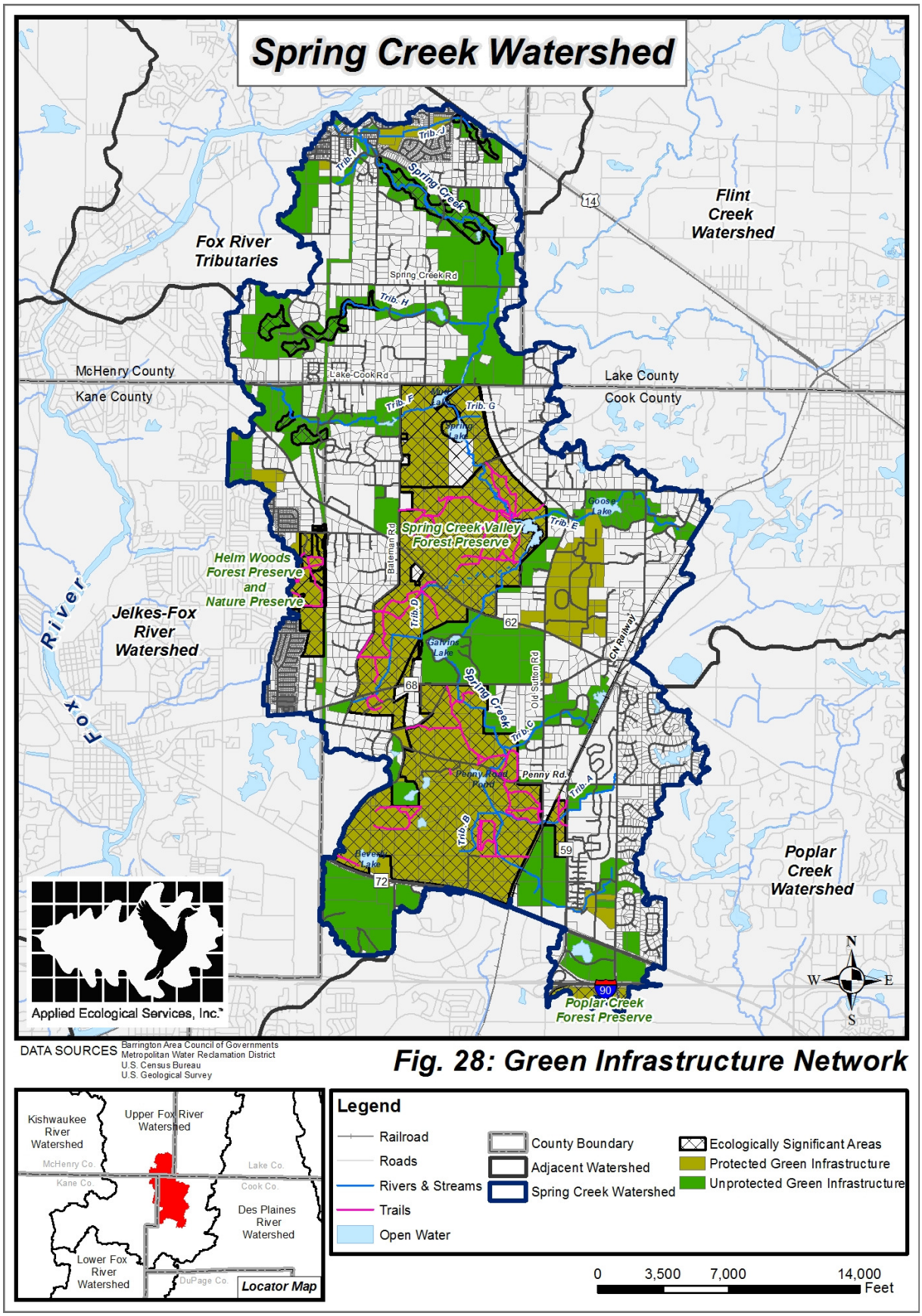


Fig. 28: Green Infrastructure Network

3.11 Ecologically Significant Areas

High quality wetlands (ADID wetlands), forest preserves, nature preserves, and Illinois Natural Area Inventory (INAI) sites are all considered "Ecologically Significant Areas" within the Spring Creek watershed. These areas often provide high quality habitat for and harbor uncommon or even threatened & endangered (T & E) species. These areas also provide large greenway corridors that interconnect land and waterways, support native species, maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life for communities and people. Several Ecologically Significant Areas are located in the watershed including 12 ADID wetlands (McHenry and Kane County only), 3 forest preserves, 2 nature preserves, and 3 INAI sites (Figure 29).

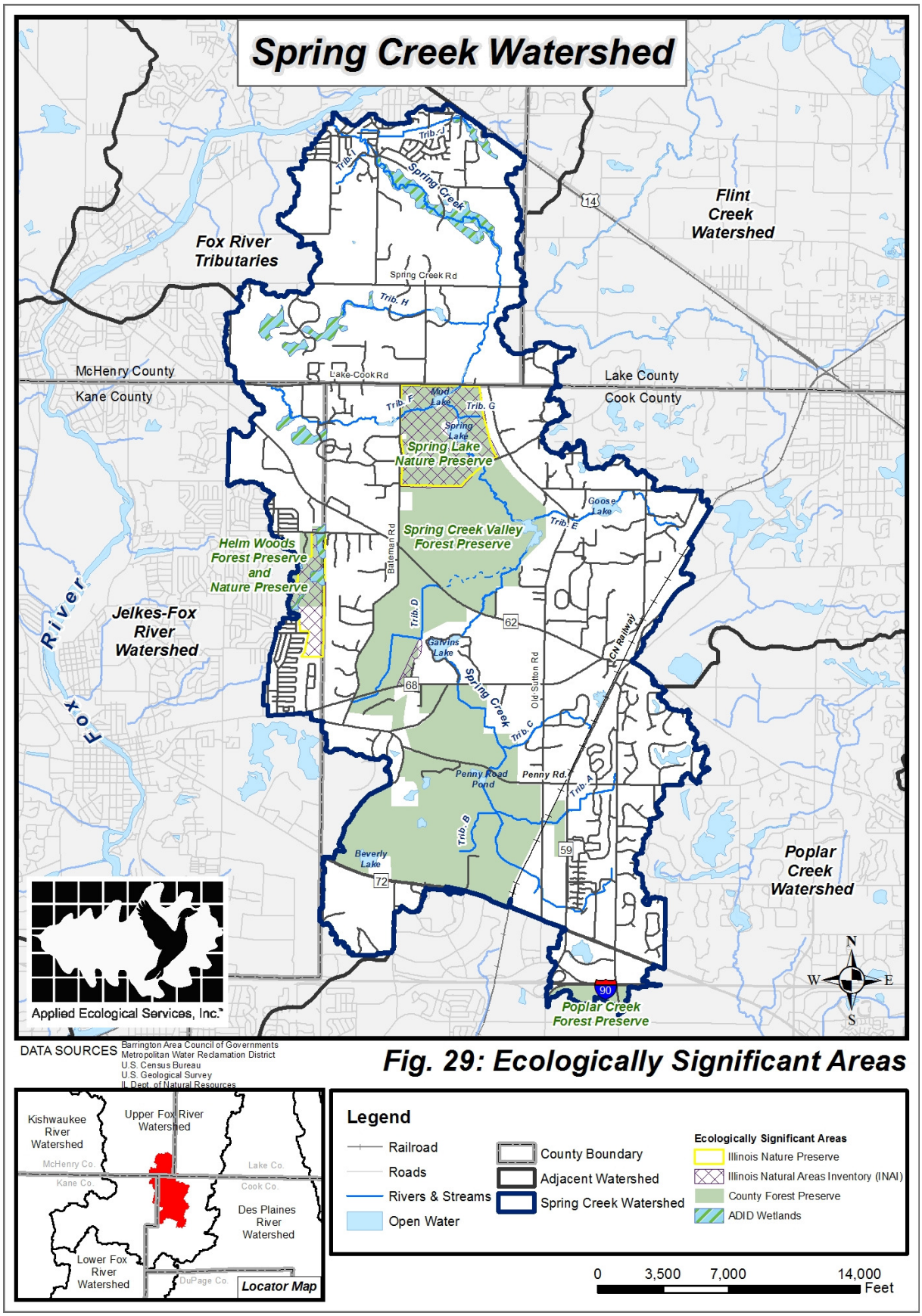
ADID Wetlands

The Advanced Identification (ADID) wetland inventory was completed for Lake, McHenry, and Kane Counties. These inventories were conducted in order to identify the functional and ecological values of individual wetlands as well as identify wetlands where special protection should be enforced. Local communities can use the ADID inventory to help them better understand the values and functions of wetlands under their jurisdiction. The 12 ADID wetlands located in the watershed are mapped on Figure 29. Three of these ADID wetlands are located in Helm Woods Forest Preserve/Nature Preserve which makes up a unique northern flatwoods habitat in the watershed that is protected. Wetlands are present in Cook County but an ADID wetland inventory has not been completed for this county. A separate wetlands map and more detailed description of their ecological significance are found in Section 3.12.3.

Forest Preserves, Nature Preserves, & INAI Sites

Three forest preserves, two which include an Illinois Nature Preserve, are located in Spring Creek watershed (Figure 29). Forest Preserves include Spring Creek Valley Forest Preserve, and Poplar Creek Forest Preserve located in the Cook County portion of the watershed. Helm Woods Forest Preserve is located in Kane County. Spring Lake Nature Preserve is found within the northern portion of Spring Creek Valley Forest Preserve while Helm Woods Nature Preserve is located within Helm Woods Forest Preserve and extends south onto open space owned by Dundee Township. Illinois Nature Preserves offer the highest level of protection for T&E species and natural communities. Forest preserves are county owned and also offer some protection to T&E species and natural communities.

The Illinois Natural Areas Inventory (INAI) was originally conducted from 1975-1978 by the Illinois Nature Preserves Commission (INPC) in order to provide information on high quality natural areas, habitats of endangered species, and other significant natural features. The inventory is currently being updated by a team consisting of the Illinois Department of Natural Resources (IDNR), INPC, INHS (Illinois Natural History Survey) and Applied Ecological Services, Inc. (AES). There are 3 INAI sites in the Spring Creek watershed (Figure 29). The first is found within Spring Lake Nature Preserve located in the northern portion of Spring Creek Valley Forest Preserve and contains high quality prairie and sedge meadow. The second INAI site is also located in Spring Creek Valley Forest Preserve just north of Route 68 and is noted for a high quality dry gravel prairie. The third INAI site is found within Helm Woods Nature Preserve and is on the inventory for its high quality dry-mesic upland forest and northern flatwoods communities.



DATA SOURCES
Barrington Area Council of Governments
Metropolitan Water Reclamation District
U.S. Census Bureau
U.S. Geological Survey
IL Dept. of Natural Resources

Fig. 29: Ecologically Significant Areas

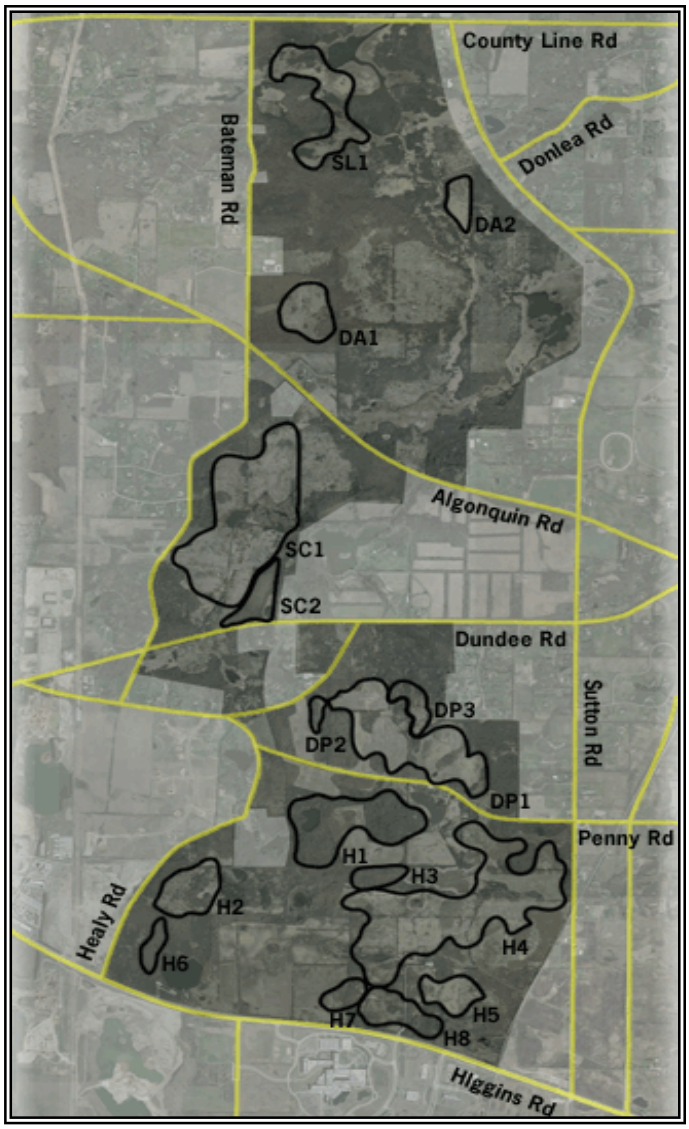
Spring Creek Valley Forest Preserve

Current Management

The Spring Creek Valley Forest Preserve consists of 3,910 acres owned and managed by the Forest Preserve District of Cook County (FPDCC). Several groups are partnered with the FPDCC in management and restoration efforts, including the U.S. Army Corps of Engineers-Chicago District, Audubon Chicago Region, Barrington Countryside Park District, Citizens for Conservation, Riding Club of Barrington Hills, Sierra Club – Northwest Cook Group, Spring Creek Volunteers, and the U. S. Fish and Wildlife Service (Chicago Wilderness 2011). First dedicated as a forest preserve in 1956, land acquisition continued through 1999 in parcel sizes ranging from 1 to 454 acres and including over 55 land owners (Chicago Wilderness 2011). In the summer of 2010, the National Audubon Society proclaimed the Preserve as an Important Bird Area for Black-billed Cuckoos, Henslow's Sparrows, bobolinks, meadowlarks, grasshopper sparrows, dickcissels, willow flycatchers, and blue-winged warblers.

To date, the management of the Spring Creek Valley Forest Preserve is divided into five regions: 1) Spring Lake Nature Preserve, 2) Donlea to Algonquin Road (Route 62), 3) Spring Creek Valley, 4) Dundee (Route 68) to Penny Road, and 5) Headwaters. Brush and burn management has resulted in hydrological benefits such as rehydration of soils and return of native grasses and sedges. This highlights the importance of having a comprehensive watershed-based plan approach to help nature with its own healing.

Within Spring Creek Valley Forest Preserve lies Region 1 comprised of the 560 acre Spring Lake Nature Preserve between County Line Road (Lake-Cook Road) and Donlea Road. This area contains a mixture of woodland, prairie, marsh, fen, and old field communities with two glacial lakes; Spring Lake and Mud Lake. "Most of the area surrounding the lakes is a peat-filled depression that supports a variety of aquatic vegetation and wetland wildlife. Small fens, sedge meadows, and mesic prairie communities occur throughout and contribute much to the species richness of the preserve. Open-grown bur oaks occur along the slopes of the moraines that lie on three sides of the preserve." The preserve was dedicated in January of 1965 as the 11th Illinois Nature Preserve (IDNR 2011). Within the Spring Lake Nature Preserve is an



Source: Chicago Wilderness Habitat Project

Figure 30. Spring Creek Valley Forest Preserve Management Regions

INAI site called Spring Lake Prairie (SL1 on Figure 30). This site is approximately 30 acres of prairie and sedge meadow that has been managed by brush control and controlled burns since the early 1980s.

Region 2 within the Spring Creek Valley Forest Preserve is located between Donlea Road and Algonquin Road (Route 62). This region consists of 950 acres of former cropland and drained wetland hayfields and grazing lands (Chicago Wilderness 2011). Within this region lies the 50 acre Steeplechase Meadow (DA1 on Figure 30) where "shrubs and tree saplings have invaded a field of Eurasian pasture grasses. Restoration as a prairie shrubland began in 2006. The goal is to restore native shrubs and herbaceous plants in a matrix that will be managed by controlled burns." Bluebird Field (DA2 on Figure 30), also within Region 2, is a roughly 20 acre field that is "home to bluebirds, kingbirds, towhees and other birds of open shrubland. Neighbors and other volunteers have cleared away invasive weeds and buckthorn so that the scenic beauty and open shrubland habitat can be preserved. Native seed has been donated by Citizens for Conservation to help diversify and stabilize the grassland matrix (Chicago Wilderness 2011)." The Riding Center, and cooperative efforts of the Countryside Park District have assisted in the maintenance and preservation of the equestrian lifestyle that continues to protect and enhance the area.

View of Spring Creek Valley Forest Preserve

Spring Creek Valley, between Algonquin Road (Route 62) and Dundee Road (Route 68) makes up Region 3. Formerly a mix of bur oak savanna, prairie and wetland, this area contains a small (4 acre) high quality prairie known as Spring Creek Prairie (SC2 on Figure 30) that is also an INAI site. The rest of these 480 acres are now mostly Eurasian meadow, brushland and partially drained wetland. Management has consisted of brush and weed control and controlled burns by the Forest Preserve District.

During the winter of 2006, a grant from the Bobolink Foundation, allowed the Forest Preserve District to realize a long-planned removal of about 15 acres of invasive brush and a tree plantation to reconnect Spring Creek Prairie to the larger adjacent grassland. The Spring Creek Valley region also comprises about 70 acres called Spring Creek Valley Prairie (SC1 on Figure 30) known for its breeding grassland birds. However, this area grew in with invasive brush to the extent that by 2002 no grassland birds continued to breed. In response, Forest Preserve District staff mowed much of the brush during the winter of 2003. Subsequent monitoring found sandhill cranes, bobolinks, and grasshopper sparrows breeding the following summer. Additional brush and weed control was conducted every year since, funded by U.S. Fish and Wildlife, Exelon, and the Bobolink Foundation.

About 20 acres were also seeded in fall 2007 with rare seed donated by Citizens for Conservation. Currently there is a wide variety of grassland bird species breeding on this site including sedge wren, Henslow's sparrow, meadowlark, and others.

Region 4 includes 540 acres from Dundee (Route 68) to Penny Road. While this area was once mostly prairie and wetlands, the "area is currently a mix of hayfields (leased to farmers), recovering native prairie, brushland, tree plantation, and partially drained wetlands including a small high-quality fen. Some of the brushland contains important populations of shrubland birds. The hayfields are currently home to Henslow's sparrow, grasshopper sparrows, meadowlarks, bobolinks, and other birds of open grassland." Within this region lies the 110 acre restored Galloping Prairie (DP1 on Figure 30). Another 5 acre area known as Stony Ridge (DP2 on Figure 30) was seeded with local prairie seed by Citizens for Conservation and Spring Creek Volunteers. A wetland complex within this area includes "sedge meadow and streamside marsh (DP3 on Figure 30), was recognized for the high quality fen harboring the Baltimore checkerspot butterfly and rare plant species such as Kalm's lobelia and bog goldenrod. Possible breeding wetland species in the less-brushy wetland include sandhill crane, least bittern, and blue-winged teal (Chicago Wilderness 2011)."

Region 5 comprises the southern-most portion of the Spring Creek Valley Forest Preserve. This is considered the Headwaters, stretching from Penny Road to Higgins Road (Route 72). "Formerly a mix of oak woodland, oak savanna, prairie, sedge meadow and marsh, this 1,330-acre area includes the headwaters of Tributary B of Spring Creek. Vegetation now includes 50 acres of hay meadow and 160 acres of row crop fields leased to farmers and prairie restoration, as well as other communities in various stages of restoration." Within this region is 80 acres of mixed oak woodland known as Hidden Pond Woods (H1 on Figure 30), consisting of "bur, white, scarlet, swamp white and red oak along with shagbark and bitternut hickory, walnut and other natural species." Removal of invasives has been done here including "buckthorn and black locust, along with a reduction of numbers of ash, basswood, maple and others. The goal is the restoration of sustainable oak woodland. The Healy Road Savanna (H2 of Figure 30) consists of "about 50 acres of bur oak savanna and a slope with remnant bur, white and red oak woodland. Volunteers began in 2004 to restore this area (Chicago Wilderness 2011)."

Also within Region 5 is the Headwaters Prairie (H4 on Figure 30), a 500 acre area of which 140 acres have been undergoing restoration efforts. "Miscellaneous brush and dozens of tall cottonwoods were cut by contractors through a grant from the U.S. Fish and Wildlife Service to restore prairie and wetland habitat during the winter of 2007. Controlled burns in 2005 through 2007 have benefited about 60 acres. The work includes mowing small brush and removing invasive tree lines that have fragmented this grassland in many areas. Spring Creek Volunteers each year cut brush (and broadcast seed donated by Citizens for Conservation)." Headwaters Prairie South (H5 on Figure 30) is similar, but separated by dense brush to the northwest. "This area has remnant native grassland species including prairie dock." Beverly Lake Woods (H6 on Figure 30) includes 30 acres of once high-quality woods, mostly on steep slopes and featuring old bur and white oaks. Headwaters Grove (H7 on Figure 30) consists of 15 acres of old bur oaks "on a north facing gentle slope. The initial goal is to open up this grove sufficiently for oak reproduction and a healthy understory." Finally, the Headwaters Shrubland (H8 on Figure 30) consists of 50 acres of open shrubland. "The area now is mostly dense brush with just a few areas still open enough for breeding shrubland birds including the blue-winged warbler and willow flycatcher. Brush was removed from parts of this area in 2007 to re-establish some of the grassland component. Natural shrubs here include hazelnut, wild plum, sumac, dogwood, oak grubs and others (Chicago Wilderness 2011)."

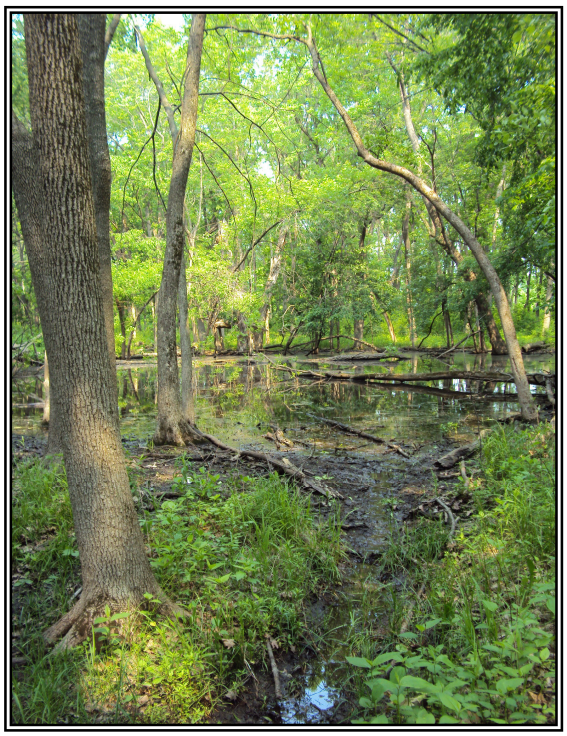
Future Management

There are extensive plans for future ecological restoration and management within Spring Creek Valley Forest Preserve. Under the authority provided by Section 206 of the Water Resources Development Act of 1996, the U.S. Army Corps of Engineers plans to design and implement various large scale projects to restore aquatic ecosystems for fish and wildlife. The Corps is spending much of 2011 and 2012 identifying, prioritizing, and determining feasibility for projects within the preserve where drain tiles currently drain wetlands, riparian areas needing restoration, stream reaches needing morphological repair, and existing trails improvements. Initial findings suggest that drain tile removal and ditch filling to restore pre-European settlement wetlands as well as removal of invasive species in many riparian areas followed by reestablishment by natives will comprise the majority of the projects implemented over a proposed 5 year period beginning in late 2012.

The Corps specifically studied approximately 1,600 acres within the preserve thought to be tile drained and found 120,000 linear feet of 4-inch to 16-inch drain tile. One major wetland restoration site has already been identified and proposed within Region 2 management area SC1. Here, the Corps proposes to disable a large network of existing drain tiles and fill Tributary B which historically did not exist until it was excavated for farming. This project would potentially restore 300+ acres of wetland that has been tile drained since the 1930's.

Helm Woods Forest Preserve

The Forest Preserve District of Kane County (FPDKC) first acquired the 233 acre Helm Woods Forest Preserve in 1980. The preserve is situated in the far west central portion of the Spring Creek watershed within Kane County (Figure 29). Historically, the site was owned by the Helm family who settled Dundee Township in the late 1800s. The family farmed portions of the site while wooded areas were used for cattle grazing. Today, the preserve contains a variety of ecological communities including old field grassland concentrated on the west-central side of the preserve and mixture of dry-mesic woodland and northern flatwoods on the east and south portions of the preserve.



Flatwoods at Helm Woods Forest Preserve

More than half of Helm Woods is dedicated Illinois Nature Preserve containing an INAI site. The nature preserve includes 75 acres of high quality northern flatwoods and dry-mesic woodland communities with 80 acres of additional buffer. The heavy clay soils and slow drainage on the southern portion of the site supports the flatwoods ecosystem comprised of water tolerant trees such as swamp white oak and ash. Uncommon plants and shrubs like swamp sedge, hop sedge, bur sedge, crowfoot fox sedge, forked aster, eastern prairie fringed orchid, large-seed sedge, buttonbush, and pagoda dogwood are also found here. In addition, wood ducks and amphibians are known to breed in the unique conditions provided by flatwoods.

Dry-Mesic Woodland at Helm Woods

Average to high quality dry-mesic woodland generally surrounds the northern flatwoods and extends to the northeast portion of the site. This community is dominated by bur, white, black, and red oak in the canopy while the understory supports rare or uncommon species such as long leaved shinleaf, shooting star, wild geranium, and red trillium, Iowa crap, hazelnut, black current, and wild gooseberry.

The FPDKC is actively managing Helm Woods Forest Preserve via landscape-scale woodland burns, enlisted the help of staff and volunteers, and employing contractors to eliminate areas dominated by heavy buckthorn, box elder, and wild black cherry. Over the course of the past eight years, the FPDKC has also reintroduced 40 species of habitat-appropriate grasses and wildflowers.

Poplar Creek Forest Preserve

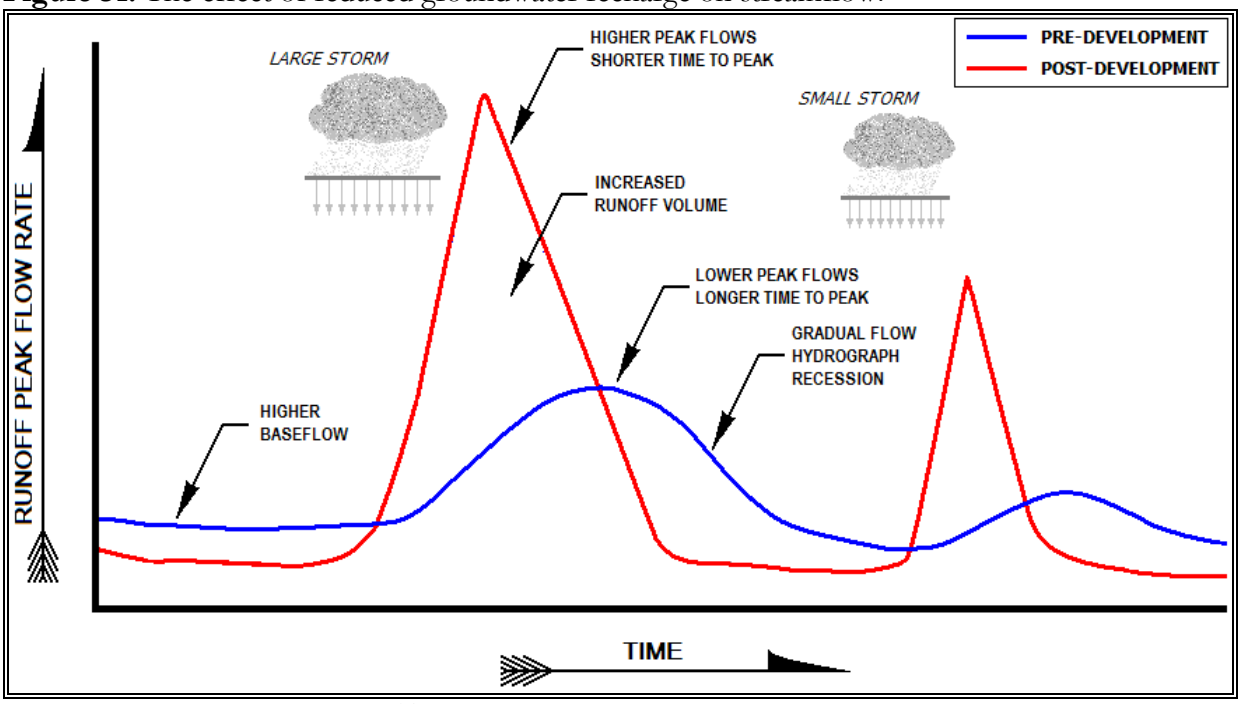
The Poplar Creek Forest Preserve is owned and managed by the Cook County Forest Preserve District. It is a large (4,200 acre) complex generally bound by Interstate 90 to the north, Route 58 to the east, W. Schaumburg Road and Bode Road to the south and the EJ&E Railroad to the west. However, only a small fraction of this preserve is located in the far southeast tip of the Spring Creek watershed (Figure 29) and is isolated from other open space in the watershed due to I90 and dense retail, commercial, and residential development to the north. The area within the watershed exhibits relatively flat topography and consists of varies ecological communities such as restored prairie, old field, marsh, and shrubland.

3.12 Watershed Drainage System

The pre-European settlement landscape in Spring Creek watershed "naturally managed" stormwater very differently than humans manage stormwater today. A relatively small percentage of the precipitation in a similar healthy watershed actually results in measurable runoff and water leaving the watershed because precipitation that falls on the land is used by plants and animals or infiltrated into groundwater aquifers. Prior to the late 1830's, many small prairie streams of the Midwest did not have conspicuous channels and were not as readily identifiable as they are today. In fact, most small streams were identified as vegetated swales, wetlands, wet prairies, and swamps in the original land survey records of the U.S. General Land Office.

Land use, stream data, and wetland data collected in the Spring Creek watershed indicate that changes in hydrology have occurred since European settlement and continue to change as land is developed. Europeans drastically changed the land after 1830 by clearing trees, tilling soils, installing drain tiles, and excavating ditches. Residential and commercial development since the 1950's also altered the overland flow of surface water following rain events. The historic slow overland flows that promoted infiltration is changing to concentrated flows where water is rushed to receiving detention basins and streams. The result is increased runoff rates and volumes that increases streambank erosion, degrades stream habitat, and transports sediment and other pollutant loads. Figure 31 depicts the effects of streamflow and volume for hypothetical pre and post development conditions whereby runoff volume spikes drastically following rain events under developed conditions compared to pre-development. The low-density development patterns in this watershed have mitigated the patterns of development that surround the central portion of the watershed. As such, significant infiltration still occurs and provides significant water quality protection.

Figure 31. The effect of reduced groundwater recharge on streamflow.



Source: *'Controlling Urban Runoff'*, Schueler, T., 1987.

3.12.1 Spring Creek & Tributaries

During the spring of 2011, the "Project Team" completed an inventory of Spring Creek and its tributaries. Approximately 27.3 stream and tributary miles were assessed based on divisions into stream reaches (Figure 32). Stream reaches are segments having similar hydraulic, geomorphic, riparian cover, and adjacent land use characteristics. Methodology included walking the reaches, collecting data, taking photos, and noting in-stream, streambank, and riparian corridor conditions. Detailed notes were recorded related to potential Management Measure and their corresponding priority for eventual inclusion into the Action Plan section of this report. Results of the inventory and detailed summaries of each stream, including an overall stream reach summary table, can be found in Appendix B. Note: Additional information about stream reaches located within Spring Creek Valley Forest Preserve was obtained via communication with the Army Corps of Engineers-Chicago District who is currently assessing the feasibility to implement large scale water quality improvement projects within the preserve. Information was also provided from the FPDCC.

Spring Creek was divided into 15 distinct reaches flowing for approximately 13.4 linear miles on its journey north from the headwaters to the Fox River (Figure 32). The stream is mostly natural with wide buffers but is heavily overgrown with invasive shrubs, trees, and herbaceous vegetation along the riparian corridor. Mowing along the water's edge in the stream corridor is common in residential areas. Several reaches are at least moderately channelized but erosion is minimal in most areas.

Spring Creek originates within the relatively new "Woods of South Barrington" residential community in the southeast portion of the watershed and flows west then north through residential and agricultural land for 1.5 miles before entering Spring Creek Valley Forest Preserve where it flows north for over 7 miles and through 4 lakes/ponds including Penny Road Pond, Galvins Lake, Spring Lake, and Mud Lake. The next 2 mile reach of Spring Creek flows north of County Line Rd. through a large equestrian area before turning to the northwest through large lot residential areas for another 2 miles then small lot residential for another mile before entering the Fox River.

Naturally meandering section of Spring Creek

Ten tributary streams (Tributaries A-J) flow into Spring Creek and total 13.9 linear miles (Figure 32). Many of the tributaries exhibit at least moderate channelization while several tributary reaches are highly channelized. Unlike the main channel of Spring Creek, several tributaries have moderate erosion and all tributaries have poor quality riparian areas dominated by invasive species. Buckthorn is the dominant invasive species found throughout the tributary reaches in wooded areas, while reed canary grass dominates wetter areas. Maintained turf grass is also common in residential areas. Most riparian areas need maintenance via removal of problematic debris, removal of invasive species, and increased natural buffer in select areas. Three secondary drainage areas are also mapped that are not considered true stream channels and are not included in the stream inventory. They are located near the Riding Center west of Bateman Road, extending south from Tributary B, and north of Horizon Farms. The FPDCC identifies these three areas as contributing significant pollutants to SCVFP and Spring Lake Nature Preserve.

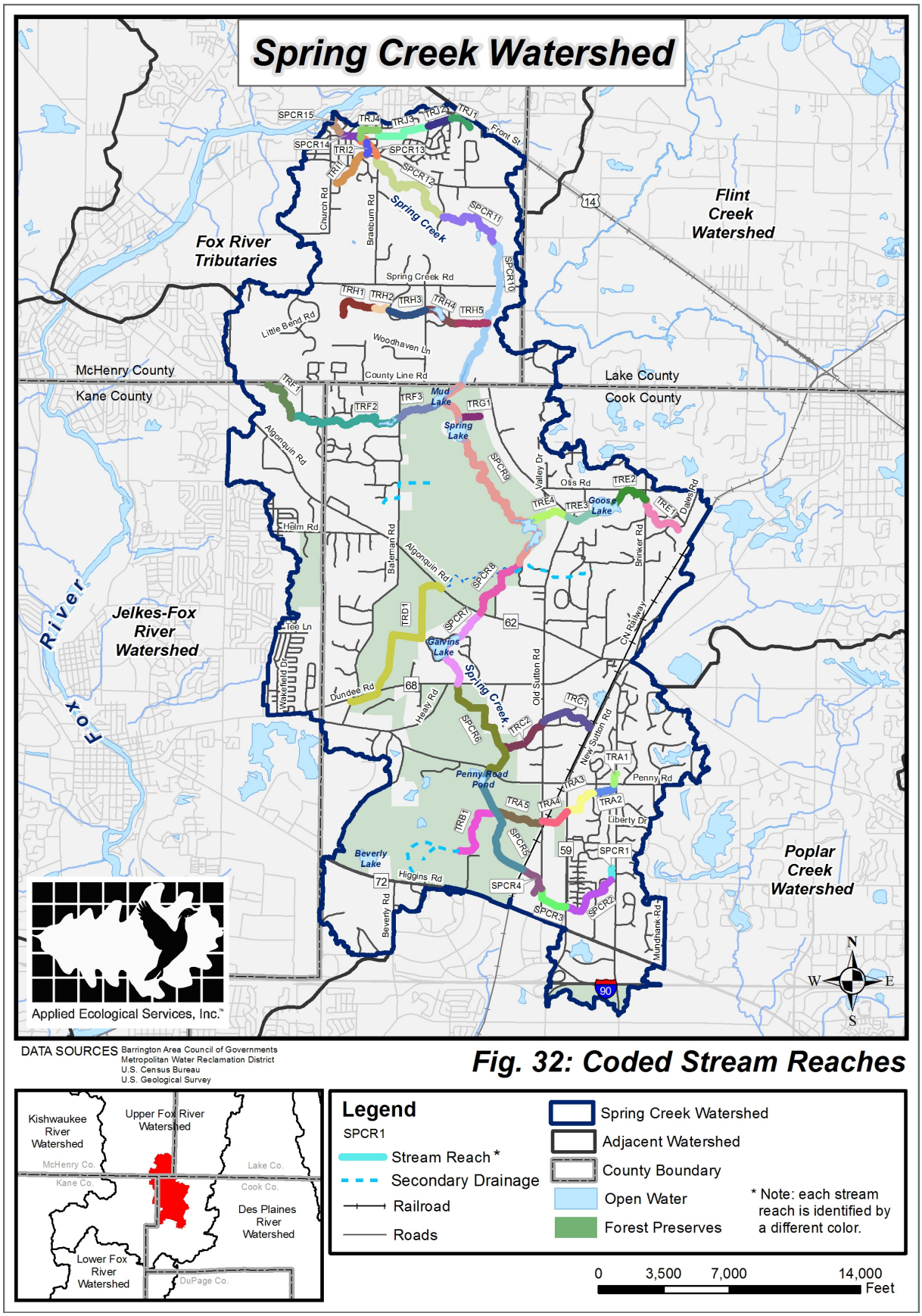


Fig. 32: Coded Stream Reaches

Degree of Channelization

Riffle-pool sequences are generally associated with naturally meandering streams and benefit the system by providing various habitats while aerating the water during low flow conditions. Channelized or ditched streams are often void of or have low quality riffles and pools. Spoils pile berms are also common along channelized streams and inhibit natural flooding into the adjacent floodplain.

Channelization along Spring Creek; Reach 10 (SPCR10)

The stream inventory reveals that over 40% of stream and tributary length is naturally meandering. However, more than 37% of the total stream & tributary length has been moderately channelized while 19% is highly channelized. Much of Spring Creek is moderately channelized in the southern half of the watershed and a large reach north of County Line Road. The most highly channelized reaches are located on Tributaries A, G, D, H, and J.

Channelized areas present many opportunities for projects such as artificial riffle and pool restoration, regrading or breaking of adjacent spoil piles for reconnection to floodplain, and in the case of Tributary D, filling a channel that was not present historically to rehydrate surrounding drained wetlands. Table 17 and Figure 33 summarize and depict the location and severity of channelized stream reaches in the watershed. The Action Plan addresses opportunities for improving many of these channelized reaches. Improvements will assist in improving water quality.

Table 17. Summary of stream and tributary channelization.

Stream or Tributary Name	Stream Length Assessed (ft)	None or Low Channelization (ft/%)		Moderate Channelization (ft/%)		High Channelization (ft/%)	
Spring Creek	71,003	33,417	47%	33,515	47%	4,070	6%
Tributary A	8,689	629	7%	4,419	51%	3,641	42%
Tributary B	3,903	0	0%	3,903	100%	0	0%
Tributary C	6,139	6,139	100%	0	0%	0	0%
Tributary D	10,313	0	0%	0	0%	10,313	100%
Tributary E	10,863	3,029	28%	7,835	72%	0	0%
Tributary F	12,823	12,823	100%	0	0%	0	0%
Tributary G	1,167	0	0%	0	0%	1,167	100%
Tributary H	9,069	4,157	46%	2,420	27%	2,491	27%
Tributary I	3,357	3,357	100%	0	0%	0	0%
Tributary J	7,155	0	0%	1,234	17%	5,921	83%
Totals	**144,481**	**63,511**	**44%**	**53,326**	**37%**	**27,603**	**19%**

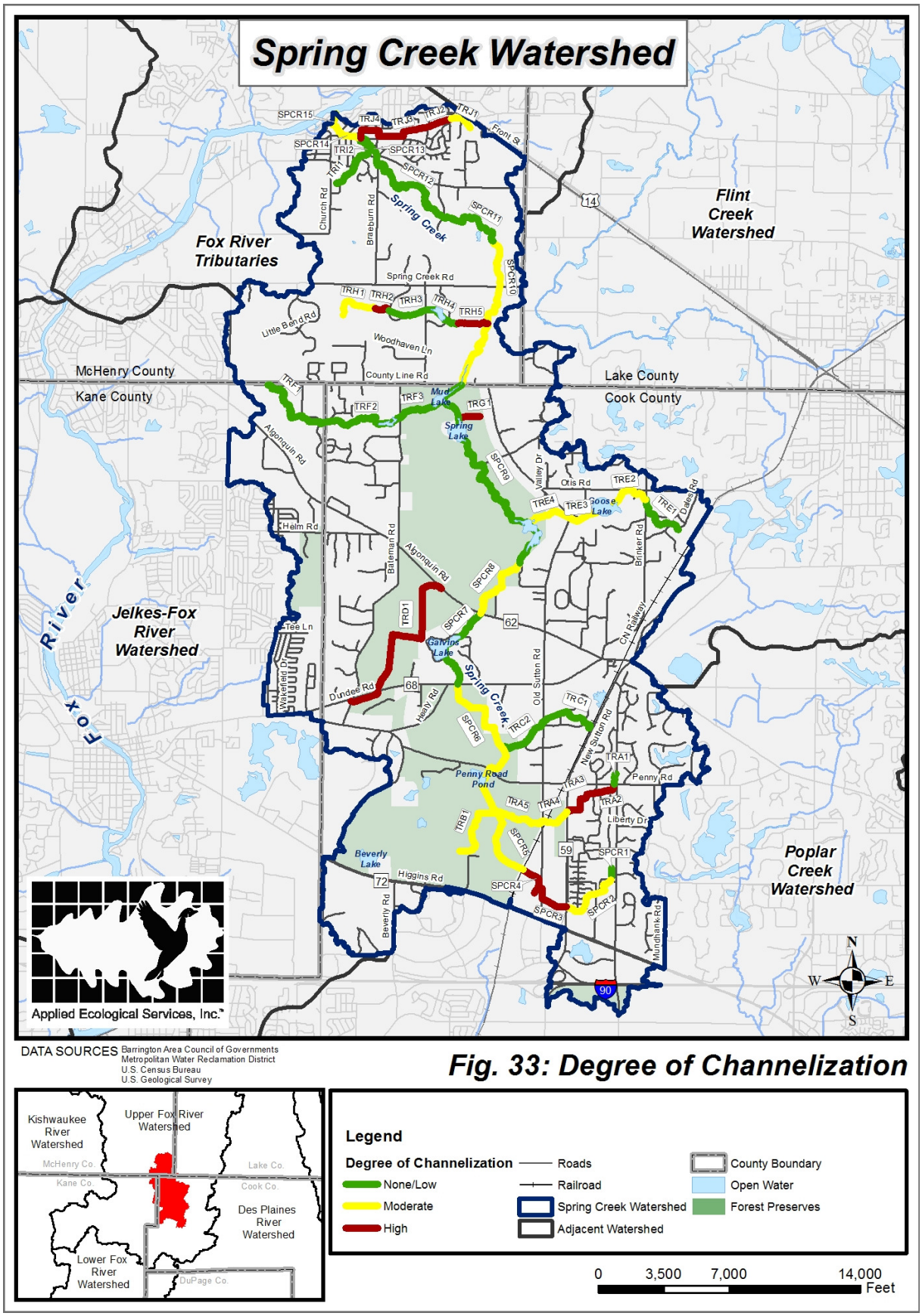


Fig. 33: Degree of Channelization

Streambank Erosion

Problematic streambank erosion generally results following an instability in water rate or volume, human alteration such as ditching, or change in streambank vegetation. Resulting sediment accumulation and transportation downstream can cause significant water quality problems. Streambank erosion is minimal in the watershed despite the number and degree of channelized streams reaches, significant changes in riparian vegetation, and increased water volume from development in the headwaters.

Highly eroded banks along Tributary H; Reach 2 (TRH2)

22% of the total stream and tributary length is moderately eroded while only 1% is highly eroded. Most of the moderate erosion is found at the headwaters of Spring Creek, Reach 9 within Spring Creek Valley Forest Preserve, and near the confluence with the Fox River. Other moderate erosion occurs along isolated reaches in Tributaries A, C, E, and H. Only one stream reach (TRH2) along Tributary H is severely eroding and in somewhat urgent need of stabilization. This reach is considered a "Critical Area".

All moderately and highly eroded stream reaches provide excellent opportunities for streambank stabilization projects. The location and severity of streambank erosion in the watershed is summarized in Table 18 and depicted on Figure 34. The Action Plan addresses and prioritizes opportunities for reducing streambank erosion.

Table 18. Summary of stream and tributary bank erosion.

Stream or Tributary Name	Stream Length Assessed (ft)	None or Low Erosion (ft/%)		Moderate Erosion (ft/%)		High Erosion (ft/%)	
Spring Creek	71,003	51,297	72%	19,706	30%	0	0%
Tributary A	8,689	8,060	93%	629	7%	0	0%
Tributary B	3,903	3,903	100%	0	0%	0	0%
Tributary C	6,139	2,976	48%	3,162	52%	0	0%
Tributary D	10,313	10,313	100%	0	0%	0	0%
Tributary E	10,863	7,253	67%	3,610	33%	0	0%
Tributary F	12,823	12,823	100%	0	0%	0	0%
Tributary G	1,167	1,167	100%	0	0%	0	0%
Tributary H	9,069	3,743	41%	4,462	49%	863	10%
Tributary I	3,357	3,357	100%	0	0%	0	0%
Tributary J	7,155	7,155	100%	0	0%	0	0%
Totals	**144,481**	**112,047**	**78%**	**51,569**	**22%**	**863**	**1%**

Riparian Corridor Condition

Riparian corridors buffer streams and tributaries by filtering pollutants from runoff and during flood events. They also provide beneficial wildlife habitat and extend or connect green infrastructure. Land use within approximately 100 feet of either side of each stream or tributary reach was assessed during the stream inventory by summarizing the percentage of land falling under general categories and by noting the type of vegetation growing in these areas.

Typical riparian corridor (Reach SPCR11) dominated by reed canary grass and invasive shrubs

Only 3% of the riparian corridor in the Spring Creek watershed is in good condition. These areas are found at the headwaters of Spring Creek and Tributary A where recent residential development included restoration of prairie and wetland habitat. The remaining 97% of the riparian corridor is in poor condition primarily because it is dominated by invasive and/or non-native species including reed canary grass and common buckthorn in areas that were historically marsh, wet prairie, or sedge meadow. Not only do these areas function differently after becoming dominated by invasives, they also support fewer insect, bird, and other wildlife species. The LCFPD and Corps of Engineers are well aware of the invasive species problems along Spring Creek within Spring Creek Valley Forest Preserve and plans are underway to implement large scale restoration projects.

The condition of riparian buffers along Spring Creek and Tributaries is summarized in Table 19 and depicted on Figure 34. The Action Plan section of this report lists and prioritizes opportunities for improving riparian areas.

Table 19. Summary of stream and tributary riparian area condition.

Stream or Tributary Name	Stream Length Assessed (ft)	Good Condition (ft/%)		Poor Condition (ft/%)	
Spring Creek	71,003	4,243	6%	66,760	94%
Tributary A	8,689	629	7%	8,086	93%
Tributary B	3,903	0	0%	3,903	100%
Tributary C	6,139	0	0%	6,139	100%
Tributary D	10,313	0	0%	10,313	100%
Tributary E	10,863	0	0%	10,863	100%
Tributary F	12,823	0	0%	12,823	100%
Tributary G	1,167	0	0%	1,167	100%
Tributary H	9,069	0	0%	9,096	100%
Tributary I	3,357	0	0%	3,357	100%
Tributary J	7,155	0	0%	7,155	100%
Totals	**144,481**	**4,872**	**3%**	**139,662**	**97%**

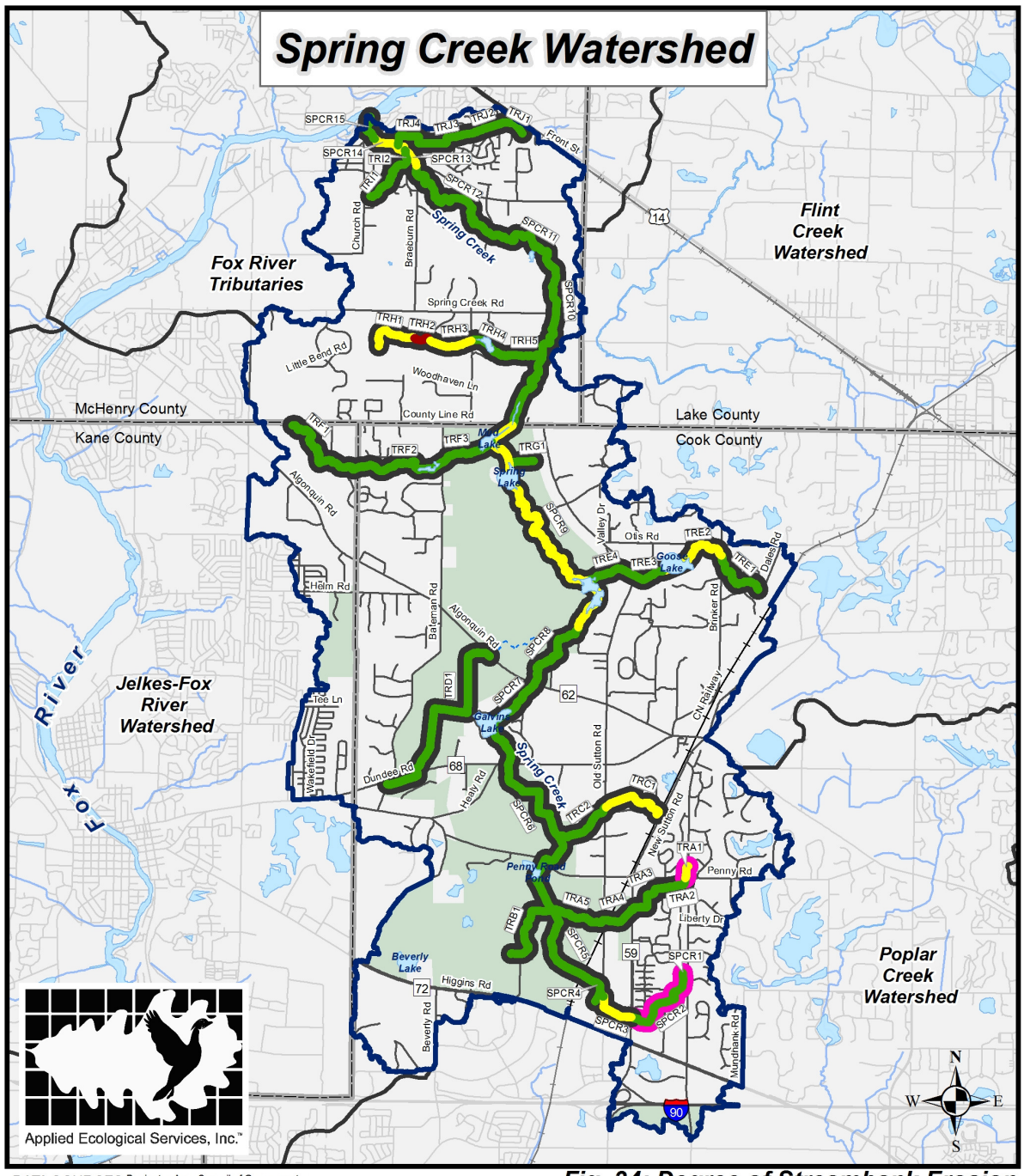


Fig. 34: Degree of Streambank Erosion & Riparian Condition

3.12.2 Lakes, Ponds, & Detention Basins

The "Project Team" completed a basic assessment of 7 lakes, 48 ponds, and 82 detention basins in spring 2011 (Figure 35). A lake differs from a pond based on size; a lake is at least 5 acres. Wet bottom detention basins differ from lakes and ponds because they are generally constructed with the purpose of detaining water during rain events to prevent flooding elsewhere. Detention basins are usually found around development and are required by local ordinances. Assessment methodology included a visit to each site and collection of data related to existing site conditions. Detailed notes were also recorded related to potential Management Measures and their corresponding priority for eventual inclusion into the Action Plan section of this report. Results of the inventory and detailed summaries of each lake, pond, or detention basin can be found in Appendix B.

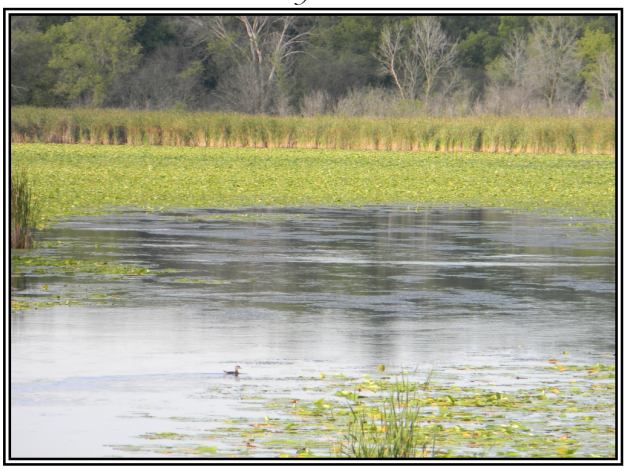
Lakes

Of the 7 main lakes within the Spring Creek watershed, only one has remained unmanipulated over time. Goose Lake is a glacial remnant containing a natural cranberry bog in its southwest corner. Beverly Lake and Penny Road Pond were both dug as gravel pits during the First World War. Mud Lake and Spring Lake are the remains of a larger glacial lake apparent on the earliest survey plats and are now part of Spring Lake Nature Preserve. The lake currently located at Beverly Quarry is being filled under permits with clean fill but a new gravel pit is being excavated to the west that will eventually become a 90 acre pond for use by Max McGraw Wildlife Area in about 20 years. Galvin's Lake was constructed about 75 years ago by placing a dam online with Spring Creek.

Goose Lake

Beverly Lake

Penny Road Pond



Mud Lake

Ponds

Typical pond in Spring Creek watershed

The vast majority of the ponds observed are small, human-made, and generally constructed in areas that were once wetlands or low lying areas. Most are also located on private property with generally only one of few owners. Many of the horse farms have ponds with mowed lawn down to the shoreline and little to no buffer zones. Also, ponds that are in highly visible areas near homes or estate entrances tend to have manicured shorelines. Typically ponds in parks or residential areas have mowed lawn in sections of the shoreline and also wooded buffer zones. The wooded buffer zones often have native oak trees but are mixed with invasive shrubs and other non-native or invasive trees. Nearly all of the ponds in the watershed require larger and better quality buffers or maintenance of existing buffers in order to improve water quality. Project recommendations are included in the Action Plan section of this report.

Detention Basins

The natural drainage system in the Spring Creek watershed is changing from farmland driven tiles, channels, and ditches to one that is now dominated by residential and commercial/retail, and transportation land uses. Most early development was constructed without detention basins. In these areas stormwater is directed to streams and lakes as quickly as possible. More recently land planners, ecologist, and engineers have realized the benefits of storing stormwater runoff in detention basins that are designed to capture stromwater runoff from a surrounding development and release the water slowly over a given amount of time. Detention basins can also provide excellent wildlife habitat and improve water quality if designed with the proper slopes and water depths then planted with native vegetation.

Detention basins are most often constructed in low areas relative to a development and contain stormsewer networks that drain into and out of them. Restrictors placed on the outlet structure controls the rate at which water is released. These basins can be constructed to be wet bottom, wetland bottom, or dry bottom. An inventory of the Spring Creek watershed conducted in spring 2011 found 67 wet bottom, 5 wetland bottom, and 10 dry bottom basins (Figure 35). The overall condition of detention basins covers the range of shoreline features from heavy amounts of rip rap to highly manicured mowed turf to fully naturalized vegetation.

Wet and wetland bottom basins typically hold water that is controlled by the elevation of the outlet pipe. These basins are usually greater than 3 feet deep and do not have emergent vegetation throughout whereas wetland bottom detentions are shallow enough to be dominated by emergent plants.

Many older wet bottom basins are lined with turf grass and in many cases have rip rap near the toe of the slope. These basins were designed with aesthetics in mind and not necessarily the potential water quality and habitat benefits. Because of this, most adjacent residents and HOAs will likely disapprove of installing water quality retrofits such as native buffers unless they can be designed to look formal. Most basins of this type are associated with older development in the southeast portion of the watershed east of Bartlett Road. Potential retrofit opportunities for older basins are included in the Action Plan section of this report.

Typical older wet bottom detention found in the east portion of the watershed

The majority of the newly constructed wet bottom detention basins can be found on the southeast portions of the watershed between Bartlett Road and New Sutton Road in the "Woods of South Barrington" residential community. Most of these have naturalized shorelines and are currently being managed so there are relatively few problems. However, most of these basins are small, scattered throughout the development, and could have been designed and constructed to look even more natural and be more effective at treating for water quality and providing wildlife habitat. A good example of this is the naturalized detention area behind the Arboretum shopping center. It will be extremely important for HOA's in this area to implement appropriate long term management by a qualified ecological contractor to maintain the existing condition.

Typical naturalized wet bottom detention basin in new residential developments

The majority of the dry bottom basins in the watershed are associated with large lot residential development in the northern and eastern portions of the watershed. All are manicured turf grass which does little to improve water quality or promote infiltration to replenish groundwater. This is because dry bottom basins planted to turf grass hold water for short periods following rain events but quickly drain and dry without the help of deep rooted vegetation. Fortunately, most dry bottom basins are relatively easy to "naturalize" with native plantings. Naturalized dry bottom basins also provide excellent wildlife habitat and can increase green infrastructure networks.

Dry bottom basin at Barbara Rose Elementary

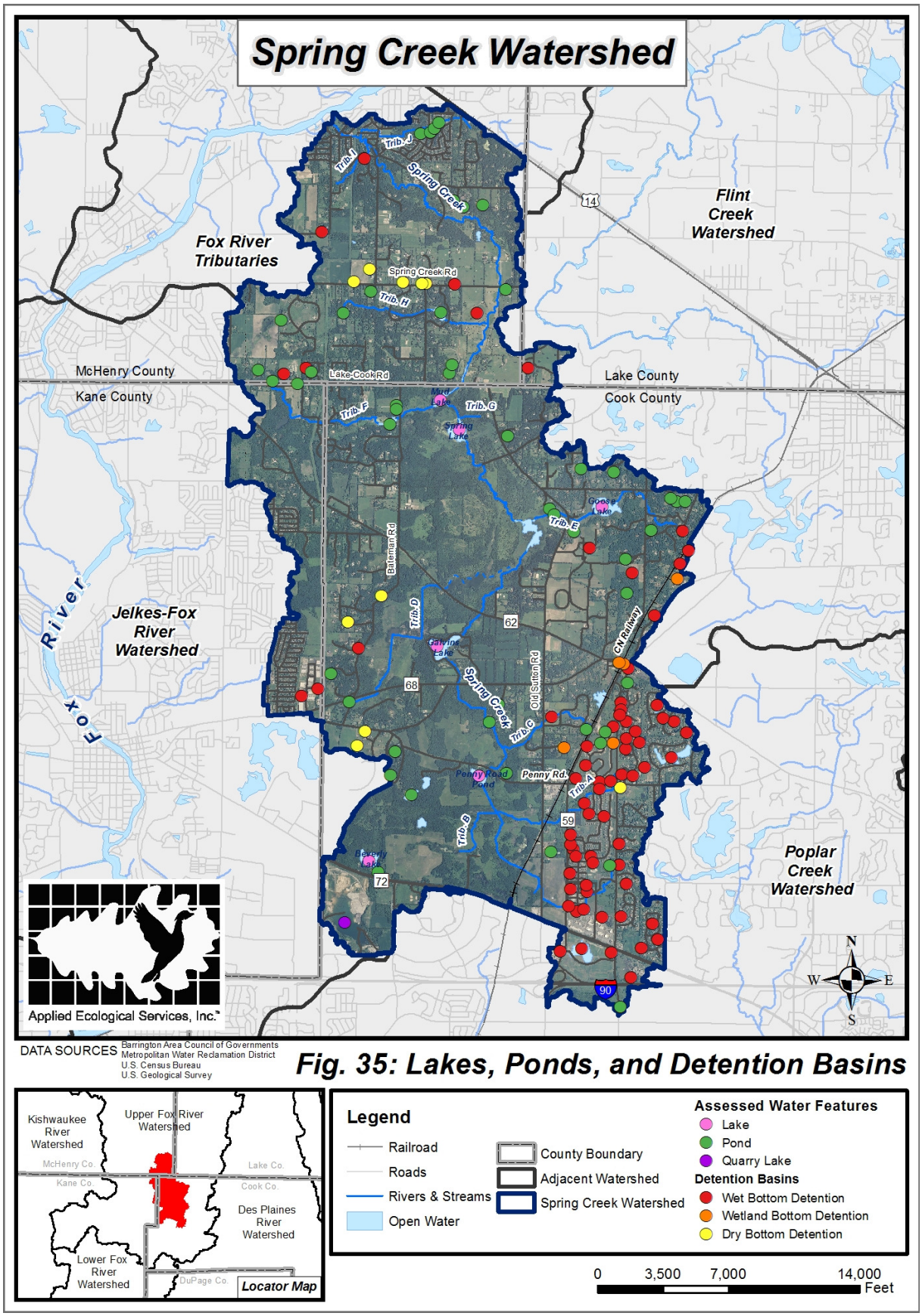


Fig. 35: Lakes, Ponds, and Detention Basins

Naturalized Detention Basin Design & Maintenance Recommendations

Future detention basin designs within the watershed should be naturalized basins that serve multiple functions including appropriate water storage, water quality improvement, natural aesthetics, and wildlife habitat. Native vegetation planted in a properly designed basin also provides excellent water quality benefits through nutrient uptake, filtering, and by gravitational settling. Up to 75% of Total Suspended Solids, 45% of Total Phosphorus, 30% of Total Nitrogen, 50% of heavy metals, and 70% of Fecal Coliform can be removed if designed properly (City of Wichita/Sedgwick County, 2011). Recommendations below and Figure 36 include schematics and seed/plant lists for the recommended design of naturalized detention basins. Note: all requirements of local and county ordinances is also required.

Properly designed/planted wet bottom naturalized detention at Arboretum Shopping Center

Location & Siting Recommendations

- Naturalized detention basins should be restricted to natural depressions, adjacent to existing USACE regulated wetlands, and adjacent to other existing natural green infrastructure in an attempt to aesthetically fit and blend into the landscape. Use of existing isolated wetlands for detention should be evaluated on a case by case basis.
- Basins should not be constructed in any average to high quality ecological community.
- Outlets from detentions should not enter sensitive ecological areas.

General Design Recommendations

- Large naturalized detentions designed for stormwater storage, water quality treatment, wildlife usage, and passive recreation across multiple development parcels should be constructed rather than designing and constructing multiple smaller detentions for each individual development.
- Side slopes should be no steeper than 4H:1V, at least 25 feet wide, planted to native mesic prairie, and stabilized with erosion control blanket. Native oaks (*Quercus sp.*) should be the only woody species planted because of maintenance implications.
- A 5-foot minimum wide shelf planted to native wet prairie and stabilized with erosion control blanket should be constructed above the normal water level. This area should be designed to inundate after every 0.5 inch rain event or greater.
- A 10-foot minimum wide shelf planted with native emergent plugs should extend from the normal water level to 2 feet below normal water level.
- Permanent pools that do not contain emergent vegetation should be at least 4 feet deep.
- Irregular islands and peninsulas should be constructed to slow the movement of water through the basin. They should be planted to native mesic or wet prairie depending on elevation above normal water level.
- A 4-6' deep forebay should be constructed at the inlet to capture sediment; a 4-6' deep micropool should be constructed at the outlet to prevent clogging.

Short Term (3 Years) Establishment Recommendations

The developer in new developments should be responsible for implementing short term management of detention basins and other natural areas to meet performance standards. Generally speaking, three years of management is needed to establish native plant communities. Measures needed include mowing during the first two growing seasons following seeding to reduce annual and biennial weeds. Spot herbiciding is also required to eliminate problematic non-native/invasive species such as thistle, reed canary grass, common reed, cattail, purple loosestrife, and emerging cottonwood, willow, buckthorn, and box elder saplings. Table 20 includes a three year schedule appropriate to establish native plantings around naturalized detention basins.

Table 20. Three year maintenance schedule for naturalized detention basins.

Year 1 Maintenance
Mow mesic prairie buffer and wet prairie shelf to a height of 6-12 inches when dry in late June, August, & September.
Spot herbicide problematic non-native/invasive species throughout site in early June and again in August/September. Specifically target thistle, reed canary grass, common reed, purple loosestrife, cattail, and emerging woody samplings such as willow, cottonwood, buckthorn, and box elder.
Year 2 Maintenance
Mow mesic prairie buffer and wet prairie shelf when dry to a height of 12 inches in late June and early August.
Spot herbicide problematic non-native/invasive species throughout site in early June and again in mid August. Specifically target thistle, reed canary grass, common reed, cattail, purple loosestrife, and emerging woody samplings such as willow, cottonwood, buckthorn, and box elder.
Plant additional emergent plugs if needed and reseed failed areas in fall.
Year 3 Maintenance
Spot herbicide problematic non-native/invasive species throughout site in early June and again in mid August. Specifically target thistle, reed canary grass, common reed, and emerging woody samplings such as willow, cottonwood, buckthorn, and box elder.

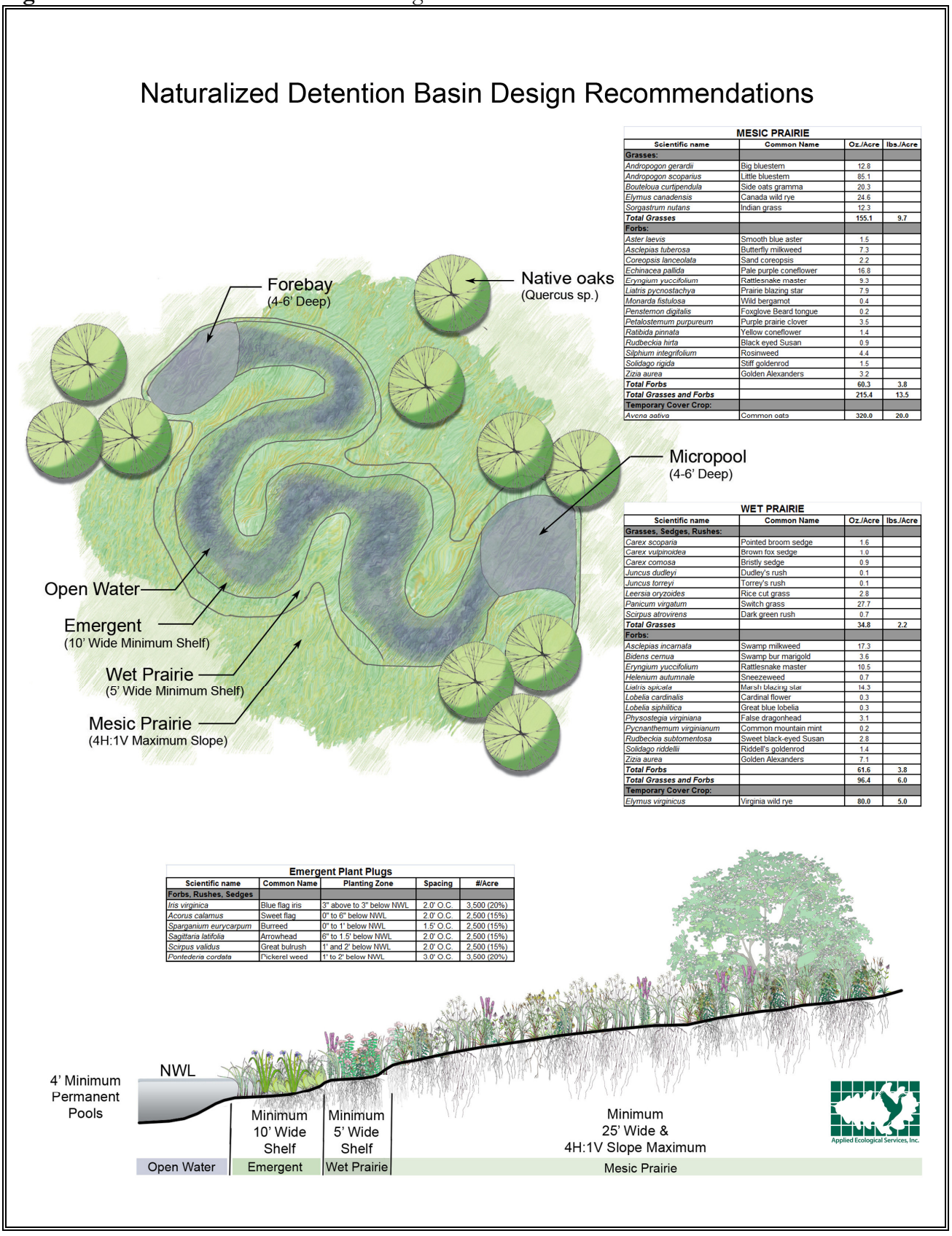
Long Term (3 Years +) Maintenance Recommendations

Currently, long term management of most detention basins and other areas associated with development is the responsibility of the homeowner's association (HOA) or business association. Often, these groups lack the knowledge and funding to implement long term management of natural areas resulting in decline of these areas over time. Future developers should be encouraged to donate naturalized detentions and other natural areas to a public agency or conservation organization for long term management who receive funding for management via a Special Service Area (SSA) tax or other means such as a watershed protection fee. Table 21 includes a cyclical long term schedule appropriate to maintain native vegetation around detention basins and other natural areas.

Table 21. Three year cyclical long term maintenance schedule for naturalized detention basins.

Year 1 of 3 Year Maintenance Cycle
Conduct controlled burn in early spring. Mow to height of 12 inches in November if burning is not allowed.
Spot herbicide problematic non-native/invasive species throughout site in mid August. Specifically target thistle, reed canary grass, common reed, cattail, and emerging woody samplings such as willow, cottonwood, buckthorn, and box elder.
Year 2 of 3 Year Maintenance Cycle
Spot herbicide problematic non-native/invasive species throughout site in August. Specifically target thistle, reed canary grass, common reed, cattail, and emerging woody samplings such as willow, cottonwood, buckthorn, and box elder.
Mow mesic prairie buffer and wet prairie shelf when dry in November.
Year 3 of 3 Year Maintenance Cycle
Spot herbicide problematic non-native/invasive species in August. Specifically target thistle, reed canary grass, common reed, and emerging woody samplings. Cutting & herbiciding stumps of some woody samplings may also be needed.

Figure 36. Naturalized Detention Basin Design Recommendations.



MESIC PRAIRIE

Scientific name	Common Name	Oz./Acre	lbs./Acre
Grasses:			
Andropogon gerardii	Big bluestem	12.8	
Andropogon scoparius	Little bluestem	85.1	
Bouteloua curtipendula	Side oats gramma	20.3	
Elymus canadensis	Canada wild rye	24.6	
Sorgastrum nutans	Indian grass	12.3	
Total Grasses		**155.1**	**9.7**
Forbs:			
Aster laevis	Smooth blue aster	1.5	
Asclepias tuberosa	Butterfly milkweed	7.3	
Coreopsis lanceolata	Sand coreopsis	2.2	
Echinacea pallida	Pale purple coneflower	16.8	
Eryngium yuccifolium	Rattlesnake master	9.3	
Liatris pycnostachya	Prairie blazing star	7.9	
Monarda fistulosa	Wild bergamot	0.4	
Penstemon digitalis	Foxglove Beard tongue	0.2	
Petalostemum purpureum	Purple prairie clover	3.5	
Ratibida pinnata	Yellow coneflower	1.4	
Rudbeckia hirta	Black eyed Susan	0.9	
Silphium integrifolium	Rosinweed	4.4	
Solidago rigida	Stiff goldenrod	1.5	
Zizia aurea	Golden Alexanders	3.2	
Total Forbs		**60.3**	**3.8**
Total Grasses and Forbs		**215.4**	**13.5**
Temporary Cover Crop:			
Avena sativa	Common oats	**320.0**	**20.0**

WET PRAIRIE

Scientific name	Common Name	Oz./Acre	lbs./Acre
Grasses, Sedges, Rushes:			
Carex scoparia	Pointed broom sedge	1.6	
Carex vulpinoidea	Brown fox sedge	1.0	
Carex comosa	Bristly sedge	0.9	
Juncus dudleyi	Dudley's rush	0.1	
Juncus torreyi	Torrey's rush	0.1	
Leersia oryzoides	Rice cut grass	2.8	
Panicum virgatum	Switch grass	27.7	
Scirpus atrovirens	Dark green rush	0.7	
Total Grasses		**34.8**	**2.2**
Forbs:			
Asclepias incarnata	Swamp milkweed	17.3	
Bidens cernua	Swamp bur marigold	3.6	
Eryngium yuccifolium	Rattlesnake master	10.5	
Helenium autumnale	Sneezeweed	0.7	
Liatris spicata	Marsh blazing star	14.3	
Lobelia cardinalis	Cardinal flower	0.3	
Lobelia siphilitica	Great blue lobelia	0.3	
Physostegia virginiana	False dragonhead	3.1	
Pycnanthemum virginianum	Common mountain mint	0.2	
Rudbeckia subtomentosa	Sweet black-eyed Susan	2.8	
Solidago riddellii	Riddell's goldenrod	1.4	
Zizia aurea	Golden Alexanders	7.1	
Total Forbs		**61.6**	**3.8**
Total Grasses and Forbs		**96.4**	**6.0**
Temporary Cover Crop:			
Elymus virginicus	Virginia wild rye	**80.0**	**5.0**

Emergent Plant Plugs

Scientific name	Common Name	Planting Zone	Spacing	#/Acre
Forbs, Rushes, Sedges				
Iris virginica	Blue flag iris	3" above to 3" below NWL	2.0' O.C.	3,500 (20%)
Acorus calamus	Sweet flag	0" to 6" below NWL	2.0' O.C.	2,500 (15%)
Sparganium eurycarpum	Burreed	0" to 1' below NWL	1.5' O.C.	2,500 (15%)
Sagittaria latifolia	Arrowhead	6" to 1.5' below NWL	2.0' O.C.	2,500 (15%)
Scirpus validus	Great bulrush	1' and 2' below NWL	2.0' O.C.	2,500 (15%)
Pontederia cordata	Pickerel weed	1' to 2' below NWL	3.0' O.C.	3,500 (20%)

3.12.3 Wetlands & Potential Wetland Restoration Sites

Most of the wetlands in the Spring Creek watershed were intact until the late 1830's when European settlers began to alter significant portions of the watershed's natural hydrology and wetland processes. Where it was feasible, wet areas were drained, streams channelized, and savanna and prairie cleared in order to farm the rich soils. There were approximately 4,007 acres of wetlands in the watershed prior to European settlement based on hydric soils data provided by the McHenry, Lake, Kane, and Cook County Natural Resource Conservation Services (NRCS). According to existing wetland inventories, 1,791 acres or 45% of the pre-European settlement wetlands remain.

An inventory of many of the wetlands in the Spring Creek watershed was conducted by the "Project Team" in spring 2011 (Appendix B). In general, the wetlands in the watershed are neglected, tucked behind walls of invasive brush or cattails, poorly buffered, and need invasive and/or non-native species removal and control. Most contain heavy infestations of reed canary grass and cattails. Often there is some native vegetation but in most cases it is low quality and outcompeted by invasives. In areas where development is or has occurred wetlands are surrounded by silt fence; much is in need of repair and other fencings needs to be removed because development is no longer occurring in the vicinity. Many of the wetlands contain dead trees, standing and fallen, likely due to altered hydrologic conditions. Some of the wetlands were excavated into ponds many years ago and are now either overgrown or surrounded by manicured turf.

Wetland area within Spring Lake Nature Preserve

Functional wetlands do more for water quality improvement and flood reduction than any other natural resource. In addition, wetlands typically provide habitat for a wide variety of plant and animal species. They also provide groundwater recharge and discharge, filter sediments and nutrients in runoff, and help maintain water levels in streams during drought periods. Wetland information and mapping is available for the entire Spring Creek watershed area from several government agencies. Advanced wetland inventories and identification studies (ADID) are available for Lake, Kane, and McHenry Counties. The U.S. Fish & Wildlife Service's (USFWS) National Wetland Inventory (NWI) mapping is the only data available for wetlands in the Cook County portion of the watershed. The combination of wetland data was used to map and describe the existing wetlands in the watershed and to locate potential wetland restoration sites. Note: no wetlands are present in the Lake County portion of the watershed.

McHenry and Kane County ADID Wetland Inventories

The McHenry County ADID wetland inventory (NIPC 1998) was developed in 1998. The methodology used builds on methods used in Lake County as well as other documented methods. The Kane County ADID wetland inventory (NIPC 2004) was completed in 2004 and builds on methods used in both Lake and McHenry Counties. The ADID studies are designed to do two things: 1) identify the values of individual wetlands and 2) identify wetlands of such high value that they merit special consideration for protection.

Protection of ADID wetlands is provided in McHenry and Kane Counties under existing Watershed Development Ordinances and the U.S. Army Corps of Engineers (USACE) via section 404 of the Clean Water Act. The USACE will usually require an Individual Permit (IP) for modifications to ADID wetlands. ADID wetlands are generally considered unmitigatable. In rare cases where mitigation is allowed, as much as a 5:1 mitigation ratio is required. Additionally, ADID wetlands located within developed areas require a 100-foot buffer to aid in protection.

Methods for conducting the ADID wetland inventories include evaluation of USDA/Soil Conservation Service wetland inventory maps, National Wetland Inventory (NWI) maps, soil surveys, and low altitude aerial imagery. Site inspections also verify the quality of wetlands. Agencies involved include the Northeast Illinois Planning Commission (NIPC now CMAP), Kane County Department of Environmental Management, U.S. Environmental Protection Agency (USEPA), U.S. Fish & Wildlife Service (USFWS), U.S.D.A. Natural Resources Conservation Service (NRCS), and the U.S. Army Corps of Engineers (USACE). Following evaluation, wetlands were categorized based on function; 1) High Habitat Value, 2) High Functional Value, and 3) Other Wetlands.

Sixty two (62) wetlands were identified in the McHenry County portion of the Spring Creek watershed, 22 wetlands in the Kane County portion of the watershed, and 128 wetlands in Cook County for a total of 212 individual wetlands (Figure 37). Of these, 5 ADID wetlands are found in McHenry County and 7 in Kane County. Data for each ADID wetland is summarized in Table 22.

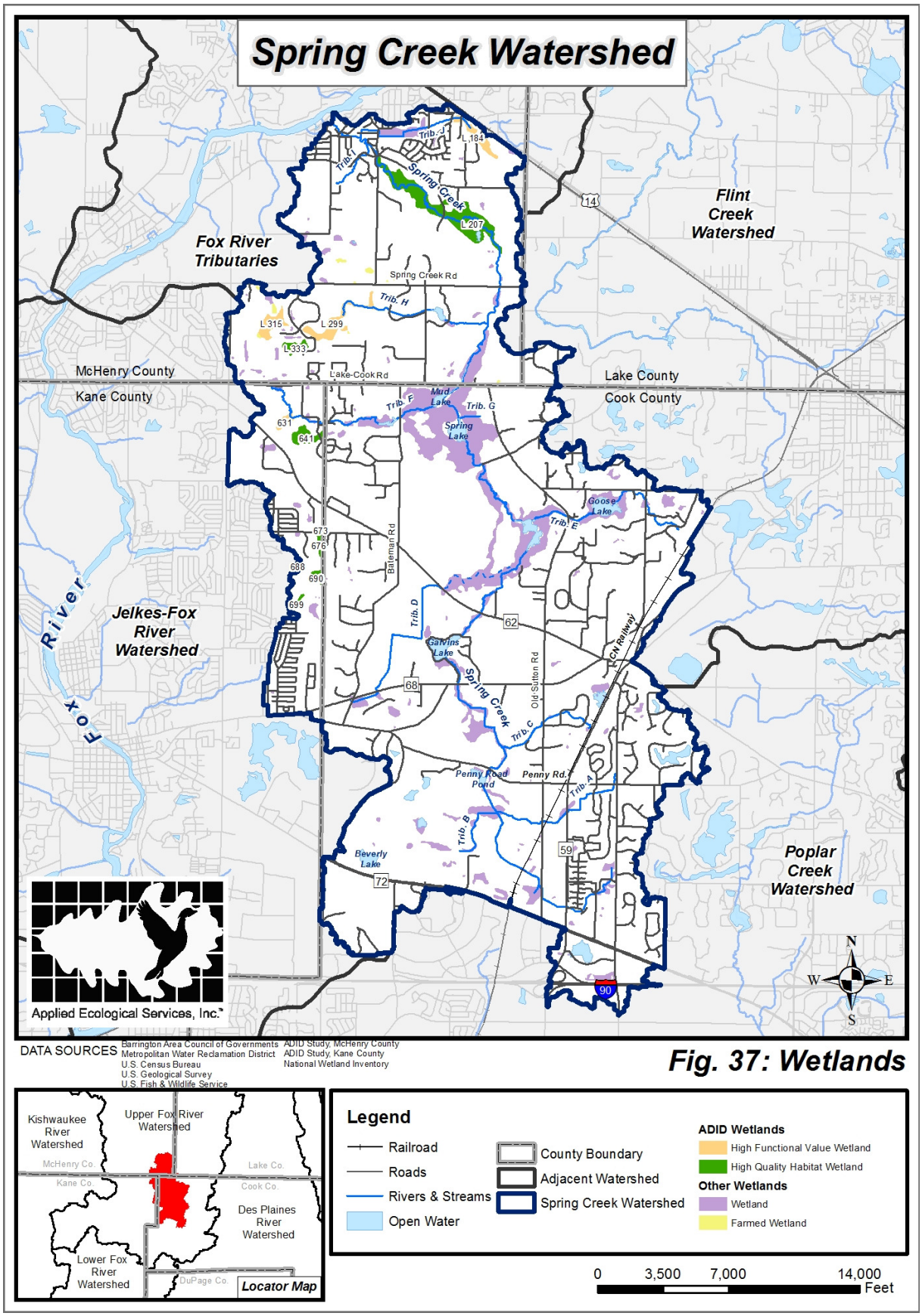
Table 22. McHenry & Kane Counties ADID wetlands and attributes.

ADID ID #	Acres	ADID Attributes
McHenry County		
L333	14.8	**High Quality Habitat**: floodplain forest & marsh
L184	21.3	**High Quality Functional Value:** sediment retention, nutrient removal, stormwater storage
L207	141.4	**High Quality Habitat**: fen/sedge meadow
L299	42.7	**High Quality Functional Value:** sediment retention, nutrient removal, stormwater storage
L315	27.9	**High Quality Functional Value:** sediment retention, nutrient removal, stormwater storage
Kane County		
631	10.1	**High Quality Functional Value:** sediment retention
641	27.1	**High Quality Habitat**: fen & sedge meadow
673	3.4	**High Quality Habitat**: northern flatwoods, T&E species
676, 688, 690	11.3, 1.3, 11.1	**High Quality Habitat**: northern flatwoods within Helm Woods Nature Preserve
699	4.2	**High Quality Habitat**: mesic forest within Helm Woods Nature Preserve

Source: McHenry and Kane County ADID Wetland Inventories

National Wetland Inventory (NWI)

The USFWS is responsible for developing National Wetland Inventory (NWI) maps. By 2001, the USFWS inventoried and produced wetland maps for more than 90 percent of the lower 48 states including all of Illinois. The maps are prepared from the analysis of high altitude imagery, vegetation, visible hydrology, and geography. Onsite wetland inspections and delineations are not part of the inventory. Also, specific wetland habitats classifications are not included in the inventory because of the limitations of aerial reconnaissance. In general, the NWI maps are not as detailed or refined as the McHenry and Kane County wetland inventories. NWI wetland data for Cook County was used in this report because Cook County does not currently have its own wetland inventory.


Spring Creek Watershed
Fox River Tributaries
Flint Creek Watershed
Jelkes-Fox River Watershed
Poplar Creek Watershed
McHenry County
Kane County
Lake County
Cook County
Spring Creek Rd
Lake-Cook Rd
Bateman Rd
Old Sutton Rd
Penny Rd.
Penny Road Pond
Mud Lake
Spring Lake
Goose Lake
Gavins Lake
Beverly Lake
Trib. A
Trib. B
Trib. C
Trib. D
Trib. E
Trib. F
Trib. G
Trib. H
Trib. J
Spring Creek
CN Railway
Fox River
Applied Ecological Services, Inc.
N
S
E
W
DATA SOURCES
Barrington Area Council of Governments
Metropolitan Water Reclamation District
U.S. Census Bureau
U.S. Geological Survey
U.S. Fish & Wildlife Service
ADID Study, McHenry County
ADID Study, Kane County
National Wetland Inventory
Fig. 37: Wetlands
Kishwaukee River Watershed
Upper Fox River Watershed
Des Plaines River Watershed
Lower Fox River Watershed
Locator Map
Legend
Railroad
Roads
Rivers & Streams
Open Water
County Boundary
Adjacent Watershed
Spring Creek Watershed
ADID Wetlands
High Functional Value Wetland
High Quality Habitat Wetland
Other Wetlands
Wetland
Farmed Wetland
0
3,500
7,000
14,000
Feet

Potential Wetland Restoration Sites

Wetland restoration projects have many positive impacts within a watershed. They are beneficial in restoring basic environmental functions that historic wetlands once served such as reducing flood volumes and rates, increasing biodiversity, and improving water quality conditions. Wetland restoration projects can also be completed as part of a Wetland Mitigation Bank where developers are able to buy wetland credits for wetland impacts occurring elsewhere in the watershed. Isolated wetland preservation is addressed by current McHenry, Lake, and Kane County Watershed Development Ordinances. The U.S. Army Corps of Engineers (USACE) regulates navigable waterways and connected wetlands. These ordinances and regulations allow only minimal impacts to wetlands. However, unavoidable larger impacts require mitigation to create or restore new wetlands. This is where Wetland Mitigation Banks become beneficial.

Potential wetland restoration sites were identified using a Geographic Information Systems (GIS) exercise and specific criteria determined to be essential for restoration of a functional and beneficial wetland. The criteria used to identify these potential sites is as follows:

- Site with at least 5 acres of drained hydric soils located on an open or partially open parcel.

The initial analysis resulted in 59 sites meeting the above criteria. After careful review of each site using 2010 aerial photography, open space inventory results, and existing (2011) land use, 29 of the original 59 sites or portions of these sites were determined to be potentially feasible or have some limited feasibility (Table 23; Figure 38). The majority of the larger potentially feasible sites are located on either private agricultural land, within public forest preserves, or on land currently under equestrian use. Smaller potentially feasible sites and sites with limited feasibility are generally associated with large lot residential areas, small agricultural fields, and forest preserves. Overall, the analysis resulted in 21 "Potentially Feasible" sites, and 8 "Limited Feasibility" sites. Note: A feasibility study beyond the scope of this project will need to be completed prior to the planning and implementation of any potential wetland restoration site.

Potential wetland restoration site #'s 1, 2, 14, 15, and 28 are worth discussing in more detail because of location, size, potential to remediate watershed problems, or potential as Wetland Mitigation Banks. Site #'s 7, 8, 9, 13, 15, 16, and 29 are also important because they are located within SCVFP and are currently being investigated by the USACE.

- Potential site #1 is a 37.9 acre area located at the headwaters of Tributary H to Spring Creek on existing agricultural land. The site is also located in a Subwatershed Management Unit (SMU) that is expected to see residential growth in the future on adjacent agricultural areas and the Longmeadow Parkway Road extension. This potential site could serve as wetland mitigation bank for wetland impacts resulting in the road extension.

Potential wetland restoration site #1 located in northwest portion of watershed.

- Potential site #2 is another large site (124 acres) located almost entirely within an existing equestrian area that was heavily farmed and likely tile drained in the late 1930s. It also borders a large stretch of Spring Creek's main stem that was partially channelized in the past. Restoration of this large complex and reconnection of Spring Creek to the floodplain would greatly benefit the watershed.

Potential wetland restoration site # 14

- Potential site #14 is located in the southeast corner of the watershed and surrounds a section of the headwaters of Spring Creek. Restoration of this 52.5 acre wetland could prove extremely beneficial in capturing increased stormwater runoff/volume and pollutants from recent dense commercial, retail, and new residential development upstream. This potential site is also located in a Subwatershed Management Unit (SMU) that is highly impacted by impervious cover and that is expected to see an additional 8% increase in impervious cover once built out.

- Potential site #15 is located within Spring Creek Valley Forest Preserve along Tributary B to Spring Creek. This 44.8 acre area was previous farmed and contains various drain tiles. Tributary B was created to help drain the area. The FPDCC has identified corporate areas including the Sears Center, Prairie Stone, and IDOT holding along Route 72 as "Critical" pollutant contributors to the headwater areas of Tributary B. Restoration of this wetland would improve wildlife habitat and water quality function at the headwaters of Tributary B. Note: The U.S. Army Corps of Engineers-Chicago District is currently working with FPDCC to design and implement this wetland restoration project.

- Potential site #28 is located within Spring Creek Valley Forest Preserve south of Route 62 and forms the headwaters of Tributary D to Spring Creek. This large (334.6 acre) potential wetland restoration site was heavily farmed and tile drained by the late 1930s. It borders a large portion of Tributary D which is highly channelized. Restoration of this wetland complex would provide beneficial habitat and improve water quality function. (Note: USACE-Chicago District is working with Cook County Forest Preserve District to prioritize water quality improvement projects within the preserve. Drain tiles in this area are already plugged to test responding hydrology prior to restoring. If selected, full wetland restoration would begin in late 2012.)

- Potential site #'s 7, 8, 9, 13, 15, 16, & 29 are located throughout Spring Creek Valley Forest Preserve and total 116 acres of potential wetland restoration in areas that were historically farmed. Restoration of these wetland complexes would primarily beneficial wildlife but also improve water quality and increase flood storage. Note: USACE-Chicago District is working with Cook County Forest Preserve District to prioritize water quality improvement projects within the preserve. Drain tiles in these areas are already plugged to test responding hydrology prior to restoring. If selected, full wetland restoration would begin in late 2012.

Table 23. Potential Wetland Restoration Sites.

ID #	Area (Acres)	Feasibility	Existing Condition
1	37.9	Potentially Feasible	Located primarily on private agricultural land; south and east portions are on residential land and not feasible. Potential as mitigation bank site.
2	124.0	Potentially Feasible	Located almost entirely on private equestrian (pasture) land use. Note: Spring Creek is highly channelized within this area.
3	7	Limited Feasibility	Located on private residential lots with connecting excavated ponds.
4	6.9	Potentially Feasible	West portion located primarily on private agricultural Land; east portion on private residential land.
5	8.1	Potentially Feasible	West end located in SCVFP; east end abuts existing wetland on private agricultural field.
6	5	Potentially Feasible	Located partially within wooded area on west end and public park on east end.
7	9.7	Potentially Feasible	Located within SCVFP in previous agricultural area.
8	10	Potentially Feasible	Isolated area located within SCVFP; site visit is required to confirm is wetland is already present.
9	15	Potentially Feasible	Located within SCVFP; site is located in previously farmed area.
10	7.2	Potentially Feasible	Isolated area located on existing agricultural land.
11	5.7	Limited Feasibility	Primarily located on private tree farm/agricultural.
12	14.9	Limited Feasibility	Located in open private pasture/agricultural residential area.
13	7.2	Potentially Feasible	Located within SCVFP in previous tree farm/agricultural area.
14	52.5	Potentially Feasible	Located primarily on agricultural land. North portion located in SCVFP. Potential to store/treat stormwater from development upstream.
15	44.8	Potentially Feasible	Located within SCVFP on previously farmed area at headwaters of Tributary B.
16	11.4	Potentially Feasible	Located within SCVFP on previously farmed area.
17	6.3	Limited Feasibility	Located primarily on private tree farm; south portion in new development.
18	13.7	Limited Feasibility	Located on private residential lots with connecting excavated ponds.
19	14.9	Potentially Feasible	Located on agricultural land but split by Old Sutton Road.
20	6.4	Limited Feasibility	Located in equestrian land use area with adjacent structures.
21	38.1	Potentially Feasible	Located primarily on equestrian land use; however is bisected by several roads/drives and track.
22	46.9	Potentially Feasible	Located on agricultural land adjacent to SCVFP.
23	6.2	Limited Feasibility	Located within open space on private residential property.
24	6.5	Potentially Feasible	Located primarily on private agricultural land.
25	40.4	Potentially Feasible	Located primarily on equestrian land use.
26	5.4	Potentially Feasible	Located on equestrian land; partially wooded; site visit required to confirm if existing wetlands currently exists.
27	5.7	Potentially Feasible	Located primarily on private agricultural land.
28	334.6	Potentially Feasible	Large area within SCVFP that was heavily farmed and tile drained in the past. Note: Tributary D is excavated channel within this area.
29	25.1	Potentially Feasible	Area is located adjacent to Spring Creek within SCVFP; north portion on previous agricultural land; west portion is shrubland.

Note: A feasibility study will need to be completed prior to the planning and restoration of any potential wetland restoration site.

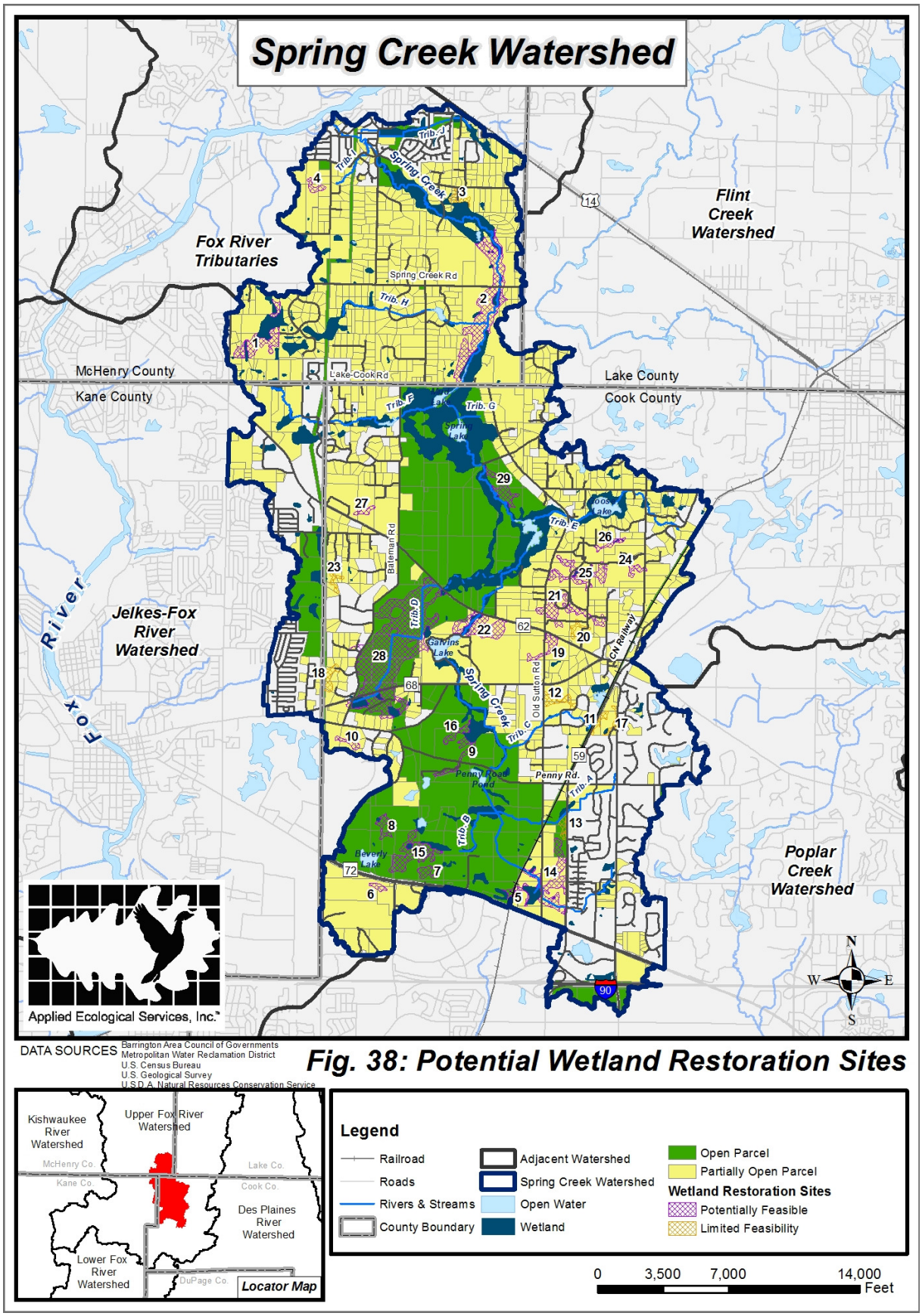


Fig. 38: Potential Wetland Restoration Sites

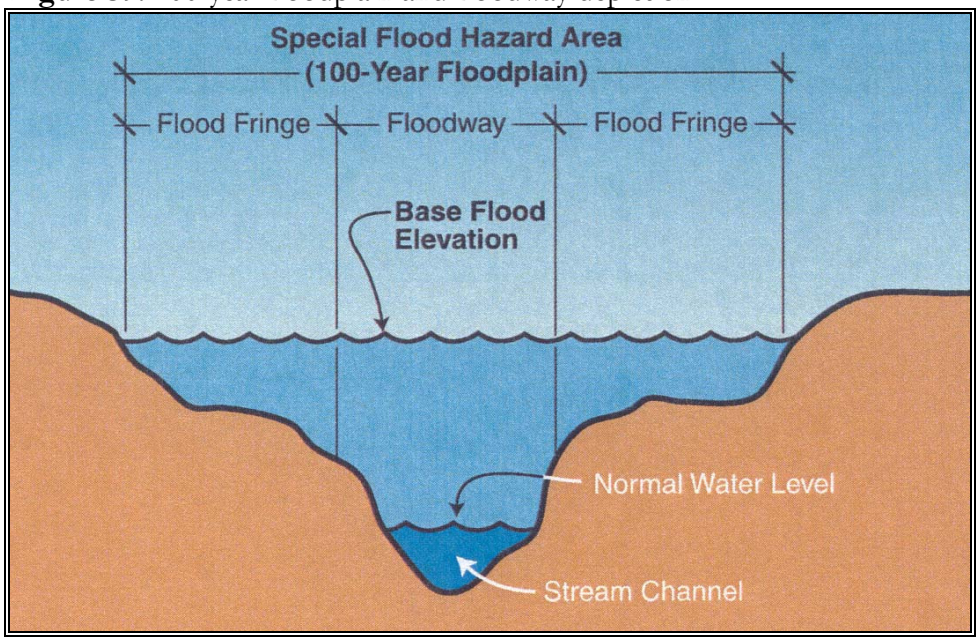
3.12.4 Floodplain & Flood Problem Areas

FEMA 100-Year Floodplain & MWRD 100-Year Inundation Model

Functional floodplains along stream and river corridors perform a variety of green infrastructure benefits such as flood storage, water quality improvement, passive recreation, and wildlife habitat. The most important function however is the capacity of the floodplain to hold water during significant rain events to minimize flooding downstream. The 100-year floodplain is defined by the Federal Emergency Management Agency (FEMA) as the area that would be inundated during a flood event that has a one percent chance of occurring in any given year (100 –year flood). 100-year floods can and do occur more frequently, however the 100-year flood has become the accepted national standard for floodplain regulatory purposes and was developed in part to guide floodplain development to lessen the damaging effects of floods.

The 100-year floodplain also includes the floodway. The floodway is the portion of the stream or river channel that comprises the adjacent land areas that must be reserved to discharge the 100-year flood without increasing the water surface. Figure 39 below depicts the 100-year floodplain and floodway in relation to a hypothetical stream channel.

Figure 39. 100-year floodplain and floodway depiction.



In December, 2010 Metropolitan Water Reclamation District of Greater Chicago (MWRD) completed a watershed plan for Poplar Creek located just south of the Spring Creek watershed (MWRD 2010). This report includes some general data about the Spring Creek watershed including an updated 100-year inundation area for the portion of Spring Creek watershed south of Lake-Cook Road. Figure 40 includes a map of the FEMA 100-year floodplain (mapped north of Lake-Cook Road) and MWRD's updated 100-year inundation area mapped south of Lake-Cook Road.

Potential & Documented Flood Problem Areas

A Flood Problem Area (FPA) is defined as a location where flooding causes property damage. Information about the location and condition of potential and documented FPAs was gathered from several sources. Metropolitan Water Reclamation District of Greater Chicago produced a report in 2010 that includes information about several documented FPAs and potential FPAs (based on 100-year flood modeling) south of Lake-Cook Road. Other information was gathered by conducting personal interviews with representatives from Villages and watershed residents. Other potential FPA's were found simply by viewing recent aerial imagery in relation to the mapped floodplain, particularly north of Lake-Cook Road where less information is available.

Four potential and three documented FPAs were identified in the Spring Creek watershed. Information about each is included in Table 24 and mapped on Figure 40. MWRD flood modeling found three potential FPAs; two pavement flooding areas and one structure. An additional potential FPA can be found within Spring Creek's floodplain between Algonquin Road and the Fox River where several residential homes are located. Documented FPAs are found at three locations including road and basement flooding at Tributary E's crossing with Old Sutton Road, flooding over Chapel Road, and Flooding on Bartlett Road. Mitigation measures for FPAs include flood proofing or acquisition of structures, culver replacement, and creation of additional stormwater storage upstream. It is important to note that resolving flood problems is not the focus of this report although many of the water quality improvement recommendations in the Action Plan have excellent secondary flood reduction benefits.

Table 24. Potential and documented Flood Problem Areas.

Flood Problem Area # (MWRD #)	Cause of Flooding	Location/Description	Potential Mitigation Measures
Potential FPAs (based on MWRD modeling & aerial interpretation)			
1 (MPA-8)*	Pavement Flooding	Penny Road crossing of Spring Creek. Road floods and one structure is damaged.	No feasible options recommended
2 (MPA-9)*	Overbank Flooding	Structure floods between Penny Road and Route 72.	Candidate for flood-proofing or possible acquisition
3 (MPA-10)*	Pavement Flooding	Route 62 crossing of Spring Creek. Road floods.	Replace culvert with larger structure and raise road elevation
4	Overbank Flooding	Potential flooding of several homes between Algonquin Road and Fox River	Stormwater storage in upper reaches of watershed
Documented FPAs			
5 (SCFP-1)*	Pavement Flooding	Tributary E and Old Sutton Road. Overflow results in flooding of local roads and basements west of Old Sutton Road and bank erosion on FPDCC property.	None developed; pavement flooding less than 6 inches deep.
6 (SCSB-1)*	Local Drainage Pavement Flooding	Higgins Road & Bartlett Road. Detention basin at Allstate property floods onto Bartlett Road.	None developed; local drainage system problem.
7	Pavement Flooding	Flooding on Chapel Road.	Improve and protect surrounding wetlands to improve hydrologic function and install/replace culverts

* Information obtained from MWRD 2010 report "Detailed Watershed Plan for the Poplar Creek Watershed Study Area: Volume 1".

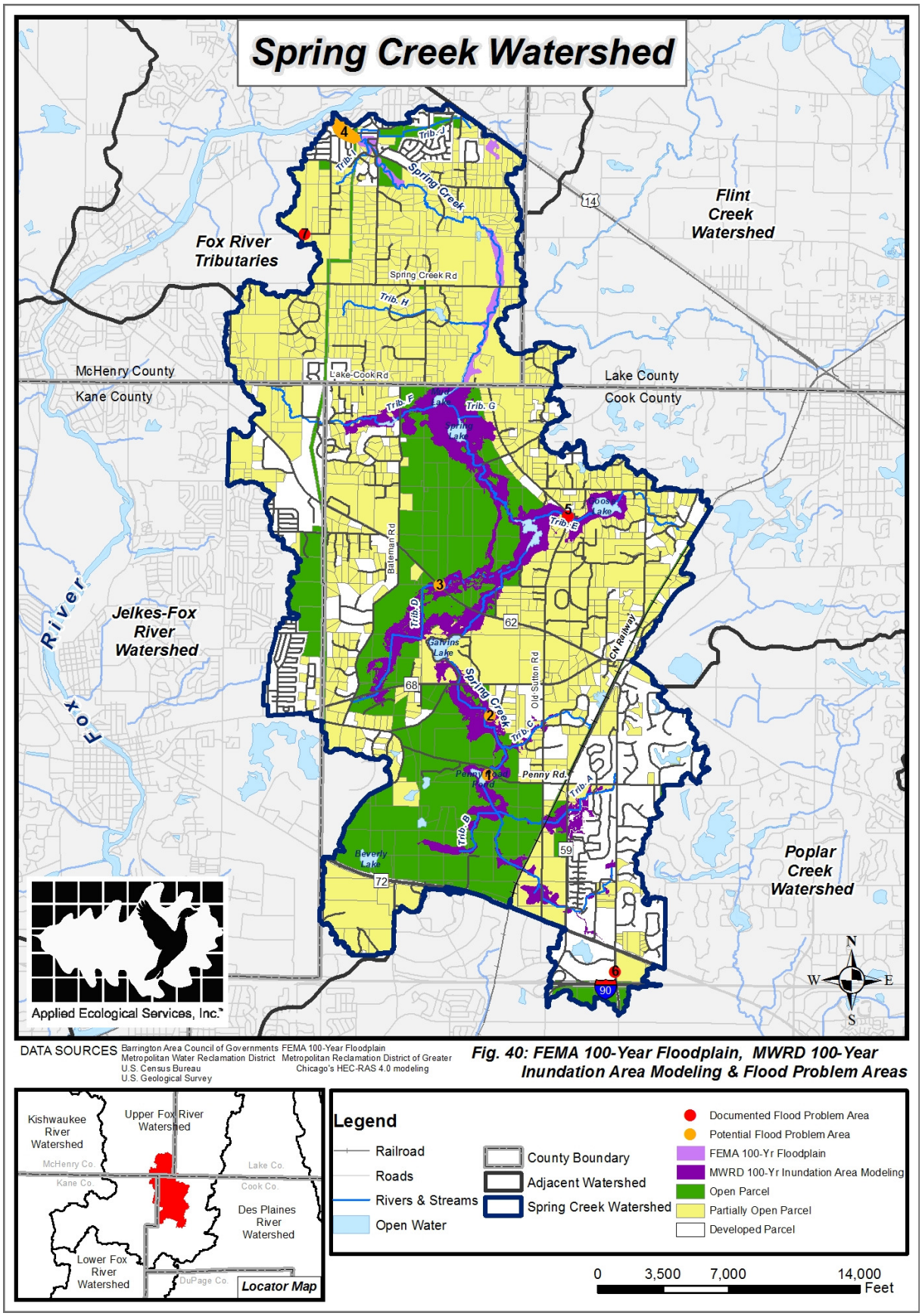


Fig. 40: FEMA 100-Year Floodplain, MWRD 100-Year Inundation Area Modeling & Flood Problem Areas

3.13 Groundwater Recharge[1]

Groundwater is one of the most important factors affecting the ecology of the Spring Creek watershed. Groundwater accounts for the base flow of streams and contributes water to many of the ponds, lakes and wetlands of the watershed. This water is supplied by the shallow groundwater system. This system consists of the limestone/dolomite bedrock underlying the watershed plus the overlying unconsolidated materials left behind by the recession of the glaciers. The unconsolidated materials mainly consist of clay, silt, sand, gravel and combinations thereof that are saturated with water. Groundwater is in storage in the void spaces between the particles of the unconsolidated materials. The coarser material such as sand and gravel form units/formations called aquifers and are the source of water extracted for human consumption in the area.

Groundwater is transient and its flow does not recognize watershed or political boundaries. In a natural state, a groundwater balance or equilibrium was reached long before human impact on the system. Groundwater flowed through the system from west to east and there was vertical flow upward and downward between the bedrock and the overlying unconsolidated materials. In addition, groundwater discharged to the surface and water was added to the system by the infiltration of rainwater, snow melt, and surface water. In the area of the Spring Creek watershed, the groundwater generally moves in an easterly direction, but significant variation in flow direction occurs near the ground surface where the flow is influenced by surface topography and discharge to surface waterways.

Once human influence is added to the equation, it provides a stress that tends to reduce groundwater levels. There is a large volume of groundwater in the area that is accessible for consumption, accomplished through public and private well pumping for drinking water, lawn watering, agricultural irrigation, and industrial and other uses. Consumption of more than a few percent of that volume, however, can diminish available community supply and reduce groundwater levels and discharge to streams to a point where the ecology of the watershed is substantially affected. The recharge process counters the reduction of groundwater levels by consumption, by allowing precipitation to infiltrate to the shallow aquifer system and increase the groundwater volume. Groundwater levels, especially trends in levels over long periods of time, reflect changes to the groundwater balance and the sustainability of the resource.

Recharge is the process by which precipitation reaches and re-supplies the groundwater. After precipitation reaches the ground a significant portion runs off and immediately evaporates. Of the larger portion that infiltrates the surface soil, most of it eventually evaporates from the soil or is taken up and used (transpired) by plants. In areas near streams, rivers, ponds, and lakes, some of the portion that infiltrated the soil will travel through the near-surface soils (upper few feet) and become delayed discharges to these water bodies within a few days of the precipitation event. In terms of annual precipitation, runoff and immediate evaporation accounts for approximately 26 and 5 percent of the precipitation respectively. About 69 percent of the precipitation enters the surface soil where 53 percent of the precipitation evaporates from the soil, is transpired by the plants and is discharged by shallow sub-surface flow. The remaining 16 percent travels downward through the underlying

[1] Groundwater recharge information was obtained from Barrington Area Council of Governments' Water Resources Initiative, Janet Agnoletti, BACOG Executive Director; written report provided by Kurt Thomsen Ph.D. PG, Principal, KOT Environmental Consulting, Inc.

unconsolidated materials, reaches the groundwater and becomes groundwater recharge. This recharging of the groundwater is a long-term process. Once the recharge contributes to the groundwater, it is available for extraction, discharge to surface waters, or remains in storage. The percentages presented above vary from place to place and over time, but are representative of typical values for the distribution of precipitation.

Areas within the watershed that have conditions that favor rapid recharge are the main areas where the shallow system groundwater is replenished. Groundwater can be extracted from anywhere, but can only be effectively re-supplied through moderate to highly sensitive recharge areas. Therefore, these recharge areas provide a fast conduit for precipitation to re-supply the groundwater and counter the effects of human consumption. On the other hand, the characteristics that encourage rapid refreshment of the groundwater are the same characteristics that favor the travel of contaminants from the surface to the groundwater and which can degrade the groundwater supply. Activities that use materials that might generate contaminants when released to the ground have the potential to cause these contaminants to migrate rapidly to the groundwater.

Research conducted through the Barrington Area Council of Governments (BACOG) has led to the classification of the watershed's recharge areas. The classification is strictly based on the area's surface soil and underlying unconsolidated material characteristics. Classification is predicated on the relative time of travel of recharging water to reach the uppermost unconsolidated material formation consisting of aquifer material after the water infiltrates the surface soil horizon. It does not account for the variability in amount and the sequence of precipitation events nor does it include the effects of transpiration.

Data sources used in the classification and mapping, include: Soil Survey for Lake County (USDA, 1970), Soil Survey for Du Page and Part of Cook County (USDA, 1979), Soil Survey for Kane County (USDA, 1979), and Soil Survey for McHenry County (USDA, 2002); stratigraphic (sequence of geologic soil types) information obtained from water-well logs (Illinois State Geological Survey [ISGS], 2001); and some techniques used by Berg (2001, ISGS).

Figures 41 and 42 show the distribution of recharge characteristics in the Spring Creek Watershed. The area of the watershed is approximately 17,100 acres of which 1,900 acres are "moderate," 2,200 acres are "sensitive," and 8,800 acres are "highly sensitive" recharge areas. A very high percentage of the watershed area has excellent recharge capability with 75.5 percent of the watershed having moderate to highly sensitive recharge characteristics. Most of the 24.5 percent of the poor to very poor recharge area lies south of Otis Road and east of Old Sutton Road with a small area located just north of the intersection of the McHenry and Kane County lines.

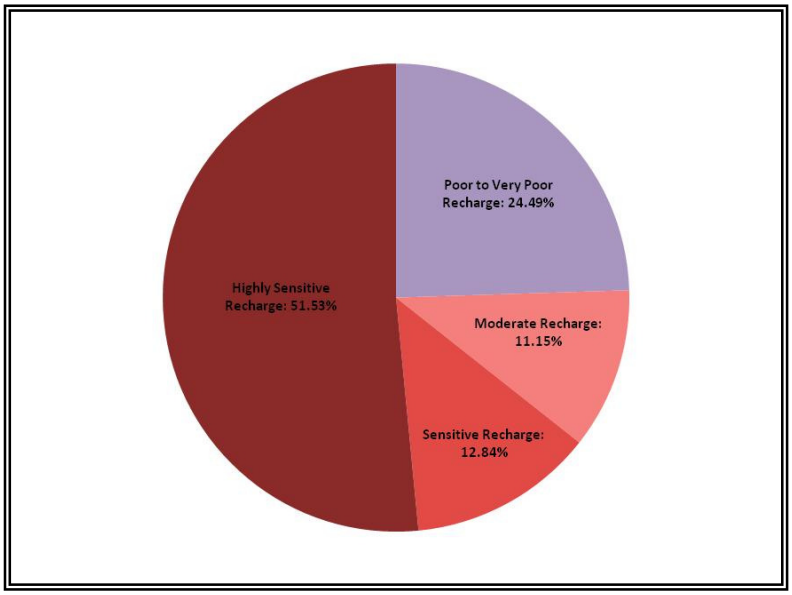


Figure 41. Distribution of recharge areas in the watershed.

The headwaters of Spring Creek originate in the southeast corner of the watershed in an area of poor to very poor recharge. The creek flows northwest entering an area of moderate recharge at the confluence with Tributary A. The headwaters of both Tributary A and Tributary C are located within poor to very poor recharge areas. Once these tributaries join Spring Creek, the Creek flows through moderate to highly sensitive recharge areas to the Fox River. All the other tributaries to Spring Creek originate and flow through areas having moderate to highly sensitive recharge. Streams flowing through recharge areas are more likely to have adequate flow through periods of drought and contribute to groundwater recharge during periods of high flow. The distribution of recharge depicted in Figures 41 and 42 is based on the best data available, but if recharge is an important consideration at a given site, more detailed site-specific recharge characteristics should be determined.

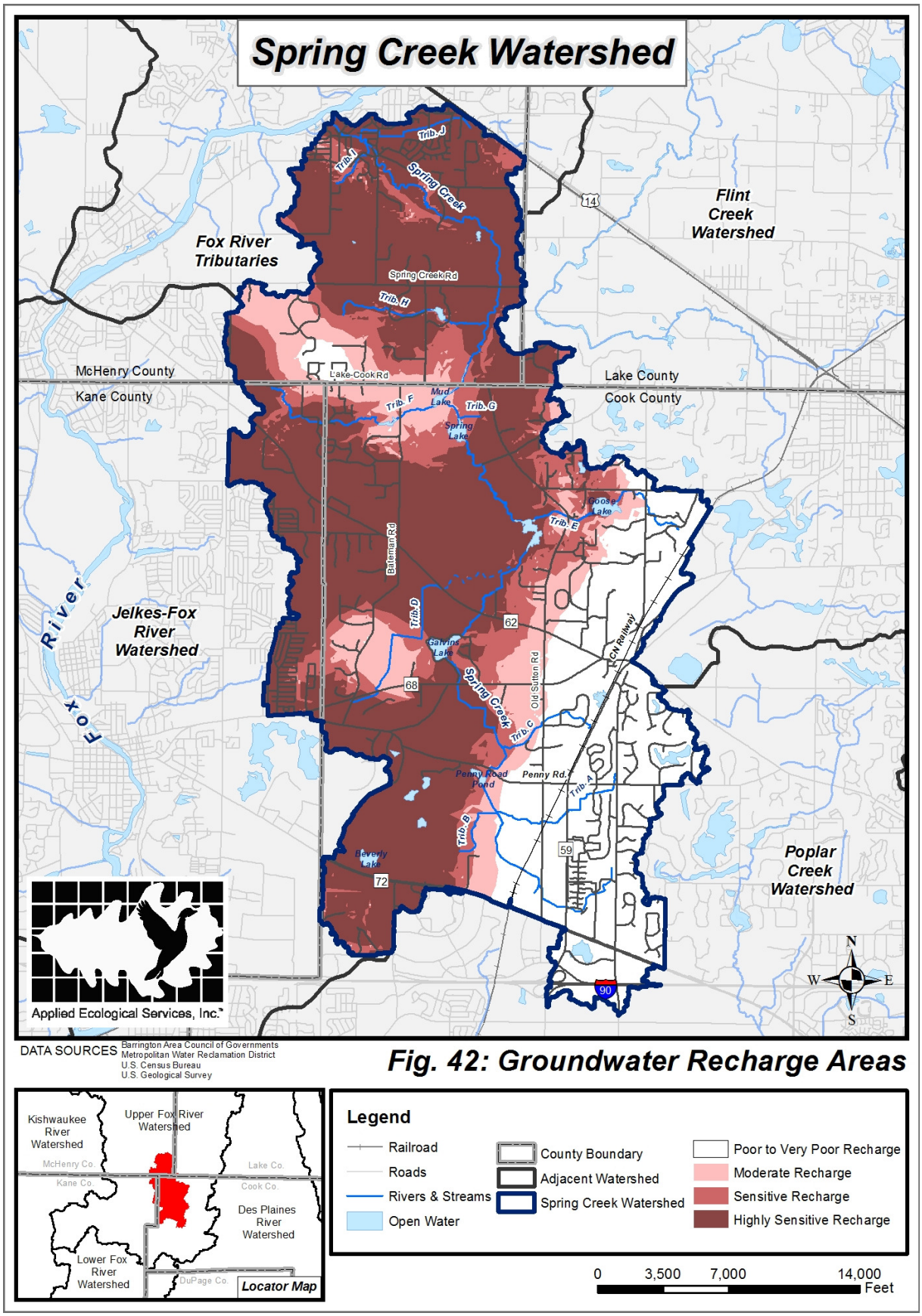
Recommendations for Action

Areas within the watershed that have conditions that favor rapid recharge are important for two reasons. First, they provide a fast conduit for precipitation to re-supply the groundwater. These areas should remain open, as much as possible, to facilitate the exchange of water between the surface and the groundwater. Second, the characteristics that encourage rapid refreshment of the groundwater are the same characteristics that favor the travel of contaminants from the surface to the groundwater and degrade the groundwater supply. These areas should be protected from activities that might generate contaminants that have the potential to migrate to the groundwater.

Local planning and zoning regulations need to be evaluated for their ability to protect against future potential development. Current land use and low-density development patterns have protected these important recharge areas thus far. Future development in an identified recharge area, should require the directing of intercepted water into the ground through use of a recharge basins or galleries. In areas having insufficient information available to assess recharge conditions, a borehole-drilling program could be instituted to collect that data. Once the data collection is completed, a monitoring well could be installed and used in a water-level measurement program.

It is critically important both to local communities and to the ecology of the watershed to monitor and understand groundwater levels. Maintenance of constant levels and increases in water levels are indicators of a healthy aquifer system. Decreases in water levels are a function of over consumption and lack of precipitation. A large decrease in the water level could affect availability of water supply for the public. It also could negatively impact the watershed ecology by not supplying sufficient water to maintain the wetlands, streams and fens, for example.

Although the data is very limited, analysis of water level trends from existing data is needed. More importantly, a program to generate new water level measurements and data such as the long-term well water level program offered by BACOG should be promoted and expanded within the watershed. Because much of the watershed is dependent on private and other non-municipal wells, a monitoring program will measure these types of wells across the watershed. The information collected will establish baseline water level conditions that could be used as a reference for comparison of future groundwater level data. This will allow for trend analysis over time. Additional private wells should be sought and brought into the BACOG program.



DATA SOURCES
Barrington Area Council of Governments
Metropolitan Water Reclamation District
U.S. Census Bureau
U.S. Geological Survey

Fig. 42: Groundwater Recharge Areas

A similar evaluation of water quality in public and private wells is recommended. An analysis from existing records is needed but data is limited. A program is in place at BACOG to sample water chemistry and quality features in wells across the watershed, and this program should be encouraged and expanded throughout the watershed. The data will be used to create a baseline, and future sampling would be compared to the baseline to allow for trend analysis. Analysis might identify contaminants or undesirable chemistry features that are caused by surface management practices, such as excessive driveway or road salting or over use by businesses and/or homeowners, and lawn fertilization activities. Such analysis could lead to development of additional local government policies and public education programs to improve water conditions.

A well water monitoring program focused on natural areas within and near the watershed that are designated or intended for protection is also recommended as contained in the BACOG comprehensive program. These areas might include significant wetlands, the Wagner Fen, and Barrington Bog. Monitoring would cluster measurements in relation to the natural areas, and would include measurements of water levels and water quality. Combined with data on water levels and quality in surface waters, the groundwater measurements would help to establish the relationship between groundwater and surface waters. Information also could be used to evaluate the relationship of changes in water levels and water quality to changes in flora and fauna. This component of the BACOG program has not yet been implemented but would be ideal for initiation in the Spring Creek watershed

If a wellhead protection assessment has been prepared it should be revised to reflect the current recharge conditions. If an assessment has not been prepared, it should be prepared using the current recharge information and by paying particular attention to identifying potential sources of contamination.

Overall, public education programs are needed to increase awareness of the importance of groundwater to watershed management and to encourage conservation and protection measures.

3.14 Water Quality Assessment

Data that is available within Spring Creek watershed indicates that water quality is generally fair with only moderate impairments. The Fox River Grove Wastewater Treatment Plant (WWTP) is the only NPDES outfall currently permitted by the Illinois EPA in the watershed but it discharges directly to the Fox River so is not a pollutant source to Spring Creek. Municipalities discharging to Spring Creek are regulated by the Illinois EPA's NPDES Phase II Stormwater Permit Program. Table 25 lists all known water quality data for the watershed while Figure 43 displays the location of water quality sample sites. In general, the most recent available data is summarized in this section so that recommendations and management strategies are based on the most current depiction of the water quality and biological conditions within the watershed. It should be noted that many of the water quality monitoring activities and collected data may not have followed an Illinois EPA approved Quality Assurance Action Plan.

Section 305 (b) of the Federal Clean Water Act requires Illinois and all other states to submit to the USEPA a biannual report of the quality of the state's surface and groundwater resources called the *Integrated Water Quality Report*. These reports must also describe how Illinois assessed water quality and whether assessed waters meet or do not meet water quality standards specific to each "Designated Use" of a waterbody as defined by the Illinois Pollution Control Board (IPCB). When a waterbody is determined to be impaired, Illinois EPA must list potential reasons for impairment in the 303 (d) impaired waters list. There are seven "Designated Uses" in Illinois; Illinois EPA has assigned five of these uses to Spring Creek including:

- Aquatic Life
- Fish Consumption
- Primary Contact
- Secondary Contact
- Aesthetic Quality

The Illinois EPA does not list Spring Creek as being impaired for any of its Designed Uses because it was not assessed in any of the most recent *Integrated Water Quality Reports* (IEPA Draft 2010, 2008, 2006). Despite the lack of Illinois EPA data, attainment of the "Aquatic Life" Designated Use is most applicable to Spring Creek and is the basis by which the quality of Spring Creek is determined in the following subsections. Fish, aquatic macroinvertebrate, and mussel data is examined in the biological monitoring subsection. This data indicates that although not fully supporting for Aquatic Life, Spring Creek is only moderately impaired and is a fair to good aquatic resource. Nutrients (nitrogen and phosphorus) and suspended solids/sedimentation are specifically examined under the water chemistry monitoring subsection as these were identified by stakeholders as the primary potential causes of water quality impairment in the watershed. Water chemistry sampling results indicate that Spring Creek is generally in good condition although phosphorus, chloride, and total suspended solids levels exceeding recommended standards have been documented.

Table 25. List of known chemical (H2O) and biological (BIO) water quality sample sites.

Map Code	Location(s)	Sampling Entity(s)	Year(s)	Purpose	Water Quality Parameters
H201	Spring Creek - @ Lincoln St. - Site# 31, McHenry County	Cary Grove H.S. (T. Bruley & CG Environmental Science) - Friends of the Fox River	4/10/2001, 9/11/2002 10/14/2004,10/26/2005 4/4/2006, 10/6/2006/ 5/2/2007, 10/3/2008 5/2011	Stream assessment study	Temp, pH, N, Phosphate, Turb. DO, Fecal coliform, BOD, substrate, water dimensions, Macroinvertebrates
H202 H203	H202: Spring Creek @ Route 59 H203: Spring Creek @ Braeburn & Algonquin Roads	Village of Barrington Hills via Gewalt Hamilton Associates, Inc.	2009-2011	NPDES Phase II requirements	Ammonia, Chloride, Flouride, BOD, Phenolics, Total Phosphorus, Total Suspended Solids, Total Kjeldahl Nitrogen, Potassium, Dissolved Oxygen, Total Dissolved Solids, Temperature, Conductivity, pH
BIO1	Spring Creek, McHenry County	Illinois Department of Natural Resources	1941	Fish Survey	Not known. Data could not be obtained.
BIO2	Spring Creek, McHenry County	Illinois Natural History Survey, Illinois Department of Natural Resources	1960	Fish Survey	Not known. Data could not be obtained.
BIO3	Spring Creek, Cook County	Illinois Natural History Survey, Illinois Department of Natural Resources	1970	Fish Survey	Not known. Data could not be obtained.
BIO4	Spring Creek - Barrington Hills, Cook County	T.G. Marsh – Illinois Department of Natural Resources	8/12/1988	Mussel Survey	None; survey only
BIO5	Spring Creek - 2 mi E Carpentersville, Spring Creek Valley Forest Preserve, Cook County	C. Anchor – Illinois Department of Natural Resources	8/28/1993	Mussel Survey	None; survey only
BIO6	Spring Creek - 2 mi S Fox River Grove near Spring Creek Rd., McHenry County	R.W. Schanzle – Illinois Department of Natural Resources	7/8/1994	Mussel Survey	None; survey only
BIO7	Goose Lake, Cook County	Illinois Natural History Survey, Illinois Department of Natural Resources	1994	Fish Survey	None; survey only
BIO8A BIO8B	Spring Creek - S of Donlea Rd., & N of Donlea Rd., Spring Creek Valley Forest Preserve, Cook County	C. Anchor & D. Antlitz – Illinois Department of Natural Resources	8/4/1995	Mussel Survey	None; survey only
BIO9	West of Rock Ridge Rd. Bridge; Rock River Farm south, Barrington Hills	McHenry County Conservation District	9/12/1996	Fish Survey	Water quality using fish communities: Index of Biotic Integrity (IBI)
BIO10	Spring Creek – Fox River Grove, Lincoln St., McHenry County	R.W. Schanzle, R. Rung, F. Jakubisek, et al. – Illinois Department of Natural Resources	9/18/1997	Mussel Survey	None; survey only
BIO11	Spring Creek - 4 mi W Algonquin, N of Spring Creek Rd., McHenry County	P. Golden – Illinois Department of Natural Resources	7/23/1997	Mussel Survey	None; survey only
BIO12A BIO12B BIO12C	Spring Creek, Spring Creek Valley Forest Preserve between Donlea Rd. and Route 62	W. Schennum, B Woodsen	1/8/99	Fish Survey	Water quality using fish communities: Index of Biotic Integrity (IBI)
BIO13	Spring Creek at Penny Road Crossing (Riverwatch # R0204101)	Riverwatch	6/2/2001, 5/25/2002, 6/7/2003, 7/5/2006, 7/13/2008, 7/5/2009, 7/17/2010	Macroinvertebrate Survey	Water quality using Macroinvertebrate Biotic Index (MBI)
BIO14	Spring Lake, Cook County	Southern Illinois University, Illinois Department of Natural Resources	2002	Fish Survey	None; survey only
BIO15	Goose Lake, Cook County	Southern Illinois University, Illinois Department of Natural Resources	2002	Fish Survey	None; survey only
KEY:		NH3 = ammonia nitrogen	TDS = total dissolved solids		
DO = dissolved oxygen		NO3 = nitrate nitrogen	Turb = turbidity		
Tot. P = total phosphorus		TKN = kjeldahl nitrogen	TSS = total suspended solids		
IBI = Index of Biotic Integrity		Cond.= conductivity	pH=acid/base scale		
MBI = Macroinvertebrate Biotic Index		BOD = Biological Oxygen Demand			

Note: Many of the water quality monitoring activities and collected data may not have followed an Illinois EPA approved Quality Assurance Action Plan.

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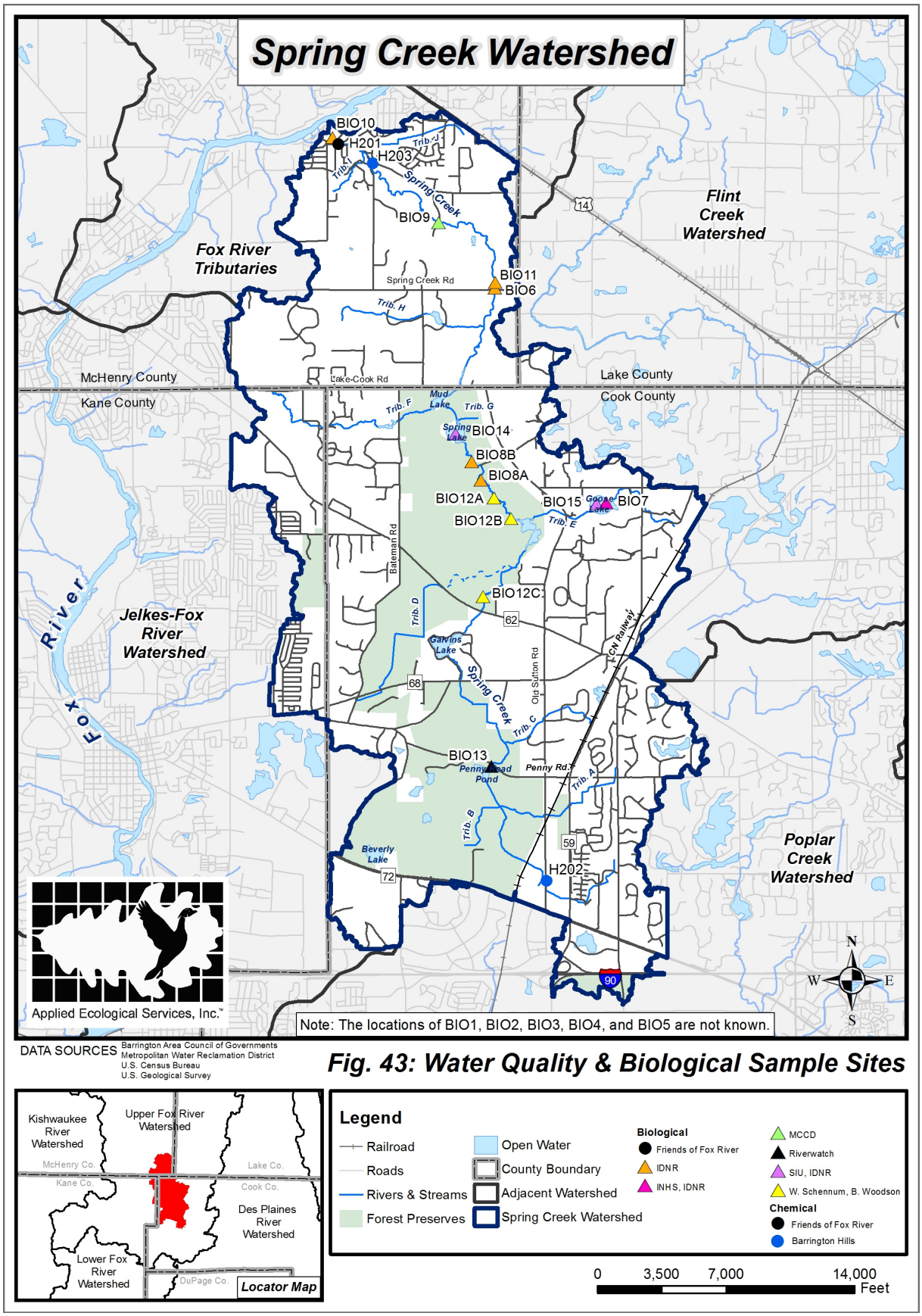


Fig. 43: Water Quality & Biological Sample Sites

Biological Monitoring

Biological data provides the primary basis for determining the level of Aquatic Life support and is a major source of information for Illinois EPA's *Integrated Water Quality Reports*. Illinois Department of Natural Resources (IDNR), Illinois Natural History Survey (INHS), McHenry County Conservation District (MCCD), and private consultant biologists, and RiverWatch and Friends of the Fox River (FOFR) volunteers conducted several macroinvertebrate, fish community, and mussel surveys beginning in the 1940's and as recently as 2011 (Table 25; Figure 43). Biologists and volunteers utilized several indices based on macroinvertebrate and fish communities including the Macroinvertebrate Biotic Index (MBI), Macroinvertebrate Index, and fish Index of Biotic Integrity (fIBI) to evaluate the water quality and biological health of Spring Creek and to detect and understand change in biological systems that result from the actions of human society.

The Illinois EPA currently uses MBI and fIBI data to determine the Aquatic Life support status of streams as shown in Table 26. The Macroinvertebrate Index (Oram 2011) is not an approved method used by the Illinois EPA and therefore is not discussed in detail below. Also, no biological index currently exists to evaluate mussels but conclusions about the quality of water can be made depending on the species present or absent.

Table 26. Illinois EPA indicators of Aquatic Life impairment using MBI and fIBI scores.

Biological Indicator	**Score**		
MBI	> 8.9	5.9 < MBI < 8.9	≤ 5.9
fIBI	≤ 20	20 < IBI< 41	≥ 41
Impairment Status - Use Support - Resource Quality			
Impairment Status	Severe Impairment	Moderate Impairment	No Impairment
Designated Use Support	Not Supporting	Not Supporting	Fully Supporting
Resource Quality	Poor	Fair	Good

Source: Integrated Water Quality Report (2010).

Macroinvertebrate Community Monitoring

RiverWatch and FOFR volunteers sampled the macroinvertebrate community several times at locations BIO13 and H2O1 respectively (Table 25; Figure 43). RiverWatch calculated MBI scores for each year while FOFR calculated Macroinvertebrate Index scores (Table 27.) The MBI and Macroinvertebrate Index are designed to rate water quality using the pollution tolerance of macroinvertebrates and human impacts as an estimate of the degree and extent of organic pollution and disturbance in streams. The Illinois EPA has determined that a MBI score less than 5.9 indicates a stream is not fully supporting aquatic life. Overall, RiverWatch macroinvertebrate data indicates that there is no impairment, the resource quality is good, and the Illinois EPA Aquatic Life Designated Use is fully supported.

Table 27. MBI and Macroinvertebrate Index scores at RiverWatch and FOFR survey sites.

Site	Year	Stream Branch	Location	MBI (Resource Quality)	Macroinvertebrate Index (Quality)
BIO13	2001	Spring Creek	SCVFP	5.59 (Good)	-
BIO13	2002	Spring Creek	SCVFP	5.78 (Good)	-
BIO13	2003	Spring Creek	SCVFP	5.69 (Good)	-
BIO13	2006	Spring Creek	SCVFP	6.27 (Fair)	-
BIO13	2008	Spring Creek	SCVFP	5.76 (Good)	-
BIO13	2009	Spring Creek	SCVFP	5.76 (Good)	-
BIO13	2010	Spring Creek	SCVFP	5.6 (Good)	-
H2O1	2001	Spring Creek	Lincoln St.	-	36 (Excellent)
H2O1	2002	Spring Creek	Lincoln St.	-	40 (Excellent)
H2O1	2004	Spring Creek	Lincoln St.	-	37 (Excellent)
H2O1	2005	Spring Creek	Lincoln St.	-	37 (Excellent)
H2O1	2006A	Spring Creek	Lincoln St.	-	35 (Excellent)
H2O1	2006B	Spring Creek	Lincoln St.	-	34 (Excellent)
H2O1	2007	Spring Creek	Lincoln St.	-	41 (Excellent)
H2O1	2008	Spring Creek	Lincoln St.	-	34 (Excellent)
H2O1	2011	Spring Creek	Lincoln St.	-	40 (Excellent)

Fish Community Monitoring

The fIBI assess biological health and water quality through several attributes of fish communities found in streams. These attributes fall into such categories as species richness and composition, trophic composition, and fish abundance and condition. After data from sampling sites has been collected, values for the metrics are compared with their corresponding expected values for a high quality reference stream and a rating is assigned to each metric based on whether it deviates strongly from, somewhat from, or closely approximates the reference values. The sum of these ratings gives a total fIBI score for the site. The Illinois EPA uses fIBI scores to determine aquatic life impairments and has determined that a score less than 41 indicate a stream is not fully supporting aquatic life.

MCCD and private consultants sampled Spring Creek's fish community and calculated fIBI scores one time at BIO9 in 1996 and at BIO12A, BIO12B, and BIO12C in 1999 (Table 25; Figure 43). Site BIO9 is located near the Rock River Road bridge over Spring Creek; BIO12A-C are located between Donlea Road and Route 62 within Spring Creek Valley Forest Preserve. fIBI scores for these sites are outlined in Table 28.

Fantail Darter found at site BIO9

The fIBI scores indicate that there is moderate impairment, the resource is fair, and the Illinois EPA Aquatic Life Designated Use is not fully supporting. A closer look at the fish data reveals that five darter species were found at BIO9. Darters are small fish that generally require sandy to gravely substrates and good

water quality for survival. Conversely, only one darter species was found upstream at BIO12A-C. The report generated for the survey conducted at BIO12A, BIO12B & BIO12C (Schennum & Woodson, 1999) notes that many of the riffles in the upper reaches of Spring Creek were dry in early August and much of the stream was dry by mid September. This is a sign of reduced groundwater recharge to the stream that causes fish populations to find permanent pools or move downstream then recolonize when water levels rise. The report also notes that typical "headwater species" were not found but rather "pioneer species" that can tolerate hydrologically unstable streams. Note: fish data collected in 1941, 1960, 1970, 1994, and 2002 could not be obtained. However, this data was collected in a fashion that does not allow for calculation of fIBI scores.

Table 28. fIBI scores and class at fish survey sites.

Site	Year	Stream Branch	Location	IBI	Quality
BIO9	1996	Spring Creek	Rock River Road Bridge	38	Fair
BIO12A	1999	Spring Creek	South of Donlea Rd. Bridge	34	Fair
BIO12B	1999	Spring Creek	Between Donlea Rd. & Route 62	36	Fair
BIO12C	1999	Spring Creek	North of Route 62	36	Fair

Mussel Community Monitoring

The IDNR conducted several mussel surveys within Spring Creek beginning in 1988 with the most recent survey occurring in 1997(Table 25; Figure 43). Data from BIO4, BIO5, BIO6, BIO8A, and BIO8B could not be obtained and therefore are not summarized in this report. Results from BIO10 and BIO11 mussel surveys conducted in 1997 were available. BIO10 is located on Spring Creek near the mouth of the Fox River while BIO11 is located just north of the Spring Creek Road bridge. Weathered shells of four species were found at BIO10: three ridge, plain pocketbook, creek heelsplitter, and ellipse. Live specimens of white heelsplitter and giant floater were also present. Weathered shells of spike and plain pocketbook were found at BIO11. Live specimens of five species were also found including slippershell, round pigtoe, giant floater, creeper, and ellipse.

Endangered Slippershell mussel found in Spring Creek

The presence of mussels in any stream is a sign of at least fair water quality and good habitat conditions. Threeridge, plain pocketbook, white heelsplitter, giant floater, and creeper are all common in Illinois streams and rivers (INHS 2011). However, round pigtoe is considered uncommon; spike, creek heelsplitter, and ellipse are considered special concern; creek heelsplitter is threatened and slippershell is endangered in Illinois (INHS 2011).

Water Chemistry Monitoring

The Illinois EPA primarily uses water chemistry data to supplement biological data when determining if streams are meeting the Aquatic Life support Designated Use. The Illinois EPA did not assess Spring Creek in their *Integrated Water Quality Report s* for 2006, 2008, or 2010 and therefore did not include any pollutants as potential causes of impairment. Consequently, the watershed stakeholder committee reasoned that based on known conditions and field inspections that nutrients (nitrogen and phosphorus) and sedimentation are the likely pollutants that are currently causing any degree of impairment to aquatic life in Spring Creek.

To date, the IPCB has not developed *numeric* water quality standards for nutrients in streams. And, Illinois rejected the USEPA ecoregion based national criteria for nitrogen and phosphorus due to lack of scientific backing. Illinois EPA does provide *statistical* guidelines for various pollutants including nitrogen, phosphorus, and sedimentation.

Two sampling locations provide the best water quality data for the watershed. Friends of the Fox River volunteer water quality monitoring program collected water quality data for Spring Creek at site H201 in 2001, 2002, 2004, 2005, 2006 (two sample dates), 2007, 2008, and 2011. The location of this site is just downstream from the Fox River Grove Waste Water Treatment Plant at Lincoln Street (Table 25; Figure 43). Sampling at this site provides a snapshot of water quality for nearly the entire watershed. The most recent data (2006 – 2011) is summarized in Table 29 below. An average over the nine sample periods does provide information to make several conclusions about water quality. First, BOD is slightly elevated but because oxygen levels are high, BOD does not appear to be a problem. Second, is a general trend in slightly elevated phosphorus levels. The average level is 0.79 mg/l which exceeds the recommended standard of 0.61 mg/l for streams. Finally, nitrate and turbidity do not appear to be problems as initially suspected by the watershed stakeholder committee.

The Village of Barrington Hills has been collecting water quality samples from 2009-2011 as part of their NPDES Phase II requirements at locations H2O2 and H2O3 (Table 25; Figure 43). Site H2O3 (known as Spring Creek North) is located at Spring Creek where it leaves Barrington Hills at Braeburn and Algonquin Roads. This sampling location also provides a snapshot of water quality for the majority of the watershed and the samples were processed using a certified lab. The sampling is conducted by the Village Engineer: Gewalt Hamilton Associates, Inc. (GHA 2011). The results for many of the sampled parameters are included in Table 29. An average of the data over the 3-year monitoring period indicates that water quality is good as it nears the point where it leaves the watershed. The most significant finding is that total phosphorus averages 0.03 mg/l as opposed to 0.79 mg/l documented by Friends of Fox River. This is far below the 0.61 mg/l recommended standard for streams and even meets the 0.05 mg/l recommendation for lakes.

Table 29. Summary of water chemistry data collected within Spring Creek at sites H2O1, H2O2, & H2O3.

Parameter	Stream Aquatic Life Statistical Guideline*	Sampling Entity	2006A	2006B	2007	2008	2009	2010	2011	Ave.
DO (mg/l)	>5.0 mg/l	FOFR	16.1	15.0	-	14.0	-	-	5.9	**13.9**
		GHA	-	-	-	-	7.5	9.1	11.5	**9.4**
pH	>6.5 or <9.0	FOFR	8.3	8.5	8.0	7.8	-	-	6.8	**7.9**
		GHA	-	-	-	-	8.4	7.1	7.7	**7.7**
BOD (mg/l)	<5.0 mg/l	FOFR	1.9	7.0	4.1	6.0	-	-	3.3	**7.0**
		GHA	-	-	-	-	0.5	1.2	<2	**1.2**
Temp (Celsius)	<32.2 C	FOFR	14.9	13.6	16.1	17.5	-	-	16.2	**12.6**
		GHA	-	-	-	-	21	13	4	**12.7**
Phosphorus (mg/l)	<0.61 mg/l	FORF	0.89	0.33	0.55	0.00	-	-	0.40	**0.79**
		GHA	-	-	-	-	0.04	0.02	0.04	**0.03**
Nitrate (mg/l)	<7.8 mg/l	FOFR	3.4	0.5	0.0	2.0	-	-	10.0	**2.5**
Ammonia (N)	<15.0 mg/l	GHA	-	-	-	-	0.4	0.1	0.1	**0.2**
Turbidity (JTU)	<20 JTU	FOFR	17.8	0.0	23.5	1.0	-	-	23.1	**13.8**
TSS	<19 mg/l	GHA	-	-	-	-	11	4	9	**8**
Chloride	<500 mg/l	GHA	-	-	-	-	99	78	70	**82**

*Statistical Guidelines obtained from Illinois EPA Integrated Water Quality Reports & conversations with Illinois EPA staff and other sources.

Illinois EPA Permit Programs

The Illinois EPA Bureau of Water regulates wastewater and stormwater discharges to streams and lakes by setting effluent limits, and monitoring/reporting on results. The Bureau oversees the National Pollutant Discharge Elimination System (NPDES) program. The NPDES program was initiated under the federal Clean Water Act to reduce pollutants to the nation's waters. This program requires permits for discharge of: 1) treated municipal effluent; 2) treated industrial effluent; and 3) stormwater from separate stormsewer systems (MS4's) and construction sites.

NPDES Permit Sites

One Waste Water Treatment Plant (WWTP) permit has been issued for plant in Fox River Grove located near Spring Creek's confluence with the Fox River. However, this plant discharges directly to the Fox River and therefore is not a pollutant source to Spring Creek.

NPDES Phase II Stormwater Permit Program

The Illinois EPA's NPDES Phase I Stormwater Program began in 1990 and applies only to large and medium-sized municipal separate stormsewer systems (MS4's), several industrial categories, and construction sites hydrologically disturbing 5 acres of land or more. The NPDES Phase II program began in 2003 and differs from Phase I by including additional MS4 categories, additional industrial coverage, and construction sites hydrologically disturbing greater than 1 acre of land. These three categories are discussed in more detail below. More detailed descriptions can be viewed on the Illinois EPA's web site.

Under NPDES Phase II, all municipalities with small, medium, and large MS4's are required to complete a series of Best Management Practices (BMPs) including; 1) Develop a stormwater management program comprised of BMPs and measurable goals for at least 6 control measures such as public education and pollution prevention; 2) Submit a completed Notice of Intent (NOI) to share Phase II requirement with other municipalities; and 3) Submit an annual report to Illinois EPA reporting on the status of the implemented programs.

The Phase II Program also covers all construction sites over 1 acre in size. For these sites the developer or owner must comply with all requirements such as completing and submitting a NOI before construction occurs, developing a Stormwater Pollution Prevention Plan (SWPPP) that shows how the site will be protected to control erosion and sedimentation, completing final stabilization of the site, and filing a Notice of Termination (NOT) after the construction site is stabilized.

3.15 Pollutant Loading Analysis

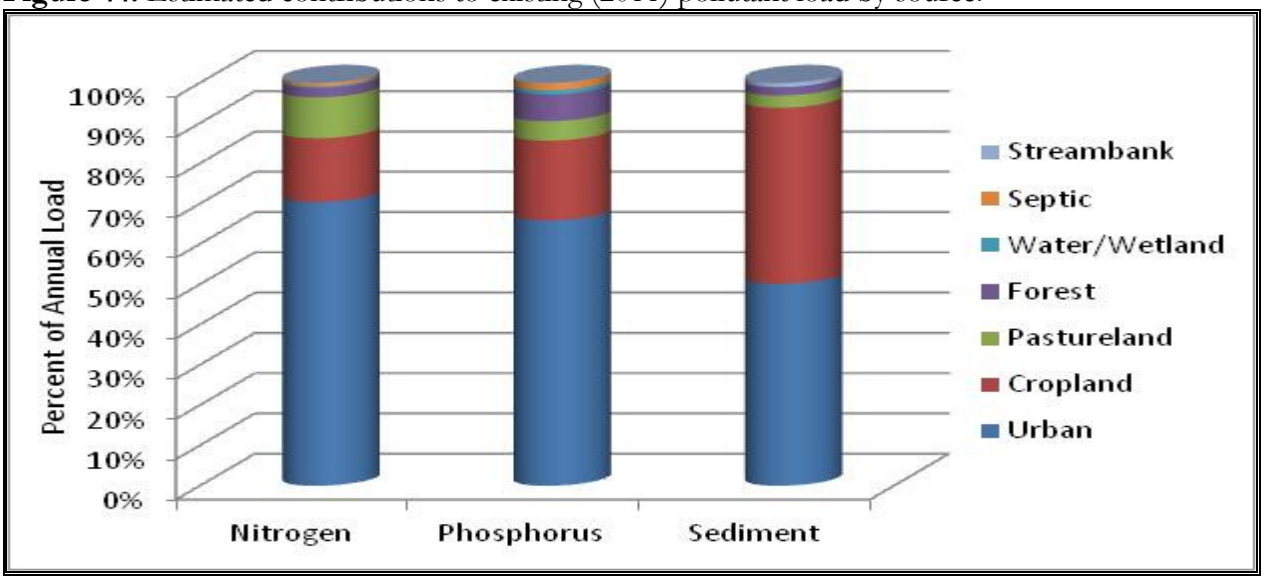
A modeling tool called STEPL (Spreadsheet Tool to Estimate Pollutant Loads) was used to estimate the existing nonpoint source load of nutrients (nitrogen & phosphorus) and sediment from Spring Creek watershed as a whole and by individual Subwatershed Management Unit (SMU). The model uses land use/cover category types, precipitation, management measures, and known water quality data input information. The model outputs average annual pollutant load for each of the land use/cover types. The results of this analysis were used to; 1) estimate the total watershed load for nitrogen, phosphorus, and sediment and 2) identify and map pollutant load "Critical Area" SMU's

The results of the STEPL model run at the watershed scale indicate that urban land uses contribute the highest load of nitrogen (70%), phosphorus (66%), and sediment (50%) (Table 30; Figure 44). This result is not surprising since approximately 6,750 acres or 39% of the watershed is in residential land use. Also notable is the contribution of nitrogen (16%), phosphorus (20%), and sediment (44%) from cropland. Cropland is also one of the dominant land uses in the watershed at about 1,580 acres or 9%. Pastureland also contributes significantly to nitrogen at 10% of the total load. Forest, water/wetland, septic, and streambanks do not contribute significantly to watershed pollutant loading. Note: Detailed STEPL Model results can be found in Appendix D.

Table 30: Estimated existing (2011) annual pollutant load by source at the watershed scale.

Source	N Load (lb/yr)	P Load (lb/yr)	Sediment Load (t/yr)
Urban	35,444	5,854	786
Cropland	7,977	1,757	685
Pastureland	5,109	430	48
Forest	1,200	588	33
Water/Wetland	191	95	0.02
Septic	382	150	0
Streambank	23	9	16
Total	**50,327**	**8,883**	**1,567**

Figure 44. Estimated contributions to existing (2011) pollutant load by source.



The results of the STEPL model were also analyzed at the SMU scale. This allows for a more refined breakdown of pollutants sources and leads to the identification of pollutant load "Critical Areas". "Critical Area" SMUs were selected based on the following criteria:

- Nitrogen contribution from SMU is greater than 3,000 lb/yr
- Phosphorus contribution from SMU is greater than 500 lb/yr
- Sediment contribution from SMU is greater than 100 tons/yr

Table 31 and Figure 45 summarize and depict the results using the criteria above. A detailed table summarizing the pollutant load for all 17 SMUs making up Spring Creek watershed can be found in Appendix D. Nine of the 17 SMUs comprising Spring Creek watershed are considered pollutant load "Critical Areas". SMUs 1, 3, and 5 are all located in the southeast portion of the watershed where commercial, transportation (roads), and small lot residential land uses dominate. SMU 1 also has significant cropland. These land uses are the primary contributors of pollutants. SMU 6 is dominated by large lot residential and pastureland which contribute pollutants. Pollutants from SMU 7 originate mostly from industrial, institutional, transportation, and small lot residential in the west half of the subwatershed. SMUs 9 and 14 contribute pollutants from large lot residential and pastureland. SMU 11 contributes pollutants from transportation, large lot residential, and cropland. Sediment from cropland is the primary pollutant coming from SMU 13.

Table 31: Pollutant load "Critical Area" SMUs based on contribution criteria.

Critical Area SMU	N Load (lb/yr)	P Load (lb/yr)	Sediment Load (t/yr)
SMU 1	6,624	1,094	206
SMU 3	4,737	804	119
SMU 5	3,480	632	119
SMU 6	4,274	821	185
SMU 7	4,374	817	-
SMU 9	3,001	501	-
SMU 11	5,352	110	197
SMU 13	-	-	103
SMU 14	3,604	532	-

The information obtained from the pollutant loading analysis is also used in Section 4.0 of this plan to map "Critical Areas", help with identification of Management Measures appropriate to reduce pollutants in "Critical Areas", and identify pollutant load reduction targets using USEPA's Region 5 Model (MDEQ 1999). The Region 5 Model provides estimates of nutrient and sediment load reductions from implementation of recommended agricultural and urban Management Measures to evaluate the ability of recommended projects to reduce pollutants to targets levels.

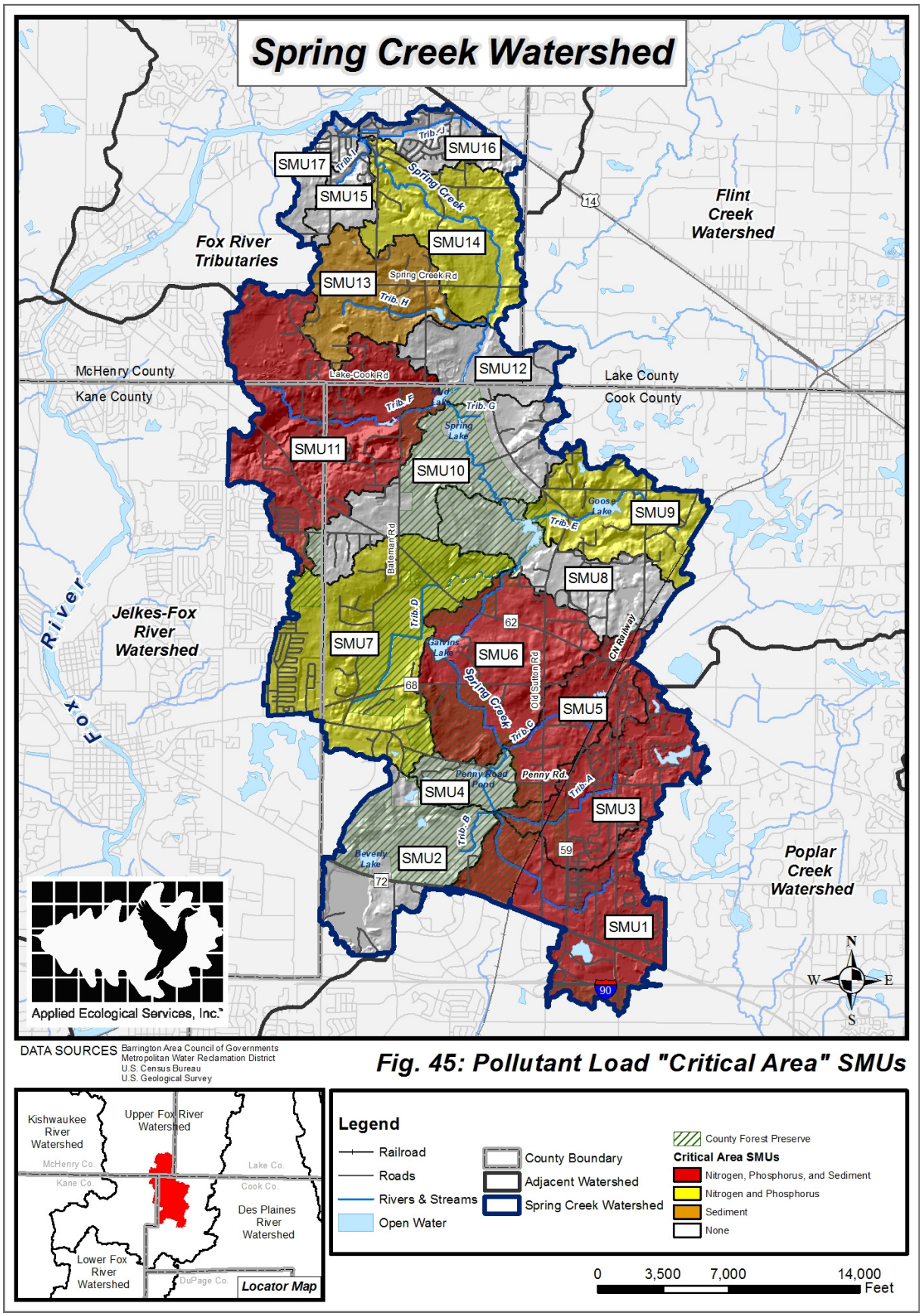


Fig. 45: Pollutant Load "Critical Area" SMUs

4.0 CAUSES AND SOURCES OF WATERSHED IMPAIRMENT

4.1 Causes & Sources of Impairment

Spring Creek is not listed by Illinois EPA as impaired for any of its 5 Designated Uses because it has not been assessed. However, available data (see Section 3.14) indicates that water quality is generally fair with only moderate impairments. As discussed in Section 3.14, Aquatic Life support is the most applicable Illinois EPA Designated Use for Spring Creek and forms the basis for identifying causes and sources of impairment and guides Management Measures recommendations.

Causes and sources of impairment are based on items identified during the watershed characteristics inventory as well as input from the Spring Creek Watershed partnership (SCW) who met twice during the planning process to discuss the topic. Table 32 includes a summary of causes and known or potential sources of watershed impairment and links this information to Illinois EPA Designated Use Impairment categories but does not necessarily mean that the Illinois Use Impairment is not supported.

Table 32. Link between causes and known or potential sources of Illinois EPA Use Impairment.

Illinois EPA or other Use Impairment	Cause of Impairment	Known or Potential Source of Impairment
Aquatic Life, Aesthetic Quality	Nutrients (Nitrogen & Phosphorus)	Agricultural row-crop runoff Residential and commercial fertilizer use Livestock and waterfowl (geese) defecation Failing Septic systems
Aquatic Life, Aesthetic Quality	Turbidity/ Streambed Sedimentation	Construction sites Streambank erosion at livestock crossings Streambank erosion from increased flows Agricultural row-crop runoff
Aquatic Life	Salinity	Deicing operations on roads & other pavement
Aquatic Life, Aesthetic quality	Low Dissolved Oxygen	Urban stormwater runoff Livestock waste Lack of natural riffles in streams
Aquatic Life	High Water Temperature	Urban stormwater runoff Poorly designed detention basins
Aquatic Life, Primary Contact, Secondary Contact, Aesthetic Quality	Petroleum Hydrocarbons (Oil & Grease)	Canadian National Railway train derailments Trucking cargo spills along major roads General urban and highway runoff Illicit dumping
Aquatic Life	Hydrology Modifications	Increased impervious cover Debris jams in streams Drain tiles
Aquatic Life, Aesthetic Quality	Negative Ecosystem Modification	Stream channelization Land development Poor land management (i.e. large lot turf lawns) Invasive and/or non-native species Hydrology changes Loss of natural management (i.e. fire) Drain tiles or wetland filling (wetland loss)
Structural Flood Damage	Flooding	Impervious surfaces Undersized culverts Structures located in floodplain
Reduced Recharge	Reduced Infiltration	Impervious cover in important recharge areas

4.2 Critical Areas, Management Measures & Estimated Impairment Reductions

For this watershed plan a "Critical Area" is best described as a particular place or area of the watershed where causes/sources of impairment or site function are relatively worse than other areas of the watershed. It also includes open space that if protected and restored to natural conditions or developed using conservation and/or low density design standards would greatly reduce impairments compared to existing conditions. Five Critical Area types were identified in the Spring Creek watershed and are described below. Table 33 includes descriptions of each individual Critical Area (by type) as well as recommended Management Measures and estimated nutrient and sediment load reduction efficiency derived from a comprehensive list found in the Action Plan section of this report. Figure 46 maps the location of each Critical Area.

Critical Stream Reach

Critical stream reaches meet specific impairment criteria. These criteria include; 1) reaches with highly eroded streambanks; 2) moderately eroded reaches with highly channelized conditions; and 3) moderately eroded reaches or highly channelized reaches on public land. Riparian area condition is also a factor in determining Critical Area status. Six total stream reaches were identified using these criteria. Section 3.12 includes a complete summary of streams in the watershed.

Critical Drained Wetland

A summary of the extent of drained wetlands and potential wetland restoration opportunities in the watershed is included in Section 3.12. Four drained wetland areas were determined to be Critical Areas based on their location, size, and potential for restoration.

Critical Detention Basin or Pond

A detention basin/pond inventory was completed as part of this project (Appendix B) and identified basins and ponds needing water quality improvement retrofits and maintenance. Three detention basins and one pond meet the criteria of a Critical Area based of their location near pollutant sources, poor function, and size. A brief summary of the detentions basins and ponds in the watershed is included in Section 3.12.

Critical Lakes

Mud Lake and Spring Lake are located within a dedicated nature preserve in Spring Creek Valley Forest Preserve. Information provided by the Forest Preserve District of Cook County (FPDCC) indicates that restoration of hydrology and the land around these lakes will allow the lakes to have the resilience to heal. The most important action steps include removal of invasive buckthorn, addressing watershed partnership issues offsite, and restoring woodlands in nearby sensitive recharge areas.

Critical Priority Protection Area

Information obtained from existing and future land use data, open space inventory, pollutant loading analysis, and green infrastructure plan sections of this report led to identification of six Priority Protection Areas. Priority Protection Areas 1, 4, and 6 are currently agricultural or a gravel quarry where residential development is likely to occur in the next 30 years. Conservation and/or low density design is recommended for these areas when and if they become developed. Areas 2 and 3 abut Spring Creek Valley Forest Preserve. The recommendation here is for the Forest Preserve District of Cook County (FPDCC) to acquire, protect and restore the land. The last Priority Protection Area (Area 5) is situated in the northwest portion of the watershed at the headwaters of

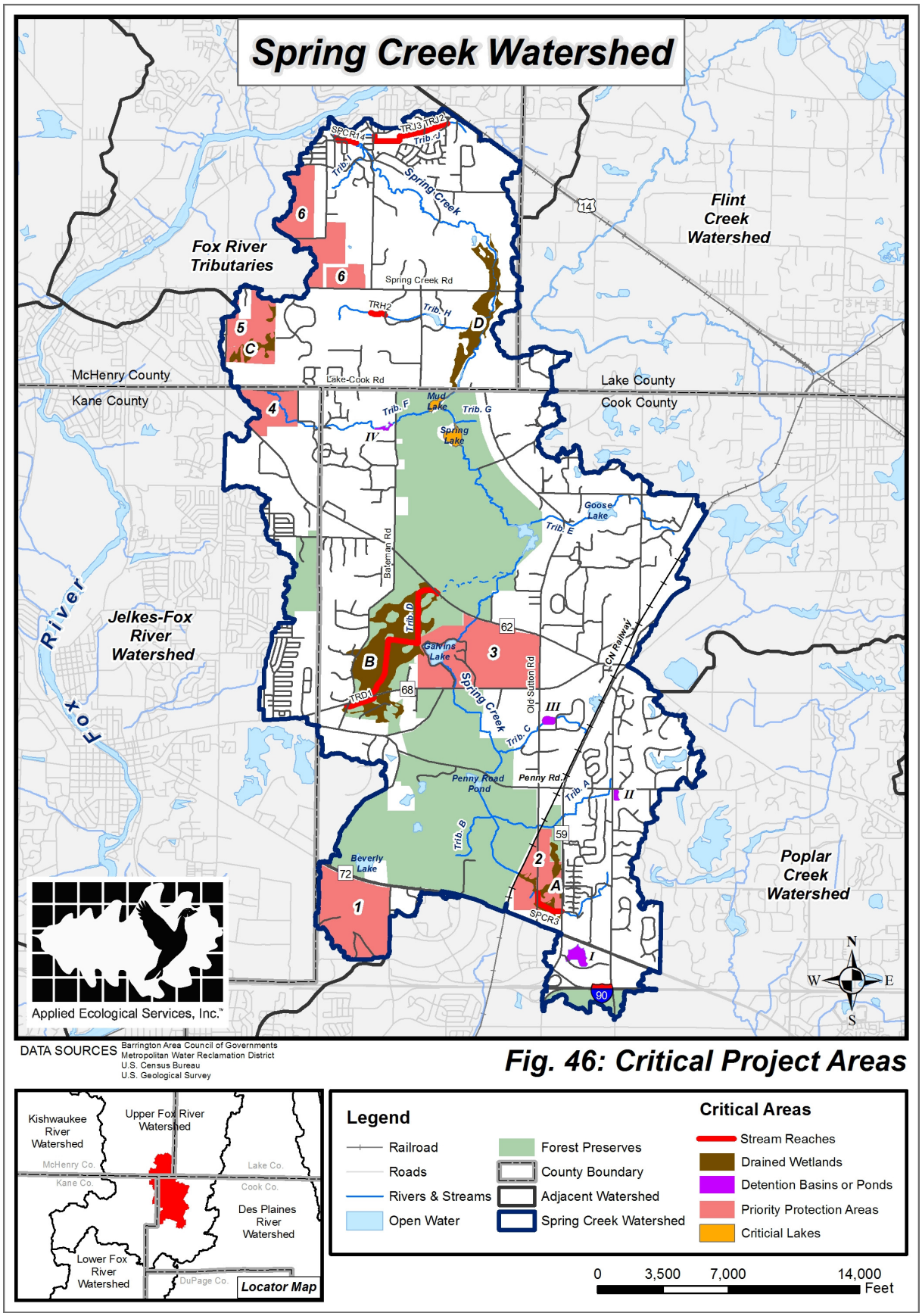
Tributary F in an agricultural area with extensive drained wetlands (Critical Drained Wetland D). Restoration of wetland and prairie in this area would best benefit the watershed.

Table 33. Critical Areas, recommended Management Measures, and estimated nutrient and sediment load reductions.

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction
Stream Reaches			
SPCR3	1,983 lf with moderate streambank erosion, highly channelized, & poor riparian condition on private agricultural land	Streambank restoration, channel improvements, & riparian area restoration	TN= 343 lbs/yr TP= 172 lbs/yr TSS= 172 tons/yr
SPCR14	1,282 lf with moderate streambank erosion & poor riparian condition at Fox River Grove WWTP	Streambank & riparian area restoration	TN= 22 lbs/yr TP= 22 lbs/yr TSS= 22 tons/yr
TRD1	10,313 lf highly channelized within SCVFP	Fill channel or pull back berm edges as part of Wetland Restoration #3	TN= 278 lbs/yr TP= 107 lbs/yr TSS= 151 tons/yr
TRH2	863 lf with high streambank erosion, highly channelized, & poor riparian condition on private residential land	Streambank restoration, channel improvements, & riparian area restoration	TN= 249 lbs/yr TP= 124 lbs/yr TSS= 124 tons/yr
TRJ2 & 3	4,563 lf highly channelized within Fox River Grove's Foxmore Park	Daylight upstream portion, improve channel condition; and improve buffer between stream and adjacent ponds	TN= 132 lbs/yr TP= 66 lbs/yr TSS= 78 tons/yr
Drained Wetlands			
A	52.5 acres drained wetland near Spring Cr headwaters on private agricultural land; development upstream	Restore wetland and buffer	TN= 275 lbs/yr TP= 55 lbs/yr TSS= 22 tons/yr
B	334.6 acres drained wetland at headwaters of Trib. D within SCVFP; includes stream reach TRD1	Restore wetland and buffer	TN= 1,375 lbs/yr TP= 289 lbs/yr TSS= 142 tons/yr
C	37.9 acres drained wetland at headwaters of Trib. F on private agricultural land; potential wetland bank	Restore wetland and buffer	TN= 135 lbs/yr TP= 29 lbs/yr TSS= 14 tons/yr
D	124 acres drained wetland along Spring Creek on private equestrian and residential land	Restore wetland and buffer	TN= 518 lbs/yr TP= 31 lbs/yr TSS= 6 tons/yr
Detention Basins & Ponds			
I	18 acre wet bottom basin with little water quality function; future Sutton Crossing development site	Retrofit w/native plant buffer and emergent zone	TN= 1,386 lbs/yr TP= 134 lbs/yr TSS= 76 tons/yr
II	4 acre dry turf bottom basin with little water quality function at Barbara Rose Elementary School	Retrofit with native vegetation	TN= 88 lbs/yr TP= 13 lbs/yr TSS= 10 tons/yr
III	7 acre wet bottom basin in horse pasture at headwaters of Trib. C.	Recommend detention district for horse access to water, rather than basin	TN= 32 lbs/yr TP= 3 lbs/yr TSS= 2 tons/yr

IV	6 acre pond online with Trib. F. FPDCC indicates that significant fertilizers in runoff flow through pond prior to entering Nature Preserve	FPDCC recommends reworking this pond in ways that would decrease pollutant loading to the Nature Preserve	TN= 414 lbs/yr TP= 115 lbs/yr TSS= 43 tons/yr
Critical Lakes			
Mud Lake & Spring Lake	Two natural lakes within nature preserve at Spring Creek Valley Forest Preserve	Remove invasive buckthorn and other woody growth from adjacent dewatered wetland areas and address watershed partnership issues offsite.	Not Applicable
Priority Protection Areas			
1	334 acres currently being gravel mined; planned future residential development	Use conservation and/or low density design	TN= 292 lbs/yr TP= 30 lbs/yr TSS= 12 tons/yr
2	180 acres in private agriculture; slated for future development; includes stream reach SPCR3	Acquire, protect, & restore prairie/wetland complex adjacent to SCVFP	TN= 944 lbs/yr TP= 188 lbs/yr TSS= 75 tons/yr
3	492 acres currently in private agriculture adjacent to SCVFP	Acquire, protect, & restore prairie adjacent to SCVFP	TN= 1,756 lbs/yr TP= 350 lbs/yr TSS= 140 tons/yr
4	123 acres of private agriculture at headwaters of Trib. F; likely site for future residential development	Use conservation and/or low density design	TN= 508 lbs/yr TP= 111 lbs/yr TSS= 51 tons/yr
5	185 acres in private agriculture; includes wetland restoration site D; potential wetland mitigation	Acquire, protect, and restore prairie/wetland complex	TN= 610 lbs/yr TP= 133 lbs/yr TSS= 61 tons/yr
6	288 acres of private agriculture in areas likely to see future residential development	Use conservation and/or low density design standards	TN= 1,025 lbs/yr TP= 234 lbs/yr TSS= 103 tons/yr

Pollutant load reduction is evaluated for the majority of the "Critical Area" Management Measures based on efficiency calculations developed for the USEPA's Region 5 Model. This model uses "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (MDEQ, 1999) to provide estimates of sediment and nutrient load reductions from the implementation of *agricultural* Management Measures. Estimate of sediment and nutrient load reduction from implementation of *urban* Management Measures is based on efficiency calculations developed by Illinois EPA. The STEPL Model was used to develop pollutant reduction estimates for Priority Protection Areas. Pollutant load reduction worksheets are located in Appendix D.


Spring Creek Watershed
Fox River Tributaries
Flint Creek Watershed
Jelkes-Fox River Watershed
Poplar Creek Watershed
McHenry County
Kane County
Lake County
Cook County
Spring Creek
Spring Creek Rd
Lake-Cook Rd
Mud Lake
Spring Lake
Goose Lake
Garvins Lake
Penny Road Pond
Beverly Lake
Penny Rd.
Old Sutton Rd
Bateman Rd
CN Railway
Trib. A
Trib. B
Trib. C
Trib. D
Trib. E
Trib. F
Trib. G
Trib. H
Trib. J
TRH2
TRJ1
TRJ2
SPCR14
TRD1
SPCR3
Fox River
Applied Ecological Services, Inc.
N
S
E
W
DATA SOURCES
Barrington Area Council of Governments
Metropolitan Water Reclamation District
U.S. Census Bureau
U.S. Geological Survey
Fig. 46: Critical Project Areas
Kishwaukee River Watershed
Upper Fox River Watershed
McHenry Co.
Lake Co.
Kane Co.
Cook Co.
Des Plaines River Watershed
Lower Fox River Watershed
DuPage Co.
Locator Map
Legend
Railroad
Roads
Rivers & Streams
Open Water
Forest Preserves
County Boundary
Adjacent Watershed
Spring Creek Watershed
Critical Areas
Stream Reaches
Drained Wetlands
Detention Basins or Ponds
Priority Protection Areas
Criticial Lakes
0
3,500
7,000
14,000
Feet

4.3 Impairment Reduction Targets

Table 34 examines the basis for identified impairments in the Spring Creek watershed and provides "Reduction Targets" based on sufficient information. Establishing Reduction Targets is important because it sets the stage for identifying "Critical Aras" where recommended Management Measures are expected to have the greatest reduction impact. Reduction Targets listed in Table 34 are based on documented information, modeling results, best professional judgment, or water quality standards set by the Illinois Pollution Control Board (IPCB). Table 34 also includes a column summarizing the overall impairment reduction expected after addressing the Critical Areas. Nearly all Reduction Targets are met by addressing Critical Areas. The Riparian Corridor condition target is not attainable by addressing Critical Areas and will require that additional projects recommended in the Action Plan be implemented.

Table 34. Basis for impairments, "Reduction Targets", & impairment reduction.

Cause of Impairment	Basis for Impairment	Reduction Target	Reduction from Critical Areas	Target Attainable?
Nutrients (Nitrogen)*	50,327 lb/yr of Nitrogen loading based on STEPL model.	>20% or 10,065 lb/yr reduction in Nitrogen loading	10,203 lbs/yr or 20% Nitrogen reduction	Yes
Nutrients (Phosphorus)	8,883 lb/yr of Phosphorus loading based on STEPL model & 0.79 mg/l average in FOFR water quality samples.	>23% or 2,043 lb/yr reduction in Phosphorus loading to reach 0.61 mg/l Illinois EPA standard for streams	2,138 lbs/yr or 24% Phosphorus reduction	Yes
Turbidity/ Streambed Sedimentation*	17,810 linear feet of moderate to highly eroded streambank and 1,567 tons/yr of Sediment loading based on STEPL model	50% or 784 tons/yr reduction in Sediment loading	1,280 tons/year or 82% Sediment reduction	Yes
Negative Ecosystem Modification (Stream Channelization)	27,603 linear feet or 19% of stream length is highly channelized	50% or 13,802 linear feet of highly channelized stream length enhanced	17,722 lf of channelized stream enhanced	Yes
Negative Ecosystem Modification (Riparian Condition)	139,662 linear feet or 97% along stream length with poor riparian area condition.	20% or 37,932 linear feet of poor riparian condition restored	19,004 lf or 14% of riparian areas restored	No**
Negative Ecosystem Modification (Drained or Filled Wetland)	2,216 acres (55%) of wetlands lost; 59 drained or filled wetlands greater than 5 acres; 120,000 lf of drain tile in 1,600 acre SCVFP study	27% or 5 "Critical Area" drained wetlands restored accounting for 594 acres	594 "Critical Area" wetland acres restored	Yes
Flooding (Culverts & Structures in Floodplain)	7 structural flood problem areas	50% or 4 feasible flood problem areas addressed	Not covered in this watershed planning effort	Not Applicable
Hydrology Modifications	2 Non-Supporting SMUs; 9 Impacted SMUs based on impervious cover model.	< 35% impervious cover for 2 Non-Supporting SMUs; < 25% impervious cover for 9 Impacted SMUs in future	Cannot be evaluated until after future built conditions	Not Applicable
Reduced Infiltration (Impervious Cover)	Approximately 15% impervious cover average in moderate to highly sensitive recharge zones	0% reduction currently required; maintain below 20% impervious cover in future	Cannot be evaluated until after future built conditions	Not Applicable

* Available water quality data indicates pollutant does not exceed Illinois EPA standard; target is based on best professional judgment.
** Target will be met if additional projects recommended in the Action Plan are implemented.

5.0 MANAGEMENT MEASURES ACTION PLAN

Earlier sections of this plan summarized Spring Creek watershed's characteristics and identified causes and sources of watershed impairment. This section includes an "Action Plan" developed to provide stakeholders with recommended "Management Measures" (Best Management Practices) to specifically address objectives related to each plan goal at general and site specific scales. The Action Plan is divided into the following subsections:

- *Programmatic Measures*: general remedial, preventive, and regulatory watershed-wide action measures that can be applied across the watershed by various stakeholders.

- *Site Specific Measures:* actual locations where projects can be implemented to improve surface and groundwater quality, open space protection, and aquatic and terrestrial habitat.

The recommended programmatic and site specific management measures provide a solid foundation for protecting and improving watershed conditions but should be updated as projects are completed or other opportunities arise. Lead parties for recommendations are encouraged to organize partnerships with key stakeholders and develop various funding arrangements to help delegate and implement the recommended actions. The key stakeholders in the watershed are listed in Table 35. Detailed descriptions of each stakeholder can be found in Appendix E.

Table 35. Key Spring Creek Watershed Stakeholders/Partners.

Watershed Stakeholder/Partner	Acronym/Abbreviation
Audubon-Chicago Region	Audubon
Barrington Area Council of Governments	BACOG
Barrington Hills Conservation Trust	BACT
Chicago Metropolitan Agency for Planning	CMAP
Citizens for Conservation	CFC
County	County
Ecological Consultants	Consultant
Forest Preserve District of Cook & Kane County	FPDCC & FPDKC
Fox River Ecosystem Partnership	FREP
Friends of Spring Creek Forest Preserves	Friends of Spring Creek
Illinois, Kane, Lake, McHenry, and Cook County Dept. of Transportation	DOTs
Illinois Environmental Protection Agency	Illinois EPA
Illinois Nature Preserves Commission	INPC
Metropolitan Water Reclamation District of Greater Chicago	MWRD
Municipalities	Munic
Natural Resource Conservation Service (Kane, Lake, McHenry, and Cook County)	SWCD/NRCS
Residents or Owner	Residents/ Owner
Riding Club of Barrington Hills	RCBH
Spring Creek Watershed partnership	SCW
Townships	Twp
US Army Corps of Engineers	USACE
US Fish & Wildlife Service	USFWS

5.1 Programmatic Measures Action Plan

Numerous types of programmatic management measures are recommended to address watershed objectives for each plan goal. Table 36 includes recommended measures that are applicable throughout the watershed and information needed to facilitate implementation of specific actions. For each action item, the table provides the Priority, Objective Addressed, Responsible Entity/Supporting Partners, and the recommended Technical Support that will likely be responsible for issuing appropriate permits or providing technical, regulatory, or funding assistance. *Note: estimated costs and pollutant load reductions are not included for programmatic measures due to the general nature of the recommendations.*

Priority is assigned to each action item and classified as High, Medium, or Low based on several factors such as importance, ownership type, potential cost, technical and financial needs, and potential shortcomings. High priority recommendations deserve immediate attention and are generally expected to be addressed in the short term (1-5 years) whereas medium and low priority recommendations are not as urgent and should be addressed in the long term (5-10+ years). Medium and low priority recommendations should not be written off as less important. In many cases, funding availability, technical assistance, or shortcomings may be responsible for a project being designated as medium or low priority.

Noteworthy- Programmatic Management Measure Categories

Non-Structural: Broad group of practices that prevent impairment through maintenance and management of Management Measures or performance of stewardship tasks that are of an ongoing nature and designed to control pollutants at their source.

Educational: Outreach to educate the public related to environmental impacts of daily activities and to build support for watershed planning and projects. Topics typically addressed include land management, waste management, pesticide and fertilizer use, good housekeeping, etc.

Policy: Local government can help prevent watershed impairments in various ways through policy but specifically related to controlling pollutants and reducing stormwater runoff from new developments and protecting floodplain and natural resources.

Project Coordination: Successful watershed plan implementation depends on coordination and cooperation between the Spring Creek Watershed Partnership and all other pertinent stakeholders.

Comprehensive Planning: Watershed impairments and pollutant load reduction targets may not be met with recommended site specific management measures and therefore will require a more comprehensive use of smaller measures such as buffers, vegetated swales, and rain gardens.

Table 36: Programmatic Actions to Address Objectives for Plan Goals A-F.

Goal A: Protect, enhance, and monitor surface water quality and groundwater resources to meet Illinois EPA water quality standards.

	Management Measure	Priority	Primary Objective	Responsible Entity/ Supporting Partners	Technical Assistance	Time Frame
1	Supplement existing road salt programs with known alternatives.	High	A3	Munic; Twp, DOT	SCW; CFC; Illinois EPA	1-5 Years
2	Identify "Champions" and have local Plan Commissions use plan as a guidance document for development.	High	A1	SCW	CFC	1-5 Years
3	Update development ordinances to require stormwater management system designs that support native vegetation, improve water quality, and provide wildlife habitat.	High	A2	Municipalities; Twp	Consultant	1-5 Years
4	Barrington Hills work with equestrian community to maintain and update equestrian guidelines if needed.	Medium	A6	RCBH	Friends of Spring Creek	5-10+ Years
5	Reduce fertilizer use on commercial and large residential lawns.	High	A4	Residents; businesses	SCW	Ongoing
6	Inspect septic systems in older residential developments.	Medium	A7	Residents; businesses	n/a	Ongoing
7	Implement a watershed wide water quality monitoring program included in Section 8.1 to assess water quality standards and success of projects.	High	A8	VLMP; CFC; IEPA; RiverWatch; MCCD IDNR; FPD; FOFR	Consultants	1-5 Years
8	Develop watershed-specific buffer requirements between developments and aquatic natural resources.	High	A1	MWRD; USACE	SCW; Munic; Twp	5-10+ Years
9	Review & update landscaping ordinances to allow native plants.	Medium	A1	Munic; Twp	SCW	5-10+ Years
10	Identify shallow aquifer monitoring sites and implement monitoring plan.	Medium	A9	BACOG	n/a	5-10+ Years
11	Maintain open space in important groundwater recharge areas.	High	A9	Munic; Twp	CFC; SCW	Ongoing
12	Implement Management Measures affecting Goose Lake and Tributary E such as easements, native landscaping, reduced fertilizer, other stormwater BMPs.	High	A1	Various Stakeholders	Varies	Ongoing
13	Implement Management Measures west of Bateman Rd. along Tributary F feeding runoff into Nature Preserve.	High	A1	Various Stakeholders	Varies	Ongoing
14	FPDCC recommends better stormwater practices and landscape maintenance on corporate properties and IDOT at headwaters of Trib. B.	High (Critical)	A1	Various Stakeholders	Varies	Ongoing

Goal B: Identify and protect important natural areas/open space and provide appropriate passive recreational benefits.

	Management Measure	Priority	Primary Objective	Responsible Entity/ Supporting Partners	Technical Assistance	Time Frame
1	Identify and designate a lead person from each governing community and other major stakeholder groups to serve as open space plan "coordinators" and meet to implement the Green Infrastructure Network Plan in Section 3.10).	High	B3	SCW	All Stakeholders	1-5 Years
2	Form multi-jurisdictional partnerships to develop funding packages and grant proposals to implement the Green Infrastructure Network Plan in Section 3.10.	Medium	B3	SCW; CFC	FPDCC; FPDKC	Ongoing
3	Include all green infrastructure parcels in community comprehensive plans and development review maps (See Section 3.10).	High	B3	Munic; Twp	Consultant	1-5 Years
4	Create zoning overlay and update development ordinances to require conservation and/or low impact development design on all green infrastructure parcels (See Section 3.10).	High	B4	Munic; Twp	CMAP	1-5 Years
5	Use results of Green Infrastructure Network Plan (See Section 3.10) to identify and create new trails and trail connections.	Medium	B3	SCW; RCBH	Friends of Spring Creek	Ongoing
6	Protect high quality natural areas or T&E species that are not currently protected.	High	B1	SCW; CFC	n/a	1-5 Years
7	Identify buffer parcels to existing forest and nature preserves and other sites with high quality natural areas using the Green Infrastructure Network Plan (See Section 3.10) then protect and implement long term management.	High	B2	FPDCC; FPDKC	SCW; CFC; Friends of Spring Creek	5-10+ Years
8	Develop watershed-specific buffer requirements between developments and important natural areas/open space.	High	B4	SCW; Munc; Twp	MWRD; USACE; USFWS	5-10+ Years
9	Identify opportunities for agencies to provide economic incentives that encourage the preservation of natural resources.	High	B1	SCW	Munic; Twp	5-10+ Years
10	Sears Center: manage prairie, renovate outlets & vegetation of naturalized detentions, and use permeable pavement.	High	B2	Sears Center	Consultant	Ongoing
11	IDOT implement better median/swale management strategies along Route 72 and other areas were roads are widened.	High	B2	IDOT	n/a	Ongoing

Goal C: Reduce existing structural flood damage and ameliorate potential flooding where flooding threatens structures and infrastructure.

	Management Measure	Priority	Primary Objective	Responsible Entity/ Supporting Partners	Technical Assistance	Time Frame
1	Protect all undeveloped floodplain parcels included in the Green Infrastructure Network Plan (See Section 3.10).	High	C1	Munic; Twp; Owner	FEMA; MWRD	1-5 Years
2	Restore historical floodplain function by removing spoil piles along channelized stream reaches.	Medium	C2	Owner	FEMA; MWRD; USACE; Counties	5-10+ Years
3	Mitigate for all identified structural flood problem areas identified in Section 3.12.4.	Medium	C6	Munic; Twp; Owner	FEMA; MWRD; USACE	5-10 Years
4	Require in-watershed wetland mitigation.	Medium	C3	Munic; Twp; MWRD	USACE	Ongoing
5	Encourage watershed-wide stream maintenance program to remove debris loads/jams.	Low	C3	Munic; Twp	USACE; MWRD	Ongoing
6	Modify streets, parking lots, lawns (i.e. rain gardens and natural swales), parks, and other open space within existing and new development for stormwater storage and infiltration.	Medium	C3	Munic; Owner; Twp	MWRD; SCW; CFC	Ongoing
7	Perform flood audits for structures known to flood (See Section 3.12.4)	Medium	C6	Owner	MWRD; County	5-10 Years
8	Assess condition & function of existing constructed stormwater management systems and manage (See Section 3.12.2).	Medium	C4	Condition & function already assessed; Owner implement	Consultant	Ongoing
9	Assess condition & function of existing wetland storage areas and manage.	Low	C5	Condition & function already assessed; Owner implement	Consultant	Ongoing
10	Assess all dams, weirs, and online impoundments for potential increased stormwater storage.	Low	C4	MWRD, County	Consultant	5-10+ Years
11	Assess each new development plan for proper design of stormwater management systems to reduce runoff volumes.	High	C4	Munic; Twp	County; SCW	Ongoing

Goal D: Improve aquatic and terrestrial habitat to encourage balanced ecosystems.

	Management Measure	Priority	Primary Objective	Responsible Entity/ Supporting Partners	Technical Assistance	Time Frame
1	Include natural pool/riffle habitat and bank stabilization designs for stream restoration projects where this type of treatment is needed.	High	D1	Munic; Twp; USACE; FPDCC; FPDKC	Consultant	Ongoing
2	Control existing populations and prevent the spread of non-native/invasive species; replace with native vegetation if needed.	High	D3	FPDCC; FPDKC; Owner; Sears Center	Friends of Spring Creek; SCW; CFC	Ongoing
3	Restore stream reaches and natural communities as an aesthetic value to all new development.	Medium	D6	Developer	USACE; Consultant; CFC; SCW	Ongoing
4	Require developers to donate natural areas to a public agency or conservation organization for long term management with dedicated funding.	High	D6	Developer; USACE; Munic; Twp	SCW	Ongoing
5	Restore potential wetland restoration sites (See Section 3.12.3)	Medium	D7	USACE; FPDCC	Consultant	Ongoing
6	Restore stream and terrestrial habitat in conjunction with construction of roads, bridges, culverts, etc. to minimize negative impacts.	Medium	D6	DOT	USACE; County	Ongoing
7	Reintroduce fire into natural areas via controlled burns.	Medium	D3	FPDCC; FPDKC; Twp; Munic	Consultant	Ongoing
8	Promote native landscaping as an alternative to standard landscaping practices at residential, industrial, commercial, and roadside properties.	High	D5	SCW; CFC	Consultant	Ongoing
9	Review local ordinances to insure that current codes do not prohibit use of native vegetation in projects and other residential and commercial landscaping.	High	D5	Munic; County; Twp	SCW; CFC	5-10+ Years
10	Develop and implement long term (5+ years) maintenance and monitoring plans for created natural areas in new developments.	High	D4	MWRD; County; USACE	Consultant	5-10+ Years
11	Develop and encourage management plans on private parcels identified in the Green Infrastructure Plan (See Section 3.10)	Medium	D4	Resident; Owner	Consultant; SCW; CFC	Ongoing
12	Develop and implement management plans for all Ecologically Significant Areas (See Section 3.11).	High	D4	FPDCC; FPDKC; Owner	Consultant; USFWS; NRCS	5-10+ Years

Goal E: Increase communication and coordination among municipal decision-makers and other stakeholders within the watershed.

	Management Measure	Priority	Primary Objective	Responsible Entity/ Supporting Partners	Technical Assistance	Time Frame
1	Meet with each applicable entity to encourage adoption of the Spring Creek Watershed-Based Plan.	High	E1	SCW	Munic; Twp; CFC; MWRD; County; Illinois EPA	1-5 Years
2	Recruit "Champions" within each municipality and other stakeholder groups to assemble and form a Watershed Council (Plan Implementation Committee) that actively implements the Watershed-Based Plan and conducts progress evaluations.	High	E2	SCW	All Stakeholders	1-5 Years
3	Hire or assign a volunteer a Watershed Implementation Coordinator to follow through on plan implementation and evaluation.	High	E2	SCW	n/a	1-5 Years
4	Provide training and watershed education opportunities for local government planners and engineers related to implementing the Watershed-Based Plan.	Medium	E2	SCW	n/a	5-10+ Years
5	Form a multijurisdictional partnership to develop funding packages and grant proposals to implement watershed plan recommendations.	Medium	E5	SCW	Munic; County; MWRD; FPDCC; FPDKC; CMAP; USACE; Illinois EPA	Ongoing
6	Incorporate watershed plan goals, objectives, and recommended actions into local comprehensive plans, codes, and ordinances.	High	E3	Munic; Twp; County	SCW	1-5 Years
7	Jurisdictional bodies in the watershed prepare annual budgets for implementing recommendations in the Watershed-Based Plan.	High	E5	All relevant stakeholders	SCW	Annually
8	Develop a model or template for an intergovernmental agreement for participation in cooperative watershed projects.	Medium	E5	SCW	Munic; Twp; FPDCC	5-10+ Years
9	Invite local professionals to lead workshops and/or make presentations to watershed stakeholders.	Low	E5	SCW	Consultant; Munic; Twp; CFC	Ongoing
10	Review local policy that protects groundwater supply and quality.	Medium	E4	Munic; Twp	BACOG	5-10+ Years

Goal F: Foster appreciation and stewardship of the watershed through education.

	Management Measure	Priority	Primary Objective	Responsible Entity/ Supporting Partners	Technical Assistance	Time Frame
1	Implement the Education Plan portion of this Watershed-Based Plan (See Section 6.0).	High	F2	SCW	All Stakeholders	Ongoing
2	Provide schools with resource information applicable to creating outdoor curriculum on adjacent or nearby natural areas.	Low	F3	SCW; CFC	IDNR; FPDCC; FPDKC; NRCS	Ongoing
3	Continue to recruit volunteers interested in natural area restoration.	Medium	F3	Friends of Spring Creek	IDNR; FPDCC; FPDKC; CFC	Annually
4	Offer workshops that help homeowners identify and choose the appropriate native plants, trees, and shrubs for landscaping.	Medium	F3	SCW; CFC	Consultants; IDNR; FPDCC; FPDKC; NRCS	Every Five Years
5	Offer workshops that provide recommendations and education related to alternatives to phosphorus use.	High	F6	SCW, CFC	Munic; Illinois EPA	Every Five Years
6	Offer workshops that provide education and alternatives to road & other pavement salt use.	Medium	F7	SCW, CFC, BACOG	Munic; DOT	Ongoing
7	Offer workshops that provide information to homeowners about how to best maintain septic systems.	Medium	F8	SCW	County; Consultant	Every Five Years
8	Offer workshops that educate the equestrian community about water quality protection.	Medium	F9	RCBH, Fox River Valley Pony Club	SCW; Friends of Spring Creek	Every Five Years
9	Install environmental interpretation/education signage at access points throughout public open space.	Low	F5	FPDCC; FPDKC; IDNR;	Friends of Spring Creek; CFC	1-5 Years
10	Offer workshops that provide education about the importance of groundwater recharge and quality and link between how property owners manage the land.	Medium	F1	BACOG	SCW, FCWP	Every Five Years
11	Provide educational information on flood proofing to owners with structural flood problems (See Section 3.12.4).	Low	F1	FEMA	Munic; Twp	Every Five Years
12	Conduct garden and restoration walks in areas currently planted with native vegetation for stakeholders interested in using natives.	Medium	F3	Owner; CFC; SCW	n/a	Annually
13	Educate municipalities, businesses, and homeowner's associations on how to maintain naturalized detention basins.	Medium	F3	SCW	CFC, Consultant	Every Two Years
14	Educate riparian landowners on how to use environmentally friendly lawn maintenance practices, protect/restore buffers, and remove problematic debris jams.	High	F3	SCW	IDNR; NRCS; Consultant	Annually

5.2 Site Specific Measures Action Plan

Site specific Management Measure (Best Management Practices) recommendations made in this section of the report are backed by findings from the watershed field inventory, overall watershed characteristics assessment, and input from watershed stakeholders. In general, the recommendations address sites where watershed problems and opportunities can best be addressed to achieve watershed goals and objectives. The Site Specific Measures Action Plan is organized by jurisdiction in which recommendations are located making it easy for users to identify project sites and corresponding details. Site specific Management Measures were identified within the following jurisdictions and are included in the Action Plan:

- *Algonquin Township*
- *Barrington Hills*
- *Barrington Township*
- *Carpentersville*
- *East Dundee*
- *Forest Preserve District of Cook County*
- *Forest Preserve District of Kane County*
- *Fox River Grove*
- *Hoffman Estates*
- *South Barrington*

The following Management Measure categories are part of the Site Specific Measures Action Plan:

- *Detention Basin Retrofits & Maintenance*
- *Pond, Lake, & Wetland Retrofits & Maintenance*
- *Wetland Restoration*
- *Priority Protection Areas*
- *Stream & Riparian Area Restoration & Maintenance*
- *Other Measures*

Descriptions and location maps (Figures 47-52) for each Management Measure category follow. Table 39 includes useful project details such as ID#, Location, Units (size/length), Owner, Existing Condition, Management Measure Recommendation, Pollutant Load Reduction Efficiency, Priority, Responsible Entity, Sources of Technical Assistance, Cost Estimate, and Implementation Schedule.

Many facets such as importance, technical and financial needs, cost, feasibility, and ownership type were taken into consideration when prioritizing and scheduling Management Measure implementation. High, Medium, or Low priority was assigned to each recommendation. Critical Areas discussed in Section 4.2 are all High priority and highlighted (in orange) on project category maps and the Action Plan table. Implementation schedule is based on short term (1-5 years), medium term (5-10 years) long term (10+ years), and ongoing objectives.

The Site Specific Action Plan is designed to be used in one of two ways.

Method 1: The user should find their respective jurisdiction (listed alphabetically in Table 39) then identify the Management Measure category of interest. An ID# can be found in the first column under each recommendation that corresponds to the ID# on a map (Figures 47-52) associated with each category.

Method 2: The user should go to the page(s) summarizing the appropriate Management Measure category of interest then locate the corresponding map and ID# of the site specific recommendations for that category (Figures 47-52-X). Next, the user should go to Table 39 and locate the jurisdiction and ID# for details about the project of interest.

Pollutant Load Estimates

Where applicable, pollutant load reductions for Sediment (TSS), Nitrogen (TN), and Phosphorus (TP) were evaluated for each recommended Management Measure based on efficiency calculations developed for the USEPA's Region 5 Model. This model uses "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (MDEQ, 1999) to provide estimate of sediment and nutrient load reductions from the implementation of *agricultural* Management Measures. Estimate of sediment and nutrient load reduction from implementation of *urban* Management Measures is based on efficiency calculations developed by Illinois EPA.

Estimates of pollutant load reduction using the Region 5 Model are measured in weight/year (tons/yr for sediment and lbs/yr for Nitrogen and Phosphorus). The Model was used to calculate weight of pollutant reductions for Critical Area detention basin retrofit projects and wetland restorations, all Priority Protection Areas; all stream & riparian area restoration & maintenance projects, and for all projects included under Other Measures. The majority of the data that was input into the model was derived from the watershed characteristics inventory.

Estimated *percent* removal of Sediment, Nitrogen, and Phosphorus is included in the Action Plan table for lower priority projects and those projects where calculation of weight reduction is beyond the scope of this project. The percent removal efficiencies were based off the Region 5 Model as shown in Table 37.

Table 37. Region 5 Model percent pollutant removal efficiencies for various Management Measures.

Management Measure	TSS	TN	TP
Vegetated Filter Strips	73%	40%	45%
Grass Swales	65%	10%	25%
Extended Wet Detention	86%	55%	68.5%
Wetland Detention	77.5%	20%	44%
Agriculture Filter Strip	70%	53%	61%
Streambank Stabilization	90%	90%	90%
Lake/Pond Shoreline Stabilization	90%	90%	90%
Gully Stabilization	90%	90%	90%

Note: Streambank, lake/pond shoreline, and gully stabilization pollutant removal is based on bank height and lateral recession rates.

Summary of Watershed-Wide Action Recommendations

All Site Specific Action Plan and Education Plan recommendation information is condensed by Management Measure Category in Table 38. This information provides a watershed-wide summary of the Total Units (size/length), Total Cost, and Total Estimate of Pollutant Load Reduction if all the recommendations in the Site Specific Action Plan and Education Plan are implemented. To summarize:

- 3,628 acres of land restoration recommendations with a total cost of $8,552,250.
- 269 acres of land require yearly maintenance at a cost of $312,325/year.
- 145,310 linear feet of stream/corridor, gullies, and swales require work costing $5,352,500.
- 1,767 tons/year of Total Suspended Sediment (TSS) would potentially be reduced each year. This exceeds the 784 tons/year Reduction Target identified in Section 4.0.
- 11,734 pounds/year of Nitrogen (TN) would potentially be reduced each year. This exceeds the 10,203 pounds/year Reduction Target indentified in Section 4.0.
- 2,750 pounds/year of Phosphorus (TP) would potentially be reduced each year. This exceeds the 2,138 pounds/year Reduction Target indentified in Section 4.0.
- Education programs will cost $52,000 to meet objectives (see Section 6.0).

Table 38. Watershed-wide summary of Management Measures recommended for implementation.

Management Measure Category	Total Units (size/length)	Total Cost	Estimated Load Reduction		
			TSS (t/yr)	TN (lbs/yr)	TP (lbs/yr)
Detention Basin Retrofits & Maintenance*					
Retrofits (prairie buffers, plantings, etc.)	89 acres	$1,338,250	88	1,506	150
Maintenance (burning, invasive control, brushing, etc.)	135 acres	$114,075/yr	n/a	n/a	n/a
Pond, Lake, & Wetland Retrofits/Maintenance*					
Retrofits (prairie buffers, plantings, etc.)	78 acres	$1,030,000	43	414	115
Maintenance (burning, invasive control,, mowing, etc.)	134 acres	$190,750/yr	n/a	n/a	n/a
Wetland Restoration*	918 acres	$4,133,000	203	2,538	451
Priority Protection Areas	1,602 acres	n/a	442	5,135	1,046
Stream & Riparian Area Restoration/Maintenance					
Streambank and Channel Stabilization	20,286 lf	$30,715,500	527	1,028	532
Riparian Area (burning, brushing, seeding, etc.)	123,024 lf	$17,090,000	168	469	149
Other Measures					
Gully Restoration	1,700 lf	$220,000	280	560	280
Residential Swale Stabilization	300 lf	$3,000	2	6	1
Wetland Detention Storage Area	0.7 acre	$55,000	14	72	21
Prairie & Savanna Restoration	940 acres	$2,116,000	0.5	5	4
Education	n/a	$52,000	n/a	n/a	n/a
TOTALS	**3,628 acres**	**$8,542,250****	**1,767 tons/yr**	**11,734 lbs/yr**	**2,750 lbs/yr**
	269 acres maintenance	**$312,325/yr**			
	145,310 lf	**$5,352,500**			
	Education	**$52,000**			

* Pollutant load reduction calculated for "Critical Areas" only.

** Does not include costs for acquiring & restoring or implementing conservation design for Priority Protection Areas.

5.2.1 Detention Basin Retrofits & Maintenance

The Project Team conducted a detention basin inventory within Spring Creek watershed in spring of 2011. Eighty two (82) basins were identified and inventoried. The results of the detention basin inventory can be found in Appendix B. The benefits of storing stormwater runoff in detention basins and releasing water slowly over time are well documented. More recently, the benefits of proper slope and depth design and introducing native vegetation to improve water quality and provide wildlife habitat is becoming the new standard.

The overall condition of detention basins in the watershed varies. Many older wet bottom detentions are heavily rip-rapped along the shoreline while others have manicured turf grass slopes. Detentions constructed more recently are generally planted with native vegetation. The majority of basins planted with native vegetation are located in the southeast portion of the watershed between Bartlett Road and New Sutton Road in "The Woods of South Barrington" residential subdivision. Most are currently being managed so there are relatively few problems. The majority of the dry bottom basins in the watershed are manicured turf grass associated with large lot residential development in the northern and eastern portions of the watershed.

The detention basin inventory primarily provides information related to potential retrofits and maintenance needs that would improve water quality and wildlife habitat by establishing and maintaining native vegetation. All detention basin retrofit and maintenance recommendations are derived directly from recommendations made during the watershed inventory.

All basins receiving Management Measure recommendations are shown by ID# and priority on Figure 47. Details about each recommendation can be found in Table 39 within the appropriate jurisdiction. Critical Area basins, most publicly owned basins with problems, and others with significant problems are assigned High or Medium priority for retrofits because funding and implementation are usually easier on public land and where major problems exist. In some cases, basins are assigned higher priority based on location and/or ability to treat stormwater runoff. Medium priority is given to all basins where native vegetation has been established but requires ongoing maintenance to sustain the restored conditions. Low priority is assigned to small private basins and those exhibiting few problems.

Potential detention basin retrofit project at Barbara Rose Elementary School.

Potential detention basin retrofit project at future Sutton Crossing development site.

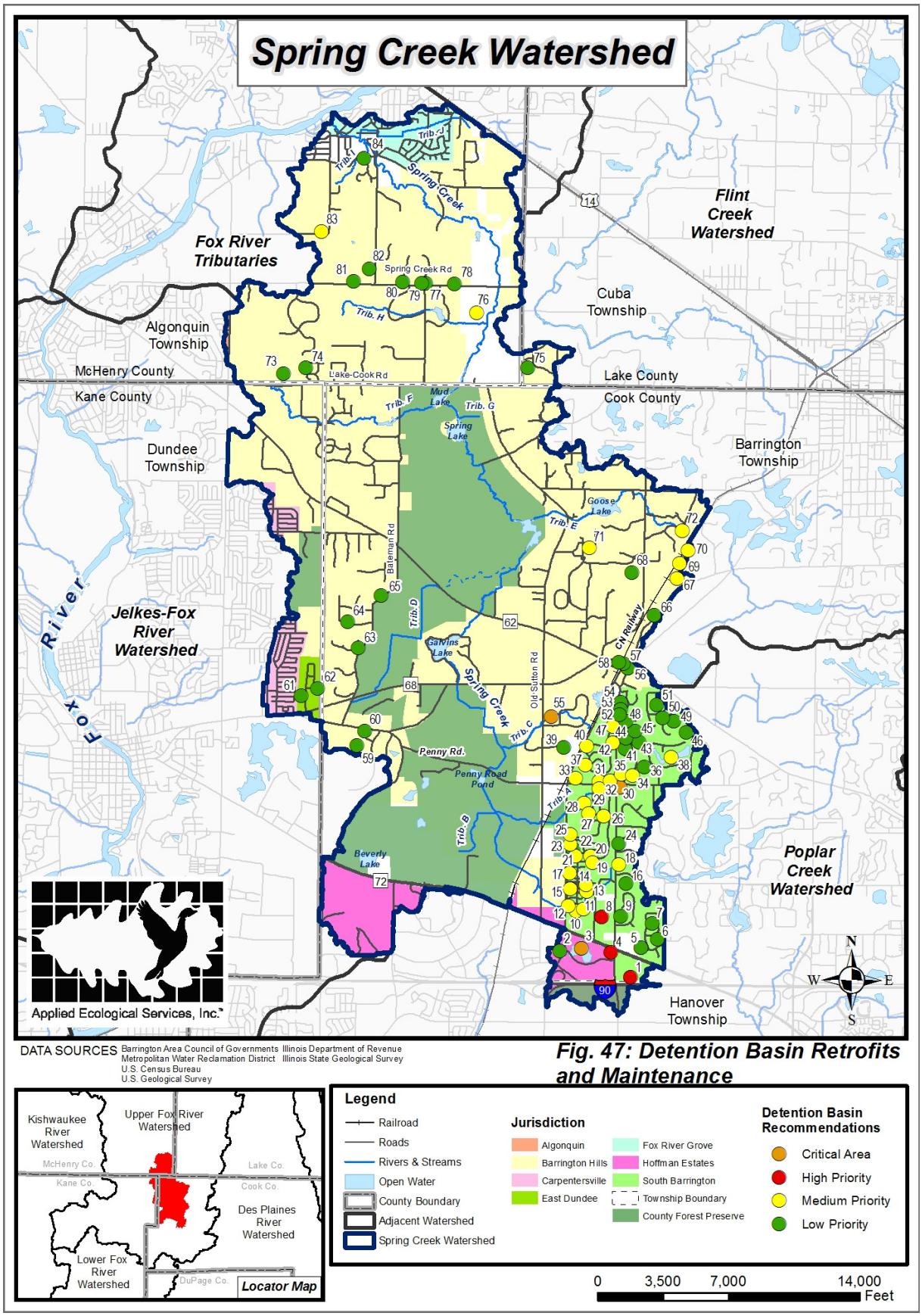


Fig. 47: Detention Basin Retrofits and Maintenance

5.2.2 Pond, Lake, and Wetland Retrofits & Maintenance

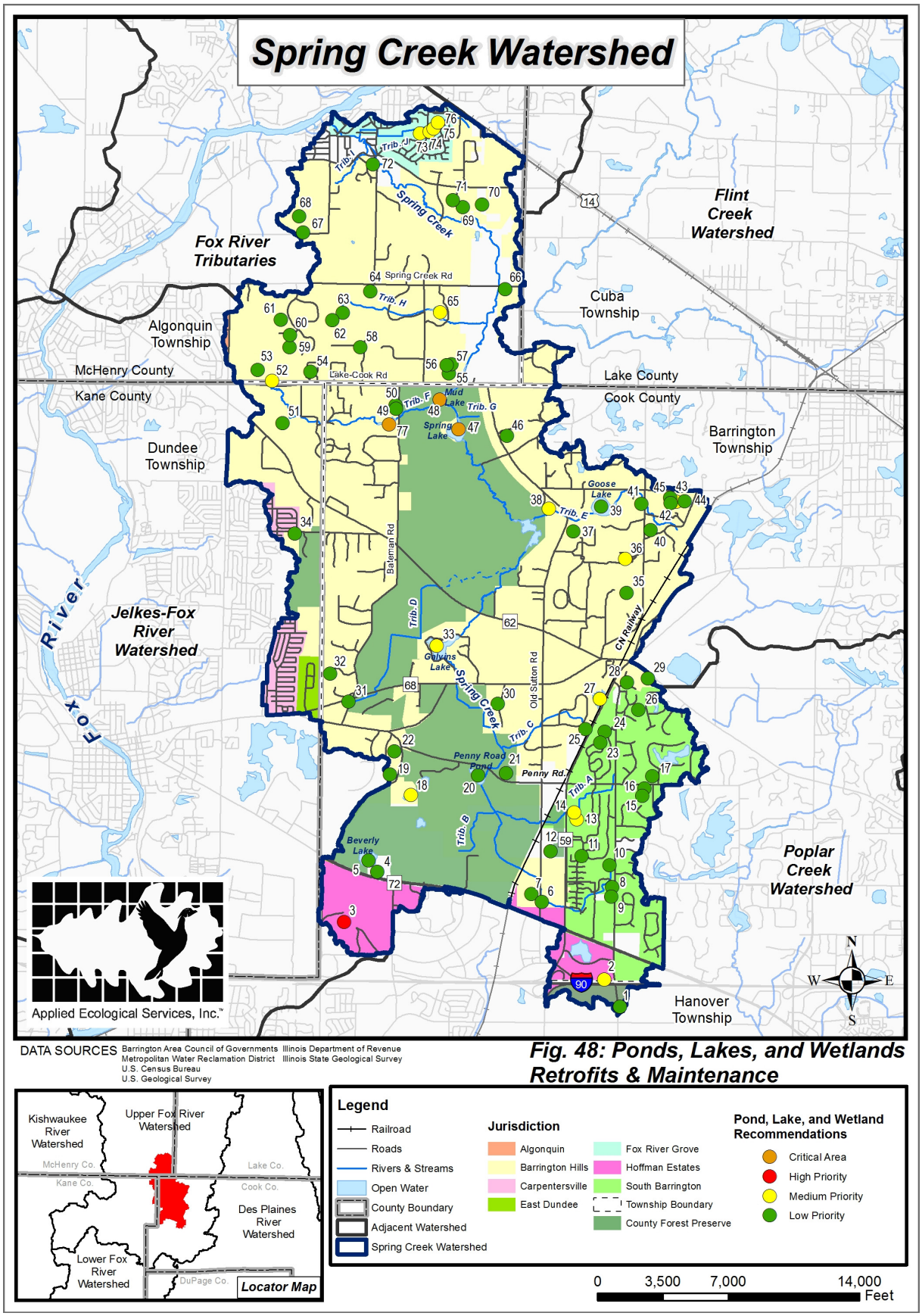
In spring 2011 the Project Team conducted an inventory of many ponds and lakes and wetlands in Spring Creek watershed in an attempt to identify areas that would benefit from retrofits or maintenance to improve water quality and habitat conditions. The results of this inventory can be found in Appendix B. All retrofit and maintenance recommendations are derived directly from recommendations made during the inventory.

Potential buffer retrofit around pond in horse pasture

The condition of ponds, lakes, and wetlands varies. Of the 7 major lakes in watershed only Goose Lake has remained in its natural state over time. The other 6 lakes were either excavated or created by placing dams online with stream reaches. Lake buffers are generally natural but dominated by invasive species. Most ponds inventoried are small, human-made, and generally constructed in areas that were once wetland on private property. Many of the horse farms have ponds with mowed lawn down to the shoreline and little to no buffer zones. Many ponds in highly visible areas near homes exhibit manicured shorelines. Ponds in parks or residential lots have areas of mowed lawn and other more natural shorelines dominated by invasive species. Almost all wetlands included in the inventory are dominated by invasive species and surrounding buffers are typically narrow and not beneficial. Nearly all of the ponds, lakes, and wetlands would benefit from larger and better quality buffers, maintenance of existing buffers, and invasive species management in order to improve water quality and habitat. On equestrian lots, education on plants that filter nutrients and are safe for horses is recommended.

All ponds, lakes, and wetlands receiving Management Measure recommendations are shown by ID# and priority on Figure 48. Details about each recommendation can be found in Table 39 within the appropriate jurisdiction. Critical Areas, publicly owned areas with problems, and others with significant problems are assigned High or Medium priority for retrofits. Some areas are assigned higher priority based on location and/or ability to treat stormwater runoff or provide large scale wildlife habitat. Medium priority is assigned to all areas where native vegetation has been established but requires ongoing maintenance to sustain the restored conditions. Low priority is generally assigned to small, privately owned areas exhibiting few problems.

Wetland dominated by invasive reed canary grass


Spring Creek Watershed
Fox River Tributaries
Flint Creek Watershed
Cuba Township
Algonquin Township
McHenry County
Kane County
Lake County
Cook County
Barrington Township
Dundee Township
Jelkes-Fox River Watershed
Poplar Creek Watershed
Hanover Township
Spring Creek
Spring Creek Rd
Lake-Cook Rd
Trib. A
Trib. B
Trib. C
Trib. D
Trib. E
Trib. F
Trib. G
Trib. H
Trib. J
Mud Lake
Spring Lake
Goose Lake
Galvins Lake
Penny Road Pond
Beverly Lake
Penny Rd.
Old Sutton Rd
Bateman Rd
CN Railway
Fox River
Applied Ecological Services, Inc.
DATA SOURCES
Barrington Area Council of Governments
Metropolitan Water Reclamation District
U.S. Census Bureau
U.S. Geological Survey
Illinois Department of Revenue
Illinois State Geological Survey
Fig. 48: Ponds, Lakes, and Wetlands Retrofits & Maintenance
Kishwaukee River Watershed
Upper Fox River Watershed
McHenry Co.
Lake Co.
Kane Co.
Cook Co.
Des Plaines River Watershed
Lower Fox River Watershed
DuPage Co.
Locator Map
Legend
Railroad
Roads
Rivers & Streams
Open Water
County Boundary
Adjacent Watershed
Spring Creek Watershed
Jurisdiction
Algonquin
Barrington Hills
Carpentersville
East Dundee
Fox River Grove
Hoffman Estates
South Barrington
Township Boundary
County Forest Preserve
Pond, Lake, and Wetland Recommendations
Critical Area
High Priority
Medium Priority
Low Priority
0
3,500
7,000
14,000
Feet
N
S
E
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5.2.3 Wetland Restoration

Wetland restoration can be important for mitigation purposes or done simply to benefit basic environmental functions that historic wetlands once served. Improvement in water quality is the greatest benefit provided by wetland restoration. Other benefits include reducing flood volumes and rates and improved habitat to increase plant and wildlife biodiversity. The wetland restoration process is generally the same for all sites. First a study must be completed to determine if restoration at the site is actually feasible. If it is, a design plan is developed, permits obtained, then the project is implemented. Implementation usually involves breaking existing drain tiles and/or regrading soils to attain proper hydrology to support wetland vegetation. Seeding and plugging with native species is the next step followed by both short and long term maintenance and monitoring.

Wetland restoration sites were identified using GIS data and specific criteria determined to be essential for restoration of a functional and beneficial wetland (see Section 3.12). The initial analysis resulted in 59 sites meeting criteria. However, only 29 of these sites were determined to be "potentially feasible" or have at least "limited feasibility" based on careful review of 2010 aerial photography and what is known about the existing land use at each location.

Figure 49 shows the location of all potential wetland restoration sites by ID# and priority while Table 39 includes action related information for each recommendation within the appropriate jurisdiction. Critical Areas, large sites on agricultural land, and sites within public forest preserves are assigned High or Medium priority for implementation. Smaller sites and those on private land are assigned medium or low priority for implementation.

"Critical Area" wetland restoration ID# 1

"Critical Area" wetland restoration ID#28

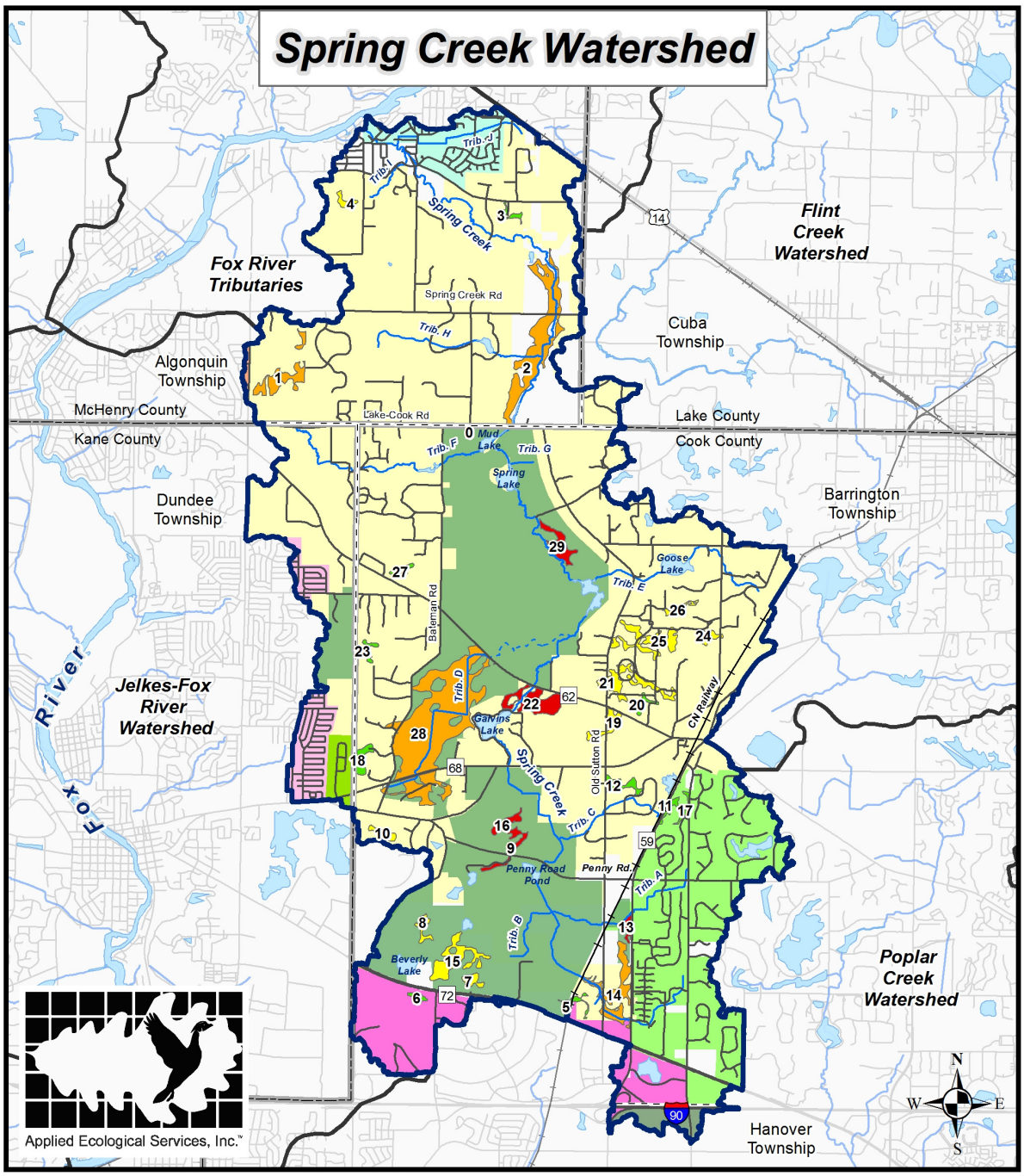

Fig. 49: Wetland Restoration

5.2.4 Priority Protection Areas

Six Priority Protection Areas were identified in the watershed after careful review of existing and future land use, open space, pollutant loading, and green infrastructure components of this plan. These areas are best described as large parcels of land that are currently undeveloped, are likely to be developed in the future, and are situated in environmentally sensitive or green infrastructure areas where acquiring, protecting, and restoring or developing using conservation and/or low density design would best benefit watershed conditions.

Aerial view of Priority Protection Area #4

Aerial view of Priority Protection Area 5

Figure 50 shows the location of all six Priority Protection Areas by site ID#. Table 39 includes specific action recommendations for each. All six sites are considered High Priority "Critical Areas". Cost estimates and schedules for implementing these projects is not included because of the difficulty in determining how or if each site will be acquired or developed. Pollutant reduction estimates were determined through the STEPL Model by assuming that the existing land use (agricultural in most cases) would change to either prairie/forest or natural open space at part of conservation or low density residential development.

Aerial view of Priority Protection Area # 3

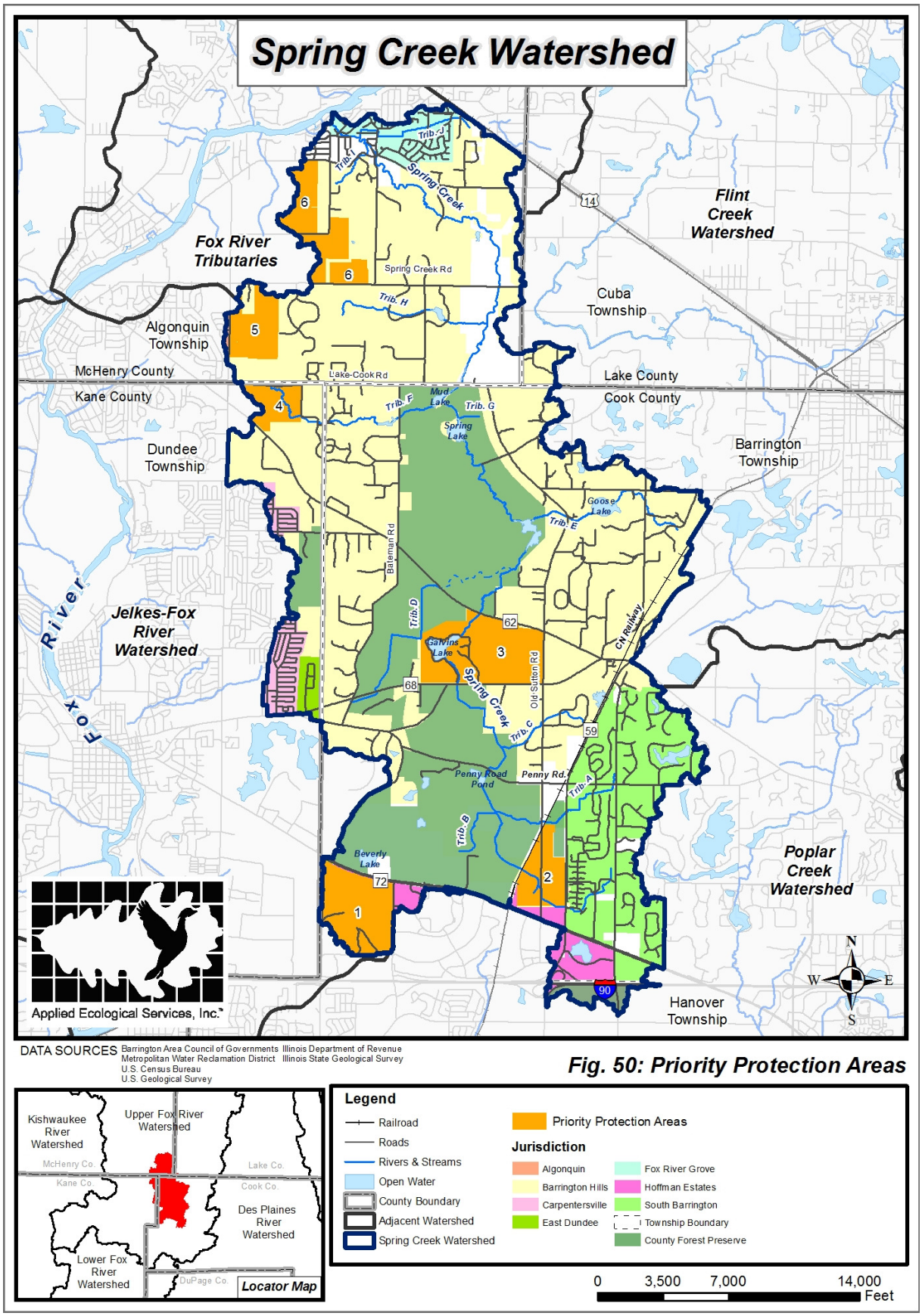

Fig. 50: Priority Protection Areas

5.2.5 Stream & Riparian Area Restoration/Maintenance

The Project Team completed a general inventory of Spring Creek and its tributaries located outside Spring Creek Valley Forest Preserve boundaries in spring 2011. Information about stream reaches located within the Preserve was obtained via personal communication with the Army Corps of Engineers: Chicago District. Detailed notes were recorded related to potential Management Measure recommendations for improving channel and streambank conditions as well as improving the general condition of the riparian corridor. The results of this inventory can be found in Appendix B.

Potential streambank and buffer quality improvement project along reach TRC1

Stream and riparian area projects usually include three water quality improvement components; 1) improved buffers; 2) stabilized streambanks using bioengineering; and 3) restored riffles/grade controls. Buffer improvements usually require removal of invasive species followed by replacement with native vegetation to primarily prevent erosion and filter runoff but also to improve wildlife habitat. Streambank stabilization recommendations include remeandering, slope regrading, and native vegetation plantings. Riffles/grade controls are associated with naturally meandering stream channels. Installation of these structures is recommended where channel conditions are degraded.

Figure 51 shows the location of all potential stream and riparian area restoration and maintenance projects by reach ID# and priority while Table 39 lists details about each recommendation within the appropriate jurisdiction. Critical Areas reaches and reaches with significant problems on agricultural and public land are generally assigned High or Medium priority for implementation. Reaches located on private land are most often assigned Low priority.

Woody invasives (reach TRE2) and mowed turf grass (reach TRH1) observed along Spring Creek & Tributaries

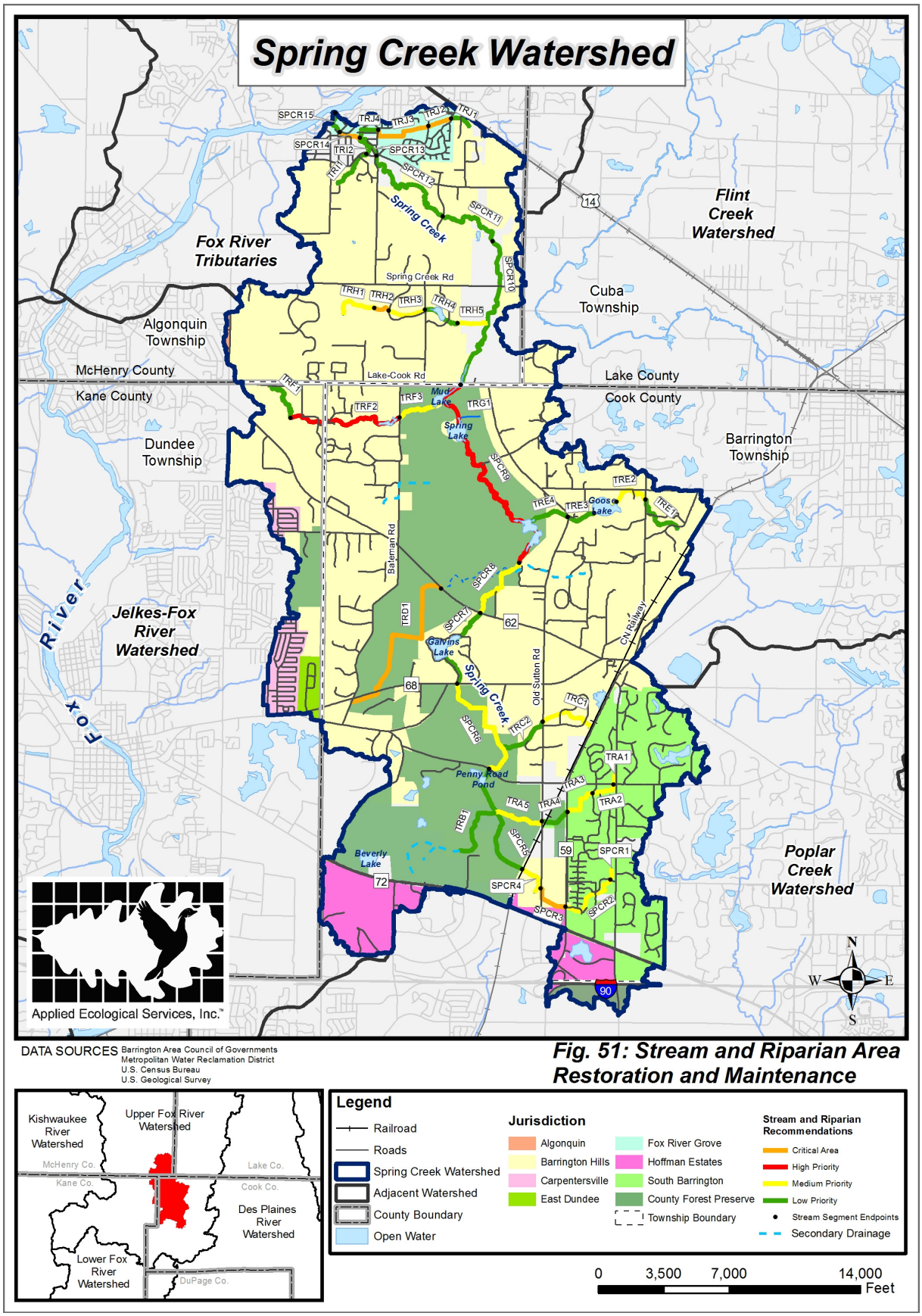

Fig. 51: Stream and Riparian Area Restoration and Maintenance

5.2.6 Other Measures

Eroded channel originating from flatwoods in Helm Woods Forest Preserve

While conducting Management Measure inventories of detention basins, ponds, wetlands, and lakes, within the watershed in spring 2011, the Project Team also looked for other potential projects that fit under categories such as gully stabilization, rain garden creation, residential swale stabilization, wetland detention/storage creation, and prairie restoration. Overall, 2 gully stabilization projects, 1 drainage swale needing protection, 1 potential wetland detention area, and 5 large-scale natural area restoration projects were discovered. The challenge within the community is the lack of a parks division for maintenance. Encouragement of education of landscapers to incorporate and maintain naturalized areas is encouraged. Figure 52 shows the location of all "Other Measures" by ID# while Table 39 lists details about each recommendation within the appropriate jurisdiction.

The Forest Preserve District of Cook County highly recommends several additional Management Practices:

- Control of buckthorn in hydric soils and sensitive soil slopes surrounding the Spring Lake Nature Preserve lakes.
- Recover sensitive soils and slopes in important recharge areas: brush control in extensive sloping meadows west of Spring Creek, South of Donlea Road, and wooded slopes west of the creek, north of Donlea Road within SCVFP.
- Protection of properties, waterways, & water quality in Priority Protection Areas 1, 2, and 3.
- Better stormwater management and pollutant/fertilizer control along Tributaries F & E.
- Better stormwater management, drain tile disablement, easements, native landscaping, fertilizer reduction, and pond retrofits along contributory drainage originating in the Riding Center west of Bateman Road.

The FPDCC believes it is "Critically" important to address the drainage that feeds Tributary B within SCVFP from corporate and IDOT owned and managed areas along Route 72 and to the south. The FPDCC indicates that a swale and also incised channel drain through this area causing erosion and off site pollution leading to invasive species gaining a foothold. FPDCC makes the following recommendations for this area:

- *IDOT Route 72 Stormwater*: Vegetate median strips as bioswales, elevate inflow grates so bioswales retain water during storm events, and vegetate non-vegetated concrete.
- *Prairie Stone*: Consider modifying current curb and gutter system into bioswale/green infrastructure system, using native landscaping, retrofitting with permeable pavement, and raise the outlet in existing detention area to retain additional water.
- *Sears Center:* Control invasive species, revegetate with more sturdy native plants, evaluate maintenance regime and adapt if needed, elevate outlet structure to all additional water retention.

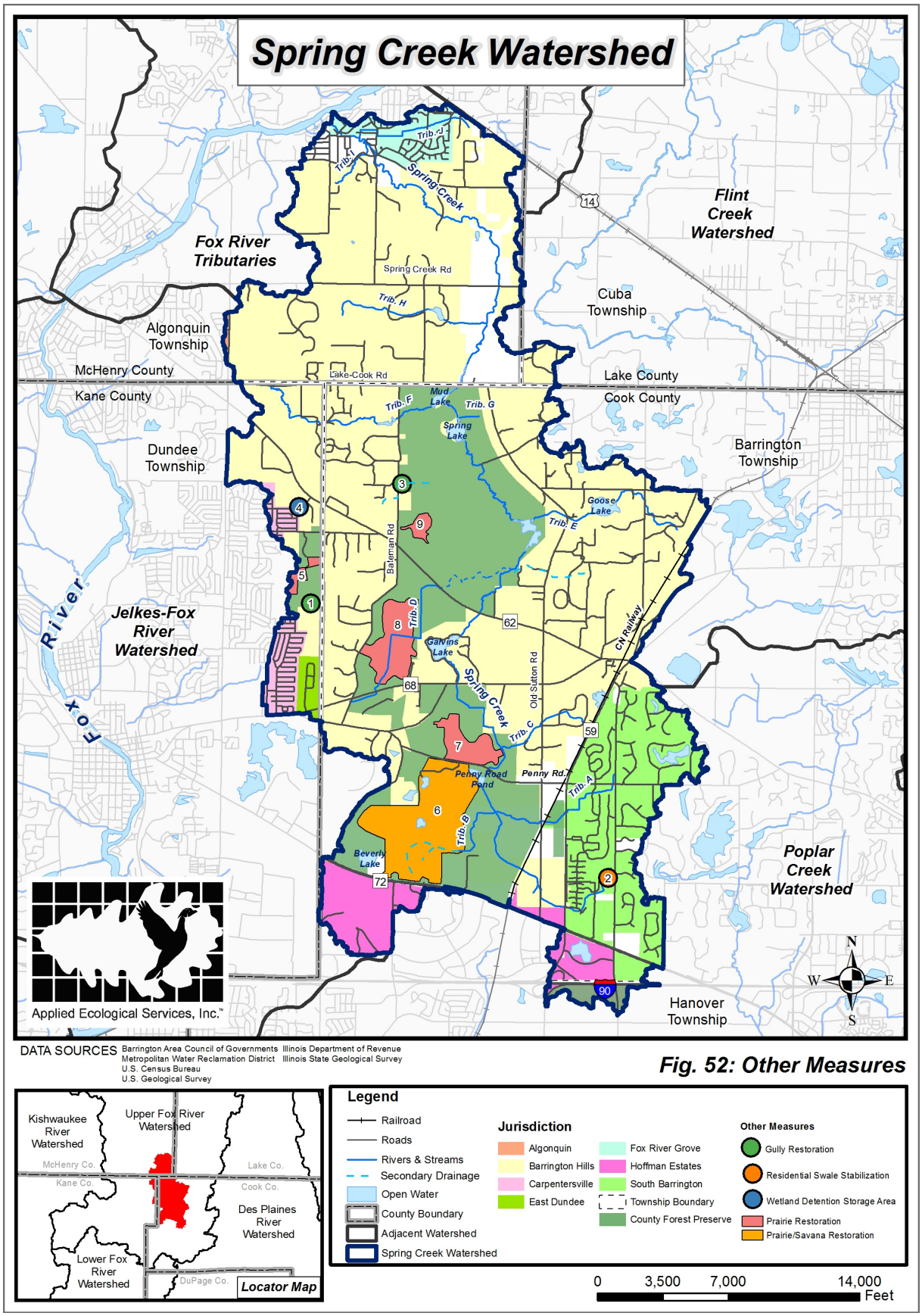

Fig. 52: Other Measures

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Table 39. Site Specific Management Measures Action Plan.

ALGONQUIN TOWNSHIP

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
DETENTION BASIN RETROFITS & MAINTENANCE (See Figure 47) Detention basin retrofit and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance is moderate. Private landowners will require the greatest assistance.											
76	N of Lake Cook Rd, W of Ridge Rd.	1.5 acres	Resident (Private)	Wet bottom detention basin with narrow natural buffer dominated by cattail and willow; hydrologically connected to Trib. H via swale.	Design and implement project to increase buffer and plant with native vegetation, remove invasive species, and maintain indefinitely.	TSS= 73% TN= 40% TP= 45%	Medium	Resident (Duchossois)	Ecological Consultant	$7,750 to install native prairie buffer; $500/year maintenance	5-10 Years
POND, LAKE, AND WETLAND RETROFITS/MAINTENANCE (See Figure 48) Pond, lake, and wetland retrofits and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement pond, lake, and wetland retrofits is relatively low; financial assistance is moderate. Private landowners will require the greatest assistance.											
70	S of Plum Tree Rd.	1 acre	Resident (Private)	Ponds with mowed turf grass buffer; horse corrals located close to pond.	Design and implement project to convert turf grass buffer to native prairie vegetation, plant native emergent plants, and maintain indefinitely.	TSS= 73% TN= 40% TP= 45%	Low	Resident	Ecological Consultant	$10,000 to install native prairie buffer & plants; $500/year maintenance	10+ Years
WETLAND RESTORATION (See Figure 49) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
2	See Figure 49	124 acres	Residents (Private)	124 acre drained wetland complex along Spring Creek on primarily equestrian/pasture land. Note: location is considered a "Critical Area".	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=6 tons/yr; TN=518 lbs/yr; TP=31 lbs/yr	High (Critical Area)	Residents	Ecological Consultant; CFC USACE; NRCS/ SWCD; Illinois EPA	$500,000 to design/permit/install/maintain wetland	1-5 Years
STREAM & RIPARIAN AREA RESTORATION/MAINTENANCE (See Figure 51) Stream restoration and maintenance projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving habitat.											
Technical and Financial Assistance Needs: Stream restorations complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.											
SPCR10	County Line Rd. to End Equestrian Area	9,267 lf	Residents (Private)	Reach is moderately channelized through equestrian area with poor buffer quality but with only minor streambank erosion.	Implement project to improve buffer w/in 100 feet of stream by removing invasive woody and herbaceous species followed by installation of native seed. Enhance channel by installing up to 3 artificial riffles.	TSS=2.8 tons/yr TN=23 lbs/yr TP=3 lbs/yr	Low	Residents	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$170,000 invasive species removal and native seeding; $12,000 to install 3 riffles	10+ Years
SPCR13	Algonquin Rd. to Utility Corridor	1,819 lf	Residents (Private)	Reach meanders naturally through residential area and exhibits low to moderate streambank erosion with poor riparian buffer condition. Debris jams are common in this reach.	Implement project to improve buffer w/in 100 feet of stream by removing invasive woody and herbaceous species followed by reintroducing native vegetation. Remove debris jams from channel.	TSS= 0.9 tons/yr TN=10 lbs/yr TP= 2 lbs/yr	Low	Residents	Ecological Consultant	$42,000 invasive woody & herbaceous species removal; $17,000 native seeding; $8,000 debris removal	10+ Years; Debris Removal Ongoing
TRH5	Beginning of Equestrian Area to Spring Creek	1,628 lf	Resident (Private)	Reach is highly channelized in pipe through much of reach. Riparian corridor is mostly mowed turf grass.	Design, permit, and implement project to "daylight" stream and create 50-foot wide native prairie buffer.	TSS= 0.4 tons/yr TN=4 lbs/yr TP= 0 lbs/yr	Medium	Resident	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$25,000 design/permit; $163,000 install	5-10 Years

BARRINGTON HILLS

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
DETENTION BASIN RETROFITS & MAINTENANCE (See Figure 47)											
Detention basin retrofit and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance is moderate. Private landowners will require the greatest assistance.											
39	End of Tricia Ln.	3 acres	Resident (Private)	Wetland bottom detention basin dominated by invasive species.	Implement yearly maintenance to eradicate invasive species.	Not Applicable	Low	Resident	Ecological Consultant	$1,500/year maintenance	Ongoing
55	Old Sutton Rd./ Creekside Ln.	7 acres	Resident (Private)	Wet bottom detention basin online & at headwaters of Trib. C. Basin is located in heavily used horse pasture within no use restrictions. Note: location is considered a "Critical Area".	Restrict horse access to basin and install buffer of native vegetation.	TN= 33 lbs/yr; TP= 3 lbs/yr; TSS= 2 tons/yr	High (Critical Area)	Resident	Barrington Hills; RCBH	$36,000 to install native prairie buffer; $2,000/year maintenance; Fencing costs	1-5 Years
56, 57, 58	Rt. 68/New Sutton Rd.	2.75 acres	IDOT (Private)	Wet and wetland bottom detention basins surrounded by mix of native and invasive species; garbage is also present.	Implement invasive species control and garbage removal.	Not Applicable	Low	IDOT	IDOT; Ecological Consultant	$2,750/year	Ongoing
59, 60	W Pond Gate Rd.	1.5 acre	Resident/ HOA (Private)	Dry bottom detention basins with mowed turf grass throughout.	Design and implement project to convert turf grass to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident/ HOA	Ecological Consultant	$8,000 to install prairie buffer; $750 year maintenance	10+ Years
63	Berron Ln. W of Bateman Rd.	0.75 acre	Resident/ HOA (Private)	Wet bottom detention basin with mowed turf grass buffer.	Design and implement project to convert turf grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident/ HOA	Ecological Consultant	$7,000 to install prairie buffer and plants; $500/year maintenance	10+ Years
64	N Rolling Hills Dr.	0.25 acre	Resident/ HOA (Private)	Dry bottom detention basin with mowed turf grass throughout.	Design and implement project to convert turf grass to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident/ HOA	Ecological Consultant	$1,500 to install prairie buffer and plants; $500/year maintenance	10+ Years
65	NW side Bateman Rd.	0.75 acre	Prairie Hills Estates HOA	Dry bottom detention basin along Bateman Road vegetated with various grasses and surrounded by woody vegetation.	Implement yearly maintenance.	Not Applicable	Low	Prairie Hills Estates HOA	Ecological Consultant	$500/year maintenance	Ongoing
66	W of Old Dundee Rd	1 acre	Resident (Private)	Wet bottom detention basin dominated by invasive woody species along shoreline.	Implement woody invasive species removal.	Not Applicable	Low	Resident	Ecological Consultant	$5,000 for invasive woody removal	10+ Years
67, 69, 70	Residential Subdivision along Jennifer Ct.	5 acres	HOA (Private)	Wet and wetland bottom detentions with turf grass side slopes located in newer residential development.	Design and implement project to convert turf grass slopes to native prairie vegetation, install native emergent & wet prairie plants at water line and bottom of wetland basin, and maintain indefinitely.	TSS=77.5% TN=20% TP=44%	Medium	Homeowners Association	Ecological Consultant	$50,000 to install native prairie buffer & plants; $1,000/acre/year maintenance	5-10 Years
68	W of Brinker Rd.	1 acre	Resident (Private)	Shallow wet bottom detention basin with mowed buffer; located between two horse pastures.	Design and implement project to convert buffer to native prairie vegetation, install native emergent plants, and maintain indefinitely.	TSS=77.5% TN=20% TP=44%	Low	Resident	Ecological Consultant	$10,000 to install prairie buffer and plants; $500/year maintenance	5-10 Years
71	Between Old Sutton & Brinker Rds.	3.75 acres	Resident (Private)	Wet bottom detention basin with native prairie buffer.	Implement maintenance to maintain prairie buffer.	Not Applicable	Medium	Resident	Ecological Consultant	$1,750/year maintenance	Ongoing
72	Residential Lot W of Hawley Woods Rd.	1 acre	Resident (Private)	Wet bottom detention basin with culvert blowout and buffer of invasive species and turf grass at headwaters of Trib. E.	Design and implement project to convert tuft grass and invasive species areas to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely. Fix culvert blowout.	TSS=77.5% TN=20% TP=44%	Medium	Resident	Ecological Consultant & Civil Engineer	$10,000 to install native prairie buffer & plants; $5,000 to repair culvert; $2,500/year maintenance	5-10 Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
73	County Line Rd: Plum Grove Farm	1.5 acres	Resident (Private)	Wet bottom detention basin/pond with mowed turf grass along buffer	Design and implement project to convert turf grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$18,000 to install prairie buffer & plants; $750/year maintenance	10+ Years
74	Barrington Bourne Rd.	0.1 acre	Resident (Private)	Wet bottom detention basin with mowed turf grass buffer and rip-rap at shoreline.	Design and implement project to convert turf grass buffer to native prairie vegetation, plant native emergent plants along waterline, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$2,000 to install prairie buffer and plants; $500/year maintenance	10+ Years
75	Peraino Circle, NE of Lake Cook and Ridge Rds.	2.4 acres	Resident (Private)	Wet bottom detention basin with naturalized buffer; some invasive species present.	Implement maintenance program to eliminate invasive species.	Not Applicable	Low	Resident	Ecological Consultant	$750/year maintenance	Ongoing
77, 79, 80	Moate Ln. & Ascot Ln.	3 acres	Resident/ HOA (Private)	Dry bottom detention basin with mowed turf grass throughout.	Design and implement project to convert turf grass to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident/ HOA	Ecological Consultant	$15,500 to install native prairie buffer; $1,000/acre/year maintenance	10+ Years
78	N Spring Cr. Rd. & E Meadow Hill Rd.	0.25 acre	Resident (Private)	Wet bottom detention basin/decorative pond with mowed turf grass buffer. This pond has little stormwater management function.	Design and implement project to convert turf grass buffer to native prairie vegetation, plant native emergent plants along waterline, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$3,500 to install prairie buffer & plants; $500/year maintenance	10+ Years
81	Spring Cr. Rd. W of Braeburn	1.5 acres	Resident (Private)	Dry bottom detention basin with work currently being done to drain area.	Design and implement project to allow basin to be wetland by restoring hydrology, plant with native vegetation, and maintain indefinitely.	TSS=77.5% TN=20% TP=44%	Low	Resident	Ecological Consultant, USACE	$13,000 to install native prairie buffer & plants; $750/year maintenance	10+ Years
82	Braeburn N of Spring Cr. Rd.	2.25 acres	Residents (Private)	Dry bottom detention basin with mowed turf grass throughout; partially farmed west of property line.	Design and implement project to convert existing vegetation to native prairie; create buffer in farmed area, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Residents	Ecological Consultant; SWCD/NRCS	$11,000 to install native prairie buffer; $1,500 year maintenance	10+ Years
83	N Chapel Rd.	0.1 acres	Resident (Private)	Wet bottom detention basin with mowed buffer and turbid water; drains surrounding horse farms.	Design and implement project to convert buffer to native prairie vegetation, plant native emergent plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Resident	Ecological Consultant	$2,000 to install prairie buffer and plants; $500/year maintenance	5-10 Years
84	Burning Oak Trl.	0.25 acre	Resident (Private)	Wet bottom detention with natural buffer.	Implement yearly maintenance.	Not Applicable	Low	Resident	Ecological Consultant	$500/year maintenance	Ongoing
POND, LAKE, AND WETLAND RETROFITS/MAINTENANCE (See Figure 48)											
Pond, lake, and wetland retrofits and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement pond, lake, and wetland retrofits is relatively low; financial assistance is moderate. Private landowners will require the greatest assistance.											
18	SE of Healy Rd	6.5 acres	Resident (Private)	Large pond with mostly mowed turf grass buffer; geese present.	Design and implement project to convert turf grass buffer to native prairie vegetation, install native wetland plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Resident	Ecological Consultant	$65,000 to install prairie buffer & plants; $3,250/year maintenance	5-10 Years
19	W of Healy Rd.	1 acre	Resident (Private)	Pond with mostly mowed turf grass buffer, algae, and geese present.	Design and implement project to convert turf grass buffer to native prairie vegetation, install native wetland plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$5,000 to install prairie buffer & plants; $500/year maintenance	10+ Years
22	W of Healy Rd.	5 acres	Resident (Private)	Pond with mostly natural shoreline and clean water.	Implement routine maintenance.	Not Applicable	Low	Resident	Owner	$1,250/year maintenance	Ongoing
25	Between New Sutton Rd. & Creekside Ln.	1 acre	Resident (Private)	Pond bordered by cattail and other invasive species; narrow buffer is present near house.	Design and implement project to create native prairie buffer near house. Implement invasive species control around perimeter of pond.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$3,000 to install prairie buffer; $500/year maintenance	10+ Years
27	Residential area W of Rail Road	15 acres	Residents; CN Railway (Private)	Large wetland complex with overall good wildlife habitat but bordered by invasive species.	Implement invasive species control	Not Applicable	Medium	Residents; CN Railway	Ecological Consultant	$7,000/year maintenance	Ongoing

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
27	Residential area W of Rail Road	15 acres	Residents; CN Railway (Private)	Large wetland complex with overall good wildlife habitat but bordered by invasive species.	Implement invasive species control	Not Applicable	Medium	Residents; CN Railway	Ecological Consultant	$7,000/year maintenance	
28	Bartlett Rd.	1 acre	Resident (Private)	Pond with mowed turf grass buffer.	Design and implement project to convert turf grass buffer to native prairie vegetation, install native wetland plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$10,000 to install prairie buffer & plants; $500/year maintenance	10+ Years
29	SW of Intersection New Sutton & Rt. 62	1 acre	Owner (Private)	Wetland with mixture of mowed turf grass and old field buffer.	Design and implement project to convert turf grass and old field buffer to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Owner	Ecological Consultant	$5,000 to install prairie buffer; $500/year maintenance	10+ Years
30	Woodcreek Rd.	0.25 acre	Resident (Private)	Ponded/turf grass area that appears to flood after rain events.	Design and implement project to convert low area to wetland planted with native vegetation.	TSS=77.5% TN=20% TP=44%	Low	Resident	Ecological Consultant	$5,000 to install native vegetation; $500/year maintenance	10+ Years
31	SW corner Bateman & Rt. 68	0.5 acre	Resident (Private)	Pond with naturalized buffer dominated by buckthorn.	Remove invasive buckthorn from pond buffer.	Not Applicable	Low	Resident	Ecological Consultant or Tree Service	$4,000 to remove buckthorn	10 + Years
32	NW Rt. 68 & Bateman Rd.	1 acre	Resident (Private)	Pond with mowed turf buffer.	Design and implement project to create native prairie buffer, install native wetland plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$10,000 to install prairie buffer & plants; $500/year maintenance	10+ Years
33	Between Rt. 62 & Rt. 68	24 acres	Resident (Private)	Galvin's Lake: Privately owned lake online with Spring Creek. Lake is lined with rip-rap; mowed turf grass buffers encircle much of lake.	Implement project to convert turf grass buffer areas to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Resident	Ecological Consultant	$65,000 to install prairie buffer; $6,000/year maintenance	5-10 Years
34	S of Helm Rd.	0.5 acre	Resident (Private)	Pond with natural buffer but heavily dominated by invasive woody species.	Remove invasive woody species from pond buffer.	Not Applicable	Low	Resident	Ecological Consultant	$3,000 to remove invasive woody species	10+ Years
35	W of Brinker Rd.	3.5 acres	Resident (Private)	Pond with mixture of natural and mowed turf buffer.	Convert turf grass buffer to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$10,000 to install prairie buffer; $1,750/year maintenance	10+ Years
36	W of Brinker Rd	1 acres	Resident (Private)	Pond with naturalized buffer of native species.	Maintain buffer.	Not Applicable	Medium	Resident	Ecological Consultant; Owner	$500/year maintenance	Ongoing
37	Old Sutton Rd.	6 acres	Resident (Private)	Large pond with natural buffer of invasive species.	Implement project to eradicate invasive species along buffer and replant with native vegetation; maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$15,000 to install prairie buffer; $3,000/year maintenance	10+ Years
38	Old Sutton Rd.	6 acres	Resident (Private)	Large wetland complex that extends onto SCVFP; native prairie buffer surrounds wetland on residence.	Maintain prairie buffer.	Not Applicable	Medium	Resident	Ecological Consultant; Owner	$3,000/year maintenance	Ongoing
39	Between Old Sutton & Brinker Rds.	40 acres	Residents/ HOA (Private)	Goose Lake: Natural lake surrounded by natural/wetland buffer but dominated by invasive species.	Implement invasive species control.	Not Applicable	Low	Residents/ HOA	Ecological Consultant; CFC	$10,000/year maintenance	Ongoing
41	W of Brinker Rd.	1 acre	Resident (Private)	Wetland dominated by invasive reed canary grass and buffer of invasive woody species.	Implement project to eradicate reed canary grass and replant with native wetland vegetation; remove woody invasives along wetland buffer.	Not Applicable	Low	Resident	Ecological Consultant; CFC	$8,000/acre native vegetation; $5,000/acre invasive woody removal; $500/year maintenance	10+ Years
40	Hills & Dales Rd.	1.5 acres	Residents (Private)	Pond with mixture of natural and mowed turf buffer.	Convert turf grass buffer to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Residents	Ecological Consultant	$4,000 to install prairie buffer; $750/year maintenance	10+ Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
42	Hills & Dales Rd.	1 acre	Resident (Private)	Wetland dominated by invasive reed canary grass; buffer is partially mowed turf grass.	Implement project to eradicate reed canary grass and replant with native wetland vegetation. Convert turf grass buffer areas to native prairie.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$8,000 to install native vegetation; $500/year maintenance	10+ Years
43	W of Hills & Dales Rd.	0.25 acre	Resident (Private)	Pond surrounded by horse pasture.	Limit horse access to pond, convert pond buffer to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Resident	Ecological Consultant; RCBH	$1,000 to install prairie buffer; $500/year maintenance	5-10 Years
44	Hills & Dales Rd.	0.5 acre	Resident (Private)	Pond with mixture of mowed turf grass and invasive woody buffer.	Implement project to convert turf grass buffer areas to native prairie vegetation; Remove invasive woody species from other areas.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$5,000 to install prairie buffer; $500/year maintenance	10+ Years
45	Hills & Dales Rd.	1 acre	Resident (Private)	Pond lined with seawall; mowed turf grass along buffer.	Design and implement project to convert turf grass buffer to native prairie vegetation and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$5,000 to install prairie buffer; $500/year maintenance	10+ Years
46	NW corner Old Sutton & Donlea Rds.	3.25 acres	Resident (Private)	Pond with mostly natural buffer of invasive species.	Implement invasive brush removal around pond buffer.	Not Applicable	Low	Resident	Ecological Consultant	$22,750 to remove invasive brush	10+ Years
49, 50	W of Bateman	0.25 acre	Resident (Private)	Two small ponds with small buffer along half of shoreline.	Install wider buffer of native prairie vegetation.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$3,000 to install prairie buffer	10+ Years
51	Between Algonquin & Lake Cook Rds.	6 acres	Owner	Large wetland with good wildlife habitat; dominated on borders by invasive reed canary grass.	Implement maintenance to eradicate reed canary grass.	Not Applicable	Low	Owner	Ecological Consultant	$500/year maintenance	10+ Years
52	N of County Line Rd.	1.5 acres	Resident (Private)	Pond with mowed turf grass buffer. Pond is located at headwaters of Trib. F.	Design and implement project to convert turf grass buffer to native prairie vegetation, install native wetland plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Resident	Ecological Consultant	$15,000 to install prairie buffer and plants; $750/year maintenance	5-10 Years
53	NW corner Haegers Bend & County Line Rds.	2 acres	Residents (Private)	Pond with natural buffer of mostly invasive species.	Implement invasive species control.	Not Applicable	Low	Residents	Ecological Consultant	$1,000/year maintenance	10+ Years
54	Barrington Bourne Rd.	1 acre	HOA (Private)	Pond with mowed turf grass buffer.	Design and implement project to convert turf grass buffer to native prairie vegetation, install native wetland plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Residents/ HOA	Ecological Consultant	$10,000 to install prairie buffer; $1,000/acre/year maintenance	10+ Years
55, 57	NE Meadow Hill & Lake Cook Rds.	2.5 acres	Residents (Private)	Ponds with mowed turf grass buffer.	Design and implement project to convert turf grass buffer to native prairie vegetation, plant native emergent plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Residents	Ecological Consultant	$25,000 to install prairie buffer and plants; $1,250/year maintenance	10+ Years
56	NE Meadow Hill & Lake Cook Rds.	0.1 acre	Resident (Private)	Small wetland with mowed turf grass to edge.	Convert turf grass buffer to native prairie vegetation.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$2,000 to install prairie buffer	10+ Years
58	SW corner Country Oaks Ln. & Country Oaks Dr.	0.25 acre	Resident (Private)	Small wetland dominated by invasive reed canary grass.	Implement reed canary grass control and overseed with native wetland species.	Not Applicable	Low	Resident	Ecological Consultant	$5,000 to control invasives and overseed	10+ Years
59	S Little Bend Road	10 acres	Residents (Private)	Large wetland complex in relatively good condition.	Implement yearly maintenance.	Not Applicable	Low	Homeowners Association	Ecological Consultant	$5,000/year maintenance	Ongoing
61	W Spring Lake Rd.	3.4 acres	Residents (Private)	Pond with wooded buffer to west, south and east sides are mowed turf grass buffer.	Install a rain garden on the south property from the sump pump drainage. Install a native prairie buffer on the south side and portions of the east side. Reduce invasives and perform maintenance.	TSS=73% TN=40% TP=45%	Low	Homeowners Association	Ecological Consultant; CFC	$5,000 to install garden; $10,000 to install prairie buffer; $1,750/year maintenance	10+ Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
62	SW of Braeburn Ln.	0.75 acre	Resident (Private)	Large wetland complex dominated by invasive reed canary grass. Wetland is located at headwaters of Trib. H.	Implement ongoing maintenance.	Not Applicable	Low	Resident	Ecological Consultant	$500/year maintenance	Ongoing
63	Braeburn Ln.	0.75 acre	Resident (Private)	Pond with natural buffer dominated by invasive species.	Remove invasive species from buffer and replant with native species; maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$2,000 to install prairie buffer; $500/year maintenance	10+ Years
64	Braeburn Ln.	0.75 acre	Resident (Private)	Pond with buffer of mostly mowed turn grass.	Design and implement project to create native prairie buffer, install native wetland plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$7,000 to install prairie buffer & plants; $500/year maintenance	10+ Years
65	Ridgecroft Rd.	5 acres	Resident (Private)	Large pond with mostly wooded shoreline and mowed turf grass beneath. Pond is online with Trib. H.	Design and implement project to naturalize pond buffer with native prairie/woodland vegetation; install native emergent plants along waterline, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Resident	Ecological Consultant; CFC	$50,000 to install prairie buffer and plants; $2,000/year maintenance	5-10 Years
66	SW Spring Cr. Rd. & Ridge Rd.	0.1 acre	Resident (Private)	Small pond with mowed turf buffer.	Design and implement project to create native prairie buffer.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$2,000 to install prairie buffer	10+ Years
67	Chapel Rd.	9 acres	Owner (Private)	Large wetland at Chapel Rd. with narrow buffer in agricultural areas. Road shows signs of flooding.	Install native prairie buffer along agricultural areas.	TSS=70% TN=53% TP=61%	Low	Owner	NRCS/SWCD; Ecological Consultant	$20,000 to install prairie buffer	10+ Years
69, 71	S of Plum Tree Rd.	5.5 acres	Residents (Private)	Ponds with mowed turf grass buffer.	Design and implement project to convert turf grass buffer to native prairie vegetation, plant native emergent plants, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Residents	Ecological Consultant	$50,000 to install prairie buffer and plants; $2,250/year maintenance	10+ Years
68	Chapel Rd.	1 acre	Ag Field Owner (Private)	Farmed wetland that is currently a mudflat.	Allow wetland to reestablish by stopping row crop farming and installing native plants and seed; install prairie buffer around wetland.	TSS=77.5% TN=20% TP=44%	Low	Owner	Ecological Consultant; NRCS/SWCD	$5,000 to install prairie buffer;	10+ Years
72	SW Plum Tree and Braeburn Rds.	0.3 acre	Resident (Private)	Small wetland in residential area; surrounded by invasive buckthorn.	Remove invasive buckthorn.	Not Applicable	Low	Resident	Ecological Consultant	$3,000 to remove buckthorn	10+ Years
77	Just W. of Bateman & S. of Lake-Cook	6 acres	Residents (Private)	Online pond that takes water from much of upstream residential development. FPDCC indicates that significant fertilizers in runoff flow through pond prior to entering Nature Preserve. Note: location is considered a "Critical Area" by FPDCC.	FPDCC recommends reworking this pond in ways that would decrease pollutant loading to the Nature Preserve. Pond could be altered to be a wetland filter.	TN= 640 lbs/yr TP= 213 lbs/yr TSS= 65 tons/yr	High (Critical Area)	Residents	FPDCC; Ecological Consultant	$100,000 to plan and convert pond into wetland filter	1-10 Years
WETLAND RESTORATION (See Figure 49) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
1	See Figure 49	37.9 acres	Owner (Private)	Large drained wetland at headwaters of Trib. F on private agricultural land; potentially feasible to restore wetland as a mitigation bank. Note: location is "Critical Area" and potential wetland mitigation bank.	Restore mitigation wetland and create prairie buffer by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS= 14 tons/yr; TN= 135 lbs/yr; TP= 29 lbs/yr	High (Critical Area)	Owner	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC; Wetland Banker	$550,000 to create wetland mitigation bank; fair market value for purchase of land if required	1-5 Years
3	See Figure 49	7 acres	Residents (Private)	Drained wetland located on private residential lots; limited feasibility to restore wetlands.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Residents	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$50,000 to design/permit/construct /maintain wetland	10+ Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
4	See Figure 49	6.9 acres	Owners (Private)	Drained wetland with west portion located primarily on private agricultural land; east portion is located on private residential lots. Wetland restoration is potentially feasible.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Medium	Owners	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$50,000 to design/permit/construct /maintain wetland	5-10 Years
10	See Figure 49	7.2 acres	Owner (Private)	Drained wetland located on private agricultural land. Wetland restoration is potentially feasible.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Medium	Owner	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$50,000 to design/permit/construct /maintain wetland	5-10 Years
12	See Figure 49	14.9 acres	Residents (Private)	Drained wetland located on private pasture/agricultural land; limited feasibility to restore wetlands.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Owner	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$100,000 to design/permit/construct /maintain wetland	10+ Years
18	See Figure 49	13.7 acres	Residents (Private)	Drained wetland located on private residential lots; limited feasibility to restore wetlands.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Residents	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$100,000 to design/permit/construct /maintain wetland	10+ Years
19	See Figure 49	14.9 acres	Owners (Private)	Drained wetland located on private agricultural land dissected by Old Sutton Rd. Wetland restoration is potentially feasible.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Medium	Owners	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$100,000 to design/permit/construct /maintain wetland	5-10 Years
20	See Figure 49	6.4 acres	Residents (Private)	Drained wetland located on private equestrian/pasture area; limited feasibility to restore wetlands.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Residents	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$45,000 to design/permit/construct /maintain wetland	10+ Years
21, 24, 25, 26	See Figure 49	90 acres	Residents (Private)	Drained wetland complexes located on private equestrian/pasture area. Wetland restoration is potentially feasible.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Medium	Residents	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$400,000 to design/permit/construct /maintain wetland	5-10 Years
22	See Figure 49	46.9 acres	Resident (Private)	Large drained wetland located on private land this currently agricultural. Wetland restoration is potentially feasible.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	High	Resident or Future Owner	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$230,000 to design/permit/construct /maintain wetland	1-5 Years
23	See Figure 49	6.2 acres	Residents (Private)	Drained wetland located on private residential lots; limited feasibility to restore wetlands.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Residents	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$43,000 to design/permit/construct /maintain wetland	10+ Years
27	See Figure 49	5.7 acres	Resident (Private)	Drained wetland located on private agricultural lot. Wetland restoration is potentially feasible.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Resident	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$40,000 to design/permit/construct /maintain wetland	10+ Years

PRIORITY PROTECTION AREAS (See Figure 50)

Acquiring and restoring or implementing future conservation and/or low density design development in Priority Protection Areas will enhance green infrastructure benefits.

Technical and Financial Assistance Needs: Technical and financial assistance needed to acquire land for restoration or conservation/low density development is high because of land, design/permitting, and construction costs.										
2	See Forest Preserve District of Cook County									
3	See Forest Preserve District of Cook County									
4	Between County Line Rd. & Rt. 62 (see Figure 50)	123 acres	Owner (Private)	Site consists primarily of agricultural and wooded land at headwaters of Tributary F. Parcels will likely be developed to residential in the future. Note: site is considered a "Critical Area".	Implement conservation and/or low density design into future development to reduce environmental impacts.	TSS= 51 tons/yr TN=508 lbs/yr TP=111 lbs/yr	High (Critical Area)	Future Developer	Barrington Hills, Kane County, Ecological Consultant; USACE	Cost to implement conservation and/or low density design cannot be determined at this time	Design & Implementation of Future Development
5	SW Spring Cr. Rd. & Haegers Bend Rd. (See Figure 50)	185 acres	Owner (Private)	Site is agricultural land with extensive drained wetlands at headwaters of Tributary F. The site contains Critical Area Wetland Restoration site #1 that could be built as a Mitigation Bank for Longmeadow Rd. extension & other impacts. Note: site is considered a "Critical Area".	The first option is to acquire, protect, and create a wetland mitigation bank site surrounded by prairie buffer. The second option is to implement conservation and/or low density design into the site if it is developed in the future.	TSS= 61 tons/yr TN=610 lbs/yr TP=133 lbs/yr	High (Critical Area)	Future Developer	Barrington Hills, McHenry County, Ecological Consultant; USACE	See cost to construct wetland mitigation bank under Wetland Restoration site #1	1-5 Years for mitigation bank
6	NW of Spring Cr. Rd. & Braeburn Rd. (See Figure 50)	288 acres	Owners (Private)	Site consists primarily of agricultural land surrounded by residential in an area likely to see additional residential development in the future. Note: site is considered a "Critical Area".	Implement conservation and/or low density design into future development to reduce environmental impacts.	TSS=103 tons/yr TN=1,025 lbs/yr TP=234 lbs/yr	High (Critical Area)	Future Developer	Barrington Hills, McHenry County, Ecological Consultant; USACE	Cost to implement conservation and/or low density design cannot be determined at this time	Design & Implementation of Future Development

STREAM & RIPARIAN AREA RESTORATION/MAINTENANCE (See Figure 51)

Stream restoration and maintenance projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving habitat.

Technical and Financial Assistance Needs: Stream restorations complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.										
SPCR3	Rt. 59 to Old Sutton Rd.	1,983 lf	Owner (Private)	Reach flows through agricultural area and exhibits moderate streambank erosion, is highly channelized, and the riparian buffer condition is poor. Note: Reach is considered a "Critical Area".	Design, permit, and implement project to improve channel condition, stabilize streambanks, and improve buffer by: 1) install artificial riffles, 2) restore streambanks using bioengineering techniques, and 3) install native prairie buffer.	TSS=172 tons/yr; TN= 343 lbs/yr; TP= 172 lbs/yr	High (Critical Area)	Current or Future Owner	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$60,000 design/permit; $300,000 install	1-5 Years
SPCR4	Old Sutton Rd. to CN Railway	2,087 lf	Owner (Private)	Reach flows through agricultural area and exhibits low/moderate streambank erosion, is highly channelized, and the riparian buffer condition is poor.	Design, permit, and implement project to improve channel condition, stabilize streambanks, and improve buffer by: 1) install artificial riffles, 2) restore streambanks using bioengineering techniques, and 3) install native prairie buffer.	TSS= 29 tons/yr; TN=59 lbs/yr; TP= 29 lbs/yr	Medium	Current or Future Owner	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$63,000 design/permit; $315,000 install	5-10 Years
SPCR7	SCVFP Rt. 68 to	5,206 lf	Resident: Galvin's Property (Private)	Reach meanders naturally through mixture of residential and agricultural areas and exhibits low streambank erosion with poor riparian buffer condition dominated by woody invasives. Galvin's Lake is online with Spring Creek in this reach.	Implement project to improve buffer w/in 100 feet of stream by removing invasive woody species followed by reintroducing native vegetation.	TSS=0.5 tons/yr TN= 9 lbs/yr TP=1 lbs/yr	Low	Current of Future Owner	Ecological Consultant	$82,500 woody species removal; $33,000 native seeding	10+ Years
SPCR11	End Equestrian Area to Rock Ridge Rd.	4,182 lf	Residents (Private)	Reach meanders naturally through large lot residential area and exhibits low streambank erosion and poor riparian buffer condition. Debris jams are common in this reach. Note: partially located in Algonquin Township.	Implement project to improve buffer w/in 100 feet of stream by removing invasive woody and herbaceous species followed by reintroducing native vegetation. Remove debris jams from channel.	TSS=2.2 tons/yr TN=24 lbs/yr TP=3 lbs/yr	Low	Residents	Ecological Consultant	$95,000 invasive woody & herbaceous species removal; $38,000 native seeding; $10,000 debris removal	10+ Years; Debris Removal Ongoing
SPCR12	Rock Ridge Rd. to Algonquin Rd.	6,941 lf	Residents (Private)	Reach meanders naturally through large lot residential area and exhibits low streambank erosion and poor riparian buffer condition. Debris jams are common in this reach. Note: partially located in Algonquin Township.	Implement project to improve buffer w/in 100 feet of stream by removing invasive woody and herbaceous species followed by reintroducing native vegetation. Remove debris jams from channel.	TSS=3.6 tons/yr TN=39 lbs/yr TP=6 lbs/yr	Low	Residents	Ecological Consultant	$159,000 invasive woody & herbaceous species removal; $63,500 native seeding; $15,000 debris removal	10+ Years; Debris Removal Ongoing

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
TRC1	CN Railway to Old Sutton Rd.	3,162 lf	Residents (Private)	Reach is located in large lot residential area. Upstream 2/3 is wooded with invasives, downstream 1/3 has turf lawn buffer. Moderate streambank erosion is present.	Implement project to improve 50-foot wide wooded area buffer by removing invasives and establishing native vegetation. Improve turf grass areas by extending 50-foot wide native prairie buffer. Install up to 3 artificial riffles.	TSS= 0.8 tons/yr TN=9 lbs/yr TP=1 lbs/yr	Medium	Residents	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$29,000 invasive woody species removal; $14,500 native vegetation seeding; $6,000 for 3 riffles	5-10 Years
TRC2	Old Sutton Rd. to Spring Creek	2,976 lf	Residents (Private)	Reach is located in residential area where riparian corridor is dominated by invasive woody species. Debris jams are also present. Note: downstream portion of site is in SCVFP.	Implement project to improve 100-foot wide riparian corridor by removing invasive woody species then establishing native vegetation. Remove woody debris jams.	TSS= 1.5 tons/yr TN=17 lbs/yr TP=2 lbs/yr	Low	Residents	Ecological Consultant	$55,000 invasive woody species removal; $27,000 native vegetation seeding; $10,000 debris removal	10+ Years
TRE1	W Hills & Dales Rd. to Brinker Rd.	3,029 lf	Residents (Private)	Reach is located in residential area dominated by invasive woody species along the stream corridor. Culvert at Hills & Dales Rd. backs up a significant amount of water.	Implement project to improve 50-foot wide riparian corridor by removing invasive woody species then establishing native vegetation. Maintain Hills & Dales Rd. Culvert.	TSS= 0.8 tons/yr TN=9 lbs/yr TP=1 lbs/yr	Low	Residents	Ecological Consultant	$28,000 invasive woody species removal; $14,000 native vegetation seeding	10+ Years; Culvert Maintenance Ongoing
TRE2	Brinker Rd. to Goose Lake	3,610 lf	Residents (Private)	Reach is located in residential area dominated by invasive woody species along the stream corridor. The stream in this reach is moderately channelized with moderate streambank erosion.	Design, permit, and implement project to improve channel condition, stabilize streambanks, and improve buffer by: 1) install artificial riffles, 2) restore streambanks using bioengineering techniques, and 3) install native prairie buffer.	TSS= 62 tons/yr TN=146 lbs/yr TP= 73 lbs/yr	Medium	Residents	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$75,000 design/permit; $550,000 install	5-10 Years
TRE3	Goose Lake to Old Sutton Rd.	1,739 lf	Residents (Private)	Reach is located in residential area and surrounded by wetlands dominated by invasive species.	Implement ongoing invasive species control along the stream corridor.	Not Applicable	Low	Residents	Ecological Consultant	$16,000/year maintenance	Ongoing
TRE4	Old Sutton Rd. to Spring Creek	2,486 lf	Residents (Private)	Reach is located in residential area for approximately 500 lf before entering wetland area within SCVFP. 500 lf section is dominated by invasive species along the corridor.	Implement project to improve 50-foot wide riparian corridor along first 500 lf by removing invasive woody species.	Not Applicable	Low	Residents	Ecological Consultant	$23,000 invasive woody species removal	10+ Years
TRF1	County Line Rd. to SE Deepwood Rd.	3,101 lf	Owner (Private)	Reach flows through wooded area heavily overgrown with invasive species.	Implement project to improve 50-foot wide riparian corridor along reach by removing invasive woody species.	Not Applicable	Low	Owner	Ecological Consultant	$28,500 invasive woody species removal	10+ Years
TRF2	SE Deepwood Rd. to Bateman Rd.	6, 930 lf	Residents (Private)	Reach flows primarily through large wetland complex dominated by invasive species. Large lot residential development borders the wetland complex. Note: reach eventually flows to Spring Lake Nature Preserve.	Implement maintenance plan to control invasive species throughout the riparian corridor and remove debris from the stream channel. FPDCC also recommends better management practices such as improved buffer, reduced fertilizer and herbicide use, and drain tile disablement.	Not Applicable	High	Residents	Ecological Consultant	$24,000/year maintenance	Ongoing
TRH1	Headwaters to Braeburn Rd.	2,420 lf	Residents (Private)	Moderately eroded and channelized reach flowing through residential area. Riparian buffer is mix of invasive shrubs and lawn grass.	Implement project to improve 50-foot wide riparian corridor in areas with lawn grass or invasive woody species. Install small-scale bank protection with natural rock where needed.	TSS= 0.6 tons/yr TN=7 lbs/yr TP= 1 lbs/yr	Medium	Residents	Ecological Consultant; USACE	$40,000 invasive woody species/turf removal converted to native vegetation; $10,000 small rock treatments	5-10 Years
TRH2	Braeburn Rd. to Bow Ln.	863 lf	Resident (Private)	Highly channelized reach with severely eroded streambanks in residential area. Riparian buffer is also dominated by invasive woody species and/or turf grass. Project site is considered a "Critical Area"	Design, permit, and implement project to improve channel condition, stabilize streambanks, and improve buffer by: 1) install artificial riffles, 2) restore streambanks using bioengineering techniques, and 3) install native prairie buffer.	TSS=124 tons/yr; TN=249lbs/yr; TP=124 lbs/yr	High (Critical Area)	Resident	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$20,000 design/permit; $175,000 install	1-5 Years
TRH3	Bow Ln. to Meadow Hill Rd.	2,042 lf	Residents (Private)	Reach with moderately eroded steambanks and poor riparian buffer condition in residential area.	Implement project to improve 50-foot wide riparian corridor by removing invasive woody species and areas with turf grass then establish native vegetation. Install up to 3 artificial riffles to act as grade controls to reduce erosion.	TSS= 0.5 tons/yr TN=6 lbs/yr TP=5 lbs/yr	Medium	Residents	Ecological Consultant; NRCS	$14,000 invasive woody species and turf removal; $9,500 native vegetation seeding; $9,000 to install 3 riffles	5-10 Years
TRH4	Meadow Hill Rd. to Equestrian Area	2,115 lf	Residents (Private)	Reach with overall poor riparian buffer condition in residential area. Buffer is mix of invasive woody species and mowed turf grass.	Implement project to improve 50-foot wide riparian corridor by removing invasive woody species and areas with turf grass then establish native vegetation.	TSS= 0.5 tons/yr TN=6 lbs/yr TP=5 lbs/yr	Low	Residents	Ecological Consultant	$14,000 invasive woody species and turf removal; $9,500 native vegetation seeding	10+ Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
TRI1	Headwaters near Church Rd. to Algonquin Rd.	2,688 lf	Residents (Private)	Reach with overall poor riparian buffer condition in residential area. Buffer is dominated by invasive woody species. Debris jams are also present.	Implement project to improve 50-foot wide riparian corridor along reach by removing invasive woody species. Remove debris dams as needed.	Not Applicable	Low	Residents	Ecological Consultant	$25,000 invasive woody species removal; $10,000 debris removal	10+ Years
TRI2	Algonquin Rd. to Spring Cr.	669 lf	Residents (Private)	Reach with overall poor riparian buffer condition in residential area. Buffer is mix of invasive woody species and mowed turf grass.	Implement project to improve 50-foot wide riparian corridor along reach by removing invasive woody species and replacing turf grass with native vegetation.	Not Applicable	Low	Residents	Ecological Consultant	$15,000 invasive woody species removal; $4,000 to convert lawn to native vegetation	10+ Years
TRJ1	Headwaters E of Foxmoor Rd. to Foxmoor Rd.	1,234 lf	Residents (Private)	Reach is located in residential area where invasive woody and herbaceous species dominate the buffer. Debris jams are also present.	Implement project to improve 50-foot wide riparian corridor by removing invasive woody & herbaceous species then establishing native vegetation. Remove debris jams as needed.	TSS= 0.3 tons/yr TN=3 lbs/yr TP=1 lbs/yr	Low	Residents	Ecological Consultant	$15,000 invasive woody & herbaceous species removal; $6,000 native vegetation seeding; $5,000 debris removal	10+ Years; Debris Removal Ongoing

BARRINGTON TOWNSHIP

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
DETENTION BASIN RETROFITS & MAINTENANCE (See Figure 47) Detention basin retrofit and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance is moderate. Private landowners will require the greatest assistance.											
24	Residential Subdivision N of Liberty Dr.	1 acre	HOA (Private)	Wet bottom detention basin with rip-rap shoreline and mowed turf grass buffer. Water is turbid and algae present.	Design and implement project to convert tuft grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Homeowners Association	Ecological Consultant	$10,000 to install prairie buffer & plants; $500/year maintenance	10+ Years
POND, LAKE, AND WETLAND RETROFITS/MAINTENANCE (See Figure 48) Pond, lake, and wetland retrofits and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement pond, lake, and wetland retrofits is relatively low; financial assistance is moderate. Private landowners will require the greatest assistance.											
4	Residential Lot N of Rt. 72	0.25 acre	Resident (Private)	Duckweed covered pond with buffer of invasive reed canary grass and various invasive trees/shrubs.	Design and implement project to remove invasive species and replace with native wetland and prairie vegetation along buffer then maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$3,000 to install prairie buffer; $500/year maintenance	10+ Years
6	E of Old Sutton Rd.	3 acres	Owner (Private)	Wetland located between road and degraded oak woodland; Spring Creek borders wetland to north. Wetland is dominated by invasive species.	Install wider buffer between agricultural field and wetland; remove invasive woody species from woodland area.	TSS=70% TN=53% TP=61%	Low	Owner	Ecological Consultant; NRCS/SWCD	$10,000 to install buffer; $4,000 woody removal	10+ Years
7	NW corner Rt. 72 & Sutton Rd.	15 acres	Owner of Agricultural Field (Private)	Large wetland complex surrounded by agricultural field. Wetland is dominated by invasive species.	Implement invasive species control and improve buffer to agricultural areas.	TSS=73% TN=53% TP=61%	Low	Owner	Ecological Consultant; SWCD/NRCS	$7,000/year maintenance	Ongoing
12	Between Sutton & Old Sutton Rds.	0.5 acre	Owner (Private)	Pond at landscape operation with eroded banks and poor buffer quality.	Design and implement project to install native prairie buffer and fix erosion along toe of slope.	TSS=90% TN=90% TP=90%	Low	Owner	Ecological Consultant; USACE; NRCS/SWCD	$3,000 to install prairie buffer; $37,500 to stabilize erosion	10+ Years
21	N of Penny Rd.	0.75 acre	Resident (Private)	Small pond with natural buffer of invasive species.	Design and implement project to remove invasive species from buffer and replace with native wetland and prairie vegetation then maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Resident	Ecological Consultant	$4,000 to install prairie buffer; $500/year maintenance	10+ Years
WETLAND RESTORATION (See Figure 49) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
14	See Figure 49	52.5 acres	Owner (Private)	Large drained wetland at headwaters of Spring Creek in active agricultural field. Wetland restoration is potentially feasible. Note: location is considered a "Critical Area".	Restore wetland and create prairie buffer by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland and buffer; and 4) conduct short and long term maintenance and monitoring.	TSS= 22 tons/yr; TN= 275 lbs/yr; TP= 55 lbs/yr	High (Critical Area)	Future Owner	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$250,000 to design/permit/construct /maintain wetland	1-5 Years

CARPENTERSVILLE

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
OTHER MEASURES (See Figure 52) These projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.											
4	NE Sioux Ave.	0.7 acre	Habitat for Humanity	Stormwater from residential subdivision flows to degraded natural area behind homes; flooding occurs on Sioux during heavy rain events.	Design and implement project to create naturalized wetland detention storage area.	TSS= 14 tons/yr TN=72 lbs/yr TP=21 lbs/yr	High	Village	Ecological Consultant; USACE; NRCS	$15,000 design/permit; $40,000 install	1-5 Years

EAST DUNDEE

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
DETENTION BASIN RETROFITS & MAINTENANCE (See Figure 47) Detention basin retrofit and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance is moderate. Private landowners will require the greatest assistance.											
61, 62	Prairie Lake Rd. Industrial Park	5.25 acres	Industrial Park (Private)	Wet bottom detention basins with naturalized buffer dominated by invasive species.	Design and implement project to convert weedy buffer areas to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Industrial Park	Ecological Consultant	$50,000 to install prairie buffer & plants; $2,500/year maintenance	10+ Years

FOREST PRESERVE DISTRICT OF COOK COUNTY

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
POND, LAKE, AND WETLAND RETROFITS/MAINTENANCE (See Figure 48) Pond, lake, and wetland retrofits and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement pond, lake, and wetland retrofits is relatively low; financial assistance is moderate. Private landowners will require the greatest assistance.											
1	Poplar Cr. Forest Preserve; SE corner I90 & Bartlett Rd.	2 acres	FPDCC	Pond with mixture of native and invasive species around buffer. FPDCC indicates that IDOT may be widening the road here.	FPDCC recommends that SCW work with the tollway authority to redesign water control upon widening the road. Changes could include storm management to help protect wetland by implementing bioswales, raised outlets, etc. Also implement invasive species control.	Not Applicable	Low	FPDCC	FPDCC; Friends of Spring Cr.; Ecological Consultant	Cost for storm management not know; $1,500/year maintenance	Ongoing
5	SCVFP N of Rt. 72	15 acres	FPDCC	Beverly Lake: lake with natural wooded buffer but dominated by invasive species.	Implement woody invasive species control around lake buffer.	Not Applicable	Low	FPDCC	FPDCC; Friends of Spring Cr.; Ecological Consultant	$50,000 to remove woody invasives	Ongoing
20	SCVFP S of Penny Road	9 acres	FPDCC	Penny Road Pond: lake with natural buffer dominated by invasive species.	Implement invasive species control and replacement with native vegetation.	TSS=73% TN=40% TP=45%	Low	FPDCC	FPDCC; Friends of Spring Cr.; Ecological Consultant	$25,000 to removed invasives & establish native species	10+ Years
47, 48	Mud Lake & Spring Lake: SCVFP S of Lake Cook Rd.	60 acres	FPDCC	Spring Lake & Mud Lake: large natural lakes with natural buffer but with dominance of invasive woody species. Lakes are located in Spring Lake Nature Preserve.	The FPDCC recommends first removing invasive woody species from the surrounding areas that impact hydrology then supplementing with native vegetation if necessary. Specifically target buckthorn that is dewatering hydric soils and disablement of existing drain tiles.	Not Applicable	High (Critical Area)	FPDCC	FPDCC; INPC; Friends of Spring Cr.; Ecological Consultant	$250,000 to remove invasives & supplement native species	1-5 Years
WETLAND RESTORATION (See Figure 49) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
7, 8	SCVFP (See Figure 49)	9.7, 10 acres	FPDCC (Public)	Drained wetlands located within SCVFP at headwaters of Trib. B. These areas are currently being addressed by USACE feasibility study.	Restore wetlands by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Medium	FPDCC	Ecological Consultant; USACE; NRCS/ SWCD; Friends of Spring Creek	$100,000 to design/permit/construct /maintain wetlands	1-5 Years
9, 13, 16, 29	SCVFP (See Figure 49)	15, 7.2, 11.4, 25.1 acres	FPDCC (Public)	Drained wetland complexes located within SCVFP in areas that were tile drained and farmed in the past. Wetland restoration is potentially feasible.	Restore wetlands by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	High	FPDCC	Ecological Consultant; USACE; NRCS/ SWCD;; Friends of Spring Creek	$300,000 to design/permit/construct /maintain wetlands	1-5 Years
15	SCVFP (See Figure 49)	44.8 acres	FPDCC (Public)	Large drained wetland within SCVFP at headwaters of Trib. B that receives runoff from IDOT, Sears, and Prairie Stone areas. Wetland restoration is potentially feasible. FPDCC considers this site as medium priority.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=19 tons/yr; TN= 235 lbs/yr; TP= 47 lbs/yr	Medium	FPDCC	Ecological Consultant; USACE; NRCS/ SWCD; Friends of Spring Creek	$225,000 to design/permit/construct /maintain wetland	5-10+ Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
28	SCVFP (See Figure 49)	334.6 acres	FPDCC (Public)	Large drained wetland within SCVFP surrounding channelized drainage ditch (Trib. D). Area was heavily farmed and tiled drained in past. Wetland restoration is potentially feasible. Note: location is considered a "Critical Area".	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) fill Trib. D and construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS= 142 tons/yr; TN= 1,375 lbs/yr; TP= 289 lbs/yr	High (Critical Area)	FPDCC	Ecological Consultant; USACE; NRCS/ SWCD; Tile Expert; Friends of Spring Creek	$850,000 to design/permit/construct /maintain wetland	1-5 Years
PRIORITY PROTECTION AREAS (See Figure 50) Acquiring and restoring or implementing future conservation and/or low density design development in Priority Protection Areas will enhance green infrastructure benefits.											
Technical and Financial Assistance Needs: Stream restorations complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.											
2	Between CN Railway and Rt. 72 (See Figure 50)	180 acres	Owner (private)	Site is currently agricultural and abuts SCVFP east of CN Railway. Northern portion of site is in Barrington Twp. The site contains Critical Areas: Wetland Restoration site #14 and stream reach SPCR3. Note: site is considered a "Critical Area".	Acquire and protect the parcels then restore native vegetation to the site as an extension of SCVFP.	TSS= 75 tons/yr TN=944 lbs/yr TP= 188 lbs/yr	High (Critical Area)	Current Owner; FPDCC	FPDCC; Ecological Consultant	Cost to acquire, protect, and restore parcels cannot be determined at this time	When/if land becomes available for purchase
3	Between Rt. 62 & 68 (See Figure 50)	492 acres	Resident (Private)	Site abuts SCVFP to the east, is mostly agricultural, and contains Galvin's Lake. Note: site is considered "Critical Area".	Acquire and protect the parcels then restore native vegetation to the site as an extension of SCVFP.	TSS=140 tons/yr TN=1,756 lbs/yr TP= 350 lbs/yr	High (Critical Area)	Current Owner; FPDCC;	FPDCC; Ecological Consultant	Cost to acquire, protect, and restore parcels cannot be determined at this time	When/if land becomes available for purchase
STREAM & RIPARIAN AREA RESTORATION/MAINTENANCE (See Figure 51) Stream restoration and maintenance projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving habitat.											
Technical and Financial Assistance Needs: Stream restorations complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.											
SPCR5	SCVFP CN Railway to Penny Rd.	6,698 lf	FPDCC (Public)	Reach is located in SCVFP in area with moderate invasive woody brush and other herbaceous invasives in the riparian zone. The stream is moderately channelized with low streambank erosion.	Design, permit, and implement project to improve channel condition and 100-foot buffer by: 1) install artificial riffles, 2) remove invasive woody species, and 3) enhance buffer with native vegetation.	TSS=0.2 tons/yr TN=2 lbs/yr TP=2 lbs/yr	Low	FPDCC	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$12,000 for 3 riffles; $120,000 woody species removal; $60,000 native seeding	10+ Years
SPCR6	SCVFP Penny Rd. to Rt. 68	6,917 lf	FPDCC (Public)	Reach is located in SCVFP in area with heavy invasive woody brush and other herbaceous invasives in the riparian zone. The stream is moderately channelized with low streambank erosion.	Design, permit, and implement project to improve channel condition and 100-foot buffer by: 1) install artificial riffles, 2) remove invasive woody species, and 3) enhance buffer with native vegetation.	TSS=0.2 tons/yr TN=3 lbs/yr TP=2 lbs/yr	Medium	FPDCC	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$12,000 for 3 riffles; $160,000 woody species removal; $63,500 native seeding	5-10 Years
SPCR8	SCVFP Rt. 62 to N of Springwood Ln.	4,458 lf	FPDCC (Public)	Reach is located in SCVFP in area with heavy invasive woody brush along riparian corridor west of Springwood Ln. The stream is moderately channelized with low streambank erosion.	Design, permit, and implement project to improve channel condition and 100-foot buffer by: 1) install artificial riffles, 2) remove invasive woody species, and 3) enhance buffer with native vegetation.	TSS=0.4 tons/yr TN=7 lbs/yr TP=2 lbs/yr	Medium	FPDCC	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$8,000 for 2 riffles; $105,000 woody species removal; $50,000 native seeding	5-10 Years
SPCR9	N of Springwood Ln. to County Line Rd.	14,622 lf	FPDCC (Public)	Reach is located in SCVFP in area with minimal invasive woody brush encroachment along the riparian corridor but dominated by invasive herbaceous species. The stream is naturally meandering with areas of moderate erosion via lateral cutting. Northern portion of reach is located in Spring Lake Nature Preserve.	Implement project to improve 100-foot buffer by removing invasive herbaceous species and enhancing with native vegetation. Also spot treat eroded undercuts as needed.	TSS=0.3 tons/yr TN=4 lbs/yr TP=3 lbs/yr	High	FPDCC	FPDCC; INPC; Friends of Spring Cr.; Ecological Consultant	$175,000 to remove invasives and seed with native species; $300,000 to spot treat erosion	1-10 Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
TRA4	SCVFP Sutton to Old Sutton Rds.	1,629 lf	FPDCC (Public)	Reach is located in SCVFP in area that was previously a tree farm. The stream in this reach is moderately channelized and the riparian area condition is poor. Minimal streambank erosion exists but numerous debris jams are present.	Implement project to improve buffer w/in 100 feet of stream by doing a drain tile investigation then removing invasive woody species followed by reintroducing native vegetation. Remove debris jams that cause flooding.	TSS=0.8tons/yr TN= 7 lbs/yr TP=1 lbs/yr	Low	FPDCC	FPDCC; Friends of Spring Cr.; Ecological Consultant	$37,500 invasive woody species removal; $15,000 native seeding;	5-10+ Years
TRA5	Old Sutton Rd. to Spring Creek	2,790 lf	FPDCC (Public)	Reach is located in SCVFP in relatively open area. Invasive trees and shrubs line the stream through this moderately channelized reach.	Implement project to improve buffer w/in 100 feet of stream by removing invasive woody species. Improve channel by installing up to 2 artificial riffles.	Not Applicable	Medium	FPDCC	FPDCC; Friends of Spring Cr.; Ecological Consultant	$51,000 invasive woody species removal; $8,000 for 2 artificial riffles	5-10 Years
TRB1	N of Wichman Rd. to Spring Creek	3,903 lf	FPDCC (Public)	Reach is located in SCVFP in relatively open area. Invasive trees and shrubs line the stream in some areas.	Implement project to improve buffer w/in 100 feet of stream by removing invasive woody species as needed.	Not Applicable	Low	FPDCC	FPDCC; Friends of Spring Cr.; Ecological Consultant	$36,000 invasive woody species removal	10+ Years
TRD1	S of Rt. 68 to Rt. 62	10,313 lf	FPDCC (Public)	Highly channelized reach located in SCVFP in area that was historically tile drained and farmed. This reach is a "Critical Area" that also lies within "Critical Area" wetland restoration site #28.	Disable adjacent draintile network and fill stream channel or pull back berm edges to restore historic wetland hydrology then plant with native vegetation.	TSS=151 tons/yr TN=278 lbs/yr TP=107 lbs/yr	High (Critical Area)	FPDCC	Ecological Consultant; USACE; IDNR; MWRD; NRCS; Tile Expert	See Wetland Restoration #28	1-5 Years
TRF3	Bateman Rd. to Mud Lake	2,792 lf	FPDCC (Public)	Reach is located in SCVFP west of Mud Lake in area bordered by extensive wetland complex. Reach is located in Spring Lake Nature Preserve.	Continue to implement maintenance program in the riparian corridor. FPDCC indicates that better management of TRF2 upstream would lead to more improvements TRF3	Not Applicable	Medium	FPDCC	FPDCC; Friends of Spring Cr.; Ecological Consultant	$25,500 invasive species control	5-10 Years
OTHER MEASURES (See Figure 52) These projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.											
3	Along Donlea E of Bateman	1,200 lf	FPDCC	Highly eroded gully/ravine that does not appear connected to any stream or waterbody.	Stabilize erosion in bottom of ravine using variety of hard armoring and bioengineering practices.	TSS=240 tons/yr TN=480 lbs/yr TP=240 lbs/yr	Low	FPDCC	Ecological Consultant; USACE; NRCS	$20,000 Design/Permit; $180,000 install	10+ Years
6	SCVFP 160-Headwaters (See Figure 52)	545 acres	FPDCC	Mosaic of degraded savanna/woodland, pasture, prairie, and wetland complexes at the headwaters of Tributary B. Note: Friends of Spring Creek volunteers are conducting ongoing restoration work in this area.	Restore degraded savanna-prairie ecosystem to increase biodiversity and provide savanna and grassland bird habitat. Implement 1) invasive brush clearing, 2) herbicide applications, 3) mowing, 4) controlled burns, and 5) seeding with native species.	Not Applicable	High	Friends of Spring Creek & FPDCC	Ecological Consultant, CFC	$1,490,000 to restore prairie/savanna	Ongoing
7	SCVFP Galloping Hill (See Figure 52)	110 acres	FPDCC	Degraded prairie ecosystem with remnant fen communities. Note: Friends of Spring Creek volunteers are conducting ongoing restoration work in this area.	Restore degraded prairie ecosystem to increase biodiversity and provide grassland bird habitat. Implement 1) invasive brush clearing, 2) herbicide applications, 3) mowing, 4) controlled burns, and 5) seeding with native species.	Not Applicable	High	Friends of Spring Creek & FPDCC	Ecological Consultant, CFC	$220,000 to restore prairie	Ongoing
8	SCVFP (See Figure 52)	192 acres	FPDCC	Degraded remnant prairie/wetland complex. Note: Friends of Spring Creek volunteers are conducting ongoing restoration work in this area.	Restore degraded prairie/wetland complex to increase biodiversity and provide grassland bird habitat. Implement 1) herbicide applications, 2) mowing, 3) controlled burns, and 4) seeding with native species.	Not Applicable	Medium	Friends of Spring Creek & FPDCC	Ecological Consultant, CFC	$192,000 to restore prairie/wetland	Ongoing
9	SCVFP Steeplechase (See Figure 52)	28 acres	FPDCC	Degraded prairie/shrubland complex. Note: Friends of Spring Creek volunteers are conducting ongoing restoration work in this area.	Restore degraded prairie/wetland complex to increase biodiversity and provide grassland & shrubland bird habitat. Implement 1) selective brush clearing, 2) herbicide applications, 3) mowing, 4) controlled burns, and 5) seeding with native species.	Not Applicable	Medium	Friends of Spring Creek & FPDCC	Ecological Consultant, CFC	$84,000 to restore prairie/shrubland	Ongoing

FOREST PRESERVE DISTRICT OF KANE COUNTY

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
OTHER MEASURES (See Figure 52) These projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.											
1	Helm Woods Forest Preserve	500 lf	FPDKC (Public)	Eroded gully/wash originating from high quality flatwoods community. Gully has potential to downcut to the extent that it could dewater and degrade the flatwoods.	Install rock check dams/grade controls as needed to reduce erosion and maintain water levels in the flatwoods.	TSS= 40 tons/yr; TN=80 lbs/yr; TP=40 lbs/yr	High	FPDKC	FPDKC; Ecological Consultant	$20,000 for 5 rock check dams	1-5 Years
5	Helm Woods Forest Preserve	65 acres	FPDKC (Public)	Old field areas dominated by European grasses.	Restore short grass prairie to attract grassland birds.	TSS=0.5 tons/yr; TN=5 lbs/yr; TP=4 lbs/yr	Medium	FPDKC	FPDKC; Ecological Consultant	$130,000 to install short grass prairie vegetation	5-10 Years

FOX RIVER GROVE

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
POND, LAKE, AND WETLAND RETROFITS/MAINTENANCE (See Figure 48) Pond, lake, and wetland retrofits and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement pond, lake, and wetland retrofits is relatively low; financial assistance is moderate. Private landowners will require the greatest assistance.											
73, 74, 75, 76	Foxmore Park	9 acres	Fox River Grove (Public)	Chain of four ponds with mixture of mowed turf grass, woodland, and wetland buffers dominated by invasive species.	Design and implement project to convert turf grass and other invasive species dominated buffer areas to native vegetation, plant native emergent plants along shoreline, and maintain indefinitely.	TSS=77.5% TN=20% TP=44%	Medium	Fox River Grove	Ecological Consultant	$80,000 to install prairie buffer & install plants; $4,000/year maintenance	5-10 Years
STREAM & RIPARIAN AREA RESTORATION/MAINTENANCE (See Figure 51) Stream restoration and maintenance projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving habitat.											
Technical and Financial Assistance Needs: Stream restorations complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.											
SPCR14	Utility Corridor to Lincoln Ave.	1,282 lf	Fox River Grove WTP (Private)	Reach flows adjacent to Fox River Grove WTP. The reach is highly channelized through the first half then meanders to Lincoln Ave. Streambank erosion is moderate riparian buffer condition is poor. Note: Reach is considered a "Critical Area".	Design, permit, and implement project to improve condition of channelized reach, stabilize streambanks, and improve buffer by: 1) install artificial riffles, 2) restore streambanks using bioengineering techniques, and 3) install native prairie buffer.	TSS= 22 tons/yr; TN=22 lbs/yr; TP=22 lbs/yr	High (Critical Area)	Fox River Grove	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$38,000 design/permit; $190,000 install	1-5 Years
SPCR15	Lincoln Ave. to Fox River	1,295 lf	Residents	Reach is moderately channelized through through residential area and exhibits minimal streambank erosion with poor riparian buffer condition.	Implement project to improve buffer w/in 50 feet of stream by removing invasive woody and herbaceous species followed by reintroducing native vegetation.	TSS= 0.3 tons/yr TN=4 lbs/yr TP= 1 lbs/yr	Low	Residents	Ecological Consultant	$15,000 invasive woody & herbaceous species removal; $6,000 native seeding	10+ Years
TRJ2, TRJ3	Foxmoor Rd. to Algonquin Rd.	4,563 lf	Fox River Grove	Highly channelized reach of stream flowing through Foxmoor Park. Riparian buffer is dominated by invasive woody species. Upstream portion of reach flows through pipe to first pond. Riparian buffer in Stanger is mowed turf grass. Note: Area is considered a "Critical Area".	Design, permit, and implement project to improve channel condition and riparian buffer by: 1) daylight 400 lf section east of Foxmoor Rd., 2) install artificial riffles in channelized areas, 3) remove invasive woody species and/or turf grass along 50-100 foot wide buffer and connect south buffer to adjacent ponds, 4) reintroduce native vegetation in the buffer areas.	TSS= 78 tons/yr; TN=132 lbs/yr; TP=66 lbs/yr	High (Critical Area)	Fox River Grove	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$25,000 design/permit; $180,000 install	1-5 Years
TRJ4	Algonquin Rd. to Spring Creek	1,358 lf	Residents	Highly channelized reach through dense residential area with riparian buffers dominated primarily by turf grass and invasive woody species.	Design and implement project to remove turf grass and invasive woody species from 15-30-foot wide buffer and plant native vegetation.	TSS=0.2 tons/yr; TN=2 lbs/yr; TP=0 lbs/yr	Low	Residents	Ecological Consultant	$10,000 invasive woody species & turf grass removal; $10,000 native seeding	10+ Years

HOFFMAN ESTATES

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
DETENTION BASIN RETROFITS & MAINTENANCE (See Figure 47) Detention basin retrofit and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance is moderate. Private landowners will require the greatest assistance.											
2	Development SW of Rt. 72 & IL 59	0.1 acre	Commercial Develop. (Private)	Small wet bottom detention basin bordered by paver blocks in retail/commercial development.	Implement yearly maintenance.	Not Applicable	Low	Commercial Development	Landscape Company	Not applicable	Ongoing
3	Sutton Crossing Development	18 acres	Sutton Crossing (Private)	Wet bottom detention basin designed to collect stormwater runoff from future Sutton Crossing development. Basin buffer is mowed turf grass. Note: location is considered a "Critical Area."	Design and implement project to convert basin to wetland bottom by regrading then installing native prairie vegetation and emergent plants, then maintain indefinitely.	TSS= 76 tons/yr; TN= 1,386 lbs/yr; TP= 134 lbs/yr	High (Critical Area)	Sutton Crossing	Ecological Consultant	$185,000 to install prairie buffer & install plants; $4,500/year maintenance	1-5 Years
4	Sutton Crossing Development	3.5 acres	Sutton Crossing (Private)	Wet bottom detention basin designed to collect stormwater runoff from future development. Basin buffer is mowed turf grass.	Design and implement project to convert basin to wetland bottom by regrading then installing native prairie vegetation and emergent plants, then maintain indefinitely.	TSS=86% TN=55% TP=68.5%	High	Sutton Crossing	Ecological Consultant	$35,000 to install prairie buffer & plants; $2,000 year maintenance	1-5 Years
POND, LAKE, AND WETLAND RETROFITS/MAINTENANCE (See Figure 48) Pond, lake, and wetland retrofits and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement pond, lake, and wetland retrofits is relatively low; financial assistance is moderate. Private landowners will require the greatest assistance.											
2	Sutton Crossing Development	8 acres	Sutton Crossing (Private)	Wetland dominated by invasive common reed, reed canary grass, and cattail; buffer is corn field.	Design and implement project to install native prairie vegetation buffer, herbicide invasive species, install native wetland plants, and maintain indefinitely.	TSS=77.5% TN=20% TP=44%	Medium	Sutton Crossing	Ecological Consultant	$80,000 to install prairie buffer & plants; $2,000/year maintenance	5-10 Years
3	Beverly Quarry S of Rt. 72	300+ acres	Beverly Gravel & Plote (Private)	Gravel quarry that is currently being filled/regraded for future use. Note: Lake is part of "Critical Priority Protection Area #1.	Incorporate quarry lake into conservation design elements as part of future development.	Not Applicable	High	Future Owner	Hoffman Estates; Ecological Consultant; Illinois EPA; USACE; NRCS/SWCD	Not applicable	Initiated during future development design phase
WETLAND RESTORATION (See Figure 49) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
5	See Figure 49	8.1 acres	Owner (Private)	Drained wetland located primarily on private agricultural land. West end is located in SCVFP. Wetland restoration is potentially feasible.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Owners	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$55,000 to design/permit/construct /maintain wetland	10+ Years
6	See Figure 49	5.0 acres	Owners (Public & Private)	Drained wetland located in public park.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Owners	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$35,000 to design/permit/construct /maintain wetland	10+ Years

PRIORITY PROTECTION AREAS (See Figure 50)

Acquiring and restoring or implementing future conservation and/or low density design development in Priority Protection Areas will enhance green infrastructure benefits.

Technical and Financial Assistance Needs: Technical and financial assistance needed to acquire land for restoration or conservation/low density development is high because of land, design/permitting, and construction costs.

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
1	Beverly Quarry South of Rt. 72 (See Figure 50)	334 acres	Beverly Materials LLC (private)	Site is currently a gravel quarry. Future landuse plans from Hoffman Estates shows the area becoming mixed residential and retail development. Note: site is considered a "Critical Area".	Implement conservation and/or low density design into future development to reduce environmental impacts.	TSS= 12 tons/yr TN=292 lbs/yr TP= 30 lbs/yr	High (Critical Area)	Future Developer	Hoffman Estates, Ecological Consultant; USACE; MWRD	Cost to implement conservation and/or low density design cannot be determined at this time	Design & Implementation of Future Development

SOUTH BARRINGTON

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
DETENTION BASIN RETROFITS & MAINTENANCE (See Figure 47) Detention basin retrofit and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance is moderate. Private landowners will require the greatest assistance.											
1	Allstate Development	12 acres	Allstate (Private)	Large wet bottom detention basin that collects stormwater runoff from Allstate Complex; also located at headwaters of Spring Creek. Exhibits mowed turf grass buffer.	Design and implement project to convert tuft grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	High	Allstate	Ecological Consultant	$90,000 to install prairie buffer; $3,000/year maintenance	1-5 Years
5, 6, 7	Residential Subdivision along Pendwater Ln.	1 acre	HOA (Private)	Wet bottom detention basins with rip-rap shoreline and mowed turf grass buffer. Water is turbid.	Design and implement project to convert tuft grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Homeowners Association	Ecological Consultant	$10,000 to install prairie buffer & plants; $10,000/year maintenance	10+ Years
8	Arboretum Shopping Center	15 acres	Arboretum (Private)	Large naturalized wet bottom detention basin that collects stormwater runoff from Arboretum Shopping Center.	Implement short and long term maintenance to establish native vegetation.	Not Applicable	High	Arboretum	Ecological Consultant	$7,000 year maintenance	Ongoing
10, 11, 12	Arboretum Shopping Center	3 acres	Arboretum (Private)	Naturalized wet bottom detention basins located in newer development.	Implement short and long term maintenance to establish native vegetation.	Not Applicable	Medium	Arboretum	Ecological Consultant	$1,500/year maintenance	Ongoing
9, 16	Residential Subdivision W of Bartlett Rd.	10 acres	HOA (Private)	Wet bottom basins with rip-rap shoreline and mowed turf grass buffer. Water is turbid and with algae.	Design and implement project to convert tuft grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Homeowners Association	Ecological Consultant	$100,000 to install prairie buffer & plants; $5,000/year maintenance	10+ Years
18	N of Morgan Rd.	4 acres	HOA (Private)	Wet bottom detention basin in residential area at headwaters of Spring Creek. Basin side slopes are currently turf grass.	Design and implement project to convert tuft grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Homeowners Association	Ecological Consultant	$40,000 to install prairie buffer & plants; $2,000/year maintenance	5-10 Years
22	Woods of S. Barrington	3.75 acres	HOA (Private)	Existing wetland converted to wet bottom detention basin in recent residential development.	Implement invasive species control along basin buffer.	Not Applicable	Low	Homeowners Association	Ecological Consultant	$2,000/year maintenance	Ongoing
13, 14, 15, 17 19, 20, 21, 23, 25, 26, 27, 28, 29, 31, 32, 33, 37, 40, 42, 47	The Woods of S. Barrington Residential Subdivision	45 acres	HOA (Private)	Existing wet bottom detention basins naturalized with native vegetation located in newer residential development.	Implement short and long term maintenance to establish native vegetation.	Not Applicable	Medium	Homeowners Association	Ecological Consultant	$20,000/year maintenance	Ongoing
30	Barbara Rose Elementary School	4 acres	School (Public)	Dry bottom detention basin designed to collect stormwater runoff from school and parking lot. Note: basin is considered a "Critical Area."	Design and implement project to convert tuft grass to native prairie vegetation and maintain indefinitely.	TSS= 10 tons/yr; TN= 88 lbs/yr; TP= 13 lbs/yr	High (Critical Area)	School	Ecological Consultant; SCW	$25,000 to install prairie vegetation; $500/year maintenance	1-5 Years
34, 35	Spring Creek Residential Subdivision	3.75 acres	HOA (Private)	Wet bottom basins with rip-rap shoreline and manicured turf grass side slopes. Water is turbid. Located at headwaters of Tributary A.	Design and implement project to convert tuft grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Homeowners Association	Ecological Consultant	$58,000 to install prairie buffer; $1,875/year maintenance	5-10 Years
36	Lakeshore Estates Residential Subdivision	2 acres	HOA (Private)	Wet bottom detention basin with mixture of natural/weedy buffer, rip-rap, and turf grass buffer; located at headwaters of Tributary A.	Design and implement project to create buffer of native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Homeowners Association	Ecological Consultant	$15,000 to install prairie buffer & plants; $1,000/year maintenance	10+ Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
38	Lakeshore Estates Residential Subdivision	37 acres	HOA (Private)	Large wet bottom basin with rip-rap shoreline and mowed turf grass buffer located in residential subdivision at headwaters of Tributary A.	Design and implement project to convert tuft grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Homeowners Association	Ecological Consultant	$285,000 to install prairie buffer & plants; $10,000/year maintenance	5-10 Years
42, 43, 44 48, 52, 53, 54	Spring Creek Residential Subdivision	15 acres	HOA (Private)	Wet bottom basins with mowed turf grass buffer.	Design and implement project to convert turf grass buffer to native prairie vegetation, install native emergent plants at water line, and maintain indefinitely.	TSS=73% TN=40% TP=45%	Low	Homeowners Association	Ecological Consultant	$175,000/to install prairie buffer; $7,500/year maintenance	10+ Years
45	Spring Creek Residential Subdivision	10 acres	HOA (Private)	Existing wetland converted to wet bottom detention basin located in residential development.	Implement invasive species control along basin buffer.	Not Applicable	Low	Homeowners Association	Ecological Consultant	$2,500/year maintenance	Ongoing
46, 49, 50, 51	Residential Subdivision along Easting Mere and Windridge Rds.	25 acres	HOA (Private)	Wet bottom detention basin with rip-rap shoreline and mowed turf grass buffer..	Design and implement project to convert tuft grass buffer to native prairie vegetation.	TSS=73% TN=40% TP=45%	Low	Homeowners Association	Ecological Consultant	$65,000 to install prairie buffer; $6,000/year maintenance	10+ Years
POND, LAKE, AND WETLAND RETROFITS/MAINTENANCE (See Figure 48) Pond, lake, and wetland retrofits and maintenance recommendations primarily address improving water quality and wildlife habitat.											
Technical and Financial Assistance Needs: Technical assistance needed to implement pond, lake, and wetland retrofits is relatively low; financial assistance is moderate. Private landowners will require the greatest assistance.											
8, 9	The Woods of S. Barrington Residential Subdivision	1.25 acres	Owner (Private)	Wetlands overgrown with invasive herbaceous and woody species.	Implement invasive species control.	Not Applicable	Low	Owner	Ecological Consultant	$1,500/year maintenance	Ongoing
10	The Woods of S. Barrington Residential Subdivision	6.75 acres	Private Lot	Large pond dominated by invasive species along buffer.	Implement invasive species control along pond buffer.	Not Applicable	Low	Owner	Ecological Consultant	$2,000/year maintenance	Ongoing
11	The Woods of S. Barrington Residential Subdivision	2.5 acres	HOA (Private)	Preexisting wetland complex in newer development. Wetland exhibits many overgrown and dead willows and buffer dominated by invasive species.	Implement invasive species control and remove hazardous dead trees.	Not Applicable	Low	Homeowners Association	Ecological Consultant	$1,500/year maintenance; $10,000 dead tree removal	Ongoing
13, 14	W of Bartlett Rd.	22 aces	HOA (Private)	Large wetland complex dominated by invasive species along buffer.	Implement invasive species control along pond buffer.	Not Applicable	Medium	Owner	Ecological Consultant	$6,000/year maintenance	Ongoing
15, 16	SW corner Penny & Revere Dr.	3 acres	School (Public)	Wetland complexes dominated by invasive species.	Implement invasive species control.	Not Applicable	Low	School	CFC; SWCD/NRCS; Ecological Consultant	$1,000/year maintenance	Ongoing
17	NW corner Penny Rd. & Shoreside Dr.	0.5 acre	Resident/ HOA (Private)	Wetland dominated by invasive common reed, reed canary grass, and cattail; buffer is mowed turf grass.	Design and implement project to convert turf grass buffer to native prairie vegetation, herbicide invasive species, install native wetland plants, and maintain indefinitely.	Not Applicable	Low	Resident/ HOA	Ecological Consultant	$5,000 to install prairie buffer and plants; $2,250/year maintenance	10+ Years
23, 24	Woods of South Barrington Residential Subdivision	7 acres	HOA (Private)	Extensive pond/wetland complex bordering new residential development. Pond exhibits natural buffer but is dominated by invasive species.	Eradicate invasive species around pond buffer and replant with native prairie vegetation; maintain indefinitely.	TSS=73% TN=40% TP=45%	Medium	Homeowners Association	Ecological Consultant	$30,000 to install prairie buffer; $1,750/year maintenance	10+ Years

ID#	Location	Units (size/ length)	Owner (public or private)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency	Priority	Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule
26	W of Brooke Ln.	6 acres	HOA (Private)	Wetland complex dominated by invasive species.	Implement invasive species control.	Not Applicable	Low	Homeowners Association	Ecological Consultant	$1,500/year maintenance	Ongoing
WETLAND RESTORATION (See Figure 49) Wetland restoration projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Wetland restoration projects are typically complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration.											
11, 17	See Figure 49	12 acres	Owner (Private)	Drained wetland located primarily on private tree farm/agricultural land. Wetland restoration is potentially feasible; limited feasibility to restore wetland.	Restore wetland by: 1) determine project feasibility, 2) design and permit project; 3) construct and plant wetland; and 4) conduct short and long term maintenance and monitoring.	TSS=77.5% TN=20% TP=44%	Low	Owner	Ecological Consultant; USACE; NRCS/SWCD; Illinois EPA; CFC	$60,000 to design/permit/construct /maintain wetland	10+ Years
STREAM & RIPARIAN AREA RESTORATION/MAINTENANCE (See Figure 51) Stream restoration and maintenance projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources. They improve water quality by stabilizing eroded banks, reduce flooding by reconnecting channelized streams to the historic floodplain, and improve natural resources by improving habitat.											
Technical and Financial Assistance Needs: Stream restorations complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration. The project becomes more complex in areas that flow through several governing bodies or multiple private residences. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.											
SPCR1	N of Bridges Rd.	648 lf	Owner (Private)	Reach is recently restored. Stream banks show little erosion and riparian area is in good condition.	Implement ongoing maintenance including yearly invasive species control and controlled burning every three years to sustain overall condition.	Not Applicable	Medium	Owner	Ecological Consultant	$1,500/year maintenance	Ongoing
SPCR2	Bridges Rd. to Rt. 59	3,595 lf	Owner (Private)	Reach is recently restored. Stream banks are stable but stream is moderately channelized.	Implement ongoing maintenance including yearly invasive species control and controlled burning every three years to sustain overall condition.	Not Applicable	Medium	Owner	Ecological Consultant	$4,000/year maintenance	Ongoing
TRA1	Bartlett Rd. to Penny Rd.	629 lf	HOA (Private)	Reach flows through new residential development and exhibits moderate streambank erosion. The riparian area is in good condition.	Design, permit, and implement project to improve channel condition and stabilize streambanks by: 1) install artificial riffles and 2) restore streambanks using bioengineering techniques.	TSS=14 tons/yr; TN=14 lbs/yr; TP=14 lbs/yr	Medium	Homeowners Association	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$20,000 design/permit; $100,000 install	5-10 Years
TRA2	Penny Rd. to Mesa Rd.	1,419 lf	HOA (Private)	Reach flows along north side of new residential development. This reach is highly channelized with a riparian area in poor condition.	Design, permit, and implement project to improve channel condition, reconnect to adjacent wetlands, and improve buffer condition by: 1) install artificial riffles as grade controls, 2) restore streambanks using bioengineering techniques, and 3) install native prairie buffer.	TSS= 10 tons/yr; TN=23 lbs/yr; TP=14 lbs/yr	Medium	Homeowners Association	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$42,500 design/permit; $213,000 install	5-10 Years
TRA3	Mesa Rd. to Sutton Rd.	2,222 lf	HOA (Private)	Reach flows along west side of new residential development. This reach is highly channelized with a riparian area in poor condition.	Design, permit, and implement project to improve channel condition, reconnect to adjacent wetlands, and improve buffer condition by: 1) install artificial riffles as grade controls, 2) restore streambanks using bioengineering techniques, and 3) install native prairie buffer.	TSS=16 tons/yr; TN=36 lbs/yr; TP=18 lbs/yr	Medium	Homeowners Association	Ecological Consultant; USACE; IDNR; MWRD; NRCS	$57,00 design/permit; $333,000 install	5-10 Years
OTHER MEASURES (See Figure 52) These projects are implemented primarily to improve water quality but also have excellent secondary benefits for reducing flooding and improving natural resources.											
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.											
2	Park in Woods of S. Barrington Development	300 lf	HOA (Private)	Mowed turf grass swale draining recently constructed park area to Tributary A.	Vegetate swale and buffer with native vegetation.	TSS= 1.9 tons/yr TN=6 lbs/yr TP=2 lbs/yr	Low	Homeowners Association	Ecological Consultant	$3,000 to stabilize with native vegetation	10+ Years

6.0 INFORMATION & EDUCATION PLAN

Spring Creek is one of the higher quality streams in northeast Illinois. Water quality and biological data suggest there is only minor overall impairment due to current land use practices. However, future land use changes, development pressure, nutrients (fertilizers), sediment, de-icing salt, invasive species, and poor land management practices are among the primary threats to watershed health now and in the future. The primary purpose of this plan is to spark interest and give stakeholders a better understanding of the watershed to promote and initiate plan recommendations with the overall intent focusing on protecting high quality conditions and restoration of identified impairments in the watershed.

The cumulative actions of individuals and communities watershed-wide can accomplish the goals. In a region dependent upon groundwater for their water needs, watershed health is of primary importance. When people begin to understand the issues related to water quality and natural resource protection/enhancement they begin to change their behaviors and activities thereby improving the overall health of the watershed.

A successful Information & Education (I&E) plan first raises awareness amongst stakeholders of watershed issues and problems. This is followed by education and actions that stakeholders can take to address the issues and problems. I&E plans include the following components (UEPA 2008):

- Define I&E goals and objectives.
- Identify and analyze the target audiences.
- Create the messages for each audience.
- Package the message to various audiences.
- Distribute the message.
- Evaluate the I&E program.

Recommended Information & Education Programs

Development of an effective I&E plan begins by defining I&E goals and objectives. The Spring Creek Watershed partnership (SCW) specifically addressed watershed information and education issues by developing an education goal with *primary* objectives. Many other *secondary* objectives that are not included under the education goal are also addressed in this Section.

Goal F: Foster appreciation and stewardship of the watershed through education.

Primary Objectives:

1) Educate the public on water supply, infiltration, potential contamination, groundwater recharge and nonpoint source pollution issues and the link between how property owners manage the land.
2) Provide watershed stakeholders with an education plan that promotes the knowledge, skills, and motivation needed to take action on implementing the watershed plan.
3) Educate the public on the benefits of native plants, a balanced ecosystem, and natural area restoration.
4) Identify open space parcels adjacent to public facilities such as schools that would be appropriate for outdoor education.
5) Install environmental interpretation/education signage at access points throughout public open space.
6) Develop recommendations for education and alternatives to phosphorus use.
7) Develop recommendations for education and alternatives to road & other pavement salt use.
8) Educate homeowners how to best maintain septic systems.

The recommended target audience for each education action is based on the need to reach each goal or objective. The target audience is a group of people who are intended to be reached by a particular message. The target audience can include people of all demographics, locations, occupations, watershed roles, and ages. The general target audiences selected to meet watershed goals and objectives include riparian and other landowners, residents, local government (i.e. municipalities and townships), homeowners associations, developers, businesses, lake property owners, schools, and equestrian and farmland owners. Each audience has specific needs and requirements and can impact the watershed on different levels.

Creating and distributing a message for each audience is done through development of actions to address the I&E program needs related to the watershed goals and objectives. The I&E needs for Spring Creek watershed were revealed through stakeholder meetings, with residents, and municipal leaders. An I&E Plan Matrix (Table 40) was developed to help implement an I&E Plan for the watershed. Not only does the matrix include education actions, it also includes:

- Primary goals addressed by each action
- Target audience(s)
- Best package (vehicle) for delivery of the action message to the target audience
- Lead and supporting organizations
- Potential outcomes (measurable behavior change)
- Estimated cost to implement each education action
- Time Fram

As with any plan, the I&E plan should be regularly evaluated to provide feedback regarding the effectiveness of the outreach efforts. Evaluation conducted early on in the effort will help determine which programs are working and which are not. Based on this information, money and time can be saved by focusing on the programs that work and doing away with and/or refining those that do not. Section 8.0 of this report contains a "Report Card" with milestones related to watershed education that can be used to assess the I&E efforts.

Table 40. Information and Education Plan Matrix.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Change	Estimated Cost	Time Frame
Primary Objectives & Actions							
Educate the public on why water quality is important and how water supply, infiltration, potential contamination, groundwater recharge, and nonpoint source pollution issues are linked to public lifestyle and how property owners manage the land.	Goal A	General Public	SCW/FCWP and BACOG hold an annual groundwater recharge and quality "event" day that includes educational workshops and field trips around the watershed to educate the general public about groundwater and ways to change everyday activities to promote recharge and water quality.	SCW, FCWP, BACOG	"Event" day attendees understand the importance of groundwater recharge and quality and begin to change everyday activities. By doing this neighbors and others become aware and also change.	$3,000	Annually
Educate the public on the benefits of native plants, a balanced ecosystem, and natural area restoration.	Goal D	General Public	CFC offer workshops that help homeowners identify and choose the appropriate native plants and trees that can be used in landscaping and where to purchase them. Certify properties under Conservation@Home or the National Wildlife Federation-Backyard Wildlife Habitat Certification Programs.	CFC, SCW Consultants, IDNR; FPDCC; FPDKC; NRCS	Homeowners become more aware of the beauty of native plants and their environmental benefits. When visiting a nursery, homeowners are able to identify native plants or go to nurseries or plant sales that specialize in native plants.	$1,000	Annually
Provide schools with resource information applicable to creating outdoor curriculum on adjacent or nearby natural areas or other open space.	All Goals	Students	Educate students about watershed planning and the importance of implementing Management Measures to improve overall watershed conditions. Integrate watershed planning and education into existing elementary, middle and high school science curriculum.	SCW, CFC, IDNR; FPDCC; FPDKC; NRCS	All students that live in the Spring Creek or other surrounding watersheds will understand the environment in which they live and realize the importance of maintaining a healthy place for people and nature to live in harmony. What is learned will be passed on to parents and future generations.	$3,000	Every 3 Years
Install environmental interpretation/ education signage at access points throughout public open space.	All Goals	General Public	Create signage at key points in restoration sites throughout the forest preserve district to highlight projects, encourage additional work, and continue to recruit local champions. Watershed education signage to highlight key points in the watershed.	FPDCC; FPDKC; IDNR; Friends of Spring Creek; CFC	Visitors and riders in the Forest Preserves will learn about the work completed and the importance of watershed protection. Residents in the watershed will understand the watershed boundaries and that there is a plan to guide future practices.	$5,000	1-5 Years
Develop recommendations for education and alternatives to phosphorus use.	Goal A	Landowners & Municipalities	SCW, BACOG, and CFC distribute "Riparian Area Management Guide for Citizens" (developed by LCSMC) to key large lot owners near waterbodies and other sensitive areas. Also use media to communicate to a wider variety of landowners the negative impacts of using fertilizer and recommend environmentally friendly alternatives.	SCW, CFC, BACOG, IEPA, LCSMC, Municipalities	The majority of landowners and local governments begin to use environmentally friendly fertilizers thereby reducing phosphorus loading into stormsewers and downstream waterbodies.	$1,000	1-5 Years
Develop recommendations for education and alternatives to road & other pavement salt use.	Goal A	Municipalities Townships, Businesses, DOTs	SCW obtain available information related to road salts and the alternatives and meet with local governments to discuss the alternatives.	SCW, CFC, BACOG	Local governments cut down on the amount of salt used and begin trying alternatives that are more environmentally friendly.	$1,000	1-5 Years
Educate homeowners how to best maintain septic systems.	Goal A	Homeowners	SCW and local municipalities offer workshops and/or mail educational letters to homeowners known to have septic systems.	SCW, Municipalities, County, Consultant	Homeowners begin to understand the threats that septic systems have on water quality. Owners act quickly to mitigate and repair all identified problems.	$2,000	1-5 Years
Educate equestrian community about strategies to minimize pollutants.	Goal A	Equestrian Community	Offer workshops that educate the equestrian community about minimizing pollutants.	RCBH, Fox River Valley Pony Club, SCW; Friends of Spring Creek	Equestrians will understand the impacts of horses on the watershed and educate visitors and residents on practices that will have low impact on water quality and habitat to preserve the resources for the next generation of riders in this unique community.	$1,500	Every 5 Years
Educate owners of large open or partially open lots about the value of restoring natural communities to their land to improve the function of existing open space in the watershed.	All Goals	Private Owners; Businesses; Local governments	SCW co-host a workshop to educate large landowners about the potential positive impacts of restoring large areas of land and protecting it with conservation easements or other means. SCW and CFC initiate a pilot funding program for restoration and protection for large land owners.	SCW, FCWP, CFC, FPDCC, FPDKC, NRCS	Large lot landowners become aware of restoration strategies and the importance in creating beneficial wildlife habitat and large greenway corridors. This causes them to take action by restoring the land and using conservation easements or other means to protect it.	$1,000	Every 3 Years

Education Actions	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Change	Estimated Cost	Time Frame
Secondary Objectives & Actions							
Provide educational information on flood proofing to owners with structural flood problems.	Goal C	Property owners with flooding	Workshops for landowners, municipal engineers and municipal leaders to mitigate flood problems in flood prone areas. Peer-to-peer training seminars.	FEMA, Municipalities, Township	Planners will understand the impact of future developments on current flood prone areas, and work to mitigate current problems with solutions that are appropriate. Homeowners will understand and keep an eye on future planning to ensure problems are addressed appropriately.	$2,000	Every 5 Years
Conduct garden and restoration walks in areas currently planted with native species for stakeholders interested in using natives.	Goal D	General Public	Garden tours will focus on native plant communities within the watershed and conduct tours of restored areas for the general public and for stakeholders.	Owner; CFC; SCW, FCWP, garden clubs	The practice of implementing and improving natural areas will be encouraged and become a more viable solution to addressing landscaping on large lots, and in private formal gardens.	$3,500	Annually
Educate riparian property owners on ways to improve riparian and streambank conditions for water quality and wildlife habitat.	Goals A&D	Riparian Landowners	SCW, IDNR, and NRCS conduct workshops for riparian landowners that recommend bioengineering options, funding sources, and qualified contractors for stabilizing eroded streambanks.	SCW, IDNR NRCS, Consultant	Riparian landowners recognize benefits of bioengineering to reduce bank erosion and habitat improvement for wildlife and use these techniques in place of hardscaping or traditional landscaping and seek funding opportunities to complete projects.	$1,500	Every 3 Years
Educate land owners on agricultural practices to improve water quality.	Goal A	Farmland managers and owners	SCW helps to identify tools and opportunities to provide education to large farm owners on Management Measures with livestock and crops.	SCW, CFC, NRCS, RCBH, For River Valley Pony Club	Less run-off occurs from agricultural practices in the watershed.	$500	Every 3 Years
Educate stakeholders on the identification & maintenance of drain tiles.	Goals A&C	Large land owners	SCW helps to provide information and programs on the modification, maintenance and identification of drain tile issues.	SCW, NRCS	Less flooding and contamination or increased runoff from failed drain tiles.	$500	Every 5 Years
Educate residents and businesses about the benefits of constructing rain gardens to capture and filter stormwater in higher density population areas and in flood prone areas.	Goals A&C	Businesses, Homeowners, Municipalities	SCW co-host a workshop with FCWP to discuss construction and planting of rain gardens.	SCW, FCWP, CFC, Consultant	Residents and businesses learn of the water quality, flood reduction, and aesthetic benefits that rain gardens have and begin installing them. Municipalities begin requiring rain gardens and decentralized stormwater management in new subdivisions.	$1,500	Every 3 Years
Educate owners/developers of old and new developments on ways to reduce volumes and rates of stormwater runoff by protecting natural areas/open space and implementing BMPs that improve water quality.	All Goals	Owners, Developers, Municipalities	Municipal Engineers, USACE, and developer meet on case-by-case basis to develop strategies and incentives for limiting impervious surfaces and using existing natural areas and open space. Homeowners Associations and developers allocate funding toward natural area protection/open space preservation and maintenance.	SCW, Engineering departments, HOA, USACE	Owners and developers learn to utilize the natural drainage features of the land, preserve open space, and construct Management Measures that reduce runoff. Municipalities provide incentives to developers that reduce impervious surfaces and use other measures (exceeding minimum requirements) in new developments.	$2,000	Ongoing
Educate municipalities, businesses, and homeowner associations on how to maintain naturalized detention basins.	Goals A&D	Municipalities, Businesses, Homeowners Associations	SCW distribute flyer and offer workshop to owners of all detention basins identified in the watershed that stresses maintenance of existing natural basins and retrofits to improve poorly functioning or poorly designed basins.	SCW; CFC, Consultant	Municipalities, businesses, and homeowner associations realize potential benefits of naturalized detention basins to reduce flooding and improve water quality and implement ongoing maintenance activities and retrofits of poorly designed/functioning basins.	$3,000	1-5 Years
Educate school-aged children, adults, corporate, and political entities how to appreciate and provide stewardship in the watershed.	Goal F	Children, Adults, Corporate Entities, Political Entities	SCW, IDNR, CFC, conduct volunteer days related to stewardship activities that can be performed to improve the watershed. Activities could include stream or lakeshore clean-ups, development and installation of interpretive signage, and volunteer natural area maintenance.	SCW, IDNR, CFC	All people in the watershed become aware of how their daily activities affect the environment and make individual changes that cumulatively improve the environment.	$5,000	Annually
Establish a watershed information sharing website.	All Goals	All Watershed Stakeholders	SCW create and maintain a website to keep people informed about watershed issues and opportunities.	SCW	Website users have information related to the watershed including potential and ongoing projects, watershed problems, funding opportunities, and a calendar of upcoming events.	$3,000	Ongoing

Education Actions	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Change	Estimated Cost	Time Frame
Educate decision makers within local governments, corporations, and other non-government agencies on how to provide a vision for protecting, restoring, and enhancing ecological systems and natural communities within their jurisdiction.	All Goals	Decision makers with local governments, Corporations, and Non-Government agencies	SCW meet with Village and Township trustees and large corporation and non-government agency heads to promote the Watershed Plan and inform them of watershed issues in their jurisdiction. SCW send brochures to other smaller agencies not included on primary contact list.	SCW	All decision makers are familiar with the Spring Creek Watershed-Based Plan, general condition of the watershed, and issues to be addressed within their jurisdiction. Local governments adopt the Watershed Plan.	$5,000	Ongoing
Include progress reports at local governments meetings as they relate to the Spring Creek Watershed-Based Plan goals and objectives.	All Goals	All Watershed Stakeholders	SCW representatives attend village and township meetings to report on progress of plan efforts toward reaching goals and objectives.	SCW; Villages; Townships	All interested stakeholders are kept up to speed regarding watershed planning and implementation efforts and how they are addressing Watershed-Based Plan goals and objectives.	$5,000	Ongoing
Inform the general public, that a Watershed-Based Plan has been developed for Spring Creek Watershed to gain interest in implementing recommended actions.	All Goals	General Public	Use as many forms of media such as radio, television, newsletters, websites (SCW and Partners), and newspapers to inform the public about the Watershed-based Plan and ways that the public can obtain the plan and help implement projects.	SCW	The majority of the public in the watershed have excellent knowledge of the watershed conditions and who to contact to get involved and implement projects. The public also begins to alter every day activities that may lead to environmental degradation.	$1,000	Ongoing

Abbreviation	Stakeholder
BACOG	Barrington Area Council of Governments
CFC	Citizens for Conservation
SCW	Spring Creek Watershed partnership
FCWP	Flint Creek Watershed Partnership
FPDCC	Forest Preserve District of Cook County
HOA	Homeowners Association
IDNR	Illinois Department of Natural Resources
FPDCC	Forest Preserve District of Cook County
FPDKC	Forest Preserve District of Kane County
IEPA	Illinois Environmental Protection Agency
LCSMC	Lake County Stormwater Management Commission
NRCS	Natural Resource Conservation Service
SWCD	Soil and Water Conservation District
USACE	US Army Corp of Engineers
DOTs	Departments of Transportation
RCBH	Riding Club of Barrington Hills

7.0 PLAN IMPLEMENTATION

7.1 Plan Implementation Roles and Coordination/Responsibilities

Identification of responsible entities for implementation of Management Measure recommendations was first mentioned in the Action Plan section of this report. These entities are key stakeholders that will be responsible in some way for sharing the responsibility required to implement the watershed plan. However, no single stakeholder has the financial or technical resources to implement the plan alone. Rather, it will require working together and using the strengths of individual stakeholders to successfully implement this plan. Key stakeholders are listed in Table 41. Appendix E includes additional information about each stakeholder and possible roles.

There are several important first steps that Spring Creek Watershed partnership (SCW) will need to accomplish prior to plan implementation:

1) Meet with each applicable entity to encourage adoption of the Spring Creek Watershed-Based Plan.
2) Recruit "Champions" within each municipality and other stakeholder groups to assemble and form a Watershed Council (Plan Implementation Committee) that actively implements the Watershed-Based Plan and conducts progress evaluations.
3) Hire a Watershed Implementation Coordinator to follow through on plan implementation.

Table 41. Key Spring Creek Watershed Stakeholders/Partners.

Watershed Stakeholder/Partner	Acronym/Abbreviation
Audubon-Chicago Region	Audubon
Barrington Area Council of Governments	BACOG
Barrington Hills Conservation Trust	BHCT
Chicago Metropolitan Agency for Planning	CMAP
Citizens for Conservation	CFC
County	County
Ecological Consultants	Consultant
Forest Preserve District of Cook & Kane County	FPDCC & FPDKC
Fox River Ecosystem Partnership	FREP
Friends of Spring Creek Forest Preserves	Friends of Spring Creek
Illinois, Kane, Lake, McHenry, and Cook County Dept. of Transportation	DOTs
Illinois Environmental Protection Agency	Illinois EPA
Illinois Nature Preserves Commission	INPC
Metropolitan Water Reclamation District of Greater Chicago	MWRD
Municipalities	Municipality
Natural Resource Conservation Service (Kane, Lake, McHenry, and Cook County)	SWCD/NRCS
Residents or Owner	Residents/ Owner
Riding Club of Barrington Hills	RCBH
Spring Creek Watershed partnership	SCW
Townships	TWP
US Army Corps of Engineers	USACE
US Fish & Wildlife Service	USFWS

7.2 Implementation Schedule

The development of an implementation schedule is important in the watershed planning process because it provides a time frame for when each recommended Management Measure should be implemented in relation to others. Critical Area and High priority projects are generally scheduled for implementation in the short term. A schedule also helps organize project implementation evenly over a given time period, allowing time for developing funding sources and opportunities.

For this plan, each site specific Management Measure recommendation located in the Site Specific Action Plan contains a column with a recommended implementation schedule based on short term (1-5 years), medium term (5-10 years), and long term (10+ years) objectives that generally relate to the implementation priority (i.e. Critical Area/high priority = 1-5 years, medium priority = 5-10, low priority = 10+ years). Other recommendations that involve maintenance have ongoing schedules. However, some projects that are high priority could be recommended for long term implementation based on selected practices, available funds, technical assistance needs, and time frame.

7.3 Funding Sources

Opportunities to secure funds for watershed improvement projects are widespread due to the variety and diversity of Management Measure recommendations found in the Action Plan. Public and private organizations that administer various conservation and environmental programs are often eager to form partnerships and leverage funds for land preservation, restoration, and environmental education. In this way, funds invested by partners in the Spring Creek watershed can be doubled or tripled, although actual dollar amounts are difficult to measure. A list of potential funding programs and opportunities is included in Appendix F. The list was developed by Applied Ecological Services, Inc. (AES) through involvement in other watershed and biodiversity studies.

Funds generally fall into two relatively distinct categories. The first includes existing grant programs, funded by a public agency or by other sources. These funds are granted following an application process. The Division of Wildlife Resources Special Funds program is an example: an applicant will submit a grant application to the program, and, if the proposed project meets the required criteria and if the funds appropriated have not been exhausted, a grant will be awarded.

A challenge with developing funds from several state and federal grant programs is the lag time between application and award of the grant. A granting system where a "pot" of funding is applied for and allocated to the watershed over a 2+year period to implement projects recommended by the watershed plan should be developed for Spring Creek watershed. Projects are proposed, reviewed and recommended to Illinois EPA by Spring Creek Watershed partnership or Watershed Implementation Coordinator Creek several times a year. This process takes a matter of a few months rather than the typical year for projects submitted through the regular annual Section 319 grant program.

The second category, one that can provide greater leverage, might be called "money to be found." The key to this money is to recognize that any given project may have multiple benefits. A good example might include road improvement projects. The DOT's goal will be to widen or extend a road but this work may be recognized by a partner organization as an opportunity to provide other benefits such as water quality improvement, flood reduction, or habitat improvement at nearby

parcels. It is important to note and explore all of the potential project benefits from the perspective of potential partners and to then engage those partners. Partners may wish to become involved because they believe the project will achieve their objectives, even if they have little interest in the specific objectives of the Watershed Plan.

It is not uncommon for an exciting and innovative project to attract funds that can be allocated at the discretion of project partners. When representatives of interested organizations gather to talk about a proposed project, they are often willing to commit discretionary funds simply because the proposed project is attractive, is a priority for the agency, is a networking opportunity, or will help the agency achieve its mission. In this way, a new partnership is assembled.

Leveraging and Partnerships

It is critically important to recognize that no one program has been identified that will simply match the overall investment of the Spring Creek watershed partners in implementing the Watershed-based Plan. Rather, partnerships are most likely to be developed in the context of individual and specific land preservation, restoration, or education projects that are recommended in the Plan. Partners attracted to one acquisition may not have an interest in another located elsewhere for jurisdictional, programmatic, or fiscal reasons.

Almost any land or water conservation project ultimately requires the support of those who live nearby if it is to be successful over the long run. Local neighborhood associations, homeowner associations, and similar groups interested in protecting water resources, open space, preventing sprawl or protecting wildlife habitat and scenic vistas, make the best partners for specific projects. Those organizations ought to be contacted in the context of specific individual projects.

It is equally important to note that the development of partnerships that will leverage funding or goodwill can be, and typically is, a time-consuming process. In many cases, it takes more time and effort to develop partnerships that will leverage support for a project than it does to negotiate with the landowners for use or acquisition of the property. Each protection or restoration project will be different; each will raise different ecological, political and financial issues, and each will in all likelihood attract different partners. It is also likely that the process will not be fully replicable. That is, each jurisdiction or partner will have a different process and different requirements.

In short, a key task in leveraging additional funds is to assign responsibility to specific staff for developing relationships with individual agencies and organizations, recognizing that the funding opportunities might not be readily apparent. With some exceptions, it will not be adequate simply to write a proposal or submit an application; more often, funding will follow a concerted effort to seek out and engage specific partners for specific projects, fitting those projects to the interests of the agencies and organizations. Successful partnerships are almost always the result of one or two enthusiastic individuals or "champions" who believe that engagement in this process is in the interests of their agency. There is an old adage in private fundraising: people give to other people, not to causes. The same thing is true with partnerships using public funds.

Partnerships are also possible, and probably necessary, that will leverage assets other than money. By entering into partnerships with some agencies, organizations, or even neighborhood groups, a stakeholder will leverage valuable goodwill, and relationships that have the potential to lead to funds and other support, including political support, from secondary sources.

8.0 MEASURING PLAN PROGRESS & SUCCESS

It is essential to have a monitoring component as part of any watershed plan. This watershed plan includes two monitoring components. The first is a "Water Quality Monitoring Plan" that includes specific locations and methods where future sampling should occur and a set of "Criteria" that can be used to determine whether pollutant load reduction targets and other watershed improvement objectives are being achieved over time. The second component includes "Report Cards" for each plan goal. The Report Cards include interim, measurable milestones linked to criteria that are specific to each plan goal/objectives. The Water Quality Monitoring Plan and Report Cards are designed to be implemented and used by Spring Creek Watershed partnership (SCW), Watershed Council or other plan users in the future to measure plan progress, success, failures, and any need for adaptive management.

8.1 Water Quality Monitoring Plan & Evaluation Criteria

As noted in Section 3.14 there is a general lack of data collection within the watershed. The Illinois EPA/IDNR and Illinois Volunteer Lakes Monitoring Program (VLMP) are not actively monitoring any sites within the watershed. The best water chemistry data is being collected by Friends of the Fox River (FOFR) near Spring Creek's confluence with the Fox River. However, the water samples were not processed by a certified lab but rather less accurate surface water test kits. No know water chemistry data is available for any of the major lakes in the watershed. Significant biological data (fish, macroinvertebrates, mussels) has been collected by IDNR, INHS, MCCD, private consultants, RiverWatch and FOFR. However, most of this data is from the mid to late 1990's.

Background Information

Water quality monitoring is performed by collecting physical, chemical, biological and/or social indicator data related to water quality goals and objectives and should be implemented in Spring Creek watershed to; 1) assess the current condition of water quality within streams and lakes; 2) assess changes in water quality following implementation of Management Measures, and 3) assess the public's social behavior related to water quality issues. **It is critically important that all future monitoring be completed using the same protocol and methods used by the Illinois EPA for comparison and QAQC purposes.** Illinois EPA Quality Assurance Project Plans (QAPPs) and Standard Operating Procedures (SOPs) can be found at:http://www.epa.state.il.us/water/water-quality/methodology/index.html.

Most physical, chemical, and biological water quality criteria and indicators are measured during base flow and again after significant (≥ 1.0 inches) rain events. Monitoring water quality in lakes and streams usually includes monitoring for nutrients, bacteria, suspended solids, water clarity, and dissolved oxygen to name a few. Biological (fish, macroinvertebrates, and mussels) and habitat assessments can also be performed depending on the criteria being assessed. Certified labs should analyze chemical water quality samples, or if a sufficient amount of samples are going to be analyzed, portable handheld monitoring instruments can be purchased but generally produce less accurate results. Physical parameters such as habitat characteristics, temperature, oxygen concentration, specific conductance, and pH should be collected or analyzed in the field by trained individuals. In the future, water quality sampling related to individual Management Measures should also be monitored. Management Measure monitoring should include water samples of inflow into the structure and a second sample at the outflow. It is best to complete Management Measure

monitoring during or shortly after large rain events (≥ 1.0 inches) to provide data on how well the practice works. Biological and habitat quality monitoring should also be part of any habitat improvement project. Because funding for such monitoring is typically limited, money should be built into the initial Management Measure project budget.

It is also important to monitor stream discharge/flow (cubic feet per second (cfs)), when calculating and comparing pollutant loads. This is performed by measuring the stream width and average depth then multiplying to obtain cross-sectional area. A flow meter must then be used to find the average velocity (feet per second) of the water in the stream. An object can also be floated to determine velocity but is less accurate. The cross-sectional area of the stream is then multiplied by the stream velocity and stream substrate correction factor to obtain stream discharge/flow. Pollutant loading is then a function of pollutant concentration taken during a grab sample and discharge/flow.

Monitoring Plan Implementation

The following sections describe procedures by which physical, chemical, and biological monitoring criteria and indicators should be collected in the watershed, where they should be collected, by whom, and how often (Table 42; Figure 53). Table 42 and Figure 53 do not depict recommended sampling locations related to specific Management Measures as this monitoring will come later as projects are implemented.

Table 42. Recommended water quality and biological monitoring locations.

Site	Recommended or Existing Sampling Parties	Sampling Location (See Figure 53)	Sampling Frequency	Parameters Tested
Lakes	Illinois Volunteer Lakes Monitoring Program	Penny Road Pond, Galvins Lake, Spring Lake, Mud Lake, & Goose Lake	Every 5 Years	Physical; Chemical; Trophic State
Spring Creek	Citizens for Conservation; School Environmental Programs	Trib A confluence, Lake-Cook Rd., Rock Ridge Rd.	Every 5 Years	Physical and Chemical
Spring Creek	Illinois EPA and IDNR: Intensive Basin Survey	Lincoln St. near confluence with Fox River	Every 5 Years	Physical, Chemical, and Biological
Spring Creek	Friends of Fox River	Lincoln St. near confluence with Fox River	Yearly	Physical, Chemical, Biological
Spring Creek	Barrington Hills/GHA	Braeburn Rd. (SC North) Rt. 59 (SC South)	Yearly	Physical, Chemical
Macroinvertebrates	RiverWatch	Spring Creek at Penny Rd.	Yearly	Biological
Fish & Mussels	McHenry County Conservation District	Spring Creek at Rock Ridge Rd.	Every 5 Years	Biological
Fish & Mussels	Cook County Forest Preserve District	Between Rt. 62 and Spring Lake	Every 5 Years at 2 Locations	Biological
Management Measures	Environmental Consultants	Varies: Specific to each project	Pre and Post Implementation	Physical, Chemical, and Biological

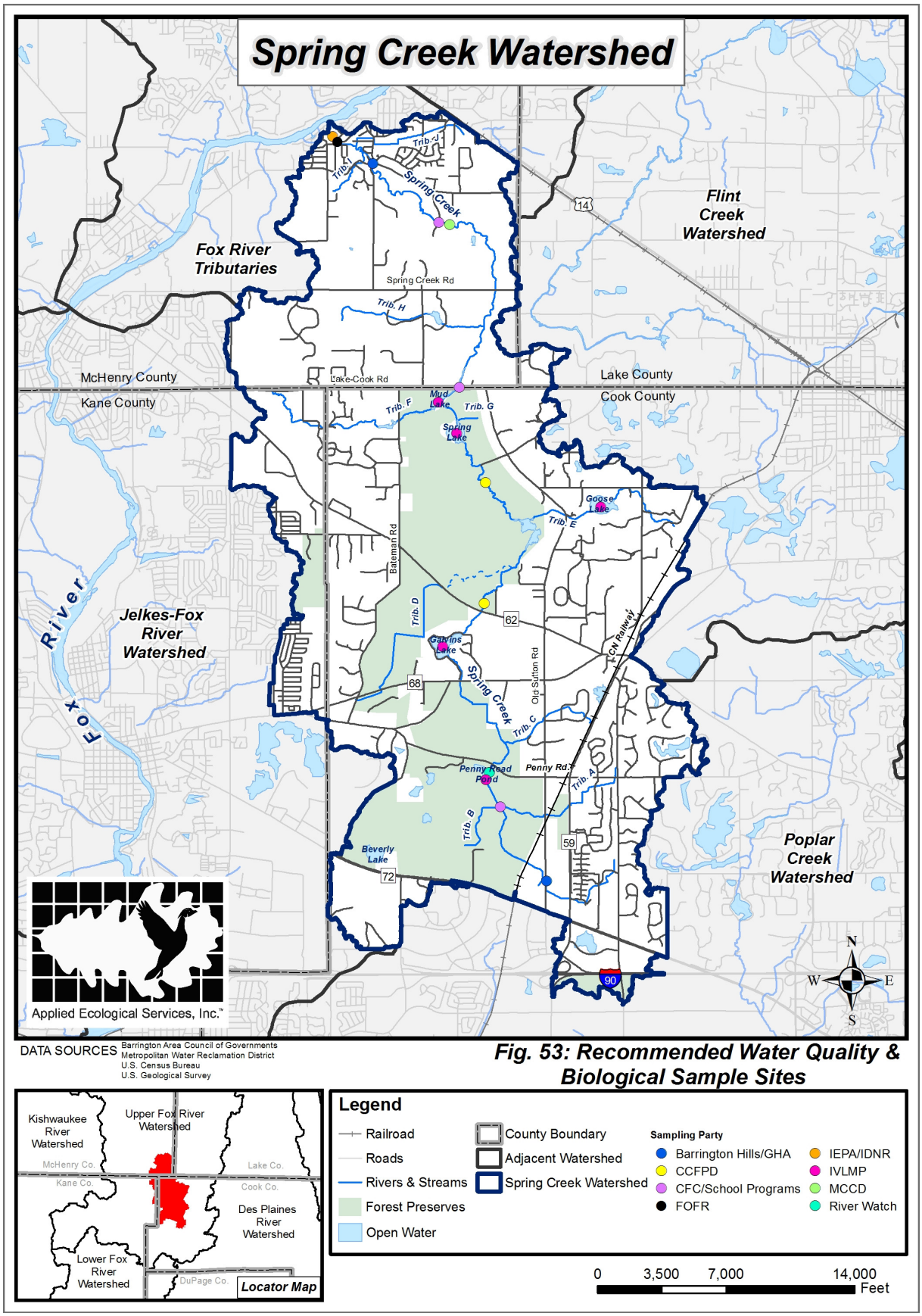

Fig. 53: Recommended Water Quality & Biological Sample Sites

Physical and Chemical Monitoring Methods & Recommendations

Physical and chemical monitoring of water can be time consuming and expensive depending on the complexity of the sampling program. Usually the budget and/or personnel available for monitoring limit the amount of data that can be collected. Therefore, the monitoring program should be developed to maximize the usable data given the available funding and personnel. Any monitoring program should be flexible and subject to change to collect additional information or use newer equipment or technology when available.

Streams

Many different parameters are included in physical monitoring of water quality in streams. They include but are not limited to temperature, pH, conductivity, dissolved oxygen, clarity, and habitat assessments. Temperature, pH, dissolved oxygen, turbidity, and conductivity measurements are usually collected at the same time that chemical water quality samples are taken but should be taken directly in the field using portable instruments. Continuous recorders (sondes) are also available. These units are typically placed in a stream or lake and left for a given period of time allowing for continuous reading of one or more parameters.

Many different chemical parameters can be tested for in streams but it is recommended that testing only be completed for parameters shown in Table 43. Unlike physical monitoring, chemical monitoring usually requires that samples be collected using specific methods and taken to certified labs for analysis. Chemical monitoring in streams should be done during base flow and then again following significant rain events (≥ 1.0 inches) to allow for pollution load comparison. This same technique can be used to determine pollutant removal efficiencies resulting from constructed water quality Management Measures. The data should also include flow and rainfall estimates at each location using a velocity meter and National Weather Service data.

It is crucial to collect representative water samples using careful handling procedures. Unrepresentative samples or samples contaminated during collection or handling are useless. The collected samples should be submitted for analysis to a laboratory certified by the National Environmental Laboratory Accreditation Conference (NELAC). Generally, the certified laboratory of choice will work closely with the client to assure that the samples are collected in the proper containers with preservatives for the parameter of interest. The laboratory often provides the containers, ice chests for transport, labels, and chain-of-custody forms to the client as part of their service.

Monitoring the overall water quality in streams throughout the watershed should occur at frequencies recommended in Table 42 and include samples from key locations shown on Figure 53. Sampling at these locations will yield pollutant loading results throughout the watershed and will help pinpoint pollutant loading hotspots thereby narrowing down and prioritize locations for future implementation of Management Measures. Most importantly, the Village of Barrington Hills should continue to sample Spring Creek at site "Spring Creek North" (Braeburn Rd.) as part of their NPDES Phase II requirements. This sample location provides a snapshot of water quality for the majority of Spring Creek watershed.

Table 43. Water quality parameters collection and handling procedures.

Parameter	Stream Aquatic Life Statistical Guideline*	Container	Volume	Preservative	Max. Hold Time
pH	>6.5 or <9.0	These parameters are measured in the field			
Conductivity					
Dissolved Oxygen	>5.0 mg/l				
Temperature	<32.2 C				
Turbidity	<20 NTU				
Total Suspended Solids	<116 mg/l	Plastic	32 oz	Cool 4 °C	7 days
Total Dissolved Solids	<1500 mg/l	Plastic	32 oz	Cool 4 °C	7 days
Biochemical Oxygen Demand	<5.0 mg/l	Plastic	32 oz	Cool 4 °C	48 hours
Total Kjeldahl Nitrogen [1]	<10 mg/l	Plastic	4 oz	Cool 4 °C 20% Sulfuric Acid	28 days
Nitrate-nitrogen [2]	<7.8 mg/l	Plastic	4 oz	Cool 4 °C 20% Sulfuric Acid	28 days
Total Phosphorus	<0.61 mg/l (<0.05 Lakes)	Plastic	4 oz	Cool 4 °C 20% Sulfuric Acid	28 days
Chloride	<500 mg/l	Plastic	32 oz	Cool 4 °C	28 days

*Statistical Guidelines obtained from IEPA Integrated Water Quality Reports & conversations with IEPA staff and other sources.
[1] TKN measures organic nitrogen and ammonia-nitrogen in the sample.
[2] Nitrate-nitrogen is measured on a filtered sample (adding TKN and nitrate-nitrogen gives the total nitrogen of the sample).

Lakes

Most water quality samples related to pollutant loading are taken in stream systems because the data provides estimates of pollutant loading following differently-sized rain events. In lakes however, the water is usually slow to cycle through the system and different techniques are needed to assess water quality. In addition to collecting parameters included in Table 43, biologists and limnologists often use "productivity" of a lake to assess its health. Productivity is measured via the Trophic State Index (TSI), an index that uses phosphorus concentrations as the primary means to assess lake health. The state of Illinois set the standard for Total Phosphorus (TP) at 0.05 mg/L. When phosphorus levels exceed 0.05 mg/L, lake-wide algal blooms can occur leading to decreased water clarity, decreased light penetration, and increased total suspended solids. The TSI is used to categorize lakes as oligotrophic (TSI <40), mesotrophic (TSI 40-49), eutrophic (TSI 50-69), and hypereutrophic (TSI >70). TSI values greater than 70 indicate that a lake is in poor health.

The work required to sample water chemistry and develop TSI values for the major lakes in the watershed should be conducted by the Illinois Volunteer Lake Monitoring Program (VLMP) as outlined in Table 42 and include samples from key locations shown on Figure 53.

Habitat

Stream habitat assessments comprise a major component of physical water quality monitoring. Many habitat assessment methods are available for assessing streams such as those developed by IDNR and Ohio EPA. The Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA is a

quick, accurate, and straightforward analysis with dependable and repeatable results. The QHEI is also used by the Illinois EPA to assess "Aquatic Life" use attainment in streams. The index can be used on any stream reach and used on stream restoration projects to document improvements. Prior to stream restoration, a QHEI evaluation should be completed by the project ecologist or engineer. A follow-up QHEI for comparison purpose should be conducted by the same ecologist/engineer or at least 2-4 years following project implementation after plant material and in-stream structures have had time to grow and perform. QHEI forms and a narrative explaining how to use the index can be located on the web at http://rock.geo.csuohio.edu/norp/qhei.htm.

The QHEI was found to correlate well with biological integrity of streams in the Midwest. It is composed of six criteria that are scored individually then summed to provide the total QHEI score. The best possible score is 100. QHEI scores from hundreds of stream segments indicate that habitat values greater than 60 generally support average quality warm-water fauna. Scores greater than 80 typify pristine habitat conditions that have the ability to support exceptional warm-water fauna (Ohio EPA 1999). Areas with habitat scores lower than 60 may support warm-water fauna but usually exhibit significant degradation. Table 44 summarizes QHEI score classifications. Stream restoration projects should strive to create conditions that produce QHEI scores of at least 60.

Table 44. QHEI score classes and characteristics.

QHEI	Class	Usual Characteristics
80-100	Excellent	Comparable to pristine conditions; exceptional assemblage of habitat types; sufficient riparian zone
60-79	Good	Impacts to riparian zone
30-59	Fair	Impacts to riparian zone; channelization; most in-stream habitat gone
0-29	Poor	All aspects of habitat in degraded state

Biological Monitoring Methods and Recommendations

The Illinois EPA uses biological data for determining "Aquatic Life" use attainment in streams and can also be useful for assessing the success of water quality and habitat improvement measures. Fish and macroinvertebrates are relatively easy to sample/identify and reflect specific and predictable responses to human induced changes to the landscape, stream habitat, and water quality. Two indices have been developed that measure water quality using fish (fish Index of Biotic Integrity (fIBI)) and macroinvertebrates (Macroinvertebrate Biotic Index (MBI)). These indices are best used prior to a stream restoration project to obtain baseline data and again following restoration to measure the success of the project. Or, they can be conducted to simply assess resource quality in a stream reach. The work required to sample and calculate biotic indexes should be conducted by the IDNR, FOFR, MCCD, Cook County Forest Preserve District, and/or private consultants as outlined in Table 42.

Fish Index of Biotic Integrity (fIBI)

The fIBI is designed to assess biological health directly through several attributes of fish communities in streams. IDNR biologists or qualified firms should be contracted to perform the fish collection and identification. Collection is usually done within a stream reach using electrofishing equipment such as backpack shockers or electric seines. After the fish have been collected and identified, the data is used to evaluate 12 metrics and a rating is assigned to each metric based on whether it deviates strongly from, somewhat from, or closely approximates the expected values found in a high quality stream. The sum of these ratings gives a total IBI score for the site.

The best possible IBI score is 60 The Illinois EPA has determined that a score less than 41 indicates a stream is not fully supporting aquatic life (Table 45). A manual for calculating IBI scores for streams in Illinois is available from IDNR.

Macroinvertebrate Biotic Index (MBI)
The MBI is designed to rate water quality using macroinvertebrate taxa tolerance to degree and extent of organic pollution in streams. The MBI is calculated by taking an average of tolerance ratings weighted by the number of individuals in the sample. The Illinois EPA has determined that a MBI score less than 5.9 indicates a stream is not fully supporting aquatic life (Table 45). A manual for collecting and calculating MBI scores for streams is available from the USEPA.

Table 45. Illinois EPA indicators of aquatic life impairment using MBI and fIBI scores.

Biological Indicator	**Score**		
MBI	> 8.9	5.9 < MBI < 8.9	≤ 5.9
fIBI	≤ 20	20 < IBI< 41	≥ 41
Impairment Status - Use Support - Resource Quality			
Impairment Status	Severe Impairment	Moderate Impairment	No Impairment
Designated Use Support	Not Supporting	Not Supporting	Fully Supporting
Resource Quality	Poor	Fair	Good

Source: Integrated Water Quality Report (2010).

Water Quality Evaluation Criteria
Water quality criteria (expressed as measurable interim targets) need to be developed so that water quality improvement objectives and pollutant load reductions can be evaluated over time. The criteria are designed to take data gathered from the Water Quality Monitoring Plan and other data and analyze the success of the plan in terms of protecting and improving water quality. These criteria also support an adaptive management approach by providing ways by which to reevaluate the implementation process if adequate progress is not being made toward achieving water quality goals. Environmental and social indicators of water quality are examined in detail below. Note: evaluation criteria are included for the water quality goal only; criteria and milestones for other plan goals are examined within the appropriate progress evaluation "Report Cards".

Watersheds are complex systems with varying degrees of interaction and interconnection between environmental (chemical, physical, biological indicators), and social characteristics. Criteria related to these attributes are a measure of health of the watershed. For example, phosphorus or nitrogen concentrations are chemical indicators; habitat characteristics in a stream or water temperature are physical indicators; and biological indicators include fish, macroinvertebrate, or mussel health and diversity. Physical habitat indicators are often highly interconnected with hydrologic and morphologic characteristics. Environmental criteria related to water quality are obtained by implementing the Water Quality Monitoring Plan.

Social criteria related to water quality issues are more difficult to guage but can and should be assessed to determine factors influencing social change and individual behaviors. Measuring social criteria will enable the Watershed Council to assess whether initiated programs and policies are indeed influencing people's behavior. Social indicators can be measured using demographics

information, values and beliefs of individuals in the watershed, number of cleanup miles along a stream, and other means.

The Spring Creek Watershed partnership (SCW) specifically developed a water quality goal and objectives for this plan (see Section 2.0). The water quality goal reads as follows:

Goal A: *Protect, enhance, and monitor surface water quality and groundwater resources to meet Illinois EPA water quality standards that fully support designated uses.*

Criteria (indicators and specific targets) are selected for each water quality objective to ascertain whether components of the water quality goal are being met (Table 46). Targets are based on Illinois EPA water quality criteria, data analysis, reference conditions, literature values, and/or expert examination of water quality conditions that primarily support Illinois EPA's "Aquatic Life" use support which is most applicable to Spring Creek watershed. Criteria are also designed to address potential or known sources of water quality impairment identified in Section 4.0. Future evaluation of the criteria will allow the watershed committee to guage plan implementation success or determine if there is a need for adaptive management.

Table 46. Set of criteria related to water quality objectives.

GOAL A: Protect, enhance, and monitor surface water quality and groundwater resources to meet Illinois EPA water quality standards that fully support designated uses.	
Water Quality Objective	**Criteria: Indicators and Targets**
1) Identify, implement, and monitor Management Measures that address "Critical" and other high priority pollutant loading areas.	• *# of Wetland Restorations:* Implement at least 2 "Critical Area" or high priority wetland restoration projects within 15 years. • *Linear Feet of Restored Stream & Riparian Area:* Implement at least 2 "Critical Area" or high priority stream channel & riparian area restoration projects within 15 years. • *# of Detention, Pond, Wetland, Lake Retrofits*: Implement at least 3 "Critical Area" or high priority detention, pond, wetland, or lake retrofits within 15 years. • *Chemical & Physical Water Quality Standards:* Water in streams meets "Aquatic Life" statistical guidelines within 15 years (Table 29). • *Biotic Indexes:* Biological communities achieve at least "Fair" resource quality within 15 years (Table 45) • *Social Indicator:* 75% of surveyed citizens are able to identify where water pollution originates, and are able to identify shallow aquifer water issues and the methods to protect them within 10 years.
2) Retrofit existing stormwater management systems and design new systems within developed areas to specifically reduce nutrient and sediment loading.	• *# of Detention, Pond, Wetland, Lake Retrofits*: Implement at least 3 "Critical Area" or high priority detention, pond, wetland, or lake retrofits within 15 years. • *New Stormwater Design:* 100% of all new systems properly designed and reviewed by Ecological Consultant. • *% of Developments Infiltrating Water:* 100% of all new development includes stormwater design that infiltrates water.
3) Use alternative to road salt.	• *Chloride (salt):* Less than 500 mg/l in stream or lake samples. • *% of Communities using Alternatives:* 50% of local communities use alternatives to road salt within 15 years.
4) Pursue phosphorus ban in the watershed.	• *Total Phosphorus:* No more than 0.61 mg/l in streams and 0.05 mg/l in lakes • *Trophic State Index:* ≥ 50 based on phosphorus concentrations (not eutrophic) • *% of Communities Implementing Ban:* 100% of local communities implement phosphorus ban within 10 years

5) Identify opportunities for drain tile modification to improve water quality.	• *% of Ag Land w/Temporarily Tile Plugs:* 50% of agricultural land with plugged tiles between fall harvest & spring planting within 15 years
6) Use "Best Equestrian Practices" to reduce nutrient runoff.	• *Social Indicator:* 75% of surveyed equestrian community implements "Best Equestrian Practices".
7) Identify and replace failing septic systems.	• *# Failing Septic Systems:* 100% of failing septic systems are identified and repaired or replaced within 10 years.
8) Illinois EPA/IDNR begin monitoring Spring Creek as part of Intensive River Basin Survey program, monitor major lakes via the Illinois Volunteer Lake Monitoring Program, and continue RiverWatch and Friends of Fox River programs.	• *Monitoring Program:* Illinois EPA/IDNR establish plan to monitor Spring Creek by 2014. • *Monitoring Program:* VLMP establish plan to monitor major lakes by 2014. • *Monitoring Program:* RiverWatch continue macroinvertebrate monitoring yearly. • *Monitoring Program:* FOFR continue monitoring program yearly.
9) Protect open space and monitor shallow aquifer water quality and supply in important recharge areas.	• *Open Space:* Use Green Infrastructure Plan in conjunction with identified "Priority Protection Areas" to implement recommendations as development occurs. • *Monitoring Program:* Establish shallow aquifer monitoring program within 10 years. • *Social Indicator:* 75% of surveyed citizens are able to identify shallow aquifer water issues and the methods to protect the resource from contamination.

Social Indicators of Water Quality

Quantifying social indicators of success in a watershed planning initiative is difficult. It is subjective to a large degree and complaints about poor conditions are often heard rather than compliments on improvements. The Great Lakes Regional Water Program (GLRWP), a leading organization that addresses water quality research, education, and outreach in Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin, defines social indicators as standards of comparison that describe the context, capacity, skills, knowledge, values, beliefs, and behaviors of individuals, households, organizations, and communities at various geographic scales. The GLRWP suggests that social indicators used in water quality management plans and outreach efforts are effective for several reasons including:

- Help watershed committee evaluate projects related to education and outreach;
- Help support improvement of water quality projects by identifying why certain groups install Management Measures while other groups do not;
- Measure changes that take place within grant and project timelines;
- Help watershed committee with information on policy, demographics, and other social factors that may impact water quality;
- Measure outcomes of water quality programs not currently examined.

Several potential social indicators could be evaluated by the Watershed Council using different strategies to assess changes in water quality. For example, surveys, public meetings, and establishment of interest groups can give an indication of the public feelings about the water quality in the watershed. It is important to involve the public in the water quality improvement process at an early stage through public meetings delineating the plans for improvement and how it is going to be monitored. Table 47 includes a list of potential social indicators and measures that can be used by the watershed committee to evaluate the social changes related to water quality issues.

Table 47. Social indicators and measures related understanding behavior toward water quality issues.

Social Indicator	Measure
1) Media Coverage	• # of radio or television broadcasts related to water quality protection • # of newspaper articles related to water quality protection • # of community newsletters related to water quality protection
2) Citizen Awareness	• # of informational flyers distributed per given time period • % of citizens who are able to identify where "Critical Pollutants" (phosphorus, nitrogen, sediment) is originating from • % change in volunteer participation to protect water quality • % change in attendance at water quality workshops • # of requests to create public use areas with interpretive signage • % of stakeholders who are aware of watershed management information
3) Watershed Management Activities	• # of stream miles cleaned up per year • # of volunteer water quality monitoring sites assessed each year • # of linear feet or miles of trails created or maintained each year • # of municipalities adopting watershed management plan • # of watershed groups implementing plan recommendations • # of farmers that properly implement nutrient management plans

Monitoring social indicators in the watershed should be the responsibility of the Spring Creek Watershed partnership (SCW). Mail or e-mail surveys are among the most popular method to gauge social behavior toward water quality. Demographic information on a county basis can be obtained from the U.S Census Bureau but will need to be modified based on the watershed boundary. This information is then followed by taking a randomized sample of individuals in the watershed from a phone directory or other means. Next, a survey should be developed that identifies citizens' perceptions of water quality problems and protection strategies. Citizens that respond to the survey should be given a chance to donate a small amount of money ($1) to a not for profit environmental group then sent thank you letters while those that did not respond should be sent a second survey. The results of the survey can be used to develop appropriate media, citizen awareness, and watershed management activities to improve social behavior.

8.2 Goal Milestones/Progress Evaluation "Report Cards"

Milestones are essential when determining if Management Measures are being implemented and how effective they are at achieving plan goals over given time periods. This allows for periodic plan updates and changes that can be made if milestones are not being met.

Watersheds are often complex systems with varying degrees of interaction and interconnection between physical, chemical, biological, hydrological, habitat, and social characteristics. Criteria that reflect these characteristics may be used as a measure of watershed health. Goals and objectives in the watershed plan determine which indicators should be monitored to assess the success of the watershed plan.

A successful watershed plan must involve stakeholder participation to get projects completed, and must include a feedback mechanism to measure progress toward meeting goals. Watershed "Report Cards" provide this information. Report Cards are intended to provide brief descriptions of current conditions, suggest performance criteria/indicators that should be evaluated and monitored, milestones to be met, and adaptive management if milestones are not being met. Report Cards were developed for each of the six plan goals and are located at the end of this section. The milestones are based on short term (1-5 years), medium term (5-10 years) and long term (10+ years) objectives. Grades for each milestone term should be calculated using the following scale: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Report Cards should be used to identify and track plan implementation to ensure that progress is being made towards achieving the plan goals and to make corrections as necessary. Lack of progress could be demonstrated in factors such as monitoring that shows no improvement in indicators, new environmental problems, lack of technical assistance, or lack of funds. In some cases, other uncontrollable factors such as weather, development, and flow impediments in streams might result in milestones not being met. In these cases the user of the Report Card should explain why other factors resulted in milestones not being met in the notes section of the Report Card.

Early on in the plan implementation process Spring Creek Watershed partnership should establish a Watershed Council and hire a Watershed Implementation Coordinator. The Council should meet at least twice a year and the Watershed Implementation Coordinator should update the Council on plan implementation progress by way of the Report Cards. If needed, adaptive management should be implemented accordingly by referencing the adaptive management recommendations on the each Report Card then developing a strategy to either change the milestone(s) or decide how to implement projects or actions to achieve the milestone(s).

Goal A Report Card

Protect, enhance, and monitor surface water quality and groundwater resources to meet Illinois EPA water quality standards that fully support designated uses.

Current Conditions:

- Spring Creek is not listed by Illinois EPA as impaired for any of its 5 Designated Uses. Available data indicates that water quality is generally fair with only moderate impairments.
- 1,900 acres are "moderate," 2,200 acres are "sensitive," and 8,800 acres are "highly sensitive" groundwater recharge areas. 75.5% of the watershed has excellent recharge capability.

Criteria to Meet Objectives:

See Criteria in Table 46

Milestones:	**Grade**
1-5 Yrs: 1) Determine feasibility and develop concept plans for at least two "Critical Area" or high priority wetland restoration projects. 2) Develop stream restoration concept plans for at least two "Critical Area" or high priority stream channel & riparian area projects. 3) Implement at least one "Critical Area" or high priority detention, pond, wetland, or lake retrofit project. 4) All natural stormwater designs in new development are reviewed by Ecological Consultant. 5) At least three local communities use alternatives to road salt. 6) Form subcommittee to decide whether to pursue a phosphorus ban in the watershed. 7) At least one farmer plugs tiles between fall harvest and spring planting. 8) Barrington Hills work with equestrian community to evaluate "Best Equestrian Practices". 9) All failing septic systems are identified. 10) Establish and implement a surface and groundwater quality monitoring program. 11) All "Priority Protection Area" recommendations are implemented as development occurs.	
5-10 Yrs: 1) Implement at least one "Critical Area" or high priority wetland restoration project. 2) Implement at least one "Critical Area" or high priority stream channel & riparian area project. 3) Implement at least one "Critical Area" or high priority detention, pond, wetland, or lake retrofit project. 4) All natural stormwater designs in new development are reviewed by Ecological Consultant. 5) Alternatives to road salt are used on all locally managed roads. 6) A phosphorus ban is implemented in the watershed if decided on by the subcommittee. 7) At least one additional farmer plugs tiles between fall harvest and spring planting. 8) 50% of failing septic systems are repaired or replaced. 9) All "Priority Protection Area" recommendations are implemented as development occurs.	
10+ Yrs: 1) Implement at least one "Critical Area" or high priority wetland restoration project. 2) Implement at least one "Critical Area" or high priority stream channel & riparian area project. 3) Implement at least one "Critical Area" or high priority detention, pond, wetland, or lake retrofit project. 4) All natural stormwater designs in new development are reviewed by Ecological Consultant. 5) At least 50% of farmers plug tiles between fall harvest and spring planting. 6) At least 50% of local communities use alternatives to road salt. 7) All "Priority Protection Area" recommendations are implemented as development occurs.	

Monitoring Needs/Efforts:

- Monitoring of physical, chemical, and biotic parameters will need to continue indefinitely to track changes in water quality.
- Periodically visit wetland, stream, detention basin, pond, wetland, and lake retrofit projects to assess success and failures.

Remedial Actions:

- Assess number of projects that have been implemented versus water quality changes to determine if projects are effectively removing pollutants or improving Biotic Index scores. If not, conduct assessment to find causes of pollution and address.
- If targeted chemical pollutants and physical parameters are not improved after 10+ years, implement only "Critical Area" projects that are specifically designed to remove pollutants and continue monitoring cycle.
- Determine if hydraulic impediments are blocking fish passage upstream or downstream if Biotic Index scores are low.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal B Report Card

Identify and protect important natural areas/open space and provide appropriate passive recreational benefits.

Current Condition:

- The historic landscape consisted of prairies, savannas, and wetlands prior to European settlement in the 1830's.
- Single family residential comprises 39% of the watershed followed by forest & grassland (31.1%) then agricultural (9.2%).
- An inventory found that 76% of the watershed is classified as open or partially open space.
- Several Ecologically Significant Areas remain including 12 ADID wetlands and 3 Forest Preserves totaling 4,000+ acres.

Criteria to Meet Objectives:

- Number of communities incorporating Green Infrastructure Plan into Comprehensive Plans and development review maps.
- Percent of permanently protected sites harboring high quality natural areas or T&E species.
- Number of unprotected buffer parcels (identified in the Green Infrastructure Plan) adjacent to existing Forest and Nature Preserves and sites with high quality natural areas and/or T&E species that are protected.
- Number of "Priority Protection Area" recommendations implemented as development occurs.
- Number of new developments on Green Infrastructure Plan parcels that use conservation or low density design standards.
- Number of passive recreation opportunities that are incorporated into the Green Infrastructure Plan.

Milestones:	**Grade**
1-5 Yrs: 1) All communities incorporate the Green Infrastructure Plan into Comp Plans and development reviews. 2) At least 50% of sites with high quality natural areas or T&E species are protected. 3) At least 1 unprotected buffer parcel adjacent to high quality natural areas/T&E species is protected and managed if any parcels become available for acquisition. 4) All "Priority Protection Area" recommendations are implemented as development occurs. 5) All new developments on Green Infrastructure parcels use conservation and/or low density design. 6) All new Green Infrastructure Plan implementation incorporates passive recreation.	
5-10 Yrs: 1) At least 75% % of sites with high quality natural areas or T&E species are protected. 2) At least 1 unprotected buffer parcel adjacent to high quality natural areas/T&E species is protected and managed if any parcels become available for acquisition. 3) All "Priority Protection Area" recommendations are implemented as development occurs. 4) All new developments on Green Infrastructure parcels use conservation and/or low density design. 5) All new Green Infrastructure Plan implementation incorporates passive recreation.	
10+ Yrs: 1) At least 90% of sites with high quality natural areas or T&E species are protected. 2) At least 1 unprotected buffer parcel adjacent to high quality natural areas/T&E species is protected and managed if any parcels become available for acquisition. 3) All "Priority Protection Area" recommendations are implemented as development occurs. 4) All new developments on Green Infrastructure parcels use conservation and/or low density design. 5) All new Green Infrastructure Plan implementation incorporates passive recreation.	

Monitoring Needs/Efforts:

- Track number of communities that incorporate Green Infrastructure Plan into Comp Plans and development reviews.
- Track number of protected sites that harbor high quality natural areas or T&E species.
- Track number of "Priority Protection Area" recommendations that are implemented as development occurs.
- Track percentage of new developments that implement conservation and/or low density design standards.
- Track percentage of Green Infrastructure Plan implementation that includes passive recreation.

Remedial Actions:

- Reassess county, township, or municipal budgets for green infrastructure protection efforts.
- Check permitting process to ensure Green Infrastructure and "Priority Protection Area" recommendations are considered.
- Check permitting process to ensure conservation and/or low density development and recreation is considered.
- Develop policies for development.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal C Report Card

Reduce existing structural flood damage and ameliorate potential flooding where flooding threatens structures and infrastructure.

Current Condition:

- Four potential and three documented Flood Problem Areas (FPAs) were identified in the Spring Creek watershed.
- Documented FPAs are found at three locations including road and basement flooding at Tributary E's crossing with Old Sutton Road, flooding over Chapel Road, and Flooding on Bartlett Road.

Criteria to Meet Objectives:

- Number of unprotected floodplain parcels identified in the Green Infrastructure Plan that are protected.
- Number of stream restoration projects that reconnect the stream channel to the adjacent floodplain.
- Number of structural Flood Problem Areas mitigated for.
- Percentage of new and redevelopments implementing natural stormwater storage/infiltration measures that are managed.

Milestones:	**Grade**
1-5 Yrs: 1) Identify at least 2 undeveloped parcels in 100 year floodplain for future protection or conservation easements. 2) Develop stream restoration concept plans for at least 2 "Critical Area" or high priority stream channel & riparian area project that includes reconnection to the floodplain. 3) Identify and develop concept plans to mitigate for at least 3 Flood Problem Areas. 4) All new and redevelopment incorporates natural stormwater storage and infiltration measures.	
5-10 Yrs: 1) Protect at least 1 undeveloped parcel in 100 year floodplain. 2) Implement at least one "Critical Area" or high priority stream channel & riparian area project. 3) Mitigate for at least 1 Flood Problem Area. 4) All new and redevelopment incorporates natural stormwater storage and infiltration measures.	
10+ Yrs: 1) Protect at least 1 undeveloped parcel in 100 year floodplain. 2) Implement at least one "Critical Area" or high priority stream channel & riparian area project. 3) Mitigate for at least 2 Flood Problem Areas. 4) All new and redevelopment incorporates natural stormwater storage and infiltration measures.	

Monitoring Needs/Efforts:

- Track number of unprotected floodplain parcels that are protected.
- Track number of stream restoration projects that include floodplain reconnection.
- Track number of mitigated Flood Problem Areas.
- Track number of new and redevelopments that use natural stormwater storage and infiltration measures.

Remedial Actions:

- Reassess county, township, or municipal budgets for green infrastructure protection efforts.
- Conduct follow-up visits to Flood Problem Area sites during flood events to determine if additional remedial work is needed.
- Conduct inventory of new and redevelopments to determine feasibility for potential retrofits.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal D Report Card

Improve aquatic and terrestrial habitat to encourage balanced ecosystems.

Current Condition:

- The historic landscape consisted of prairies, savannas, and wetlands prior to European settlement in the 1830's.
- Following European settlement, fires rarely occurred and large tracts of savanna were cleared, prairies were tilled for farmland or developed, wetlands were drained, and many streams were channelized.
- Most remaining remnants are degraded by invasive species or by poor land management by humans.
- Over 50% of stream length is moderately to high channelized; 13% of stream length is moderately to highly eroded; 97% of riparian corridor is in poor condition.

Criteria to Meet Objectives:

- Number of stream and riparian area restoration projects using natural design.
- Acres of terrestrial habitat that is restored and managed on both public and private land.
- Number of natural area management plans created and implemented.
- Percentage of new development that includes restoration of degraded natural areas then donation of natural areas to entity for long term management with dedicated funding.
- Number of wetland restorations.
- Number of municipal ordinances that allow use of native vegetation in projects.

Milestones:	**Grade**
1-5 Yrs: 1) Develop concept plans for at least 2 "Critical Area" or high priority stream channel/riparian area projects. 2) Restore at least 50 acres of habitat and implement long term management on public or private land. 3) Develop and implement management plans for at least 2 public or private natural areas. 4) All new development on Green Infrastructure Plan parcels and/or "Priority Protection Areas" include natural area restoration then donation and management of land. 5) Determine feasibility and develop concept plans for at least two "Critical Area" or high priority wetland restoration projects. 6) All local ordinances allow use of native plants in projects. 7) Continue practice of trash pick-up throughout communities to protect riparian corridors	
5-10 Yrs: 1) Implement at least one "Critical Area" or high priority stream channel & riparian area project. 2) Restore at least 50 acres of habitat and implement long term management on public or private land. 3) Develop and implement management plans for at least 3 public or private natural areas. 4) All new development on Green Infrastructure Plan parcels and/or "Priority Protection Areas" include natural area restoration then donation and management of land. 5) Design and implement at least one "Critical Area" or high priority wetland restoration project.	
10+ Yrs: 1) Implement at least one "Critical Area" or high priority stream channel & riparian area project. 2) Restore at least 200 acres of habitat and implement long term management on public or private land. 3) Implement at least one "Critical Area" or high priority stream channel & riparian area project. 4) Develop and implement management plans for at least 4 public or private natural areas. 5) Design and implement at least one "Critical Area" or high priority wetland restoration project.	

Monitoring Needs/Efforts:

- Track number of "Critical Area" or high priority stream channel, riparian, and wetland projects implemented each year.
- Track acres of degraded habitat that is restored each year.
- Track number of natural area management plans that are created and implemented each year.
- Track number of new developments that restore land, donate land, and provide long term funding for management.
- Track number of local municipalities that allow native plants in projects.

Remedial Actions:

- If terrestrial restoration acreage milestones cannot be achieved, reduce acreage to more feasible goal.
- Actively pursue private and public entities to create and implement natural area management plans.
- Meet with communities that do not allow native plants in projects and explain their benefits.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal E Report Card

Increase communication and coordination among municipal decision-makers and other stakeholders within the watershed.

Current Condition:

- Very few watershed stakeholders or "Champions" are currently pursuing grant funds to implement watershed improvement projects.
- A number of practices and projects will require multi-jurisdictional and public-private participation/cooperation.
- This plan recommends that SWC partnership establish a Watershed Council among multiple stakeholders to implement this plan and track progress.

Criteria to Meet Objectives:

- Number of municipalities in the watershed that adopt the Spring Creek Watershed-Based Plan.
- Number of municipalities and stakeholders that identify a "Champion" to participate in the Watershed Council.
- Number of municipalities that adopt municipal comprehensive plans, codes, and ordinances supportive of watershed plan goals and objectives.
- Number of workshops that teach municipal stakeholders how to use and implement the Watershed-Based Plan.

Milestones:	**Grade**
1-5 Yrs: 1) All municipalities in the watershed adopt the Spring Creek Watershed-Based Plan and implement plans, codes, and projects that support watershed plan goals and objectives. 2) A Watershed Council is established and Watershed Implementation Coordinator hired; meetings occur twice each year to discuss plan recommendations and track plan success. 3) "Champions" from each municipality and other stakeholder groups attend regular meetings of the Watershed Council and SCW partnership. 4) Implement 2 workshops related to plan implementation for municipal stakeholders.	
5-10 Yrs: 1) Watershed Council meets twice yearly to discuss plan recommendations and to track plan success. 2) "Champions" from each municipality and other select stakeholders groups attend regular meetings of the Watershed Council and SCW partnership. 3) Implement at least 1 workshop related to plan implementation for municipal stakeholders.	
*10 + Yrs:*1) Watershed council meets twice yearly to discuss plan recommendations and to track plan success. 2) Representatives from each municipality and other select stakeholder groups attend regular meetings of the Watershed Council and SCW partnership. 3) Implement at least 1 workshop related to plan implementation for municipal stakeholders.	

Monitoring Needs/Efforts:

- Track number of municipalities that adopt the Spring Creek Watershed-Based Plan.
- Track number of "Champions" identified, Watershed Council meetings, and what was discussed.
- Track number of workshops related to plan implementation for municipal stakeholders.

Remedial Actions:

- SCW partnership or Watershed Council conduct meetings with government officials to adopt the watershed plan if it is not adopted in years 1-5.
- Seek out potential "Champions" in the watershed if not already identified.
- Approach municipalities regarding plan implementation that do not attend workshops.
- Develop policies that support watershed plan goals and compliance issues.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

Goal F Report Card

Foster appreciation and stewardship of the watershed through education.

Current Condition:

- Spring Creek Watershed partnership (SWC) is currently the primary entity promoting the Watershed-Based Plan.
- Citizens for Conservation (CFC), Barrington Area Council of Governments (BACOG), and Friends of Spring Creek Forest Preserves promote appreciation and stewardship of the watershed through education and volunteer activities.
- Education will be ongoing and involve constant and continuous campaigns to reach as many target audiences as possible.

Criteria to Meet Objectives:

- Number of Information & Education programs that are implemented.
- Number of Friends of Spring Creek volunteers participating in natural area restoration.
- Number of environmental interpretation/education signage installed at access public access points.
- Number of garden and restoration walks in areas currently planted with native vegetation.
- Number of identified open space parcels adjacent to public facilities that would be appropriate for outdoor education.
- Attendance at watershed education programs such as seminars, workshops, etc.
- Number of publicized watershed improvement projects in news media, agency newsletters, website, etc.

Milestones:	**Grade**
1-5 Yrs: 1) Implement at least 5 programs recommended in the Information & Education Plan. 2) Local conservation groups recruit at least 2 new volunteers to assist with natural area restoration. 3) Install environmental interpretation/education signage at all public access points to natural areas. 4) Conduct at least 2 native garden and/or restoration walks. 5) Identify at least 1 open parcel adjacent to each school appropriate to teach outdoor education. 6) At least 20 people on average attend each education program. 7) Publicize all watershed improvement projects in news media, newsletters, website/internet, etc.	
5-10 Yrs: 1) Implement at least 5 programs recommended in the Information & Education Plan. 2) Local conservation groups recruit at least 3 new volunteers to assist with natural area restoration. 3) Install environmental interpretation/education signage at all new public access points. 4) Conduct at least 2 native garden and/or restoration walks. 5) At least 25 people on average attend each education program. 6) Publicize all watershed improvement projects in news media, newsletters, website/internet, etc.	
10+ Yrs: 1) Implement at least 5 programs recommended in the Information & Education Plan. 2) Local conservation groups recruit at least 3 new volunteers to assist with natural area restoration. 3) Install environmental interpretation/education signage at all new public access points. 4) Conduct at least 2 native garden and/or restoration walks. 5) At least 25 people on average attend each education event. 6) Publicize all watershed improvement projects in news media, newsletters, website/internet, etc.	

Monitoring Needs/Efforts:

- Track number of education programs implemented each year.
- Track number of new volunteers recruited each year.
- Track number of native garden and/or natural area restoration walks conducted each year.
- Track number and location of open parcels identified and used for environmental education.
- Track number of people attending education programs.
- Track publicized watershed improvement projects.

Remedial Actions:

- Hire Watershed Implementation Coordinator to organize education programs.
- Ask state, county, and government agencies such as IDNR, NRCS, and Forest Preserves to hold workshops.
- Actively pursue interested people if attendance at education programs is low.

Notes:

Grade Evaluation: 80%-100% met = A; 60%-79% met = B; 40%-59% met = C; and < 40% = failed.

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