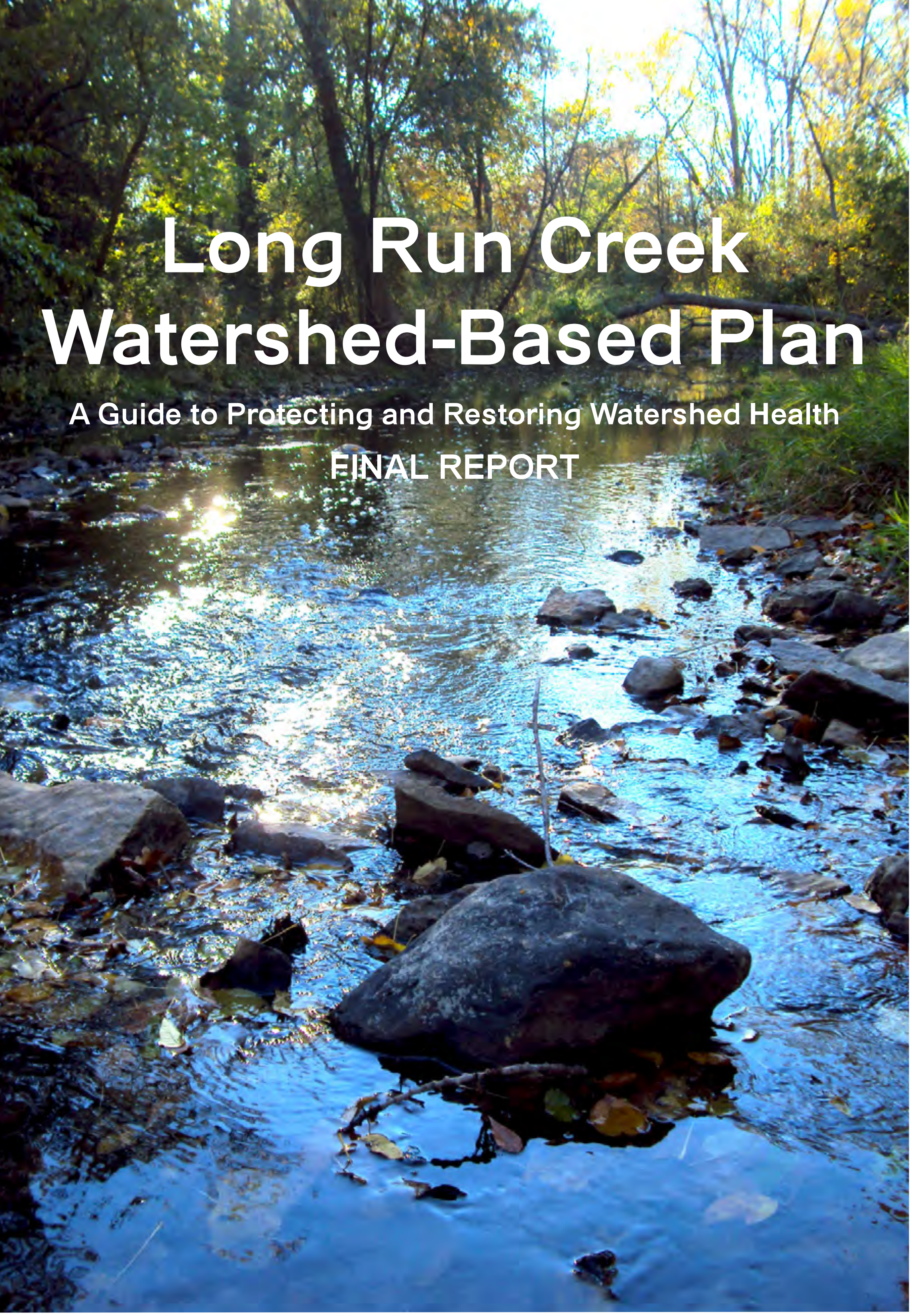
Long Run Creek Watershed-Based Plan

A Guide to Protecting and Restoring Watershed Health

FINAL REPORT



Prepared for
Long Run Creek Watershed Planning Committee
By Applied Ecological Services, Inc.
March 2014

Applied Ecological Services, Inc.™

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LONG RUN CREEK WATERSHED-BASED PLAN
Cook and Will Counties, Illinois

A Guide for Protecting and Restoring Watershed Health

FINAL REPORT

March 2014
(AES #10-0381)

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Long Run Creek Watershed Planning Committee

Long Run Creek Watershed Planning Committee
with the Village of Lemont as fiscal agent
Funding for this project provided, in part, by the Illinois Environmental Protection Agency through Section 319 of the Clean Water Act (#3191115).

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Acknowledgements

Funding for the Long Run Creek Watershed-Based Plan was provided, in part, by the Illinois Environmental Protection Agency (IEPA) through Section 319 of the Clean Water Act via Financial Assistance Agreement #3191115. The Village of Lemont is the recipient of the IEPA grant. Additional funding was provided by the watershed partners. Of particular mention is an $18,000 grant from Hanson Material Service (HMS) for completing an in-depth Information & Education Plan.

Scott Ristau acted as project manager for Illinois EPA's Bureau of Water while Marcia De Vivo (President: Lower Des Plaines Ecosystem Partnership) acted as Watershed Coordinator for Long Run Creek Watershed Planning Committee (LRCWPC) and worked closely with watershed partners and Applied Ecological Services, Inc. (AES) to produce the watershed planning document. James Brown (Lemont Planning & Economic Development Director) and Martha Glas (Lemont-Village Planner), representing the Village of Lemont, performed consultant contract administration, and finance management.

Long Run Creek Watershed Planning Committee (LRCWPC) consists of representatives from various municipal, governmental, private, and public organizations as well as local residents. Key partners include the Forest Preserve District of Will County (FPDWC), Forest Preserve District of Cook County (FPDCC), Christopher Burke Engineering, Illinois Department of Natural Resources (IDNR), Illinois Nature Preserves Commission (INPC), Lower Des Plaines Ecosystem Partnership (LDPEP), Will-South Cook Soil and Water Conservation District (SWCD), City of Lockport, Village of Homer Glen, Village of Lemont, Village of Orland Park, Village of Palos Park, Lemont Township, Homer Township Highway Department, Lemont Township Highway Department, Will County Planning and Zoning Commission, Will County Stormwater Management Planning Committee, Big Run Golf Course, Crystal Tree Golf & Country Club, Woodbine Golf Course, Old Oak Golf Course, Byzantine Church, Hanson Material Service, Enbridge and Cardno JFNew (representing ComEd). These partners played an important role in providing input on watershed goals & objectives, various planning approaches, and input on potential watershed projects.

Bluestem Communications (formerly Biodiversity Project) was hired as a subconsultant to produce a detailed watershed Information & Education Plan. Bluestem Communications also headed up a pilot project that included a campaign to educate residents about the benefits and consequences of living in a watershed.

Applied Ecological Services, Inc. (AES) conducted analysis, presented at LRCWPC meetings, summarized results, and authored the Long Run Creek Watershed-Based Plan.

People from the following entities attended and provided input at LRCWPC meetings:

Applied Ecological Services, Inc.: Steve Zimmerman
Big Run Golf Course: Terry Hogan
Bluestem Communications: Rebeca Bell, Meg Kelly
Byzantine Church: Father Thomas Loya
Cardno JFNew (representing ComEd): Marcy Knysz
City of Lockport: Jack Linehan
Christopher Burke Engineering: Travis Parry
Crystal Tree Golf & Country Club: Les Rutan
Enbridge: Jennifer Smith
Forest Preserve District of Cook County (FPDCC): Charles O'Leary, Kristen Pink
Forest Preserve District of Will County (FPDWC): Tim Good
Hanson Material Service: Randy Boisvert
Homer Township Highway Department: Mike De Vivo, Debbie Stevens
Illinois Department of Natural Resources (IDNR): Lynn Boerman
Illinois Nature Preserves Commission (INPC): Kim Roman
Lemont Township: Kathy Hendrickson
Lemont Township Highway Department: Sig Vaznelis
Lower Des Plaines Ecosystem Partnership/Coordinator - Marcia De Vivo
Old Oak Golf Club: Al Lieponis
Village of Homer Glen: Mike Salamowicz

Village of Lemont: Martha Glas, James Brown, Maggie Richardson
Village of Orland Park: Jane Turley
Village of Palos Park: Mike Sibraver
Will County Planning and Zoning Commission: Derek O'Sullivan
Will County Stormwater Management Planning Committee: Ken Carroll
Will-South Cook Soil & Water Conservation District (SWCD): Neil Pellmann, Randy Edwards
Woodbine Golf Club: Jim Ludwic

All photos by Applied Ecological Services, Inc. (AES) unless otherwise noted.

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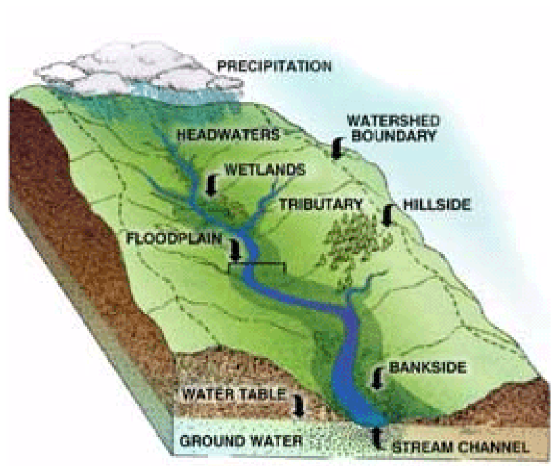
1.0 INTRODUCTION

1.1 LONG RUN CREEK WATERSHED SETTING

People live, work, and recreate in areas of land known as "Watersheds." A watershed is best described as an area of land where surface water drains to a common location such as a stream, river, lake, or other body of water (Figure 1). The source of groundwater recharge to streams, rivers, and lakes is also considered part of a watershed. Despite the simple definition for a watershed, they are complex in that there is interaction between natural elements such as climate, surface water, groundwater, vegetation, and wildlife as well as human elements such as agriculture and urban development that produce polluted stormwater runoff, increase impervious surfaces thereby altering stormwater flows, and degrade or fragment natural areas. Other common names given to watersheds, depending on size, include basins, sub-basins, subwatersheds, and Subwatershed Management Units (SMUs).



Source: City of Berkley-Public Works

Figure 1. Hypothetical Watershed Setting.

Long Run Creek watershed (HUC 071200040703) is located 24 miles southwest of Chicago in both Cook and Will Counties, Illinois (Figure 2). Long Run Creek and its many smaller tributaries account for approximately 32.7 stream/tributary miles that drain approximately 26.1 square miles (16,714 acres) of land surface. Long Run Creek drains west for approximately 12.5 miles before it joins the Illinois and Michigan Canal (I & M) north of the City of Lockport. From there the I & M Canal flows south and parallels the Chicago Sanitary & Ship Canal for approximately 6 miles prior to joining the Des Plaines River. The Des Plaines River Basin (HUC 07120004) drains over 1,300 square miles in Kenosha County, Wisconsin and Lake, Cook, DuPage, and Will Counties in Illinois. The Des Plaines River eventually joins the Kankakee River near Morris, Illinois to form the Illinois River. The Illinois River flows southwest across the heart of Illinois before joining the Mississippi River north of St. Louis, Missouri.

Pre-European settlement ecological communities in Long Run Creek watershed and surrounding area were balanced ecosystems with clean water and diverse with plant and wildlife populations. The mosaic of oak-hickory woodlands, forests, and savannas mixed with open prairie 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 ecosystem via large scale grazing. During these times most of the water that fell as precipitation was absorbed in prairie and wooded communities and within the extensive floodplain wetlands that existed along stream and tributary corridors.

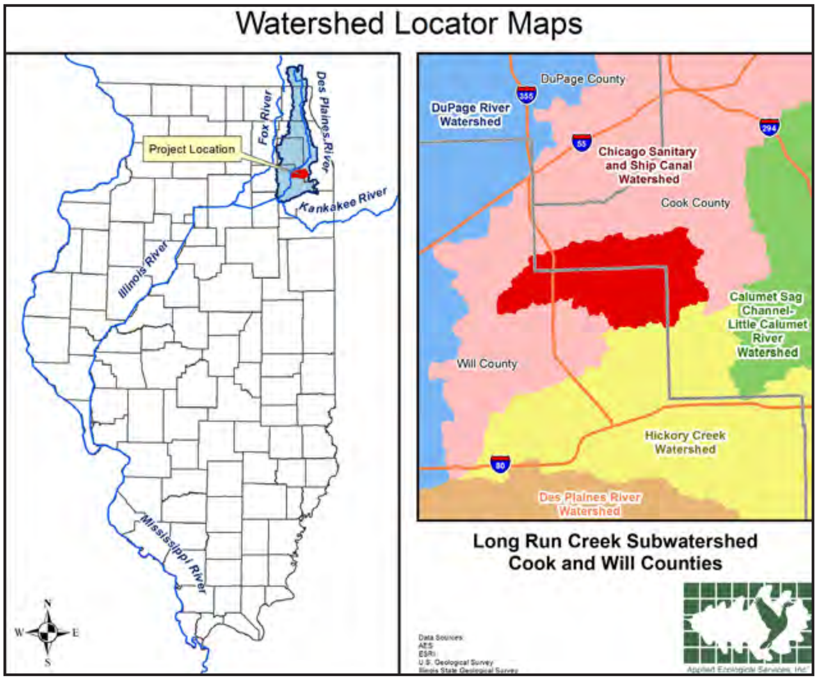


Figure 2. Watershed Locator Maps.

Ecological conditions changed quickly and drastically following European settlement in the mid 1800s. Large scale fires no longer occurred and bison and elk were extirpated. Significant portions of wooded communities and nearly all prairies were tilled and tile systems were installed to drain wetland areas as farming became the primary land use by the early 1900s. Conversion from farmland to primarily residential and commercial uses followed and continues to this day. Long Run Creek watershed is presently dominated by residential subdivisions, commercial/industrial

Depiction of Pre-European settlement prairie & wetland landscape at nearby Lockport Prairie centers, farmland, forest preserve land, and until recently, eight golf courses. Woodbine Golf Course was purchased in December 2013 by Homer Glen and will become mostly park while the club house will become the Village Hall.

Homer Glen open space; formerly Woodbine Golf Course

With ongoing "Traditional" development and landscape change in the watershed comes negative impacts to the environment. Impervious surfaces greatly reduce the ability of precipitation to infiltrate into the ground and instead cause stormwater runoff to quickly reach streams and tributaries. This in turn results in downcutting, widening, and bank erosion causing sediment and nutrient loading downstream. Meanwhile, invasive species established in adjacent floodplain wetlands are causing loss of wildlife habitat and reduced floodplain function. In addition, nutrients from residential lawn fertilizers and effluent from wastewater treatment plants is negatively impacting the biological communities in Long Run Creek. Discharged water from various sources that is not properly filtered is referred to as "non-point source pollution" and is the primary focus of this plan.

Tampier Lake, located in the northeast portion of the watershed, currently appears on the Illinois Environmental Protection Agency's (Illinois EPA) 303(d) impaired waters list (IEPA 2012). Illinois EPA lists total suspended solids (TSS), phosphorus, aquatic plants, and aquatic algae as the causes of impairment to the "Aesthetic Quality" Designated Use of Tampier Lake. Long Run Creek is not currently 303(d) listed and fully supports its "Aquatic Life" Designated Use according to Illinois EPA. More recent data, however, suggest moderate impairment to Long Run Creek.

The Long Run Creek Watershed Planning Committee (LRCWPC) became concerned over the health of Long Run Creek watershed when it began showing signs of degradation. In 2010 LRCWPC hosted a meeting of local volunteer stakeholders and partners in the watershed to discuss the possibility of updating a watershed plan that had been completed by Illinois Department of Natural Resources (IDNR) 10 years prior and was not current with Illinois EPA standards. One of the most important reasons to update the plan is to protect Long Run Seep Nature Preserve, home to the federally endangered Hine's Emerald Dragonfly. The rare seep ecosystem which supports the endangered dragonfly is fragile, and if impacts from development and water quality impairment continue to worsen, the dragonfly population could decline or disappear altogether.

NOTEWORTHY - Watershed at a Glance

- Long Run Creek and its tributaries drain **26.1 square miles** of land in Cook and Will Counties, Illinois.
- Long Run Creek is **moderately impacted** by nutrients, sediment, & channel/riparian modification.
- 67% of streams and tributaries are naturally meandering; 33% are moderately to highly channelized.
- 35% of streams and tributaries exhibit minimal bank erosion; 65% are moderately to highly eroded.
- 63% of the riparian areas are "Moderate" quality; 37% are in "Poor" condition.
- **Tampier Lake** is an Illinois EPA 303(d) **impaired water body** in 2012 caused by high phosphorus levels.
- Prairie, marsh, and woodland were the primary land cover types prior to European settlement in the 1830s.
- There were 3,312 acres of **wetlands** prior to European settlement; 1,191 acres or **36% remain** in 2012.
- The dominant land uses in 2012 include residential, agricultural, and forest/shrubland/grassland.
- Municipalities in the watershed include **Homer Glen, Lemont, Lockport, Orland Park, and Palos Park**.
- The **population** of the watershed in 2012 was over **42,000** and expected to increase to over 62,000 by 2040.
- Long Run Seep Nature Preserve is home to the **federally endangered Hine's Emerald Dragonfly**.
- There are 185 known detention basins. Only 20 (11%) provide "Good" ecological/water quality benefits.
- Open space parcels comprise approximately 6,637 acres or 40% of the watershed.
- 17 "Important Natural Areas" are found in the watershed; John J. Duffy Preserve is the largest at 1,614 ac.
- Groundwater provides the community water supply to over half the watershed.
- In 2012, INPC petitioned Illinois EPA to designate the groundwater recharge area to **Long Run Seep Nature Preserve** as a **Class III Special Resource Groundwater Classification**.
- Two NPDES permitted **WWTPs** account for **56% and 65% of phosphorus & nitrogen loading** respectively.
- **Streambank erosion** accounts for over **82% of sediment loading**.
- >64.4% phosphorus, >58.1% nitrogen, & >62% suspended solid reduction is needed in LRC to meet targets.
- >48% of 0.5 lbs/day reduction in phosphorus from external watershed sources is needed in Tampier Lake.

1.2 PROJECT SCOPE & PURPOSE

In 2010, Long Run Creek Watershed Planning Committee (LRCWPC) applied for and received Illinois Environmental Protection Agency (Illinois EPA) funding in 2012 through Section 319 of the Clean Water Act to undergo a watershed planning effort and produce a comprehensive "Watershed-Based Plan" to act as a "**guidance document**" for stakeholders in Long Run Creek watershed that would meet 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 water quality standards. The Village of Lemont, acting as the fiscal agent, hired Applied Ecological Services, Inc. (AES) in July 2012 to develop the plan.

The watershed planning process is a collaborative effort involving voluntary stakeholders with the primary scope to restore impaired waters and protect unimpaired waters by developing an ecologically-based management plan for Long Run Creek watershed that focuses on improving water quality by protecting green infrastructure, creating protection policies, implementing ecological restoration, and educating the public. Another important outcome is to improve the quality of life for people in the watershed for current and future generations.

The primary purpose of this plan is to spark interest and give stakeholders a better understanding of Long Run Creek watershed to promote and initiate plan recommendations that will accomplish the goals and objectives of this plan. This plan was produced via a comprehensive watershed planning approach that involved input from stakeholders and analysis of complex watershed issues by Applied Ecological Service's watershed planners, ecologists, GIS specialists, and environmental engineers.

LRCWPC held regular, public meetings the second half of 2012, throughout 2013, and into 2014 to guide the watershed planning process by establishing goals and objectives to address watershed issues and to encourage participation of stakeholders to develop planning and support for watershed improvement projects and programs.

Interests, issues, and opportunities identified by LRCWPC were addressed and incorporated into the Watershed-Based Plan. The plan acknowledges the importance of managing remaining green infrastructure to meet many of the goals and objectives in the plan and provides scientific and practical rational for protecting appropriate green infrastructure from traditional development and 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. **It is important to note that all recommendations in this plan are for guidance only and not required by any federal, state, or local agency.**

1.3 USEPA WATERSHED-BASED PLAN REQUIREMENTS

In March 2008, the United States Environmental Protection Agency (USEPA) released watershed protection guidance entitled *Non-point Source Program and Grant Guidelines for States and Territories*. The document was created to ensure that Section 319 funded Watershed-Based Plans and projects make progress towards restoring waters impaired by non-point source pollution. Applied Ecological Services, Inc. consulted USEPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (USEPA 2008) and Chicago Metropolitan Agency for Planning's (CMAP's) *Guidance for Developing Watershed Implementation Plans in Illinois* (CMAP 2007) to create this watershed plan. Having a Watershed-Based Plan will allow Long Run Creek watershed stakeholders to access 319 Grant funding for watershed improvement projects recommended in this plan. Under USEPA guidance, "Nine Elements" are required in order for a plan to be considered a Watershed-Based Plan.

NOTEWORTHY - USEPA Nine Elements

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 BMPs (non-point source management measures) that are expected 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

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 will be implemented to enhance public understanding of the project and encourage early and continued participation in selecting, designing, and implementing/ maintaining non-point source management measures that will be implemented;

Element F: Schedule for implementing the activities and non-point source management measures the plan; identified in this plan that is reasonably expeditious;

Element G: Description of interim, measurable milestones for determining whether non-point source management measures or other control actions are being implemented;

Element H: Set of environmental or administrative criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards;

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

1.4 PLANNING PROCESS

Watershed Stakeholder Planning Committee

The Long Run Creek Watershed Planning Committee (LRCWPC) first met in July 2012 to kickoff the watershed planning process. At this meeting, Applied Ecological Services, Inc. (AES) provided stakeholders with an overview of the steps involved in the watershed planning process. The LRCWPC Watershed Coordinator engaged stakeholders by explaining how their input and participation would benefit the overall outcome of the project. Volunteer stakeholders representing LRCWPC met 9 times throughout the planning process. The committee generally consisted of representatives from various municipal, governmental, private, and public organizations as well as local residents.

Site visit to Annunciation of the Mother of God Byzantine Catholic Church during watershed stakeholder tour

The LRCWPC developed goals and objectives for the watershed and identified problem areas and opportunities. Meetings were initiated by the Watershed Coordinator and generally covered one or more watershed topics. Meetings were devoted to development of goals and objectives, watershed assessment findings, and action plan items. Local experts and watershed residents were also invited to give presentations on specific topics. A list of the meetings is summarized in Table 1. Complete meeting minutes are included in Appendix A.

Table 1. Long Run Creek Watershed Planning Committee (LRCWPC) meeting schedule.

Date	Agenda	Summary
Jul. 25, 2012	· Watershed Planning Summary · Stakeholder Involvement	AES summarized to LRCWPC "Elements" needed in a USEPA approved watershed plan. The Watershed Coordinator discussed how stakeholder participation would benefit the overall outcome of the project.
Nov. 29, 2012	· Watershed Field Inventory Results · Detention Basin Discussion · Mission Statement · Discuss Future Meetings	AES summarized the results of the "Watershed Resource Inventory" field investigation. A discussion followed regarding the importance of detention basins. A mission statement was created. The Watershed Coordinator discussed options for future meetings.
Feb. 14, 2013	· Long Run Seep Nature Preserve · Watershed Inventory: Part 1 · Identification of Impairments	Kim Roman of INPC presented info about Long Run Seep Nature Preserve, rare species found there, and groundwater recharge. AES updated stakeholders with watershed information including jurisdictions, demographics, land use, soils, open space and natural areas. A discussion was then held to identify potential impairments in the watershed.
Apr. 24, 2013	· Watershed Inventory: Part 2 · Critical Areas & Pollutant Targets · Identify & Prioritize Goals · Discuss Future Meetings	AES updated stakeholders with watershed information including the watershed drainage system, groundwater issues, wastewater treatment plants, water quality for LRC and Tampier Lake, pollutant loading, and identification of Critical Areas and pollutant reduction targets. The LRCWPC then completed a goals exercise.
June 13, 2013	· Watershed Tour	A watershed tour via bus was conducted to introduce stakeholders to various aspects of the watershed including streams, open space, residential development, and potential watershed projects. Twelve sites were visited during the tour.
July 31, 2013	· Education and Outreach	Bluestem Communications (formerly Biodiversity Project) presented stakeholders with an outline of the education and outreach plan for LRC watershed. LRCWPC provided input that will be incorporated into the final plan.
Sep. 25, 2013	· Watershed Action Plan · Education & Outreach Pilot Project	AES presented the "Programmatic" and "Site Specific" Action Plan to the LRCWPC. Bluestem Communications (formerly Biodiversity Project) then discussed potential education and outreach pilot projects. LRCWPC then voted on a pilot project.
Nov. 20, 2013	· Water Quality Monitoring Plan · Plan Evaluation Report Cards	AES presented a water quality monitoring plan for the watershed then went through each of the six report cards developed for each plan goal/objectives. LRCWPC provided input that clarified monitoring roles and appropriate report card milestones.
Feb. 19, 2014	· Education and Outreach · Conservation Development · Future Plan Implementation	Bluestem Communications discussed the Pilot Project process. AES then presented on Conservation Development. The meeting ended with an open discussion regarding future plan implementation.

1.5 USING THE WATERSHED-BASED PLAN

The information provided in this Watershed-Based Plan is prepared so that it can be easily used as a tool by any stakeholder including elected officials, federal/state/county/municipal staff, and the general public to identify and take actions related to watershed issues and opportunities. The pages below summarize what the user can expect to find in each major "Section" of the Watershed-Based Plan. **All recommendations in this plan are for guidance only and not required by any federal, state, or local agency.**

Section 2.0: Mission, Goals, and Objectives

Section 2.0 of the plan contains the Long Run Creek Watershed Planning Committee's (LRCWPC) mission and goals/objectives. Goal topics include protection of green infrastructure, improved groundwater recharge, improved surface water quality, updates to watershed policy, reduction in problematic flooding, and implementation of education opportunities. In addition, "Measurable Objectives" were developed where possible for each goal so that the progress toward meeting each goal can be measured in the future by evaluating information included in Section 9.0: Measuring Plan Progress & Success.

Section 3.0: Watershed Resource Inventory

An inventory of the characteristics, problems, and opportunities in Long Run Creek watershed is examined in Section 3.0. Resulting analysis of the inventory data led to recommended watershed actions that are included in Section 6.0: Management Measures Action Plan. Inventory results also helped identify causes and sources of watershed impairment as required under USEPA's *Element A* and found in Section 5.0.

Section 3.0 includes summaries and analysis of the following inventory topics:

Watershed Resource Inventory Topics *Included* in the Plan

- **3.1** Geology & Climate
- **3.2** Pre-European Settlement Landscape & Present Landscape
- **3.3** Topography, Watershed Boundary, Subwatersheds
- **3.4** Soils
- **3.5** Jurisdictions
- **3.6** Existing Policies
- **3.7** Demographics
- **3.8** Existing & Future Land Use
- **3.9** Transportation Network
- **3.10** Impervious Cover Impacts
- **3.11** Open Space and Green Infrastructure
- **3.12** Important Natural Areas
- **3.13** Watershed Drainage System
    - Long Run Creek Hydrology & Flow
    - Long Run Creek & Tributaries
    - Detention Basins
    - Tampier Lake
    - Wetlands
    - Floodplain & Flood Problem Areas
- **3.14** Groundwater and Community Water
- **3.15** Wastewater Treatment Plants and Septic

Section 4.0: Water Quality & Pollutant Modeling Assessment

A summary and analysis of available water quality data for the watershed and pollutant modeling assessment is included in its own section because of its importance in the watershed planning process. This section includes a detailed summary of all physical, chemical, and biological data available for Long Run Creek, Tampier Lake, and the two wastewater treatment plants (WWTPs). The pollutant loading assessment identifies pollutant loads from various land cover types and the two WWTPs. Water quality data combined with pollutant loading data provides information that sets the stage for developing pollutant reduction targets outlined in Section 5.0.

Section 5.0: Causes/Sources of Impairment & Reduction Targets

This section of the plan includes a list of causes and sources of watershed impairment as identified in Section 3.0 that affect Illinois EPA "Designated Uses" for water quality and other watershed features. As required by USEPA, Section 5.0 also addresses all or portions of *Elements A, B, & C* including an identification of the "Critical Areas", pollutant load reduction targets, and estimate of pollutant load reductions following implementation of Critical Area Management Measures identified in Section 6.0.

Section 6.0: Management Measures Action Plan

A "Management Measures Action Plan" is included in Section 6.0. The Action Plan is divided into a Programmatic Action Plan and a Site Specific Action Plan. Programmatic recommendations are described in paragraph format; site specific recommendations are presented in paragraph, figure, and table formats with references to entities that would provide consulting, permitting, or other technical services needed to implement specific measures. The site specific tables also outline project priority, pollutant reduction efficiency, implementation schedule, sources of technical and financial assistance, and cost estimates. As required by Illinois EPA, this section also contains a watershed-wide summary table of specific information for all recommended site specific management measures combined including "Units," "Cost," and "Estimated Pollutant Load Reduction". This section addresses all or a portion of USEPA *Elements C & D*. **All recommendations in the Action Plan are for guidance only and not required by any federal, state, or local agency.**

Section 7.0: Information & Education Plan

This section 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 recommendations provided in the Watershed-Based Plan. This is accomplished by providing a matrix that outlines each education objective followed by primary and secondary recommended education activities. For each activity, a target audience, package (vehicle and pathways for reaching audiences), priority/schedule, lead and supporting agencies, what the expected outcomes or behavior change will be, and estimated costs to implement is provided.

Sections 8.0 & 9.0: Plan Implementation & Measuring Plan Progress & Success

A list of key stakeholders and discussion about forming a Watershed Implementation Committee that forms partnerships to implement watershed improvement projects is included in Section 8.0. Section 9.0 includes two monitoring components: 1) a "Water Quality Monitoring Plan" that includes specific locations and methods where future monitoring programs should focus and a set of water quality "Criteria" that can be used to determine whether pollutant load reduction targets are being achieved over time and 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 8.0 and 9.0 address USEPA *Elements F, G, H, and I*.

Sections 10.0 & 11.0: Literature Cited and Glossary of Terms

Section 10.0 includes a list of literature that is cited throughout the report. The Glossary of Terms (Section 11.0) includes definitions or descriptions for many of the technical words or agencies that the user may find useful when reading or using the document.

Appendix

The Appendix to this report is included on the attached CD located on the back cover (hard copies only). It contains LRCWPC meeting minutes (Appendix A), results of the watershed resource field inventory (Appendix B), Center for Watershed Protection local ordinance review summary (Appendix C), raw data used to develop the STEPL pollutant loading and reduction models (Appendix D), a list of Long Run Creek stakeholders & partners (Appendix E), and a list of potential funding opportunities (Appendix F).

1.6 PRIOR STUDIES & PROJECTS

Various studies have been completed describing and analyzing conditions within Long Run Creek watershed. Several ecological restoration efforts have also been implemented. 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 or restoration work is summarized below.

1. In May 2013, the USFWS-Chicago Ecological Services Field Office completed a 5-year review of the federally endangered Hine's Emerald Dragonfly (USFWS 2013). The 5 year review is a periodic analysis of HED status conducted to ensure that the listing classification as threatened or endangered is appropriate. The study also tracks the progress toward recovery and to propose appropriate next steps for HED conservation.

2. The Village of Homer Glen completed a project in 2012 at Yangas Park that involved stabilizing a section of Long Run Creek to improve water quality/reduce sedimentation while serving as a pilot project for residents. The Village wanted to provide an example for bank stabilization in an easily accessible location that residents could view. The project included cutting back the near vertical banks at a 3:1 slope

Streambank project completed by Homer Glen

SECTION 1.0

and either installing native plantings via plugs or placing a prairie seed mix with erosion blanket. The Village will also place interpretive signage at the trail/creek crossing to provide information of the completed project. The Village also worked with the Homer Township Highway Department to clear dead trees/limbs to open the canopy above to allow the new plantings to grow. This project was ultimately completed using grant funds provided by Hanson Material Services, Inc. (HMS).

3. In 2012, the Illinois Nature Preserves Commission (INPC) petitioned Illinois EPA to designate a Regional Groundwater Contribution Area (GCA) developed by Illinois State Geological Survey (ISGS) as a Class III Special Resource Groundwater Classification area. This designation allows an area to be subjected to special water quality standards and can result in the Office of the Illinois Attorney General ceasing operations that impact a groundwater resource to a nature preserve.

4. Integrated Lakes Management, Inc. (ILM) prepared the "Hydrologic Characterization - Long Run Seep" report in 2008 (ILM, 2008). The purpose of the project was to delineate and characterize the recharge area for Long Run Seep to understand impacts on habitat for the Hine's Emerald Dragonfly (HED), a federally endangered species. The goal was to define the contributing aquifer for the seep with the ultimate goal of putting together a protection program for the HED.

Master Landscape Plan for Annunciation of the Mother of God Byzantine Catholic Parish

5. The Annunciation of the Mother of God Byzantine Catholic Parish in Homer Glen incorporates green practices into the surrounding landscape such as rainwater collection, replenishment, and irrigation features. These features are supplemented by use of native plant ecosystems that improve water quality and provide wildlife habitat. The site won a "Conservation and Native Landscaping" award from Illinois EPA/Chicago Wilderness in 2006.

   The Byzantine Church also purchased a lot on the west side of the property that included a dry bottom detention basin. This detention basin was retrofitted with prairie and wetland vegetation and incorporates pervious pavement into a sitting area overlooking the basin. The project is known as "Transformation Prairie" and won an award from Homer Glen in 2012 for Community & Nature in Harmony.

"Transformation Prairie" detention retrofit

6. In the spring of 2006, the Village of Homer Glen received a grant from the IDNR C2000 Ecosystem Program to conduct a detailed baseline physical and biological survey of Long Run Creek. Integrated Lakes Management, Inc. (ILM) was hired to perform the work in 2007 (ILM, 2007). The study reviewed historical data and profiled the physical character of the stream corridor noting in-stream habitat, as well as stream biology, which is an indicator of the quality of water. The report is intended to aid in community decision making regarding future development and to be able to assess the impact of surrounding changes in the watershed.

7. Baetis Environmental Services, Inc. completed a benthic macroinvertebrate

survey at four locations along Long Run Creek in 2004. The purpose of the survey was to assemble baseline information about the macroinvertebrate community and to ascertain the effects of wastewater treatment plant discharges on aquatic life. One study site was upstream of both discharges; the other three study sites were downstream of both. Two commonly used indicators of stream health, the Hilsenhoff Biotic Index utilizing taxa-specific pollution tolerance values, and EPT Richness, suggests that the effects of the two wastewater treatment plants diminishes with downstream distance.

8. The Illinois Nature Preserves Commission (INPC) has been conducting management at Long Run Seep Nature Preserve since 2004 by introducing fire, removing invasive woody species, and herbiciding invasive purple loosestrife, common reed, and reed canary grass around seep/fen areas. Much of this work is being done to protect the Federally Endangered Hine's Emerald Dragonfly that inhabits the site.

9. In 2001, the Long Run Creek Watershed Planning Committee (LRCWPC) partnered with the Village of Homer Glen to develop the "Long Run Creek Watershed Plan" (LRCWPC 2001), with funding from the IDNR C2000 Ecosystem Program. In all, the plan developed dozens of recommendations grouped into seven categories including flooding, water quality, soil erosion and sedimentation, education and outreach, wildlife and open space, development and natural resources, and vegetation. At the time of publication however, the USEPA had not yet issued its Nine Elements of a Watershed-Based-Plan. Therefore, the plan addresses some but not all Elements that are now required.

10. Municipal comprehensive plans are available for the Village of Homer Glen (2005), Village of Lemont (2002), Village of Palos Park (2009), and Village of Orland Park (2013).

11. Illinois EPA collects water samples at three locations within Tampier Lake (sites ILRGZO1-3) via the Ambient Lakes Monitoring Program (ALMP). This data is included in biannual *Integrated Water Quality Reports*. These reports must 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.

12. Existing Cook and Will County and CMAP Geographic Information System (GIS) data for Long Run Creek watershed was obtained and used to analyze various data related to wetlands, soils, land use, demographics, and other relevant information.

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2.0 MISSION, GOALS, & OBJECTIVES

2.1 LONG RUN CREEK WATERSHED PLANNING COMMITTEE MISSION

The Long Run Creek Watershed Planning Committee (LRCWPC) is comprised of watershed stakeholders dedicated to the preservation, protection, and improvement of Long Run Creek watershed. The LRCWPC's mission is to:

"Develop and encourage the funding and implementation of a long-range plan among landowners, government, and other appropriate groups which will enhance, manage, and protect the human, ecological, and socio-economic resources within Long Run Creek watershed."

"The Watershed-Based Plan will promote the health and safety of human inhabitants, stormwater management, improve surface and groundwater quality, aesthetic values, education, wildlife protection, and address the present and future flooding issues"

2.2 GOALS & OBJECTIVES

Watershed stakeholders were first presented with information about the character and quality of watershed resources over the course of three separate meetings prior to developing goals. Next, stakeholders listed a variety of issues, concerns, and opportunities that were sorted into six general goals that should be addressed in the watershed plan. Stakeholders were then given the opportunity to vote on goals they felt were most important.

The voting process occurred following the April 24, 2013 stakeholder meeting. Each stakeholder was given five votes. Each person was allowed to use up to two votes on a single goal if he or she felt strongly about it. The voting process helped focus on goals that need to be adequately addressed in the planning process and within this watershed plan report. Tallied votes are as follows:

1. Manage natural and cultural components of the identified Green Infrastructure Network – *18 votes*
2. Improve groundwater recharge to benefit public water supply and federally endangered Hine's Emerald Dragonfly critical habitat– *18 votes*
3. Improve surface water quality to meet applicable standards– *14 votes*
4. Create and/or update county and local policy to protect watershed resources – *14 votes*
5. Manage and mitigate for existing and future structural flood problems– *13 votes*
6. Implement watershed educational opportunities – *10 votes*

Objectives for each goal were also formulated and are very specific where feasible and designed to be measurable so that future progress toward meeting goals can be assessed. Goals and objectives ultimately lead to the development of action items. The Management Measures Action Plan section of this report is geared toward addressing watershed goals by recommending programmatic and site specific Management Measure actions to address each goal. The goals and objectives are examined in more detail when measuring plan progress and success via milestones and "Report Cards" in Section 9.

Goal 1: *Manage natural and cultural components of the identified Green Infrastructure Network.*

Objectives:

1. Include the identified Green Infrastructure Network in all county and municipal comprehensive plans and development review maps.
2. Implement conservation or low impact design standards for applicable "Critical Green Infrastructure Protection Areas" where new or redevelopment occurs.
3. Prepare and implement management plans for all publically owned Important Natural Areas within the Green Infrastructure Network.
4. Incorporate natural landscaping into golf courses within the Green Infrastructure Network.
5. Extend and connect trails through appropriate ComEd utility corridors and other corridors within the Green Infrastructure Network.
6. Private land owners with parcels along Long Run Creek and tributaries manage their land for green infrastructure benefits.

Goal 2: *Improve groundwater recharge to benefit public water supply and federally designated Hine's Emerald Dragonfly critical habitat.*

Objectives:

1. Assign all future mitigation dollars from impacts to Hine's Emerald Dragonfly critical habitat to fund projects that support management and restoration of critical habitat or to fund projects that support groundwater recharge within the proposed Class III Groundwater Contribution Area to Long Run Seep Nature Preserve.
2. Use stormwater infiltration/cleaning practices in all new and redevelopment within the proposed Class III Groundwater Contribution Area to Long Run Seep Nature Preserve to meet Illinois EPA recommendations.
3. Establish a monitoring plan for Hine's Emerald Dragonfly at Long Run Seep Nature Preserve to study groundwater/seep water chemistry, seep discharge, estimate population size and dynamics, and conduct population augmentation via captive-rearing.
4. Model groundwater impacts to Hine's Emerald Dragonfly habitat prior to installing new wells.

Goal 3: *Improve surface water quality to meet applicable standards.*

Objectives:

1. Incorporate nutrient removal technologies into future upgrades for Derby Meadows and Chickasaw Hills wastewater treatment plants that reduce effluent total phosphorus to <1.0 mg/l and total nitrogen to <5.5 mg/l.
2. Stabilize 26,789 linear feet of highly eroded streambank located along six "High Priority-Critical Area" stream reaches.
3. Restore 14,966 linear feet of buffer along four "High Priority-Critical Area" riparian areas.
4. Install a vegetated buffer along 9,650 linear feet of Tampier Lake shoreline at "High Priority-Critical Area".
5. Restore 355 acres of wetland at thirteen "High Priority-Critical Area" wetland restoration sites.
6. Retrofit 21 "High Priority-Critical Area" detention basins.
7. Implement conservation tillage (no till) farming practices on 13 sites (1,282 acres) identified as "High Priority-Critical Area" cropland.
8. Implement manure reduction practices on two sites (24 acres) identified as "High Priority-Critical Area" livestock operations.
9. Decrease the use of phosphorus (in fertilizer) in agricultural, commercial, and residential areas based on soil testing and Illinois Phosphorus Law.
10. Identify septic systems in violation of county ordinance requirements and require maintenance or adequate sizing.
11. Municipalities in the watershed implement minimum bi-weekly street sweeping programs.

Goal 4: *Create and/or update county and local policy to protect watershed resources.*

Objectives:

1. All key watershed partners adopt and/or support (via a resolution) the Long Run Creek Watershed-Based Plan as a "guidance document."
2. Amend existing municipal comprehensive plans and zoning ordinances to include tools such as conservation/low impact design standards for use at "High Priority-Critical Area" Green Infrastructure Protection Areas where new development occurs.
3. Utilize tools such as Development Impact Fees, Stormwater Utility Taxes, Special Service Area (SSA) Taxes, etc. to help fund future management of green infrastructure components where new and redevelopment occurs.
4. Developers protect sensitive natural areas, restore degraded natural areas and streams, then donate all natural areas and naturalized stormwater management systems to a public agency or conservation organization for long term management with dedicated funding via tools such as Development Impact Fees, Stormwater Utility Taxes, Special Service Area (SSA) Taxes, etc.
5. Amend existing municipal zoning ordinances to include recommendations for stormwater infiltration practices in all new and redevelopment within the proposed Class III Groundwater Contribution Area to Long Run Seep Nature Preserve.
6. Consider limiting mitigation for all wetlands lost to development to occur in the watershed.
7. Amend local ordinances to allow for native landscaping.
8. Require reduced or no phosphorus fertilizer use based on soil testing and Illinois Phosphorus Law.

Goal 5: *Manage and mitigate for existing and future structural flood problems.*

Objectives:

1. Reconnect channelized portions of Long Run Creek along Reaches 3 and 4 to adjacent floodplain where feasible.
2. Implement impervious reduction measures into development that is predicted to occur within Subwatershed Management Units 1, 8, 18, and 20 which are "Highly Vulnerable" to future development and associated impervious cover.
3. Mitigate for identified structural flood problem areas on a case by case basis where feasible.
4. Limit development in the identified FEMA 100-year floodplain.
5. Provide tax incentives for homeowners or businesses using stormwater infiltration, harvesting, and/or re-use technology.

Goal 6: *Implement watershed educational opportunities.*

Objectives:

1. Build a sense of community around Long Run Creek and the watershed.
2. Connect residents to decision-makers and experts with knowledge about water issues, like pollution and problematic flooding, and their potential solutions.
3. Educate watershed stakeholders on ways to improve water quality and reduce problematic flooding in Long Run Creek and its tributaries.
4. Educate watershed stakeholders on ways to preserve groundwater supply to serve future demands for water supply and to benefit Hine's Emerald Dragonfly.
5. Educate municipalities about ways to promote responsible development and best management practices in their communities.

3.0 WATERSHED RESOURCE INVENTORY

3.1 GEOLOGY, CLIMATE, & SOILS

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 thick or more. The Illinois 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 episode 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 the glaciers retreated. As temperatures continued to rise, tundra was replaced by cool moist deciduous forests and eventually by oak-hickory forests, oak savannas, marshes, and prairies.

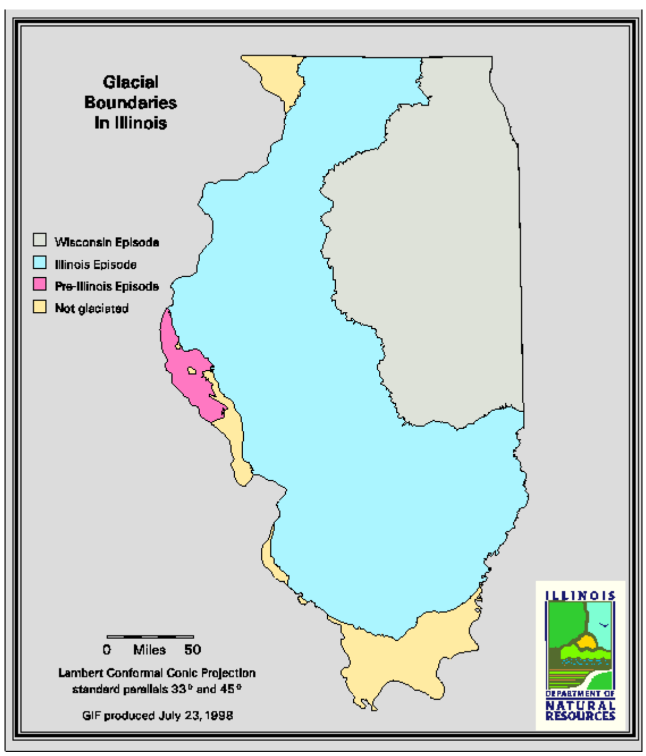

Figure 3. Glacial boundaries in Illinois.

The nearby Des Plaines River and surrounding area was formed at the end of the Wisconsin glaciation within deposits left by the Valparaiso Moraine System. Long Run 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 watershed is also a remnant of that ancient ice movement. Above the bedrock lies a layer of deposits left behind from the glaciers, consisting of clay, silt, sand, and gravel (Hansel, 2005). Silurian Dolomite is located near the surface on the far west portion of the watershed.

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 moving southward or tropical air moving northward cause 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 Weather Channel website (www.weather.com) provides an excellent summary of climate statistics including monthly averages and records for most locations in Illinois. Data for Lemont represents the climate and weather patterns experienced in Long Run Creek watershed (Figure 4). The winter months are cold averaging highs around 33° F while winter lows are around 17° F. Summers are warm with average highs around 80° F and summer lows around 57° F. The highest recorded temperature was 105° F in July 1995 while the lowest temperature was -26° F in January 1985.

Fairly typical for the Midwest, the current climate of Long Run Creek watershed consists of an average rainfall around 36 inches and snowfall around 38 inches annually. According to data collected in Lemont, the most precipitation on average occurs in August (4.34 inches) while January receives the least amount of precipitation with 1.91 inches on average.

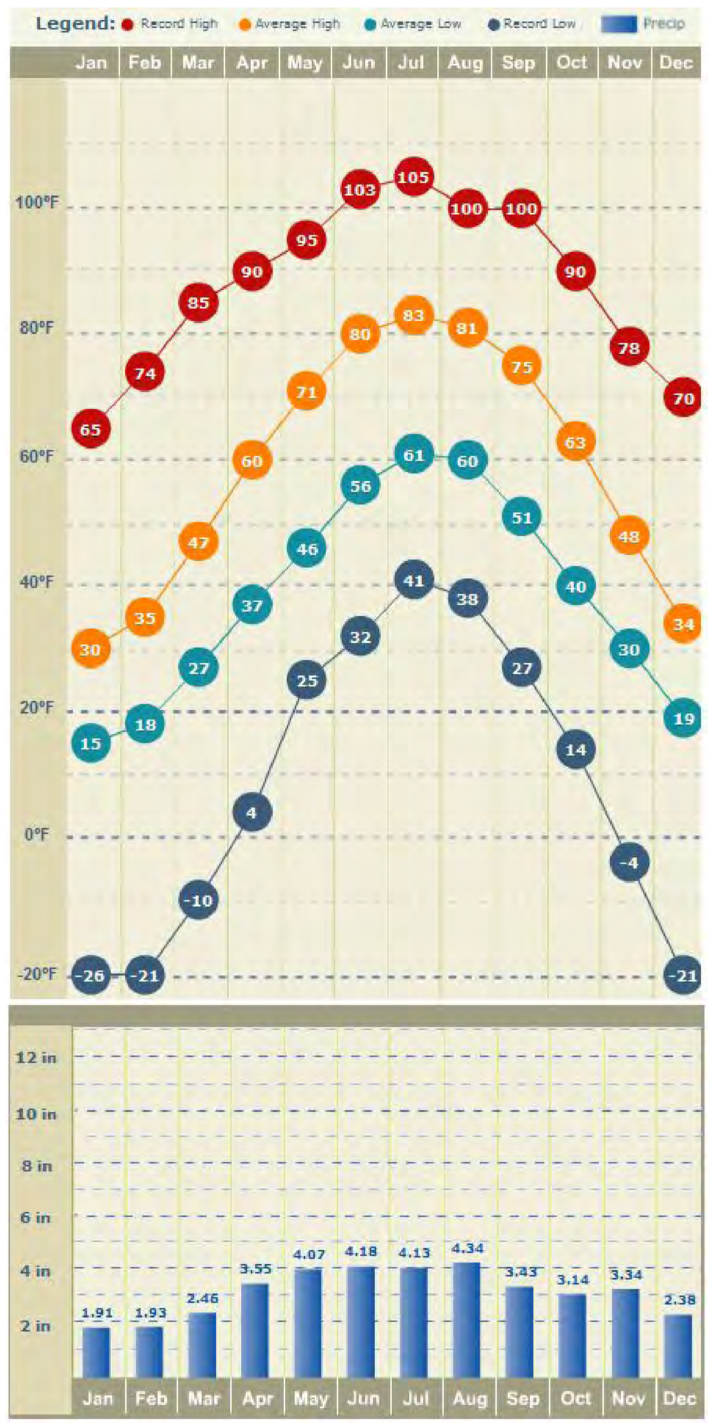

Figure 4. Monthly averages for temperature and precipitation in Lemont, Illinois. Source: The Weather Channel

Pre-European settlement prairie-savanna landscape

3.2 PRE-EUROPEAN SETTLEMENT LANDSCAPE COMPARED TO PRESENT LANDSCAPE

The last Native American Indian tribe to call the area home was the Potawatomie. However, they were removed from the land with the signing of a treaty in 1833. The original public land surveyors that worked for the office of U.S. Surveyor General in the early and mid 1800s mapped and described natural and man-made features and vegetation communities while creating the "rectangular survey system" for mapping and sale of western public lands of the United States (Daly & Lutes et. al., 2011). Ecologists 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, woodlands, savannas, and wetlands prior to European settlement in the 1830s.

The surveyors described the western half of Long Run Creek watershed as "Timber" while the eastern half was described as mostly "Prairie" mixed with areas of "Marsh" and pockets of "Timber" (Figure 5). This mixture of "Prairie" and "Timber" across the landscape was widely described in the mid 1800s 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." The prairie-savanna landscape was maintained and renewed by frequent lightning strike fires, fires ignited by Native Americans, and grazing by bison and elk. Fires ultimately removed dead plant material, exposing the soils to early spring sun, and returning nutrients to the soil. Running through the prairie-savanna landscape were meandering stream corridors and low wet depressions consisting of sedge meadow, marsh, wet prairie and highly unique seeps, springs, and fen wetlands hydrated by alkaline-rich groundwater discharge.

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 most of the defined stream channels seen today were simply wetland complexes. This is true for most of the central and eastern portions of Long Run Creek. It is also interesting to note that Long Run Creek once flowed south for several miles prior to joining the Des Plaines River. Sometime between 1840 and 1939, the stream channel was altered and made to flow directly into the I & M Canal which was also a human created feature.

European settlement resulted in drastic changes to the fragile ecological communities. Fires no longer occurred, prairie and wetlands were tilled under or drained for farmland or developed, and many channels/ ditches were excavated through wetland areas to further drain the land for farming purposes. The earliest aerial photographs taken in 1939 (Figure 6) depict Long Run Creek watershed when row crop farming was the primary land use but before residential and commercial development seen today. Many of the woodland communities described in the western portion of the watershed were still present in 1939 but farmland clearly replaced most of the prairie and wetland communities. With the advent of farming came significant changes in stormwater runoff. By 1939 defined stream channels had formed or were created throughout the watershed.

Figure 7 shows a 2012 aerial photograph of Long Run Creek watershed. It is clear that residential and commercial development replaced much of the farmland, particularly in the eastern half of the watershed. The dark signatures in the western half of the watershed reveal stands of remnant oak and hickory groves that persist but are mostly fragmented by residential development. Another area of interest is John J. Duffey preserve, located in the northeast corner of the watershed. In the late 1950s the Forest Preserve District of Cook County (FPDCC) began converting wetlands into shallow sloughs and Tampier Lake. In addition, there are also seven golf courses located in the watershed.

With degraded ecological conditions comes the opportunity to implement ecological restoration to improve the condition of Long Run 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 remaining natural areas.

Long Run Creek Watershed

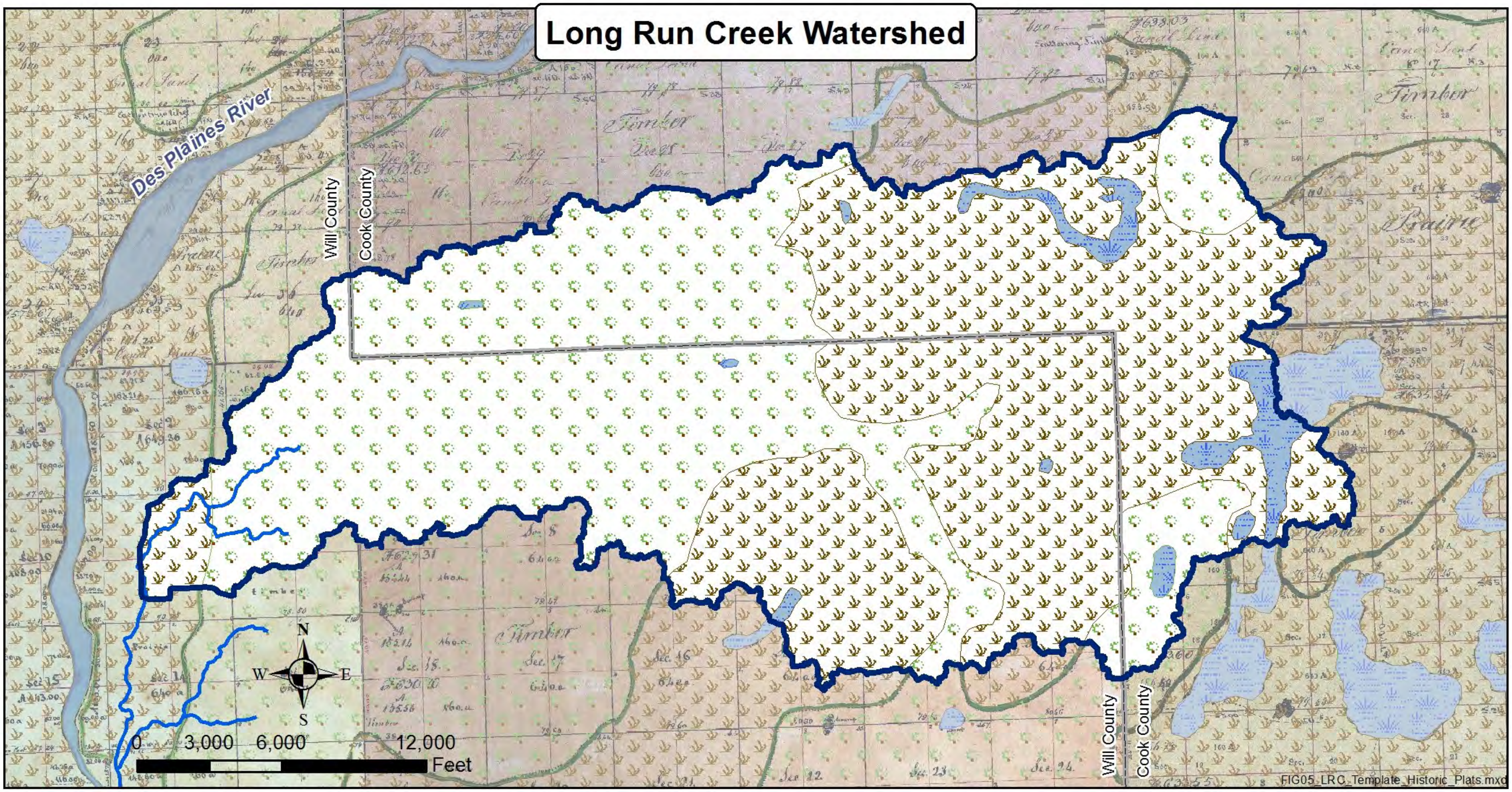

Fig. 5: Pre-European Settlement Vegetation (1830s)

Legend

- LRC Watershed Boundary
- County Boundary
- Presettlement Streams & Tributaries
- Des Plaines River

Presettlement Vegetation (1830's)

- Marsh (Wetland)
- Prairie (Upland & Wet Prairie)
- Timber (Oak Woodland & Savanna)

Data Sources:
IL State Archives

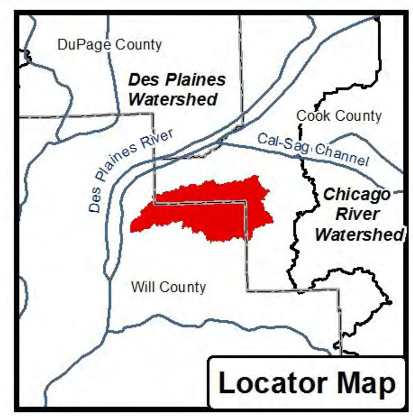

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Figure 5

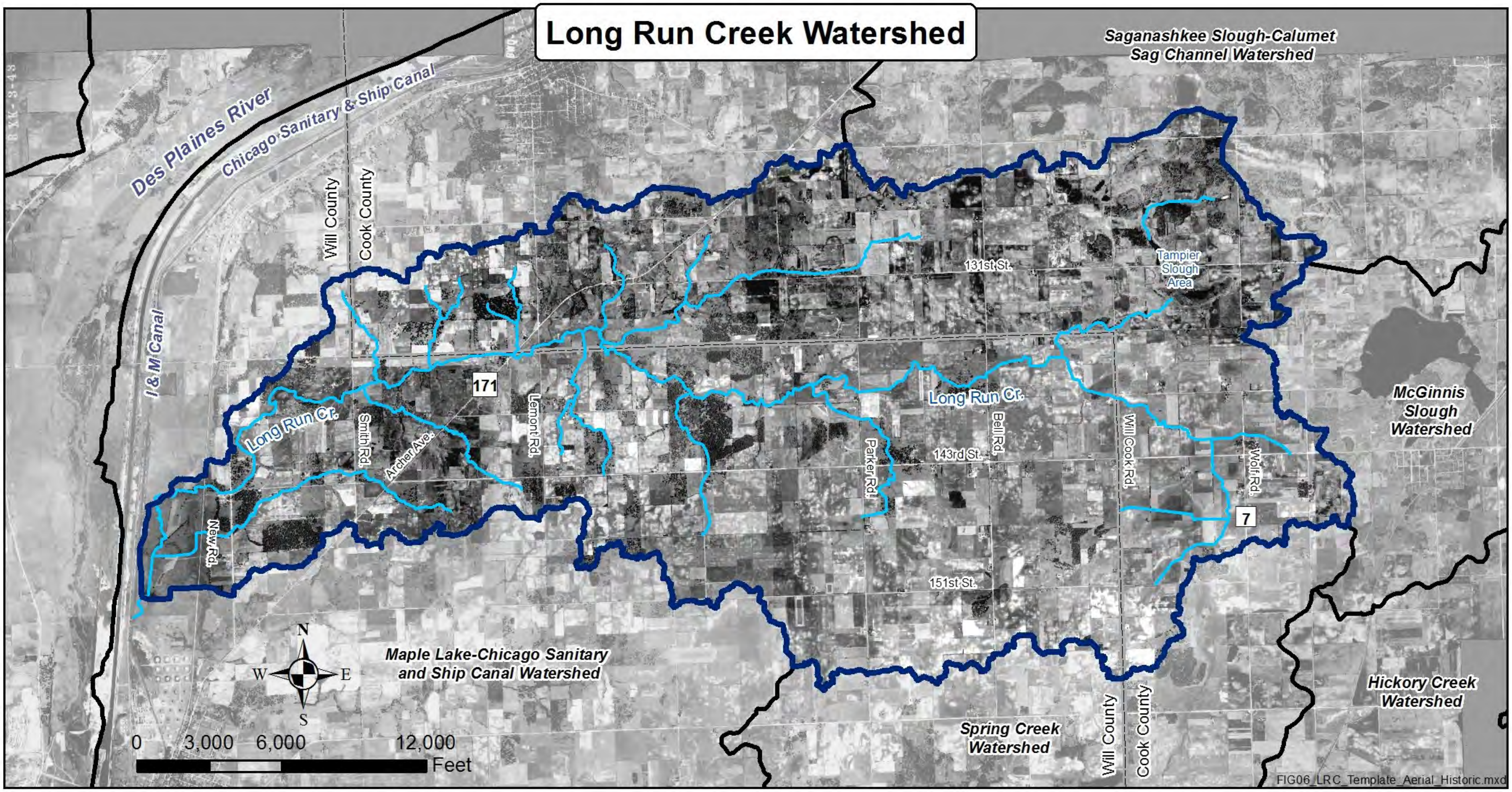

Fig. 6:1939 Aerial Image

Legend

- Roads
- 1939 Streams & Tributaries
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Data Sources:
Illinois State Geological Survey

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Figure 6

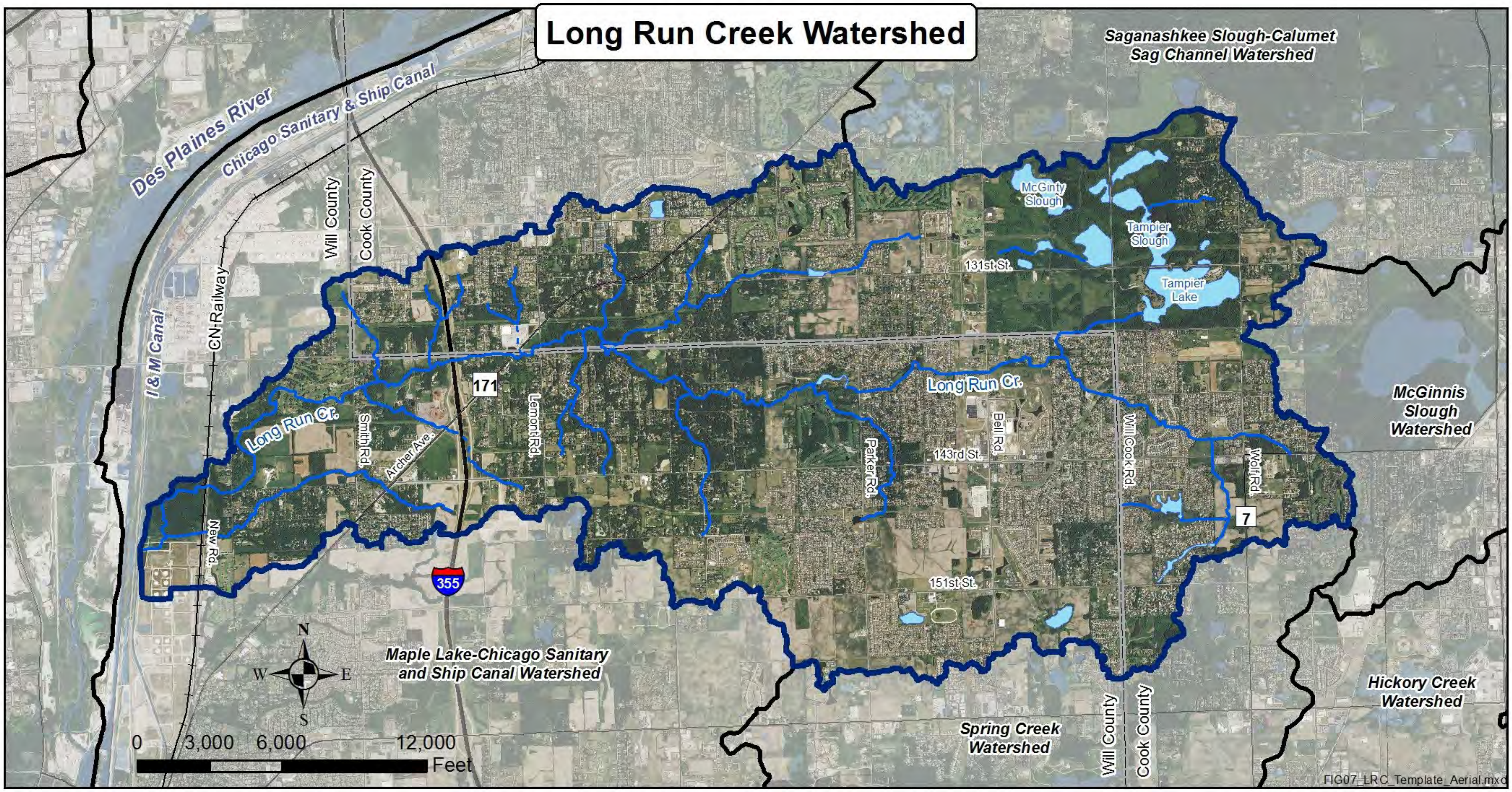

Fig. 7: 2012 Aerial Image

Legend

- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Data Sources:
NAIP 2012

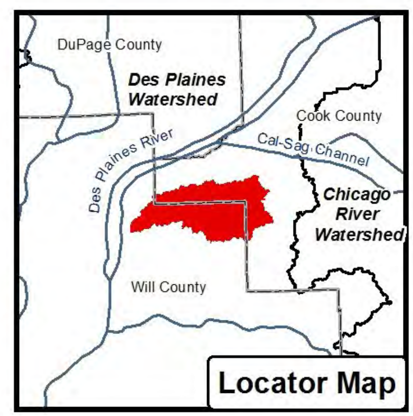

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Figure 7

3.3 TOPOGRAPHY, WATERSHED BOUNDARY, & SUBWATERSHED MANAGEMENT UNITS

Topography & Watershed Boundary

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

The Long Run Creek watershed boundary was updated and refined for this study using the most up-to-date 2-foot topography data available from Cook and Will Counties. 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). Long Run Creek watershed is 16,714 acres or 26.1 square miles in size.

Long Run Creek watershed generally drains from east to west before entering the I & M Canal and eventually the Des Plaines River. Elevation within the watershed ranges from a high of 792 feet above mean sea level (AMSL) to a low of 577 feet AMSL for a total relief of 215 feet (Figure 8). The highest point is found in the south central portion of the watershed. Higher elevations also extend along much of the southern portion of the watershed. As expected, the lowest elevation occurs where Long Run Creek enters the I & M Canal with lower elevations extending along the main stem of Long Run Creek and many tributaries.

The DEM (Figure 8) depicts the rolling topography of the watershed. Land north and south of Long Run Creek in the central and west portions of the watershed have slopes ranging from 10-20% while the land in the east portion of the watershed is relatively flat (0-5% slopes).

Rolling topography viewed from John J. Duffy Preserve

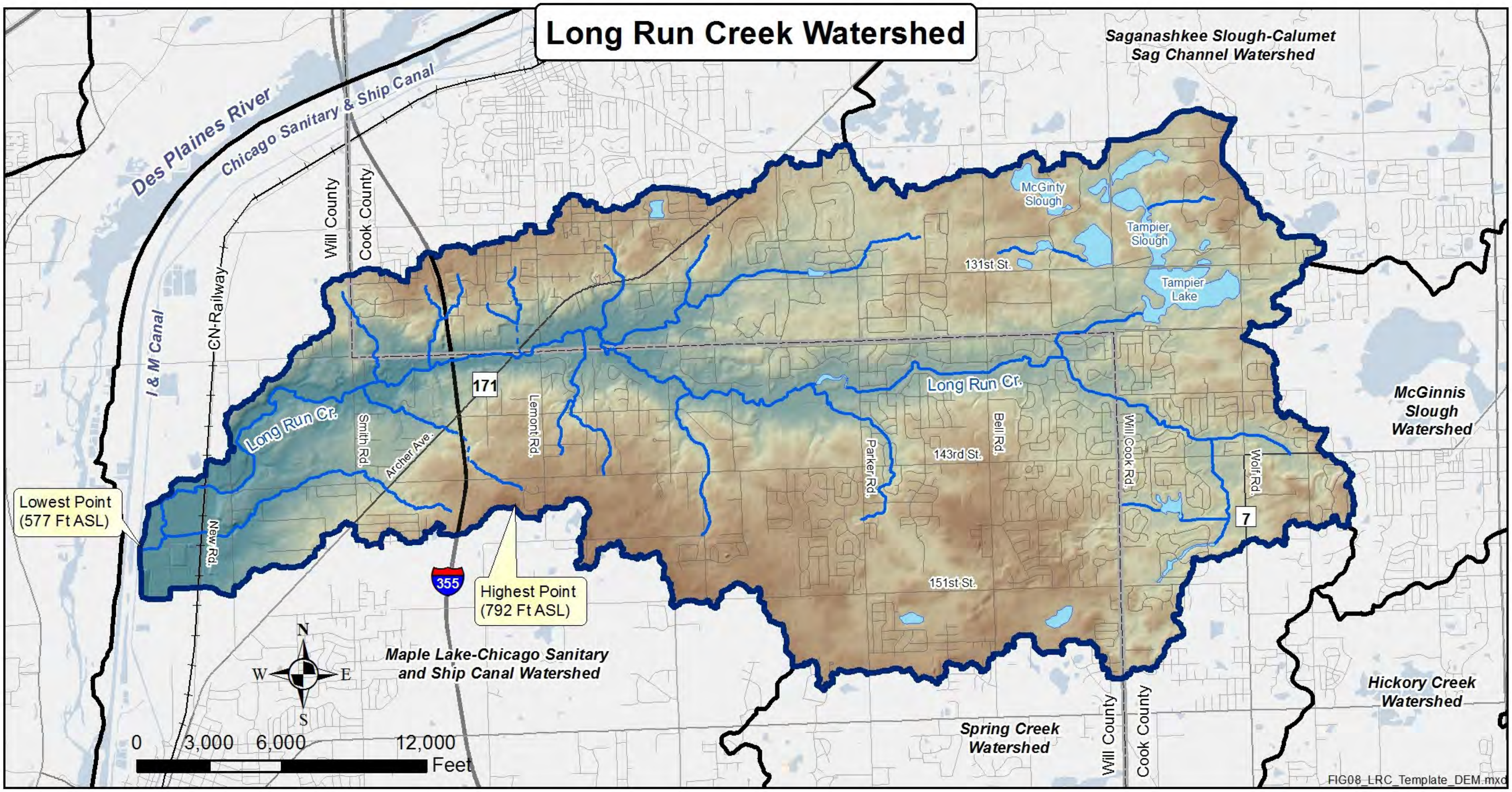

Fig. 8: Digital Elevation Model

Legend

- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Feet Above Sea Level (ASL)

High : 792

Low : 577

Data Sources:
Cook County
Will County

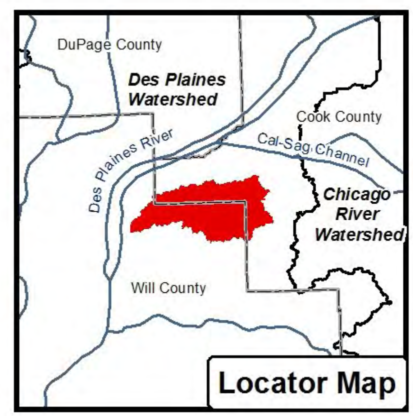

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Figure 8

Subwatershed Management Units (SMUs)

The Center for Watershed Protection (CWP) is a leading watershed planning agency and has defined watershed and subwatershed sizes appropriate to meet watershed planning 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 up to 100 square miles. Broad assessments of conditions such as soils, wetlands, and water quality are generally evaluated at the watershed level and provide some information about overall conditions. Long Run Creek watershed is about 16 square miles and therefore this plan allows for a detailed look at watershed characteristics, problem areas, and management opportunities. However, an even more detailed look at smaller drainage areas must be completed to find site specific problem areas or "Critical Areas" that need immediate attention.

To address issues at a small scale, a watershed can be divided into subwatersheds called Subwatershed Management Units (SMUs). Long Run Creek watershed was delineated into 20 SMUs by using the Digital Elevation Model (DEM). Information obtained at the SMU scale allows for detailed analysis and better recommendations for site specific "Management Measures" otherwise known as Best Management Practices (BMPs). Table 2 presents each SMU and size within the watershed. Figure 9 depicts the location of each SMU boundary delineated within the larger Long Run Creek watershed.

Table 2. Subwatershed Management Units and size.

SMU#	Total Acres	Total Square Miles
SMU 1	743.6	1.2
SMU 2	410.2	0.6
SMU 3	1,218.2	1.9
SMU 4	493.9	0.8
SMU 5	1,576.6	2.5
SMU 6	633.4	1.0
SMU 7	1,290.7	2.0
SMU 8	1,969.1	3.1
SMU 9	1,037.0	1.6
SMU 10	772.8	1.2
SMU 11	2,047.8	3.2
SMU 12	434.6	0.7
SMU 13	445.9	0.7
SMU 14	549.1	0.9
SMU 15	362.4	0.6
SMU 16	215.2	0.3
SMU 17	281.4	0.4
SMU18	545.4	0.8
SMU19	779.9	1.2
SMU 20	907.3	1.4
Totals	**16,714.1**	**26.1**

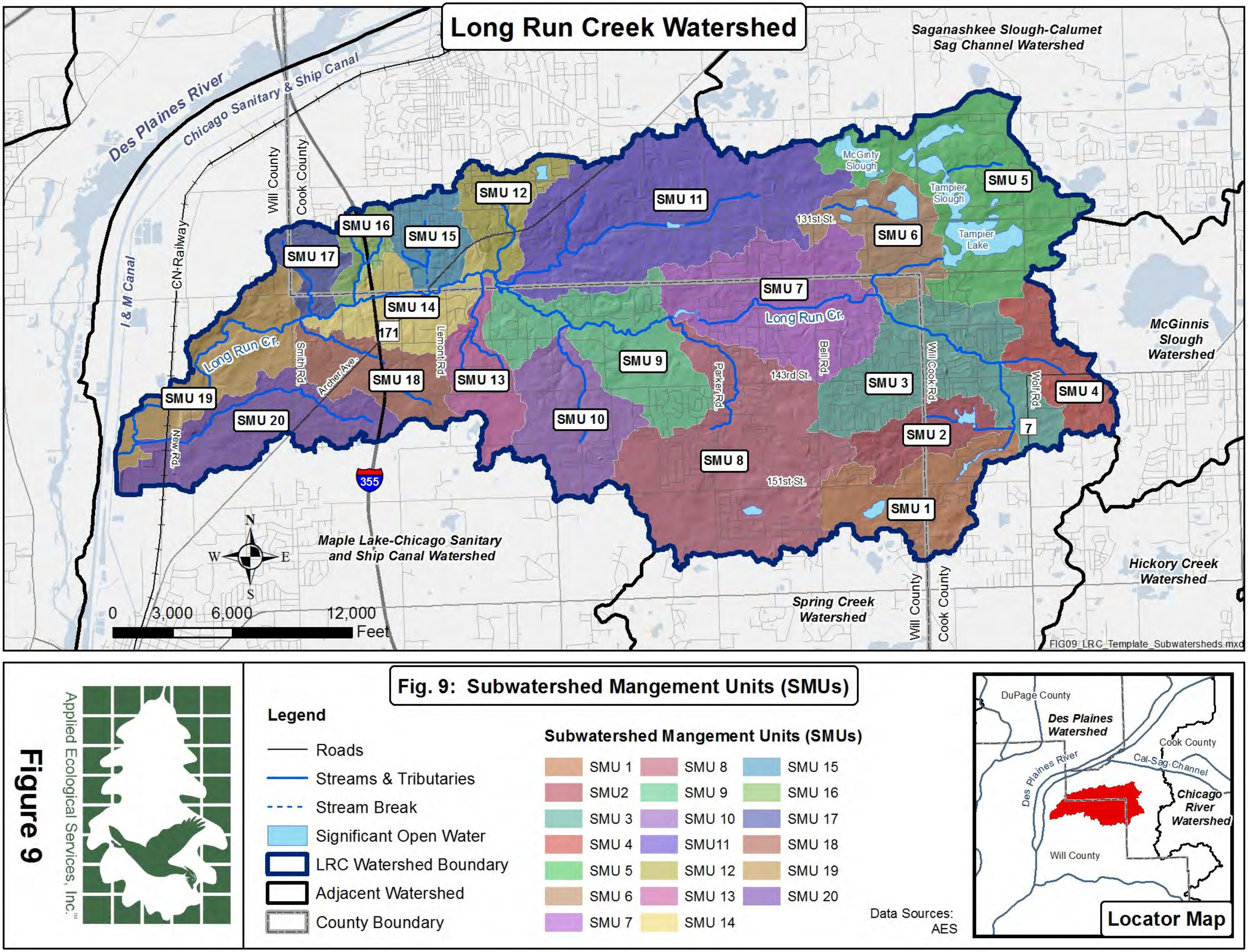


Fig. 9: Subwatershed Mangement Units (SMUs)

Figure 9

3.4 HYDRIC SOILS, SOIL ERODIBILITY, & HYDROLOGIC SOIL GROUPS

Soils

Deposits left by the Wisconsin glaciation 14,000 years ago are the raw materials of present soil types in the watershed. 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 under wetland, woodland, and prairie vegetation. The most up to date soils mapping provided by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) was used to summarize the extent of soil types, including hydric soils, soil erodibility, and hydrologic soil groups within Long Run Creek watershed (Tables 3 and 4; Figures 10-12).

Hydric Soils

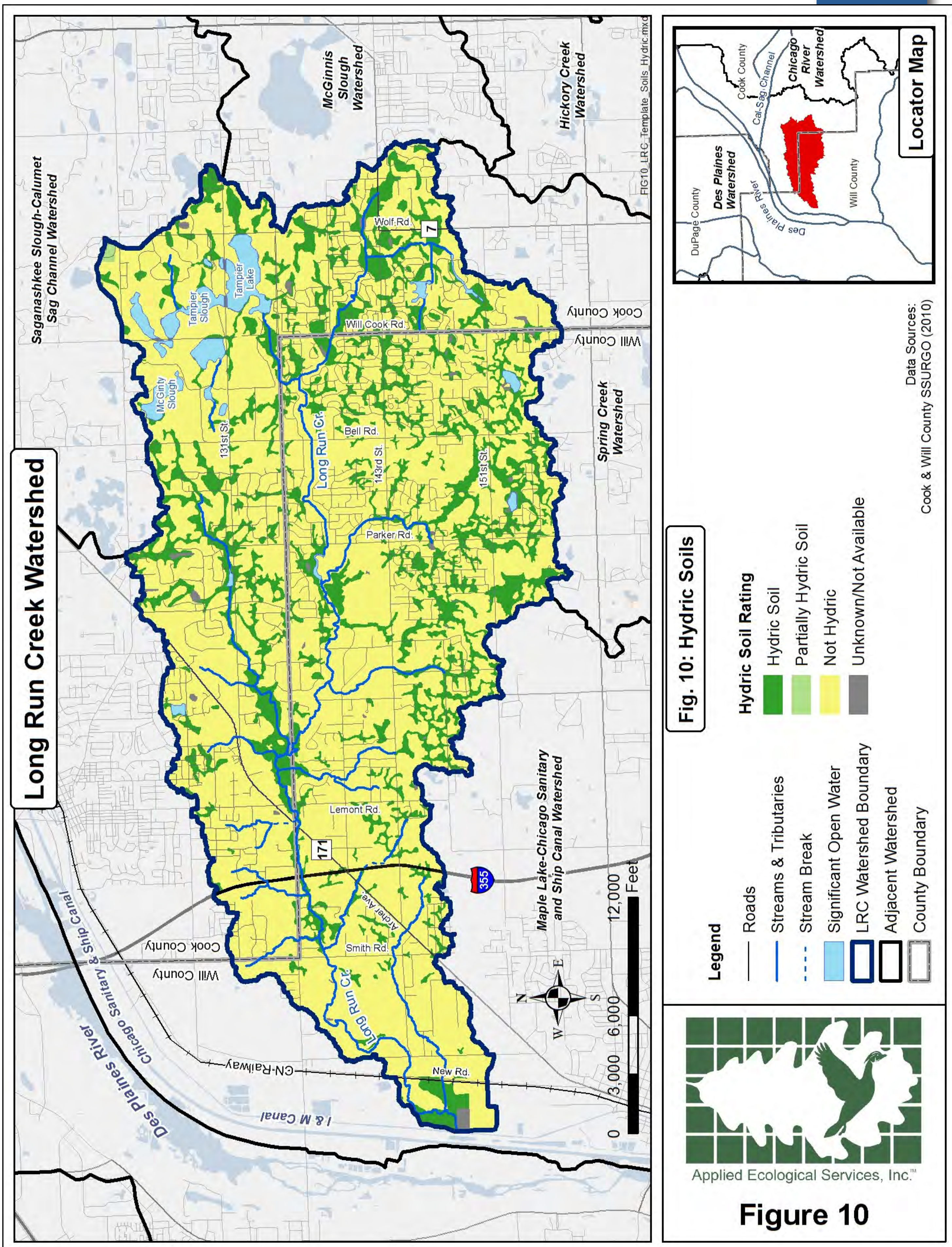
Wetland or "Hydric Soils" generally form over poorly drained clay material associated with wet prairies, marshes, and other wetlands and from accumulated organic matter from decomposing surface vegetation. Hydric soils are important because they indicate the presence of existing wetlands or drained wetlands where restoration may be possible. Most of the wetlands in Long Run Creek watershed were intact until the late 1830s 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 woodland and prairie cleared to farm the rich soils.

Historically there were approximately 3,312 acres of wetlands in the watershed. Approximately 12,967 acres are not hydric and the remaining 435 acres have unknown classification because they have been heavily disturbed by human land practices. According to existing wetland inventories, 1,191 acres or 36% of the pre-European settlement wetlands remain. The location of hydric soils in the watershed is depicted on Figure 10. Existing wetlands and wetland restoration opportunities are discussed in detail in Section 3.13.

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 often blanket rock, cobble, and sandy substrates needed by fish and aquatic macroinvertebrates for habitat, food, and reproduction. Sedimentation is a problem in several stream reaches in the watershed (see Section 3.13).

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 (Figure 11). It is important to know the location of highly erodible soils because these areas have the highest potential to degrade water quality during farm tillage and development. Based on mapping, 2,305 acres or 14% of the soils in the watershed are potentially highly erodible. Fortunately, a good portion of these soils are located in upland areas that are currently stabilized by existing land uses/cover. But others are located on row crop farmland in the south and far west portions of the watershed where erosion following annual tilling is a possibility.


Long Run Creek Watershed
Fig. 10: Hydric Soils
Figure 10
Applied Ecological Services, Inc.™
Legend
Roads
Streams & Tributaries
Stream Break
Significant Open Water
LRC Watershed Boundary
Adjacent Watershed
County Boundary
Hydric Soil Rating
Hydric Soil
Partially Hydric Soil
Not Hydric
Unknown/Not Available
Data Sources:
Cook & Will County SSURGO (2010)
Locator Map
DuPage County
Des Plaines Watershed
Des Plaines River
Cook County
Cal-Sag Channel
Chicago River Watershed
Will County
Saganashkee Slough-Calumet Sag Channel Watershed
McGinnis Slough Watershed
Hickory Creek Watershed
Spring Creek Watershed
Maple Lake-Chicago Sanitary and Ship Canal Watershed
Tampier Slough
Tampier Lake
McGinty Slough
Long Run Cr.
131st St.
143rd St.
151st St.
Bell Rd.
Parker Rd.
Wolf Rd.
Will Cook Rd.
Lemont Rd.
Smith Rd.
Archer Ave.
New Rd.
CN-Railway
I & M Canal
Des Plaines River
Chicago Sanitary & Ship Canal
Cook County
Will County
7
171
355
0 3,000 6,000 12,000 Feet
N S E W
FIG10_LRC_Template_Soils_Hydric.mxd

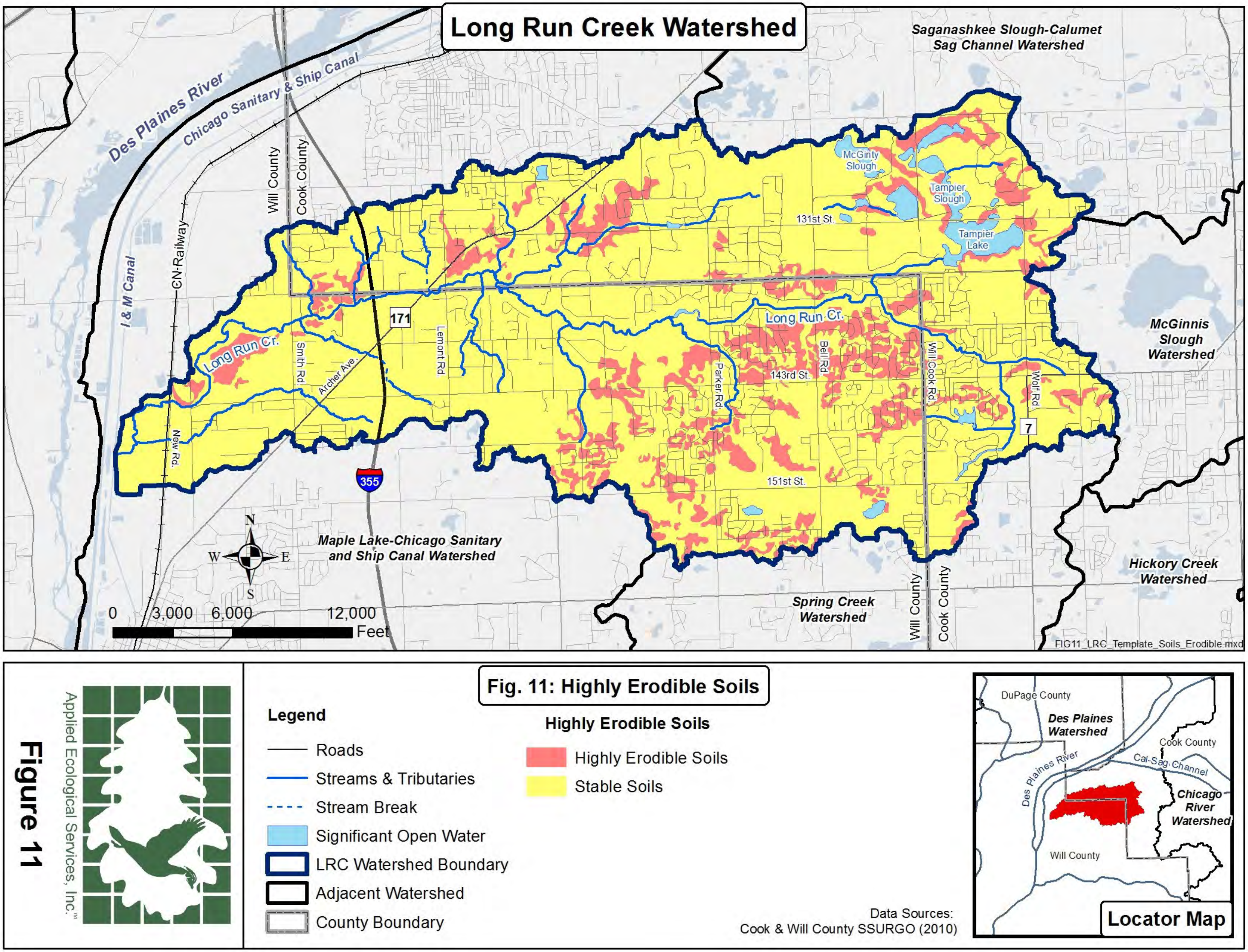

Long Run Creek Watershed
Saganashkee Slough-Calumet Sag Channel Watershed
McGinnis Slough Watershed
Hickory Creek Watershed
Spring Creek Watershed
Maple Lake-Chicago Sanitary and Ship Canal Watershed
Des Plaines River
Chicago Sanitary & Ship Canal
I & M Canal
CN-Railway
Will County
Cook County
McGinty Slough
Tampier Slough
Tampier Lake
131st St.
143rd St.
151st St.
Long Run Cr.
Smith Rd.
Archer Ave.
Lemont Rd.
Parker Rd.
Bell Rd.
Will Cook Rd.
Wolf Rd.
New Rd.
171
7
355
N
S
E
W
0
3,000
6,000
12,000
Feet
FIG11_LRC_Template_Soils_Erodible.mxd
Fig. 11: Highly Erodible Soils
Legend
Roads
Streams & Tributaries
Stream Break
Significant Open Water
LRC Watershed Boundary
Adjacent Watershed
County Boundary
Highly Erodible Soils
Highly Erodible Soils
Stable Soils
Data Sources:
Cook & Will County SSURGO (2010)
DuPage County
Des Plaines Watershed
Cook County
Cal-Sag Channel
Des Plaines River
Chicago River Watershed
Will County
Locator Map
Applied Ecological Services, Inc.™

Figure 11

Hydrologic Soil Groups

Soils also exhibit different infiltration capabilities and have been classified to fit what are known as "Hydrologic Soil Groups" (HSGs). HSGs are based on a soil's infiltration and transmission (permeability) rates and are used by engineers and planners to estimate stormwater runoff potential. Knowing how a soil will hold water ultimately affects the type and location of recommended infiltration Management Measures such as wetland restorations and detention basins. More important, however, is the link between hydrologic soil groups and groundwater recharge areas. Groundwater recharge is discussed in detail in Section 3.14.

HSG's are classified into four primary categories; A, B, C, and D, and three dual classes, A/D, B/D, and C/D. Figure 12 depicts the location of each HSG in the watershed. The HSG categories and their corresponding soil texture, drainage description, runoff potential, infiltration rate, and transmission rate are shown in Table 3 while Table 4 summarizes the acreage and percent of each HSG. Group B soils are dominant throughout the watershed at about 48% coverage and are found along the main stem of Long Run Creek. Group C and C/D soils also make up a significant portion of the watershed at around 40% combined.

Table 3. 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

Table 4. Hydrologic Soil Groups including acreage and percent of watershed.

Hydrologic Soil Group	Area (acres)	% of Watershed
A	1.8	<1
A/D	780.3	4.7
B	8,006.2	47.9
B/D	1,460.9	8.7
C	4,819.1	28.8
C/D	1,548.7	9.3
D	37.7	0.2
Unclassified	59.0	0.4
Totals	**16,714**	**100%**

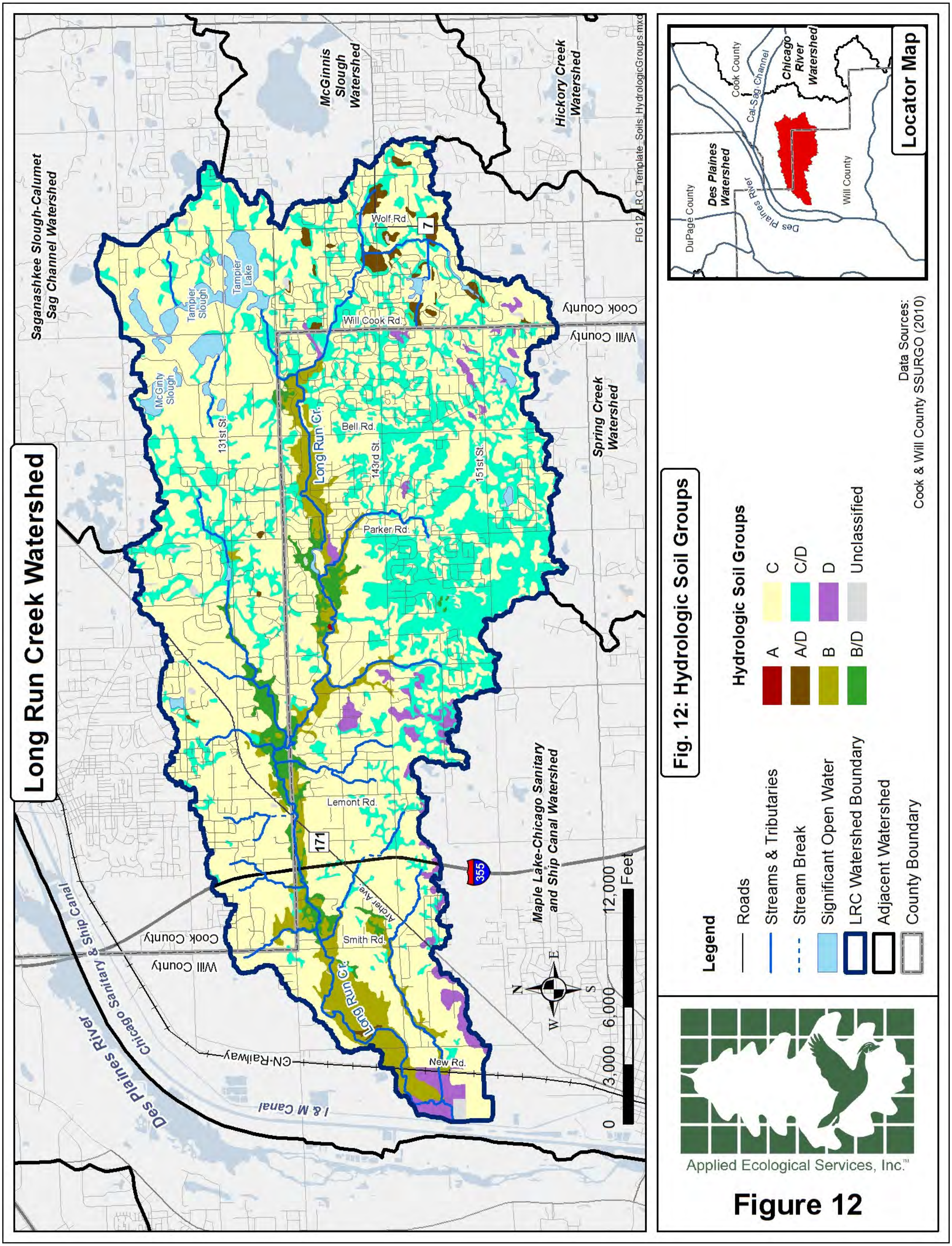


Fig. 12: Hydrologic Soil Groups

Figure 12

3.5 JURISDICTIONS, ROLES, & PROTECTIONS

Long Run Creek watershed is located in two counties, portions of six townships, and five municipalities (Table 5, Figure 13). Most of the northern portion of the watershed (7,556; 45%) is located in Cook County while the remaining 9,158 acres (55% of the watershed) in the southern and far eastern portions of the watershed are located in Will County. Of the five municipalities in the watershed, Homer Glen is the largest (6,578 acres; 39%) followed by Lemont (1,364 acres; 8%) and Orland Park (1,276; 8%). Lockport and Palos Park account for 817 acres or 5% of the watershed. The largest Unincorporated areas are found in Lemont Township (2,205 acres; 13%) and Lockport Township (1,305 acres; 6%). In addition, conservation areas at John J. Duffy Preserve and Long Run Seep account for another 1,702 acres or 10% of the watershed. These areas are owned and managed by the Forest Preserve District of Cook County (FPDCC) and Illinois Nature Preserves Commission (INPC), respectively.

Table 5. County, township, unincorporated, and municipal jurisdictions.

Jurisdiction	Area (acres)	% of Watershed
County	**16,714**	**100**
Cook	7,556	45
Will	9,158	55
Township	**16,714**	**100**
Du Page Township	96	<1
Homer Township	7,757	46
Lemont Township	4,391	26
Lockport Township	1,305	8
Orland Township	1,896	11
Palos Township	1,269	8
Unincorporated Areas	**5,073**	**30**
Unincorporated Du Page Twp.	92	1
Unincorporated Homer Twp.	971	6
Unincorporated Lemont Twp.	2,205	13
Unincorporated Lockport Twp.	1,017	6
Unincorporated Orland Twp.	625	4
Unincorporated Palos Twp.	163	1
Municipalities	**10,034**	**60**
Homer Glen	6,578	39
Lemont	1,364	8
Lockport	507	3
Orland Park	1,276	8
Palos Park	310	2
Conservation Areas	**1,702**	**10**
John J. Duffy Preserve	1,613	10
Long Run Seep Nature Preserve	89	<1

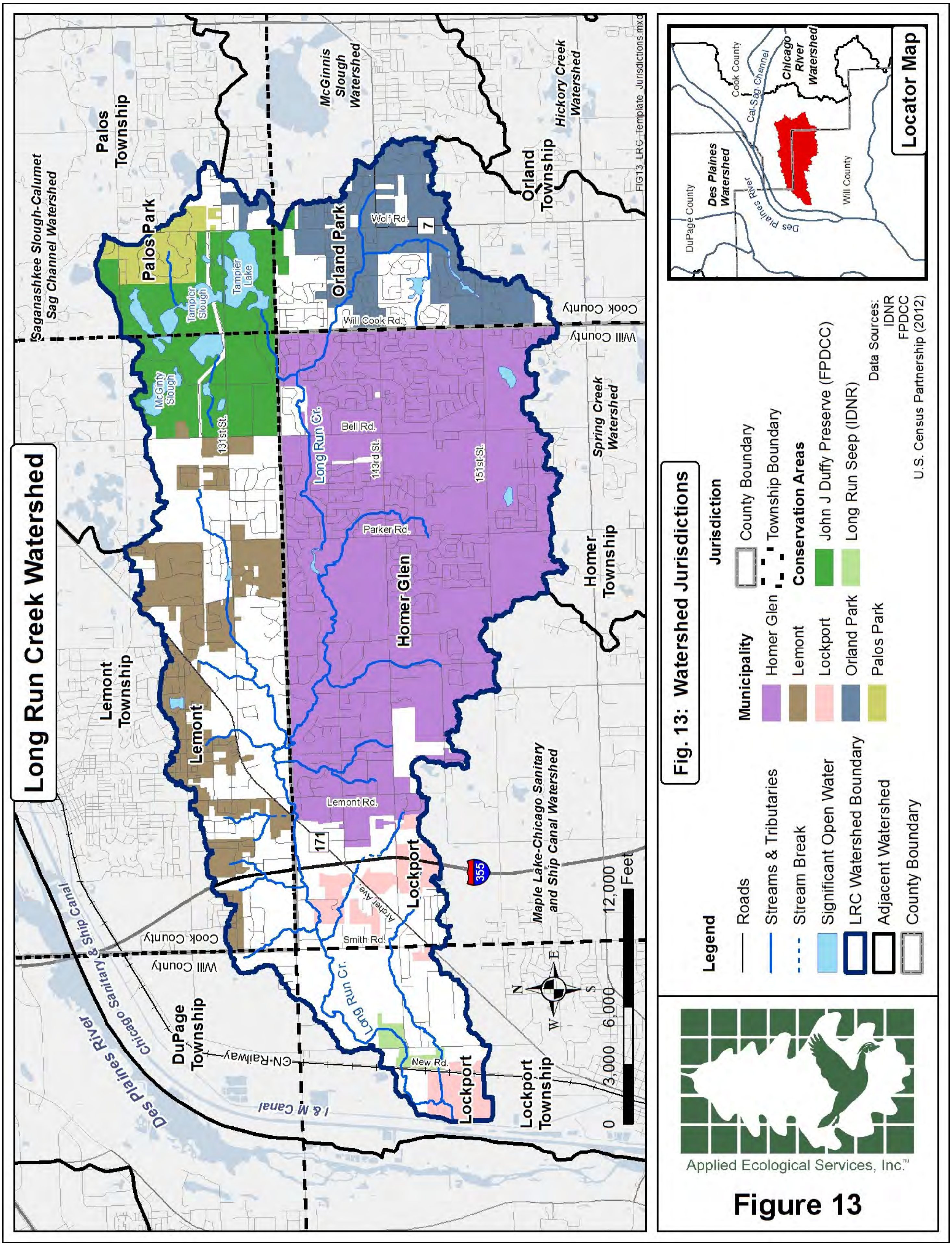


Fig. 13: Watershed Jurisdictions

Figure 13

Jurisdictional Roles and Protections

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 county 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 ordinances that address other natural resource issues. The Illinois EPA Bureau of Water regulates wastewater and stormwater discharges to streams and lakes. Watershed protection in Cook and Will Counties is primarily the responsibility of county and municipal level government.

Land development affecting water resources (rivers, streams, lakes, 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 jurisdictional wetlands.

Land development in Will County is regulated by the Will County Stormwater Management Ordinance (last revised March 25, 2010). In October 2013 the Metropolitan Water Reclamation District of Greater Chicago (MWRD) adopted the Cook County Watershed Management Ordinance. Ordinances are enforced by county agencies or by "Certified Communities" or "Authorized Municipalities." Homer Glen, Lockport, and Orland Park are all "Certified Communities" in the Will County portion of the watershed. Lemont, Palos Park, and Orland Park have the option to become "Authorized Municipalities" and enforce the Cook County Watershed Management Ordinance.

Land development located on unincorporated land within Cook and Will Counties is ultimately regulated by the Cook County Department of Building and Zoning and Will County Land Use Department respectively. Unincorporated areas include 92 acres in Du Page Township, 971 acres in Homer Township, 2,205 acres in Lemont Township, 1,017 acres in Lockport Township, 625 acres in Orland Township, and 163 acres in Palos Township. Development in these townships must be reviewed by the respective agencies listed above.

Other governments and private entities with watershed jurisdictional or technical advisory roles include the USFWS and IDNR, County Board Districts, and the Will/South Cook Soil and Water Conservation District (SWCD). The USFWS and IDNR 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 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. Municipal codes present opportunities for outlining and requiring recommendations in this plan such as conservation development, Special Service Area (SSA) or watershed protection fees, and native landscaping.

NPDES Phase II Stormwater Permit Program

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 municipal separate stormsewer systems (MS4's) and construction sites.

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

SECTION 3.0

coverage, and construction sites hydrologically disturbing greater than 1 acre of land. 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) and measure goals for six minimum control measures:

1. Public education and outreach
2. Public participation and involvement
3. Illicit discharge detention and elimination
4. Construction site runoff control
5. Post-construction runoff control
6. Pollution prevention and good housekeeping

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 Notice of Intent (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.

All of the municipalities and townships in Long Run Creek watershed have been issued NPDES permits by Illinois EPA for stormwater discharges to MS4s. There are also two NPDES permitted wastewater treatment plant (WWTP) discharges to Long Run Creek. Chickasaw Hills WWTP discharges under NPDES Permit No. IL0031984. Derby Meadows WWTP discharges under NPDES Permit No. IL0045993.

3.6 EXISTING POLICIES & ORDINANCE REVIEW

Protection of natural resources and green infrastructure during future urban growth will be important for the future health of Long Run Creek watershed. To assess how future growth might further impact the watershed, an assessment of local municipal ordinances was performed to determine how development currently occurs in each municipality. In this way, potential improvements to local ordinances can be identified. As part of the assessment, municipal governments were asked to compare their local ordinances against model policies outlined by the Center for Watershed Protection (CWP) in a publication entitled "*Better Site Design: A Handbook for Changing Development Rules in Your Community*. (CWP, 1998)"

Applied Ecological Services, Inc. (AES) began the assessment process by reviewing municipal ordinances for Homer Glen, Lemont, Lockport, Orland Park, and Palos Park. The results of the initial review were then sent to each municipality for review and update if needed. Lemont, Homer Glen, and Orland Park provided updates that were then added to AES's original review. The results of the review for each municipality can be found in Appendix C.

CWP's recommended ordinance review process involves assessments of three general categories including "Residential Streets & Parking Lots," "Lot Development," and "Conservation of Natural Areas." Various questions with point totals are examined under each category. The maximum score is 100. CWP also provides general rules based on scores. Scores between 60 and 80 suggest that it may be advisable to reform local development ordinances. Scores less than 60 generally mean that local ordinances are not environmentally friendly and serious reform may be needed. Municipal scores ranged from 7 to 50 with an average score of 29 (Figure 14).

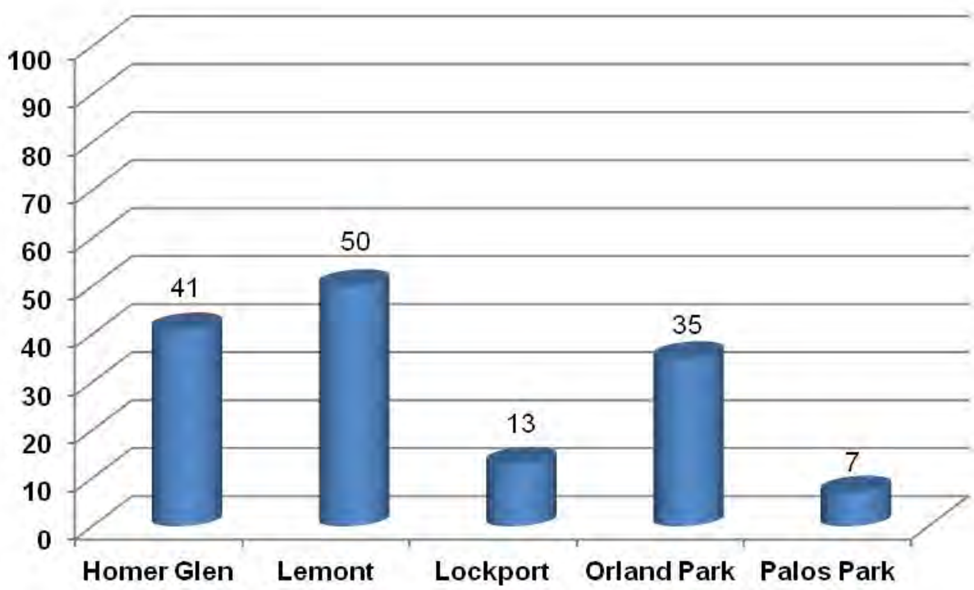


Figure 14. Center for Watershed Protection ordinance review results for local municipalities.

Lemont scored the highest with 50 points followed by Homer Glen with 41 and Orland Park with 35 points. Although all scores are low, it should be noted that this assessment is meant to be a tool to local communities to help guide development of future ordinances. Various policy recommendations are included in the Action Plan section of the report to address general ordinance deficiencies.

3.7 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 Long Run Creek watershed (Table 6). 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. The data is generated by township, range, and quarter section and is depicted on Figures 15 and 16. It is also important to note that much of CMAP's work was done prior to the economic downturn beginning in 2006/2007 and may not accurately reflect future projections. Note: Applied Ecological Services, Inc. (AES) used GIS to overlay the Long Run 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. It is important to note that this methodology makes best use of the data limitations but likely increases estimates, especially for municipalities such as Lemont that have urbanized areas along the north portion of the watershed boundary.

The combined population of the watershed is expected to increase from 42,344 in 2010 to 62,403 by 2040, a 47.4% increase. Household change follows this trend and is predicted to increase from 13,156 to 19,684 (49.6% increase). The highest population and household increase is expected in areas that are currently agriculture along Bell Road and 151st Street within the Village of Homer Glen (Figure 15). Most employment change is also predicted along Bell Road and 151st Street in areas with predicted household/population change (Figure 16).

Socioeconomic Status

The communities within the watershed can best be described as actively growing and affluent. These "satellite" suburbs of the Chicago region offer excellent amenities such as parks, shopping, conservation areas, quality schools and libraries, safe neighborhoods, and are in close proximity to commuter rail and interstate access. 2010 U.S. Census Bureau information for the Villages of Homer Glen, Lemont, and Orland Park, the largest communities in the watershed, were averaged and used as a basis for profiling the socioeconomic status of Long Run Creek watershed. To summarize, the area is comprised of a mostly white population (>92%) with a median household income over $87,000. In addition, approximately 90% of housing units are owner occupied, about 38% of residents hold a college bachelor's degree or higher, and over 70% of the employed population work in white collar/professional jobs.

Table 6. CMAP 2010 data and 2040 forecast data.

Data Category	2010	2040	Change (2010-2040)	Percent Change
Population	42,344	62,403	20,059	+47.4
Household	13,156	19,684	6,528	+49.6
Employment	9,338	15,045	5,706	+61.1

Source: Chicago Metropolitan Agency for Planning 2040 Forecasts

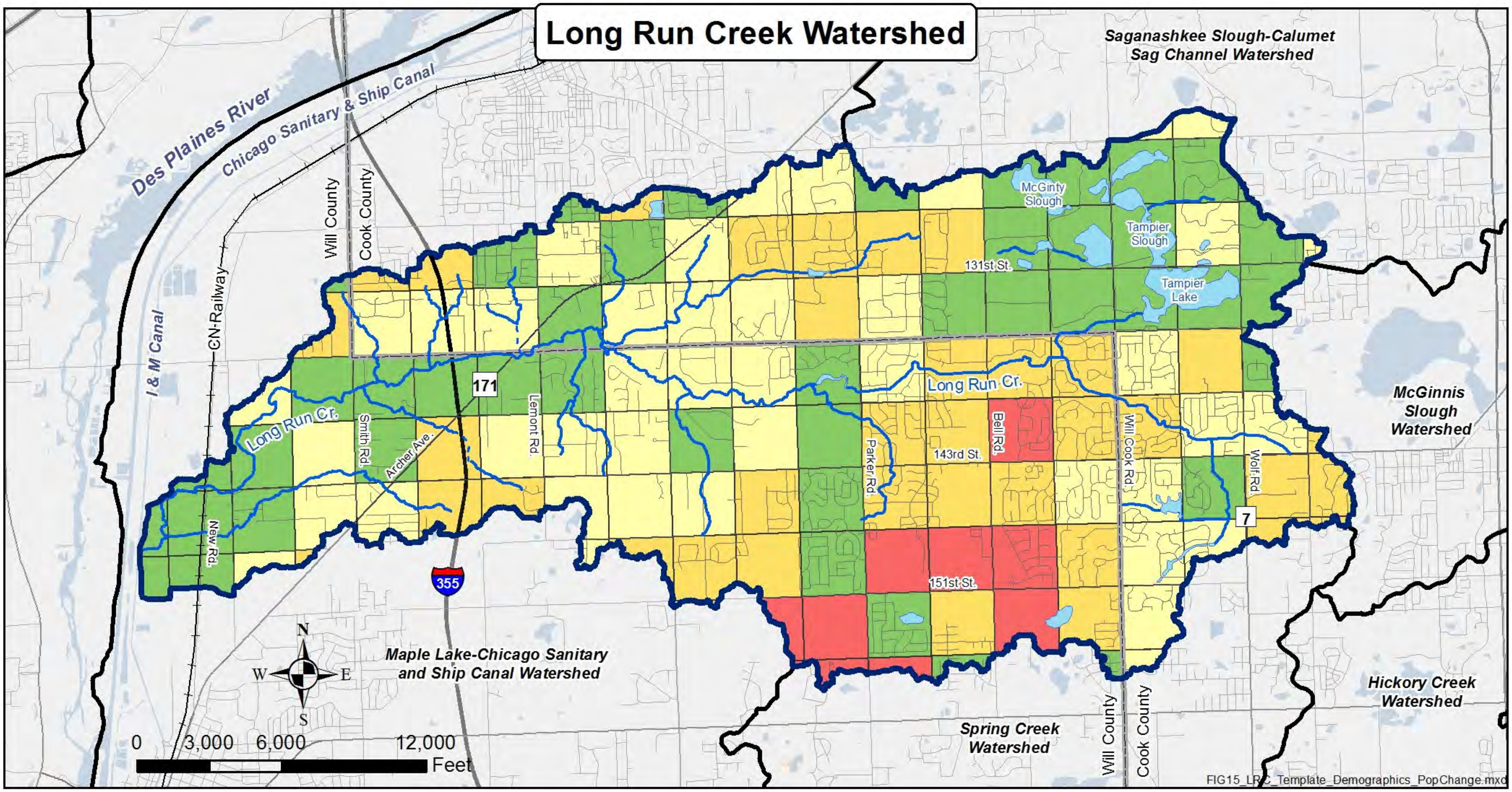


Fig. 15: Population and Household Change Year 2010 to 2040

Legend

- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Population Change (# of people)	Household Change (# of homes)
-44 to 40	-14 to 16
41 to 120	17 to 42
121 to 400	43 to 150
401 to 950	151 to 300

Data Sources:
CMAP (2040 Forecast)

Applied Ecological Services, Inc.™

Figure 15

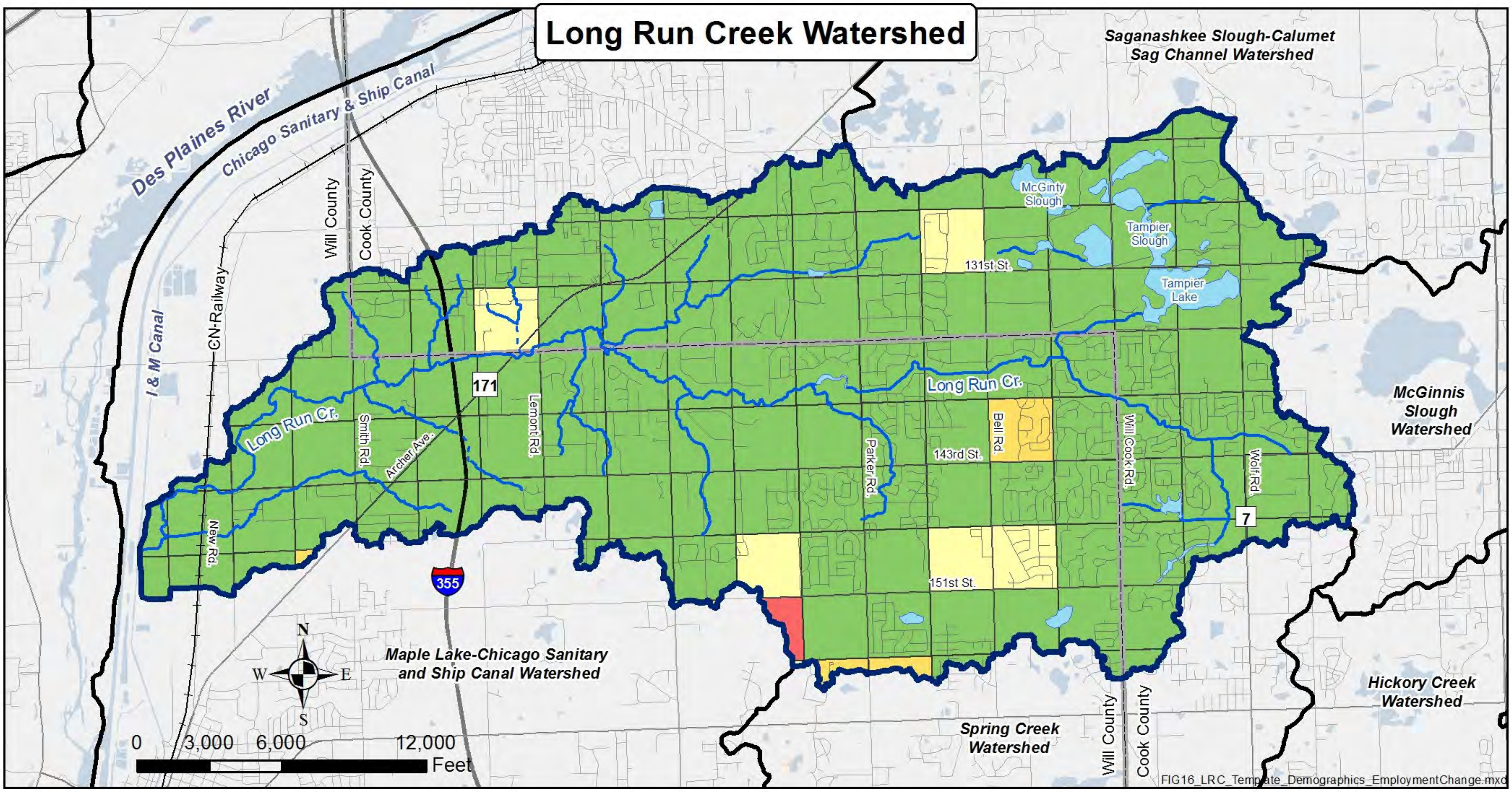


Fig. 16: Employment Change Year 2010 to 2040

Legend

- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Employment Change 2010 - 2040 (# of people)

- 0 to 100
- 101 to 300
- 301 to 800
- 801 to 1554

Data Sources:
CMAP (2040 Forecast)

Applied Ecological Services, Inc.™

Figure 16

3.8 EXISTING & FUTURE LAND USE/LAND COVER

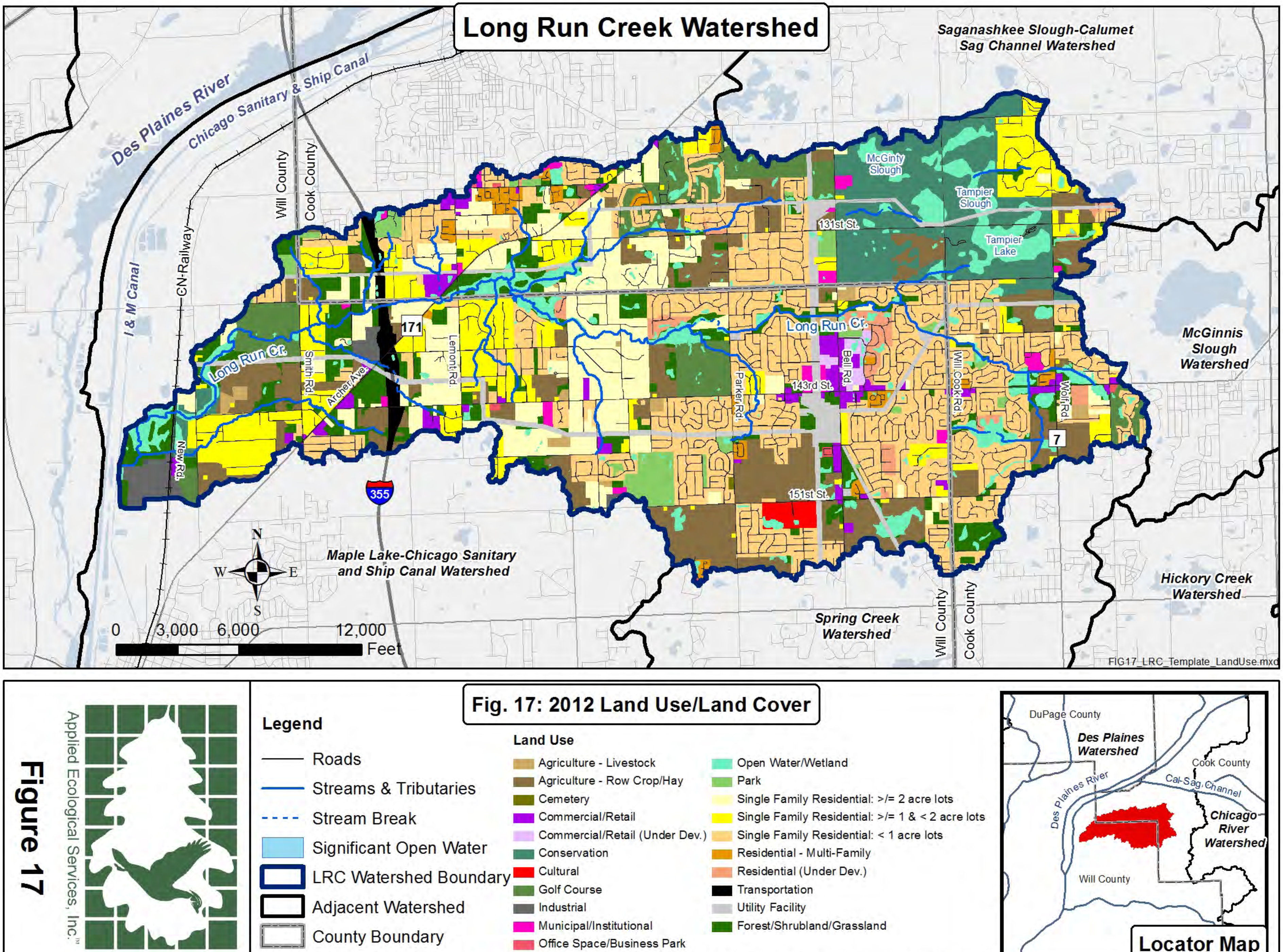
2012 Land Use/Land Cover

Highly accurate land use/land cover data was produced for Long Run Creek watershed using several sources of data. First, Chicago Metropolitan Agency for Planning (CMAP) 2005 land use data was used as a base layer. Next, the most recent land use/land cover data from the municipalities in the watershed was obtained from comprehensive plans and adjustments were made to CMAP's data where appropriate. 2012 USDA aerial photography of the watershed was also overlaid on existing land use data in GIS so that additional discrepancies could be corrected. Finally, several corrections were made to land use based on field notes taken by Applied Ecological Services, Inc (AES) during the fall of 2012 watershed resource inventory. The 2012 land use/land cover data and map for Long Run Creek watershed is included in Table 7 and depicted on Figure 17. Land cover classifications are defined in the "Noteworthy-Land Use/Land Cover Definitions" side bar below.

Residential areas are the most abundant land use in the watershed at 7,231 acres or 44.4%. Other common land uses include agricultural (2,010.9; 12%), private forest/shubland/grassland (1,236.3 acres; 7.4%), public conservation areas (1,210.7 acres; 7.2%), open water/wetland (1,160.5 acres; 6.9%), transportation (905.3 acres; 5.4%), golf courses (748.6 acres; 4.5%), and utility facilities (703 acres; 4.2%).

Table 7. 2012 land use/land cover classifications and acreage.

Land Use	Area (acres)	% of Watershed
Agricultural-Livestock	100.8	0.6
Agriculture-Row Crop/Hay	2,010.9	12.0
Cemetery	3.7	<0.5
Commercial/Retail	313.1	1.9
Commercial/Retail (under dev.)	52.8	<0.5
Conservation (public)	1,210.7	7.2
Cultural	67.1	<0.5
Golf Course	748.6	4.5
Industrial	158.9	0.9
Municipal/Institutional	124.7	0.7
Office Space/Business Park	17.9	<0.5
Open Water/Wetland	1,160.5	6.9
Park	275.4	1.6
Single Family Residential (2 acre lots)	1,878.0	11.2
Single Family Residential (1 acre & < 2 acre lots)	1,578.1	9.4
Single Family Residential (< 1 acre lots)	3,774.9	22.6
Residential-Multifamily	195.9	1.2
Residential (under dev.)	196.5	1.2
Transportation	905.3	5.4
Utility Facility	703.0	4.2
Forest/Shrubland/Grassland (private)	1,236.3	7.4
Total	**16,714.0**	**100**



Data Sources: CMAP 2005 Land Use modified during 2012 AES Inventory; municipal comprehensive plans

Figure 17

Agricultural land dominated the watershed from the late 1800s to the 1990s. Agricultural row crops and hay operations are reduced to 2,110.9 acres or 12% of the watershed in 2012. Agricultural areas are spread out with the largest tracts remaining in the south central portion of the watershed. Several of these areas are slated for future residential and commercial development.

Most natural areas can be found in forest/shrubland/grassland, open water/wetlands, and conservation land uses. Forest/shrubland/grassland areas are generally private and are scattered throughout the watershed while conservation areas are public and include Cook County Forest Preserve District's (CCFPD's) John J. Duffy Preserve in the northeast corner of the watershed and the Illinois Nature Preserve Commission's (INPC's) Long Run Seep in the far west portion of the watershed. Many of the open water/wetland features are located in and around natural areas with the largest wetland complexes found in the corridor along Long Run Creek and the largest lake/slough complexes found within John J. Duffy Preserve.

The roads and interstates making up the transportation network are abundant. Interstate 355, in the western half of the watershed, is a major north-south interstate connecting many western Chicago suburbs. Other major two lane roads include east-west roads 127th Street, 131st Street, 143rd Street, and 151st Street. Major north-south two land roads are New Road, Smith Road, Lemont Road, Parker Road, Bell Road, Will-Cook Road, and Wolf Road. Many secondary two lane roads also traverse the watershed within residential areas.


Utility easement off High Road

The area in and around Long Run Creek watershed is dense with golf courses. Until December 2013, there were eight golf courses found in the watershed: 1) Lockport Golf and Recreation, 2) Big Run Golf Club, 3) Ruffled Feathers Golf Course, 4) Glen Eagles Country Club, 5) Crystal Tree Golf & Country Club, 6) Old Oak Country Club, 7) Mid Iron Golf Club, and) Woodbine Golf Course. Woodbine Golf Course was purchased in December 2012 by Homer Glen and will become mostly park. The club house will become the Village Hall.

Unique to Long Run Creek watershed is a diverse system of Com Ed utility easements/corridors that stem from a main power plant located on the west side of Bell Road in the south central portion of the watershed. Utility corridors provide opportunities for trails and green infrastructure connections.

In addition, total open space land uses such as agricultural lands, conservation, golf courses, open water/wetlands, parks, utility easements, and forest/shrubland/grassland make up 7,446 acres or 44.5% of the watershed. Developed land uses account for the remaining 9,268 acres or 55.5% of the watershed.

Noteworthy-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 grazing. Also includes nurseries, greenhouses, orchards, tree farms, and sod farms.

Cemetery: Land use that includes burial grounds and associated chapels and mausoleums.

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

Conservation: Open space in a mostly natural state that includes public land such as federal, state, county, or other conservation areas and nature preserves.

Cultural: Land use that includes museums, zoos, historic sites, amphitheaters, stadiums, race tracks, conference centers, fairgrounds, and amusement parks.

Golf Course: Public or private golf courses, country clubs and driving ranges; including associated buildings and parking.

Municipal/Institutional: Land use that includes medical facilities, educational facilities, government buildings, religious facilities, and others.

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

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

Open Water & Wetland: Open water and wetland areas including rivers, streams, canals, lakes, ponds, detention basins, reservoirs, lagoons/sloughs, marshes, wet prairie, meadows, bogs, etc.

Park: Recreational open space with greater than 50% manicured turf such as playgrounds and athletic fields.

Single Family Residential (≥ 2 acre lots): Land use that includes single family homes and farmhouses and immediate residential area around them with lot sizes greater than or equal to 2 acres and impervious cover less than 5%.

Single Family Residential (≥ 1 acre & < 2 acre lots): Land use that includes single family homes and farmhouses and immediate residential area around them with lot sizes greater than or equal to 1 acre but less than 2 acres and impervious cover around 15%.

Single Family Residential (< 1 acre lots): Land use that includes single family homes and farmhouses and immediate residential area around them with lot sizes less than 1 acre and impervious cover around 30%.

Residential-Multifamily: Land use that includes multifamily residences. These include duplex and townhouse units, apartment complexes, retirement complexes, mobile home parks, trailer courts, condominiums, and associated parking on lots less than 1/8 acre with impervious cover around 65%.

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

Upland Forest and Grassland: Natural land cover that includes private and public property that has not been developed for any human purpose.

Utility Facility: Land use that includes telephone, radio and television towers, dishes, gas, sewage pipeline, right-of-ways, waste water facilities, etc.

Future Land Use/Land Cover Predictions

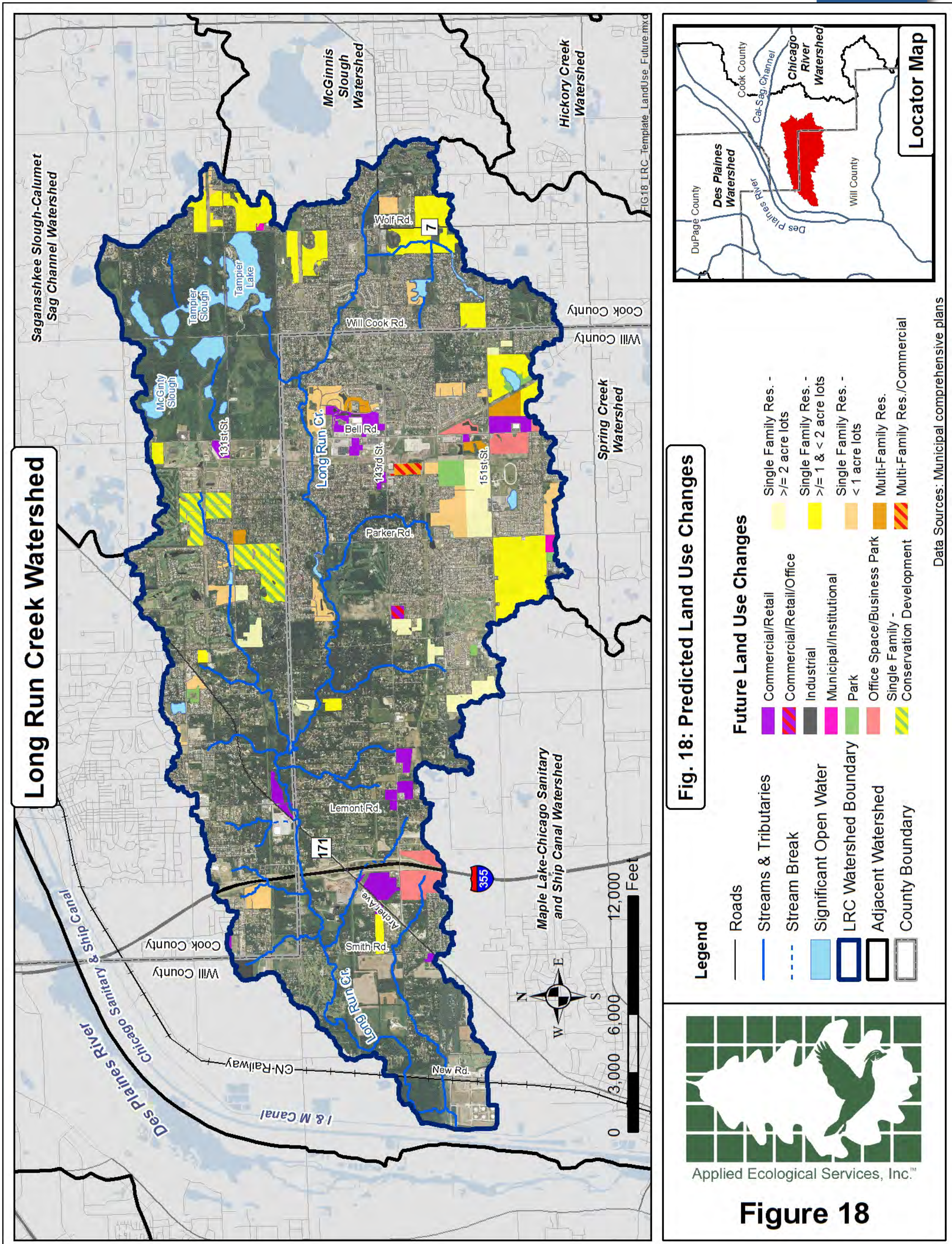
Information on predicted future land use/land cover for the watershed was obtained primarily from municipal comprehensive plans where available. Available data was analyzed and GIS used to map predicted land use/land cover changes. The results are summarized in Table 8 and Figure 18.

Table 8 compares existing land use/land cover acreage to predicted future land use/land cover acreage. The largest loss of a current land use/land cover is expected to occur on agricultural row crop/hay land where approximately 1,581.4 acres of the existing 2,010.9 acres (78.3% decrease) is expected to be converted to mostly residential and commercial/retail land uses. The majority of these changes are expected to occur in the eastern half of the watershed within the municipalities of Lemont, Orland Park, and Homer Glen. In addition, it is important to note that existing forest/shrubland/grassland is also expected to decrease significantly from 1,236.3 acres to 1,008.6 acres in the future, an 18.9% decrease. To summarize, about 1,944 acres of existing open space within agricultural lands, open water/wetland, and forest/shrubland/grassland is expected to be lost to development. However, it is also important to note that 80 acres of public parks are expected to be created, a 50% increase from existing acreage. Revamping of Woodbine Golf Course by Home Glen in the future will add another 100+ acres of park land.

Conversely, commercial/retail development and office space are predicted to increase by over 400 acres. But the most development change occurs where residential land uses will replace primarily farm land and account for nearly 1,600 additional acres in the future.

Table 8. Comparison between 2012 and predicted future land use/land cover statistics.

Land Use/Land Cover	Current Area (acres)	Current % of Watershed	Predicted Area (acres)	Predicted % of Watershed	Change (acres)	Percent Change
Agricultural-Livestock	100.8	0.6	91.1	0.5	-9.7	-16.7
Agriculture-Row Crop/Hay	2,010.9	12.0	429.5	2.6	-1,581.4	-78.3
Cemetery	3.7	<0.5	3.7	<0.5	0	0
Commercial/Retail	313.1	1.9	558.3	3.3	+245.2	+73.7
Commercial/Retail (under dev.)	52.8	<0.5	0	0	-52.8	-100.0
Conservation (public)	1,210.7	7.2	1210.7	7.2	0	0
Cultural	67.1	<0.5	67.1	<0.5	0	0
Golf Course	748.6	4.5	748.6	4.5	0	0
Industrial	158.9	0.9	182.1	1.1	+23.2	+22.2
Municipal/Institutional	124.7	0.7	138.7	0.8	+14.0	+14.3
Office Space/Business Park	17.9	<0.5	174.4	1.0	+156.5	+100.0
Open Water/Wetland	1,160.5	6.9	1,095.2	6.6	-65.3	-4.3
Park	275.4	1.6	355.0	2.1	+79.6	+50.0
Single Family Residential (≥ 2 acre lots)	1,878.0	11.2	1,136.1	12.8	+258.1	+14.3
Single Family Residential (≥ 1 & < 2 acre lots)	1,578.1	9.4	2,336.3	14.0	+758.2	+48.9
Single Family Residential (< 1 acre lots)	3,774.9	22.6	4,081.4	24.4	+306.5	+8.0
Residential-Multifamily	195.9	1.2	264.3	1.6	+68.4	+33.3
Residential (under dev.)	196.5	1.2	0	0	-196.5	-100.0
Transportation	905.3	5.4	905.3	5.4	0	0
Utility Facility	703.0	4.2	703.0	4.2	0	0
Forest/Shrubland/Grassland (private)	1,236.3	7.4	1,008.6	6.0	-227.7	-18.9



Long Run Creek Watershed
Fig. 18: Predicted Land Use Changes
Saganashkee Slough-Calumet Sag Channel Watershed
McGinnis Slough Watershed
Hickory Creek Watershed
Spring Creek Watershed
Maple Lake-Chicago Sanitary and Ship Canal Watershed
Des Plaines River
Chicago Sanitary & Ship Canal
I & M Canal
CN-Railway
Cook County
Will County
Tampier Lake
Tampier Slough
McGinty Slough
Wolf Rd.
Will Cook Rd.
Bell Rd.
131st St.
143rd St.
151st St.
Parker Rd.
Long Run Cr.
Lemont Rd.
Smith Rd.
Archer Ave.
New Rd.
7
171
355
0 3,000 6,000 12,000 Feet
FIG18_LRC_Template_LandUse_Future.mxd
Locator Map
DuPage County
Des Plaines Watershed
Des Plaines River
Cal-Sag Channel
Cook County
Chicago River Watershed
Will County
Legend
Roads
Streams & Tributaries
Stream Break
Significant Open Water
LRC Watershed Boundary
Adjacent Watershed
County Boundary
Future Land Use Changes
Commercial/Retail
Commercial/Retail/Office
Industrial
Municipal/Institutional
Park
Office Space/Business Park
Single Family - Conservation Development
Single Family Res. - >/= 2 acre lots
Single Family Res. - >/= 1 & < 2 acre lots
Single Family Res. - < 1 acre lots
Multi-Family Res.
Multi-Family Res./Commercial
Data Sources: Municipal comprehensive plans
Applied Ecological Services, Inc.™
Figure 18

3.9 TRANSPORTATION NETWORK

Roads

There are approximately 286 miles of roads in the watershed. Two lane roads make up 280 miles and four lane roads make up the remaining 6 miles. Four lane roads include Interstate 355 and two sections of 143rd Street. Interstate 355 (Veterans Memorial Tollway) is the most highly used road in the watershed and connects to I-55, I-88, and I-290 north of the watershed and to I-80 south of the watershed (Figure 19). The portion of the interstate between I-55 and I-80 was recently constructed and opened in November 2007. The extension was delayed for over six years however due to the discovery of the federally endangered Hine's Emerald Dragonfly. The Tollway Authority was required to address Environmental Impact Statement (EIS) concerns and funded several habitat restoration projects in nearby preserves.

Several other major roads are worth mentioning. Major east-west roads include 127th Street, 131st Street, 135th Street, 143rd Street, and 151st Street. Major north-south roads include New Road, Smith Road, Lemont Road, Parker Road, Bell Road, Will-Cook Road, and Wolf Road.

Railroads

The Canadian National Railway (CN) purchased the Illinois Central (IC) line in 1998. The IC line ran thru Lemont and served various industries. CN then purchased the Elgin, Joliet & Eastern Railway Company (EJ&E) in 2009. The railway runs north-south along New Road in the far west portion of the watershed (Figure 19). The CN system 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 seen increased freight traffic from across the US, allowing railway traffic to bypass the congested rail system of the City of Chicago.

Trails/Bike Paths

Available data on the location of existing trails and bike paths in the watershed reveals a relatively broken network (Figure 19). Homer Glen and Cook County Forest Preserve District (CCFPD) have done the best job of creating and connecting trail networks but many opportunities remain, especially along existing Com Ed utility easement right-of-ways that span the entire watershed. According to most municipal comprehensive plan transportation maps, most of the municipalities in the watershed show proposed trails and bike paths that traverse and connect much of the watershed however most of these trail systems remain in the planning phase. A good system of trails would give the community a unique opportunity to interact with nature and see the benefits of green infrastructure planning.

Horse/walking trail in John J. Duffy Preserve

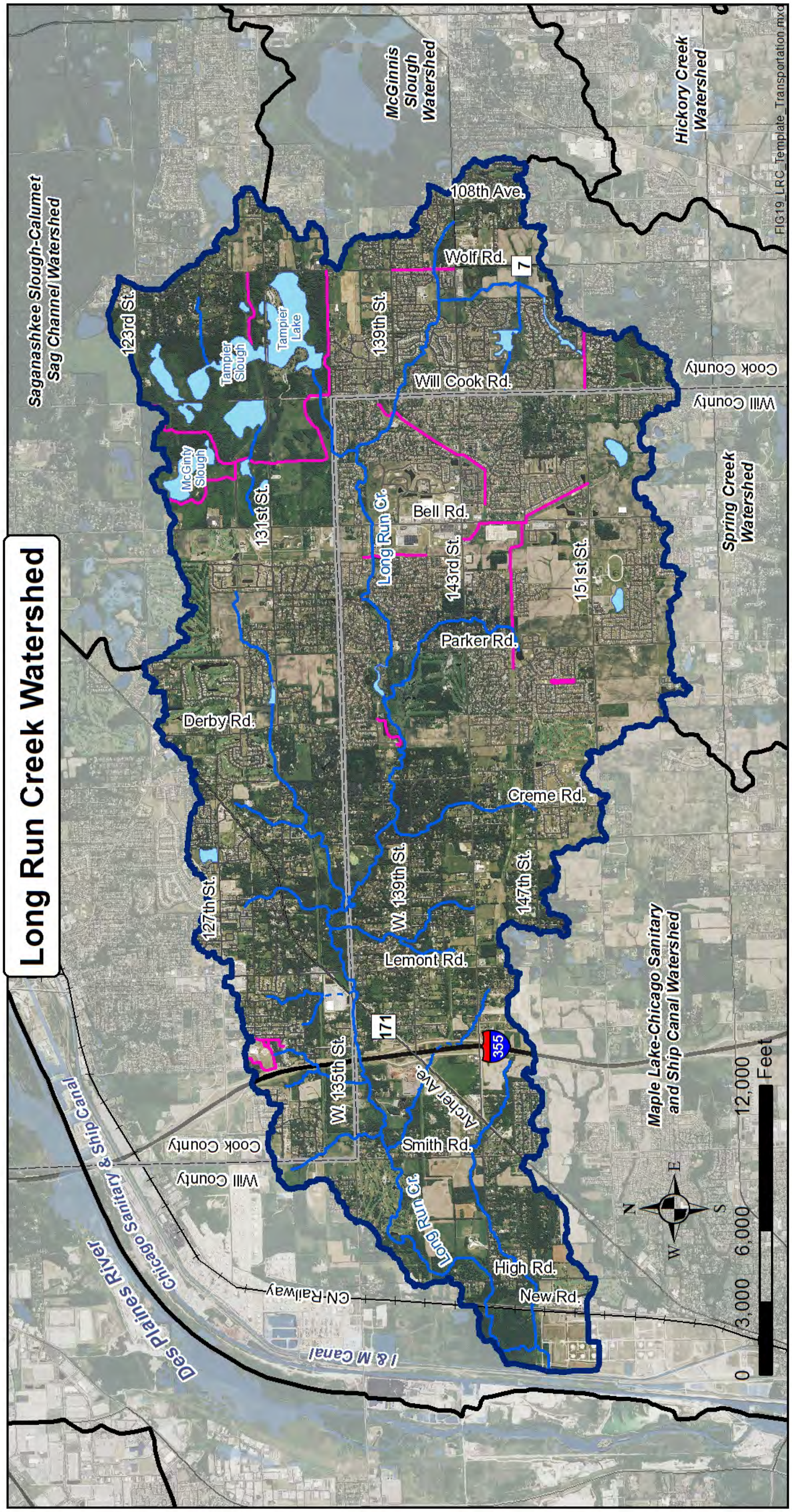
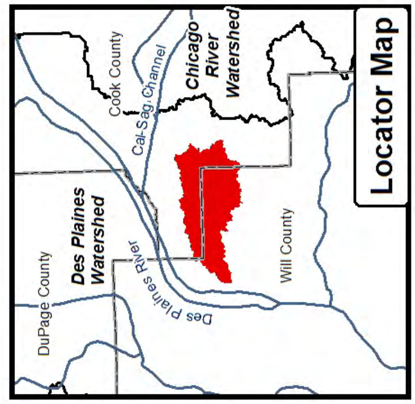


Fig. 19: Existing Transportation Network

Existing Walking/Bike Paths

Legend

- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary



Data Sources:
Municipal comprehensive plans; TIGER 2010

Applied Ecological Services, Inc.™

Figure 19

3.10 IMPERVIOUS COVER

Impervious cover is defined as 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 (Figure 20). 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 9). 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 resulting in a shift from sensitive species to ones that are more tolerant of pollution and hydrologic stress.

Figure 20. Relationship between impervious surfaces, evapotransporation, & infiltration. Source: The Federal Interagency Stream Restoration Working Group, 1998 (Rev. 2001).

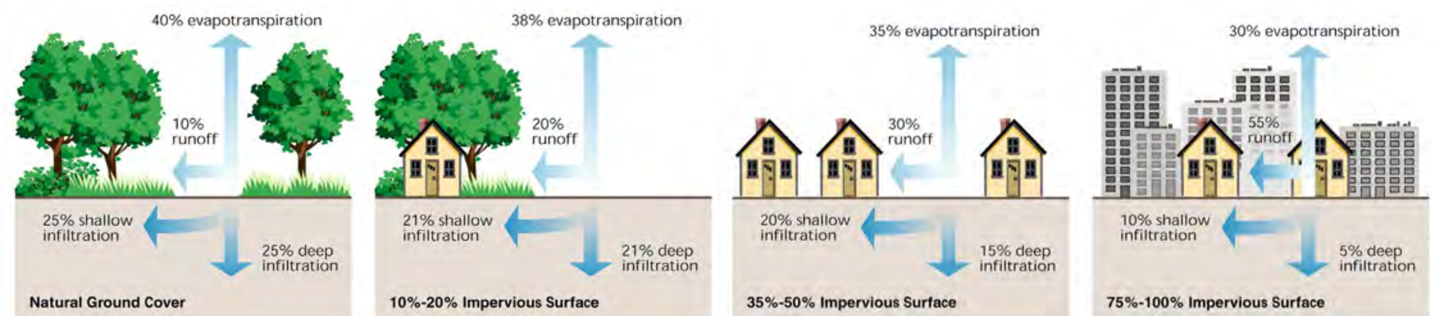


Table 9. Impervious category & corresponding stream condition via the Impervious Cover Model. Source: Zielinski, 2002.

Category	% Impervious	Stream Condition within Subwatershed
Sensitive	<10%	Stable stream channels, excellent habitat, good water quality, and diverse biological communities
Impacted	>10% but <25%	Somewhat degraded stream channels, altered habitat, decreasing water quality, and fair-quality biological communities.
Non-Supporting	>25%	Highly degraded stream channels, degraded habitat, poor water quality, and poor-quality biological communities.

Sensitive Stream

Impacted Stream

Non-Supporting Stream

The following paragraphs describe the implications of increasing impervious cover:

Water Quality Impacts

Imperviousness affects water quality in streams and lakes by increasing pollutant loads and water temperature. Impervious surfaces accumulate pollutants from the atmosphere, vehicles, roof surfaces, lawns and other diverse sources. During a storm event, pollutants such as nutrients (nitrogen and phosphorus), metals, oil/grease, and bacteria are delivered to streams and lakes. 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 Flow Impacts

Higher impervious cover translates to greater runoff volumes thereby changing hydrology and flows in streams. 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 results in increased flows because wetlands and open space typically soak up rainfall and release it slowly via groundwater discharge 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

A threshold in habitat quality exists at approximately 10% to 15% imperviousness (Booth and Reinelt, 1993). 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 benthic macroinvertebrates and some fish species. Physical habitat degradation also occurs when high and frequent flows result in loss of riffle-pool complexes.

2012 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 at the beginning of this subsection to classify Subwatershed Management Units (SMUs). SMUs are defined and examined in more detail in Section 3.3.

Applied Ecological Services, Inc. (AES) used a modified Vulnerability Analysis to compare each SMU's vulnerability to predicted land use changes across Long Run Creek watershed. Three steps were used to generate a vulnerability ranking of each SMU. The results were used to make and rank 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 on the following pages:

Step 1: Existing impervious cover classification of SMUs based on 2012 land use/land cover
Step 2: Predicted future impervious cover classification of SMUs based on predicted land use/land cover changes
Step 3: Vulnerability Ranking of SMUs based on changes in impervious cover and classification

Step 1: Existing Impervious Cover Classification

Step 1 in the Vulnerability Analysis is an existing classification of each SMU based on 2012 land use/land cover and measured impervious cover. 2012 impervious cover was calculated by assigning an impervious cover percentage for each land use/land cover category based upon the United States Department of Agriculture's (USDA) Technical Release 55 (TR55) (USDA 1986). Highly developed land such as commercial/retail for example is estimated to have over 70% impervious cover while a typical medium density residential development exhibits around 25% impervious cover. Open space areas such as forest preserves generally have less than 5% impervious cover. GIS analysis was used to estimate the percent impervious cover for each SMU in the watershed using 2012 land use/land cover data. Each SMU then received an initial classification (Sensitive, Impacted, or Non-Supporting) based on percent of existing impervious cover (Table 10; Figure 21).

To summarize, three SMUs (SMUs 5, 6, and 19) were classified as Sensitive, twelve as Impacted (SMUs 1, 4, 8, 9, 10, 11, 13, 14, 16, 17, 18, & 20), and five as Non-Supporting (SMUs 2, 3, 7 12, & 15) based on 2012 impervious cover estimates. Sensitive SMUs 5 and 6 include John J. Duffy Preserve in the northeast corner of the watershed. Sensitive SMU 19 is also found in an area with mostly open space comprised of Big Run Golf Club, agricultural land, Long Run Seep Nature Preserve, and wetland areas owned by Hanson Material Services, Inc. Most of the Impacted SMUs are located in the central portion of watershed where medium and low density residential development and scattered agricultural areas are common. All of the Non-Supporting SMUs are associated with highly impervious commercial/retail and high density residential development in portions of Lemont, along Bell Road, and surrounding communities in Homer Glen and Orland Park.

Table 10. 2012 & predicted future impervious cover by Subwatershed Management Unit.

SMU #	Step 1: Existing Impervious %	Existing (2012) Impervious Classification	Step 2: Predicted Impervious %	Predicted Impervious Classification	Percent Change	Step 3: Vulnerability
SMU1	17.6%	Impacted	28.6%	Non-Supporting	11.0%	High
SMU2	26.5%	Non-Supporting	28.3%	Non-Supporting	1.8%	Low
SMU3	29.0%	Non-Supporting	31.0%	Non-Supporting	2.0%	Low
SMU4	22.7%	Impacted	24.2%	Impacted	1.5%	Medium
SMU5	6.7%	Sensitive	8.5%	Sensitive	1.8%	Medium
SMU6	6.7%	Sensitive	7.8%	Sensitive	1.1%	Low
SMU7	25.5%	Non-Supporting	30.3%	Non-Supporting	4.8%	Low
SMU8	20.8%	Impacted	28.7%	Non-Supporting	7.9%	High
SMU9	14.9%	Impacted	16.3%	Impacted	1.4%	Low
SMU10	16.0%	Impacted	16.5%	Impacted	0.5%	Low
SMU11	13.8%	Impacted	15.7%	Impacted	1.9%	Low
SMU12	26.2%	Non-Supporting	26.4%	Non-Supporting	0.2%	Low
SMU13	15.2%	Impacted	22.4%	Impacted	7.2%	Medium
SMU14	19.2%	Impacted	19.9%	Impacted	0.7%	Low
SMU15	32.5%	Non-Supporting	36.7%	Non-Supporting	4.2%	Low
SMU16	22.6%	Impacted	23.0%	Impacted	0.4%	Low
SMU17	12.6%	Impacted	20.5%	Impacted	7.9%	Medium
SMU18	21.6%	Impacted	30.7%	Non-Supporting	9.1%	High
SMU19	7.0%	Sensitive	7.0%	Sensitive	0.0%	Low
SMU20	21.6%	Impacted	28.7%	Non-Supporting	7.1%	High

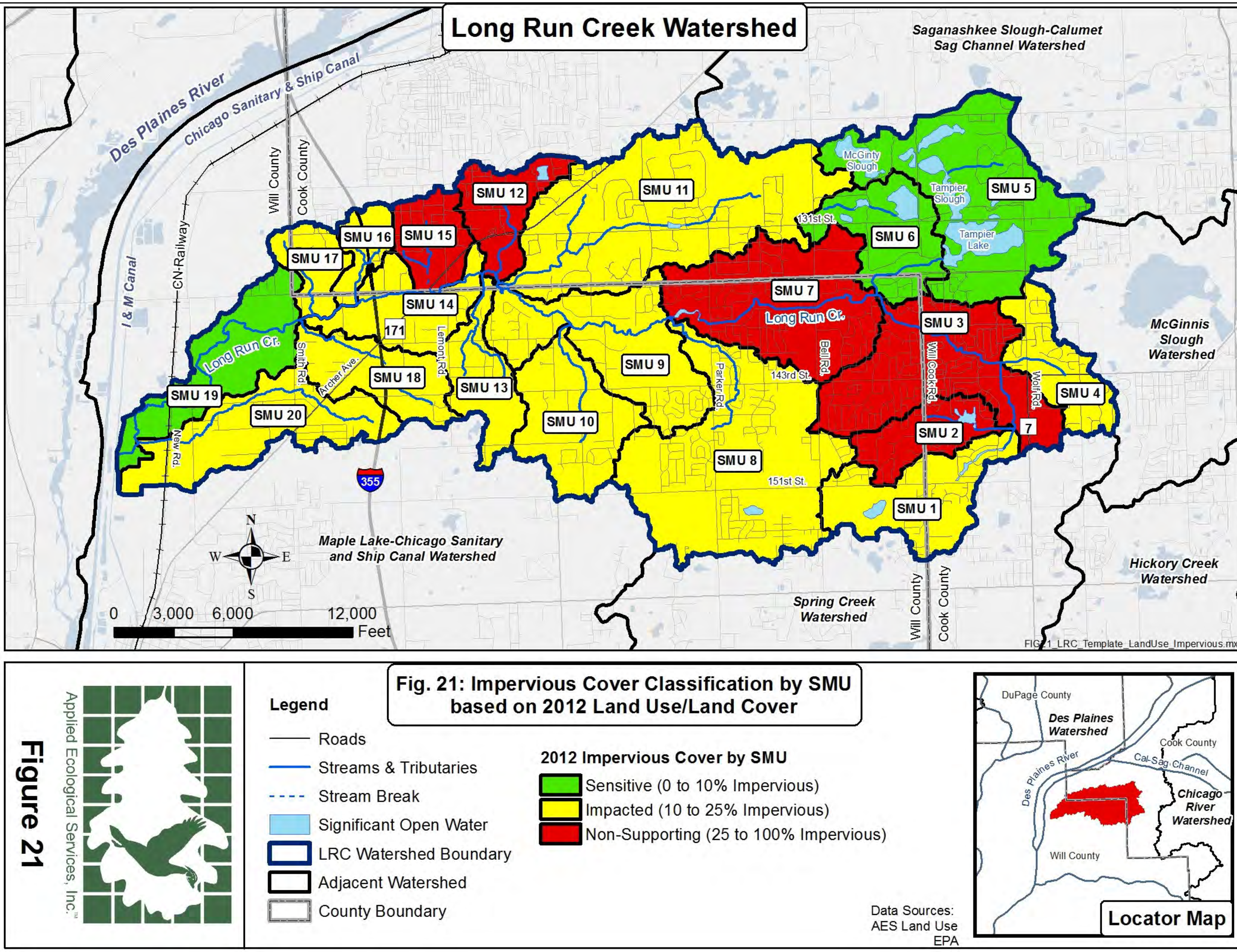


Fig. 21: Impervious Cover Classification by SMU based on 2012 Land Use/Land Cover

Figure 21

Step 2: Predicted Future Impervious Cover Classification

Predicted future impervious cover was evaluated in Step 2 of the vulnerability analysis by classifying each SMU as Sensitive, Impacted, or Non-Supporting based on predicted land use changes. Table 10 and Figure 22 summarize and depict predicted future impervious cover classifications for each SMU. This step identifies Sensitive and Impacted SMUs that are most vulnerable to future development pressure. SMUs 1, 8, 18, and 20 all changed from Impacted to Non-Supporting. These changes are attributed to predicted commercial/retail/office and residential development in the southern and southwest portions of the watershed that are currently agriculture land or other type of open space resulting in a significant increase in impervious cover.

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?
2. Does the SMU classification come close to changing (within 2%)?
3. What is the absolute change in impervious cover from existing to predicted conditions?

Vulnerability to future development for each SMU was categorized as Low, Medium, or High:

Low = no change in classification; <2% change in impervious cover
Medium = classification close to changing (within 2%) and/or 5-10% change in impervious cover
High = classification change or close to changing (within 2%) and/or >10% change in impervious cover

The vulnerability analysis resulted in 4 High, 4 Medium, and 16 Low ranked SMUs (Table 10; Figure 23). SMUs 1, 8, 18 and 20 are ranked as highly vulnerable to future problems associated with impervious cover because each is expected to change classification from Impacted to Non-Supporting. Predicted commercial/retail and residential development in the southern portion of the watershed (SMUs 1 & 8) and commercial/retail/office development along the I-355 corridor in the southwest portion of the watershed (SMUs 18 & 20) are the potential causes of increased impervious cover.

SMUs 4, 5, 13, and 17 are ranked as moderately vulnerable to predicted land use changes. SMUs 4 and 5 are approaching a classification change while SMUs 13 and 17 are expected to see between 5% and 10% change in impervious cover. Predicted residential development in areas that are currently agricultural will most affect SMUs 4, 5, and 17 while commercial/retail development is expected to affect SMU 13. The remaining SMUs are less vulnerable to predicted future land use changes.

The results of this analysis clearly point to the potential negative impacts of traditional residential and commercial/retail development. It will be important to consider developing these areas using Conservation/Low Impact Design standards that incorporate the most effective and reliable Stormwater Treatment Train practices whereby stormwater is routed through various Management Measures prior to being released from the development site.

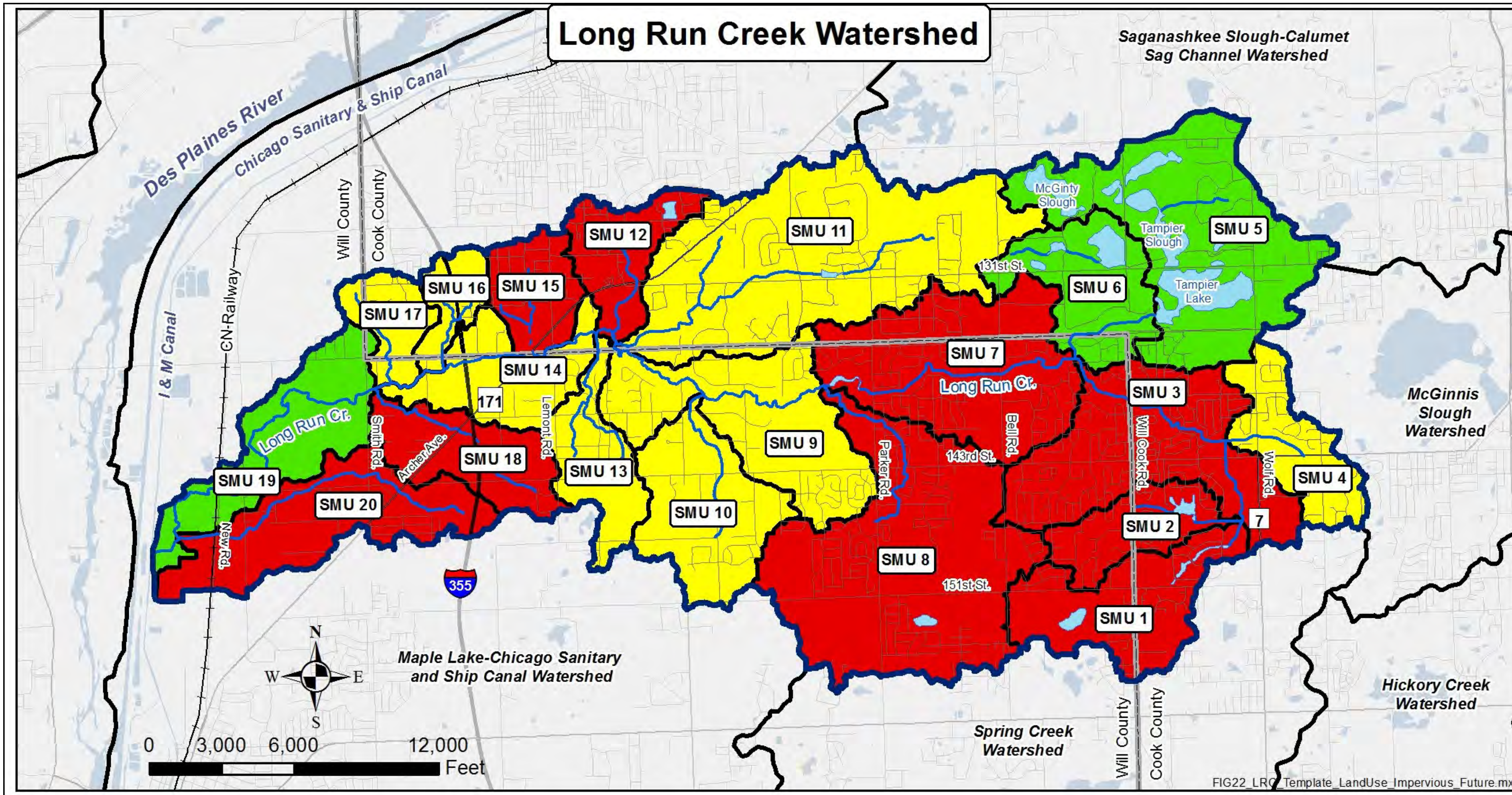


Figure 22

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Fig. 22: Predicted Future Impervious Cover Classification by SMU

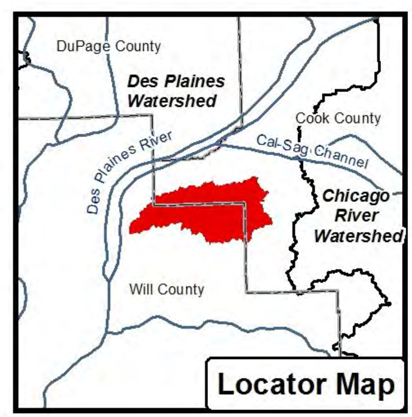
Legend

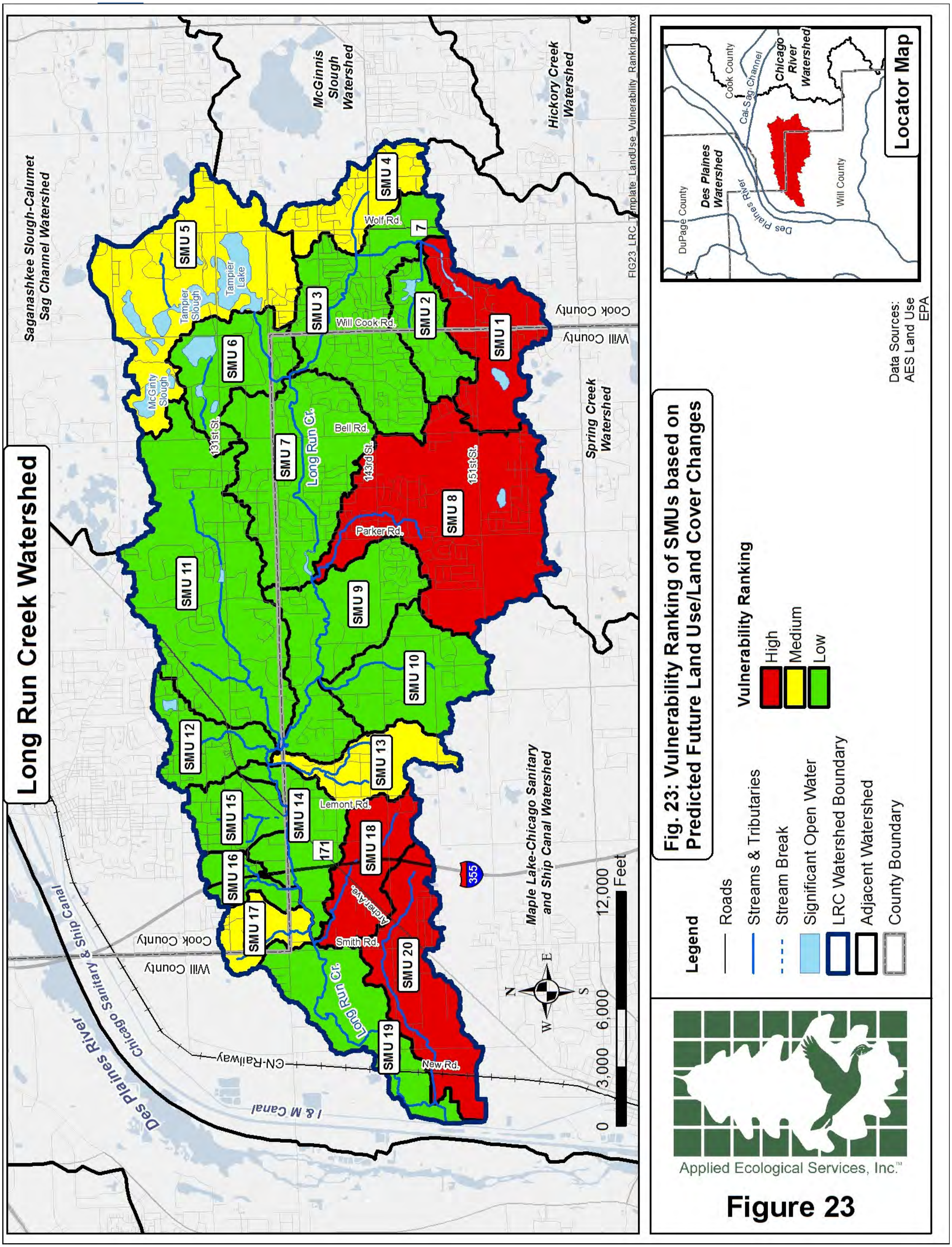
- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Predicted Impervious Cover by SMU

- Sensitive (0 to 10% Impervious)
- Impacted (10 to 25% Impervious)
- Non-Supporting (25 to 100% Impervious)

Data Sources:
AES Land Use
EPA




Long Run Creek Watershed
Fig. 23: Vulnerability Ranking of SMUs based on Predicted Future Land Use/Land Cover Changes
Legend
Roads
Streams & Tributaries
Stream Break
Significant Open Water
LRC Watershed Boundary
Adjacent Watershed
County Boundary
Vulnerability Ranking
High
Medium
Low
Data Sources: AES Land Use EPA
Locator Map
DuPage County
Des Plaines Watershed
Des Plaines River
Cook County
Cal-Sag Channel
Chicago River Watershed
Will County
Saganashkee Slough-Calumet Sag Channel Watershed
McGinnis Slough Watershed
Hickory Creek Watershed
Spring Creek Watershed
Maple Lake-Chicago Sanitary and Ship Canal Watershed
Des Plaines River
Chicago Sanitary & Ship Canal
I & M Canal
CN-Railway
SMU 1
SMU 2
SMU 3
SMU 4
SMU 5
SMU 6
SMU 7
SMU 8
SMU 9
SMU 10
SMU 11
SMU 12
SMU 13
SMU 14
SMU 15
SMU 16
SMU 17
SMU 18
SMU 19
SMU 20
7
Tampier Slough
Tampier Lake
McGinty Slough
Long Run Cr.
Wolf Rd.
Will Cook Rd.
Bell Rd.
131st St.
143rd St.
151st St.
Parker Rd.
Lemont Rd.
Smith Rd.
Archer Ave.
New Rd.
171
355
Cook County
Will County
0 3,000 6,000 12,000 Feet
FIG23_LRC_Template_LandUse_Vulnerability_Ranking.mxd
Applied Ecological Services, Inc.™
Figure 23

3.11 OPEN SPACE INVENTORY, PRIORITIZATION, & GREEN INFRASTRUCTURE NETWORK

A major component of watershed planning includes an examination of open space to determine how it best fits into a "Green Infrastructure Network". Green infrastructure 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 features such as stream corridors, wetlands, floodplain, woodlands, and grassland are the primary components of green infrastructure. Working lands such as farms and partially developed areas including parks, ball fields, golf courses, school grounds, detention basins, large residential parcels, and any residential lot that includes a stream corridor are also considered components of a Green Infrastructure Network. A three step process was used to create a parcel-based Green Infrastructure Network for Long Run Creek watershed:

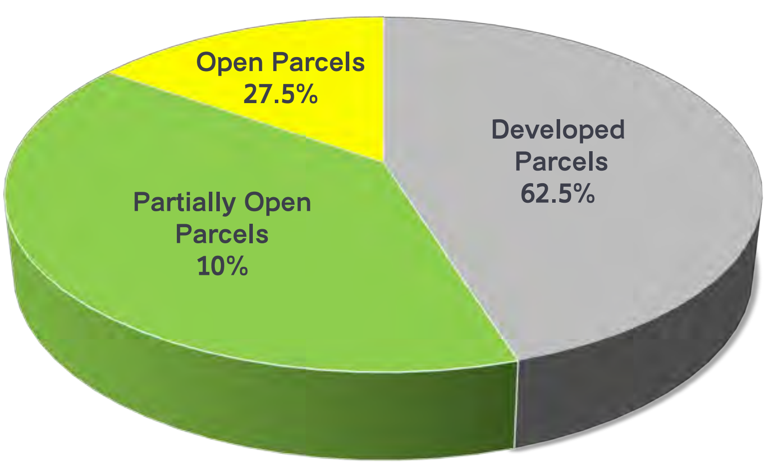
Step 1: All parcels of land in the watershed were categorized as open space, partially open space, or developed.
Step 2: All open and partially open parcels were prioritized based on a set of criteria important to green infrastructure.
Step 3: Prioritized open and partially open parcels were configured to form a Green Infrastructure Network.

For this watershed plan, an "open space" parcel is generally defined as any parcel that is not developed such as a nature preserve or agricultural field. "Partially open" parcels have been developed to some extent, but the parcels still offer potential green infrastructure opportunities. Examples of partially open parcels include school grounds and residential lots generally greater than two to three acres with minimal development. Parcels that are mostly built out such as commercial/retail areas and roads are considered "developed." Public versus private and protected versus unprotected status of open and partially open space parcels are other important green infrastructure attributes that are discussed in more detail below.

Open, Partially Open, & Developed Parcels

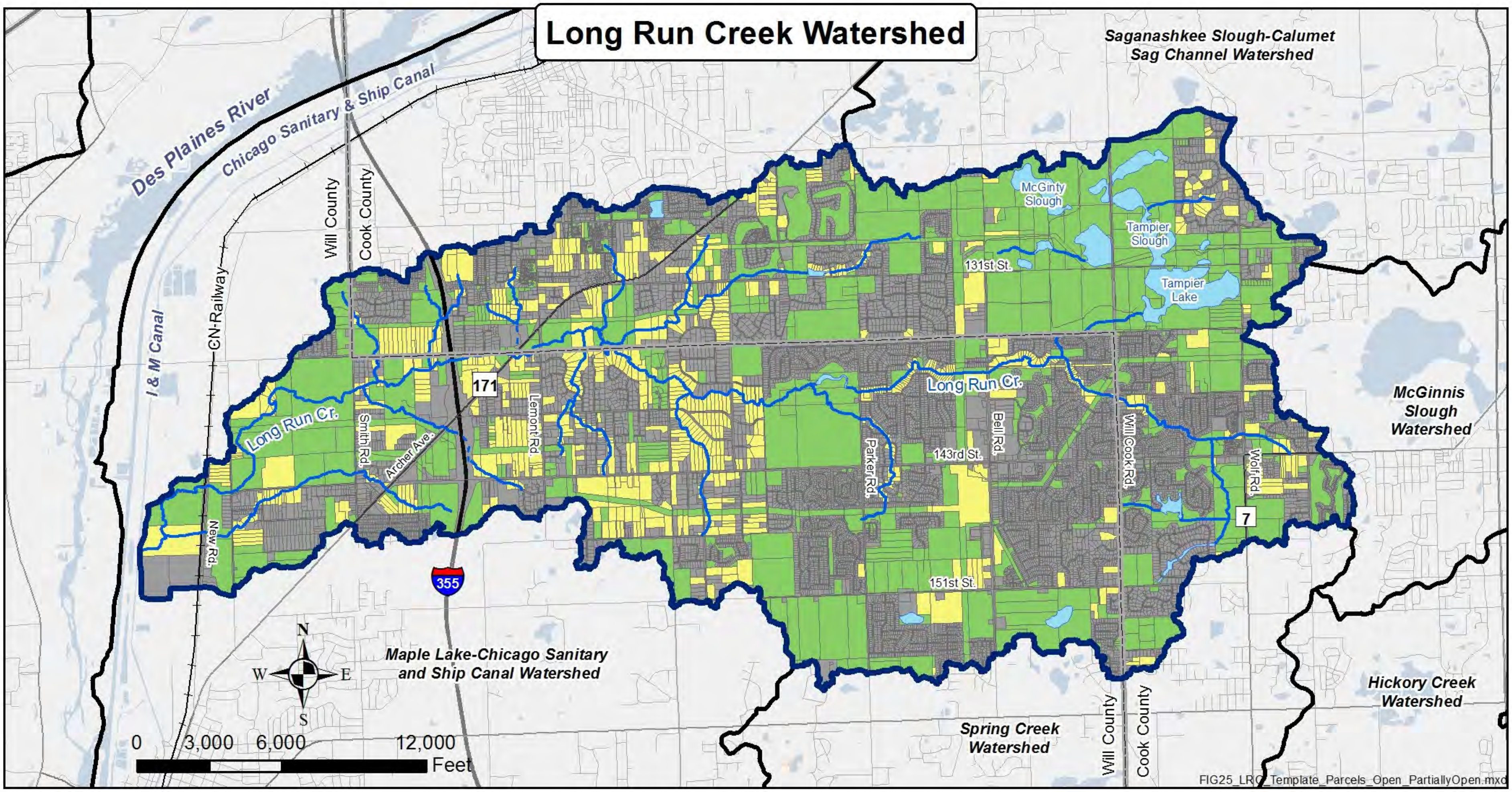
Step 1 in creating a Green Infrastructure Network was completed by categorizing all parcels in the watershed as "open," "partially open," or "developed." Figures 24 and 25 summarize and depict Step 1 results used to develop the Green Infrastructure Network. Open space parcels comprise approximately 6,637 acres or 39.7% of the watershed. Parcels range from less than 1 acre to 157 acres with an 8.3-acre average. Partially open parcels make up another 2,528 acres or 15.1% of the watershed. Parcels range from less than 1 acre to 72 acres with a 2.8-acre average. Developed parcels account for the remaining 7,549 acres or 45.2% of the watershed. Most open and partially open parcels are located on golf courses, agricultural land, John J. Duffy Preserve, ComEd utility easements and larger residential lots.

Figure 24. Distribution of open, partially open, and developed parcels.



SECTION 3.0

Long Run Creek Watershed



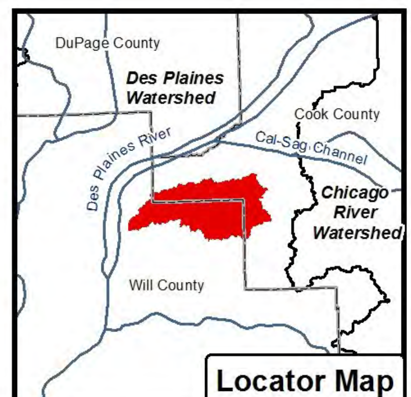


Fig. 25: 2012 Open, Partially Open, and Developed Parcels

Legend

- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Parcel Classification

- Open Parcel
- Partially Open Parcel
- Developed Parcel

Data Sources:
Cook & Will Counties
2012 NAIP

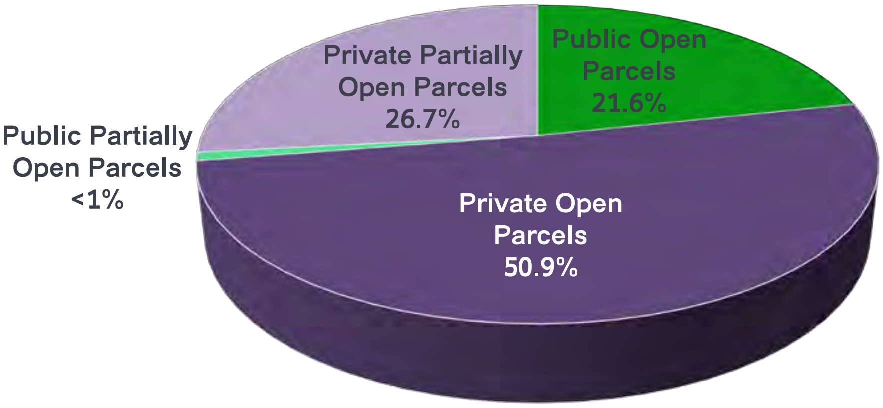
Applied Ecological Services, Inc.™

Figure 25

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. Developed parcels are not included in this summary. Publicly owned parcels include those owned by state, county, township, or municipal government or school districts. Public open and partially open parcels account for 21.6% and <1% of the open and partially open acreage respectively (Figures 26 & 28). Private ownership types include homeowners/business associations, commercial, residential, agricultural, golf clubs, etc. Private open parcels comprise 50.9% of the open and partially open acreage whereas private partially open parcels comprise 26.7% (Figures 26 & 28). Public open and partially open parcels are owned by county forest preserves, IDNR, municipalities, and townships.

Figure 26. Distribution of private and public open and partially open parcels.

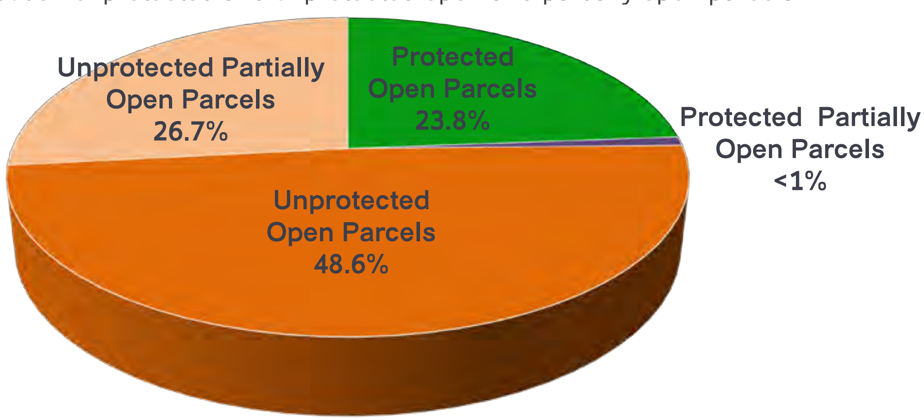


Protected Status of Open and Partially Open Parcels

Preservation of open space 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 wildlife and people. Without preservation, open space can be converted to other less desirable land uses in the future. Protected open and partially open parcels account for about 24% of the open and partially open parcel acreage in the watershed while unprotected open and partially open parcels account for the remaining 76% (Figures 27 & 29). Most protected open or partially open parcels are owned by state, county, township, homeowner association, or municipal government.

The most critical unprotected open and partially open parcels include golf courses and the undeveloped agricultural areas in the central, southern, and eastern portions of the watershed. Many of these areas are currently open space connected or adjacent to other green infrastructure. Aside from the December 2013 purchase of Woodbine Golf Course by Homer Glen, it is not likely that other golf courses will change land uses in the future but most of the agricultural areas will likely be developed to mostly residential. Future development that incorporates conservation design and/or Stormwater Treatment Train systems will be extremely important in these areas to improve water quality and reduce stormwater runoff volume to an already stressed Long Run Creek

Figure 27. Distribution of protected and unprotected open and partially open parcels.



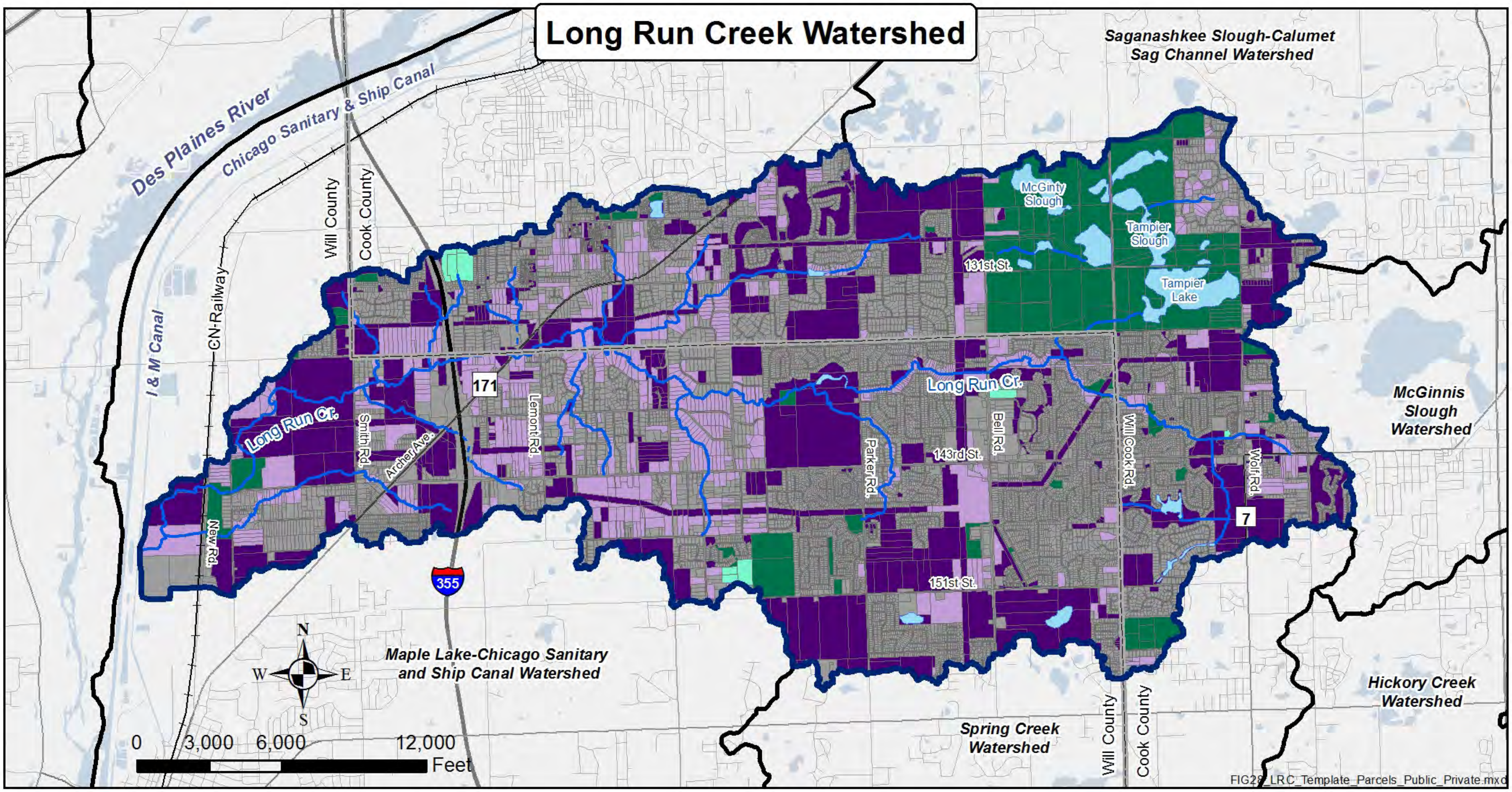


Figure 28

Applied Ecological Services, Inc.™

Fig. 28: Public versus Private Ownership of Open and Partially Open Parcels

Legend

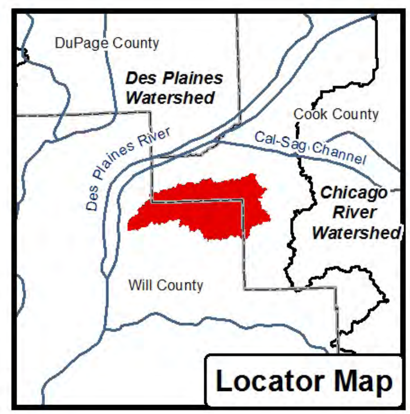
- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Open Parcel
- Public
- Private

Partially Open Parcel
- Public
- Private

Developed Parcel
- Public or Private

Data Sources:
Cook & Will Counties
2012 NAIP



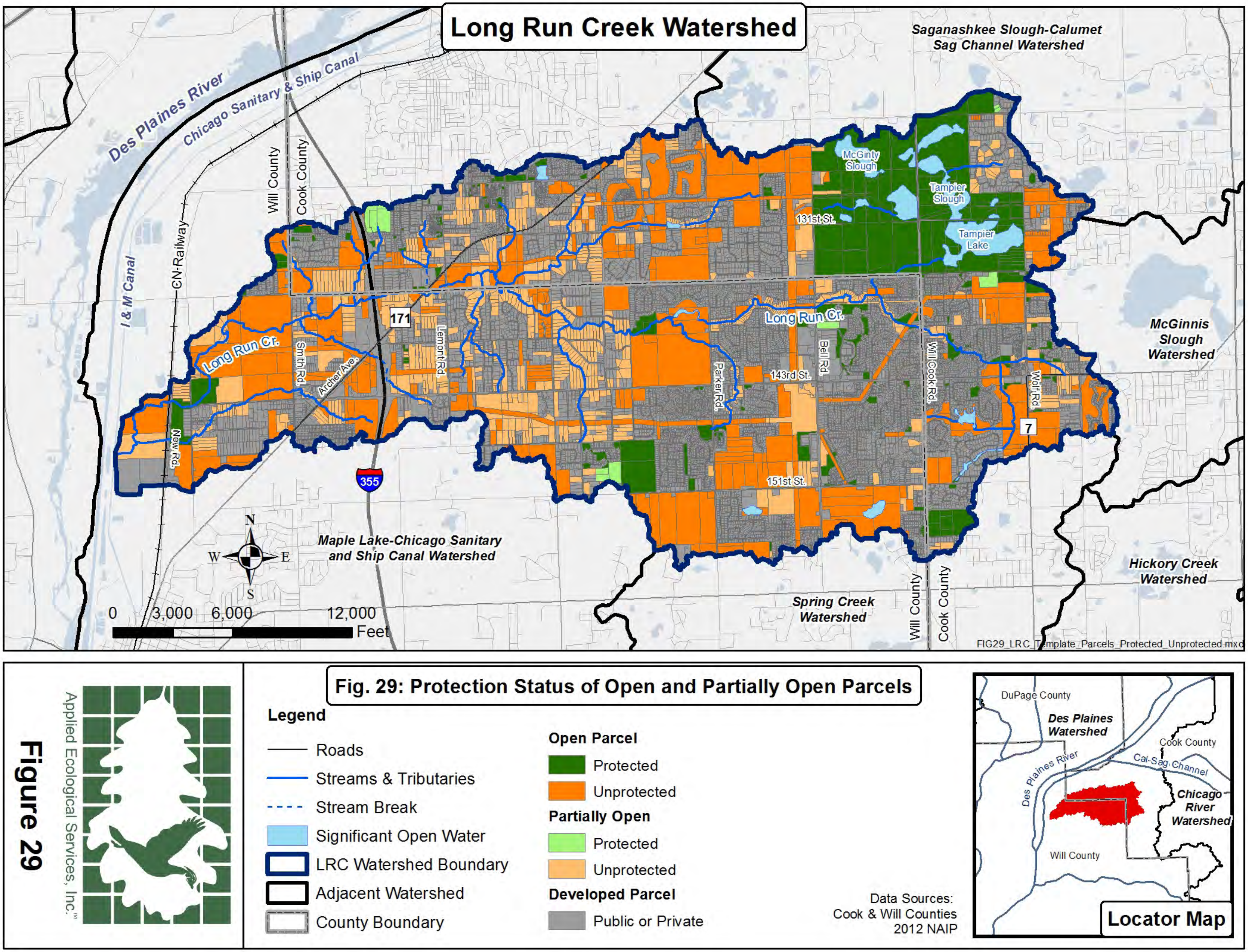


Fig. 29: Protection Status of Open and Partially Open Parcels

Figure 29

Open Space Parcel Prioritization

Step 2 in creating a Green Infrastructure Network for Long Run Creek watershed was completed by prioritizing open and partially open parcels. For this step, 11 prioritization criteria important to green infrastructure were examined via a GIS analysis (Table 11). 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 open parcel and for all criteria. The prioritization process was not completed for developed parcels. The total points received for each parcel were summed to determine parcel prioritization within the Green Infrastructure Network- parcels with the highest number of points being more important to green infrastructure than parcels that met fewer criteria.

The combined possible total of points any one parcel could accumulate was 11 (11 of 11 total criteria met). The highest actual 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 were designated High Priority for inclusion into the Green Infrastructure Network while parcels meeting 4-5 criteria were designated Medium Priority. Parcels with a combined value of 1-3 were categorized as Low Priority but were not necessarily excluded from the Green Infrastructure Network based on their location or position as linking parcels.

Figure 30 depicts the results of the parcel prioritization. There is no obvious correlation between High Priority green infrastructure parcels and their relation to Long Run Creek and its tributaries. What is obvious is that many High Priority parcels are large and include forest preserves, nature preserves, golf courses, and agricultural land. Many of the Medium Priority parcels abut High Priority parcels or intersect a stream or wetland. Low Priority parcels are generally smaller, found along streams in heavily developed areas, isolated from other natural features, and include many ComEd utility corridors.

Table 11. Criteria used to prioritize parcels for a Green Infrastructure Network.

Green Infrastructure Criteria
1. Open or partially open parcels that intersect FEMA 100-year floodplain
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 within the groundwater recharge area to Long Run Seep
5. Open or partially open parcels equal to or greater than 10 acres
6. Open or partially open parcels that are within 100 feet of a stream or significant open water
7. Open or partially open parcels in a “Highly or Moderately Vulnerable” Land Use/Land Cover SMU
8. Open or partially open parcels adjacent to or including private or public protected open space
9. Open or partially open parcels included in Forest Preserve District of Will County resource plan
10. Open or partially open parcels that intersect existing trails
11. Open or partially open parcels that include or intersect an “Important Natural Area”

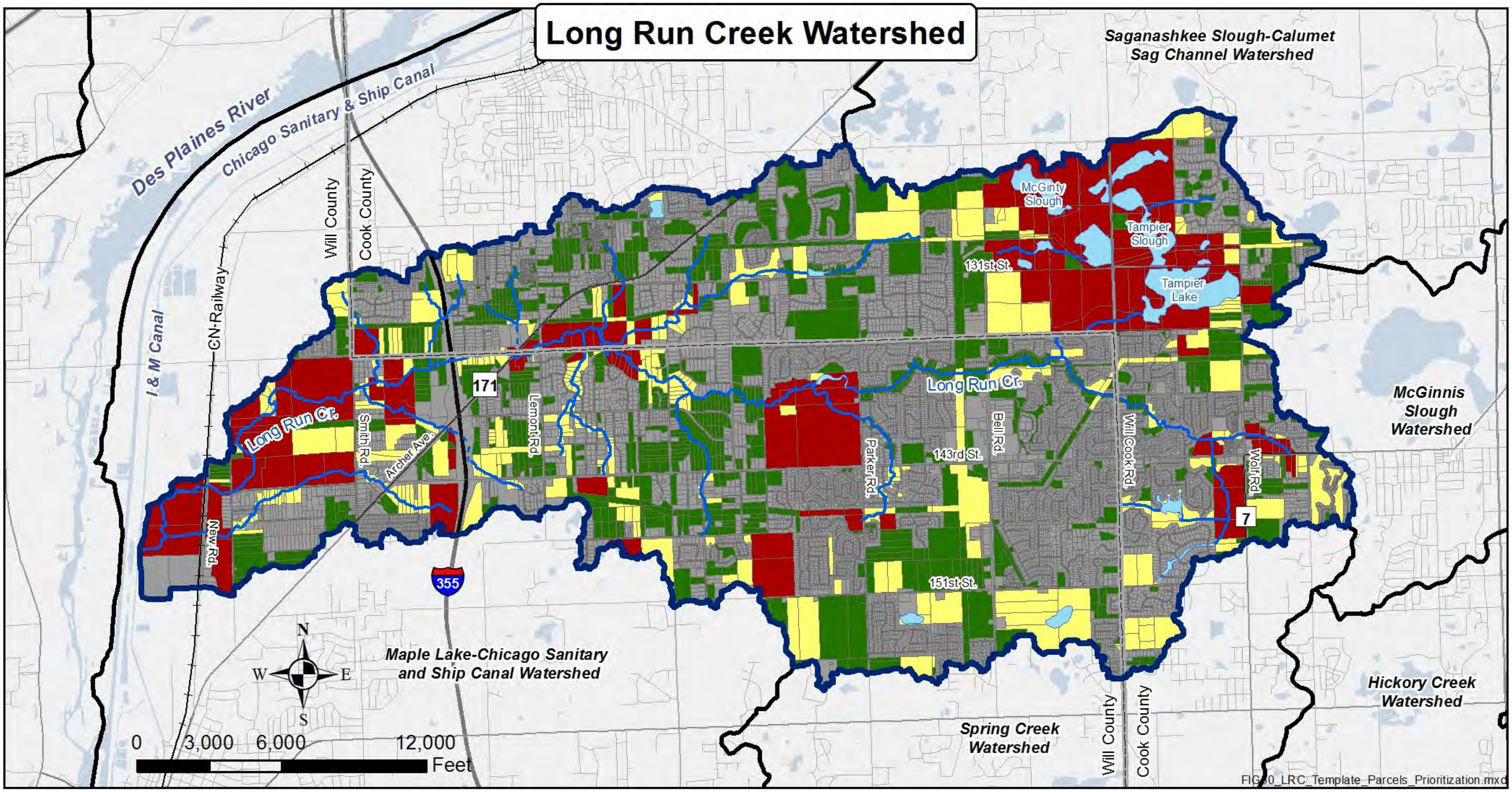


Figure 30

Applied Ecological Services, Inc.™

Fig. 30: Open Space Parcel Prioritization

Legend

- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Parcel Prioritization Points

- 1 - 3 Low Priority
- 4 - 5 Medium Priority
- 6 - 9 High Priority
- Developed Parcel

Data Sources:
Cook & Will Counties

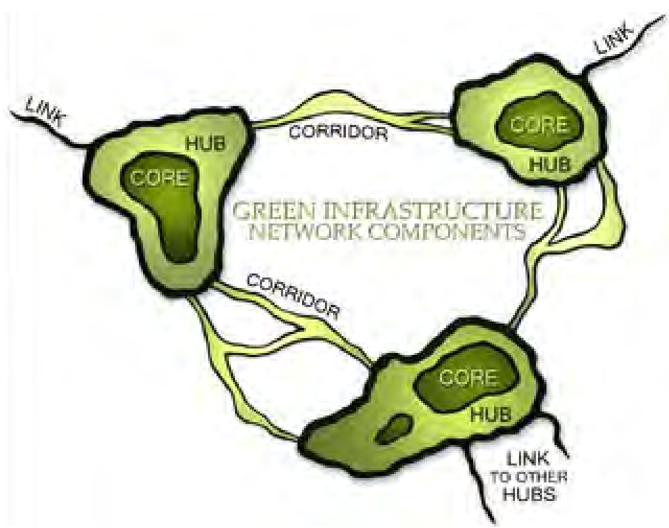
Green Infrastructure Network

The final step (Step 3) in creating a Green Infrastructure Network for Long Run Creek watershed involves laying out the network by incorporating: 1) prioritized open space results from Steps 1 & 2, 2) information gathered during the watershed resource field inventory conducted by AES in fall 2012, and 3) stakeholder recommendations. County and region-wide green infrastructure plans generally focus on natural features such as stream corridors, wetlands, floodplain, buffers, and other natural components. The Green Infrastructure Network created for Long Run Creek watershed captures all the natural components and other green infrastructure such as recreational parks, large residential lots, school grounds, and golf courses at the parcel level. Parcel level green infrastructure planning is important because land purchases, acquisitions, and land use changes almost always occur at the parcel level. A Green Infrastructure Network for Long Run Creek watershed is illustrated on Figure 32.

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). Green infrastructure planning provides a framework for future growth that identifies areas not suitable for development, areas suitable for development but which should incorporate conservation/ low impact design standards, and areas that do not affect green infrastructure.

A Green Infrastructure Network is a connected system of *Hubs* and linking *Corridors* (Figure 31). Hubs generally consist of the largest and least fragmented areas such as John J. Duffy Preserve, Long Run Seep Nature Preserve, several agricultural areas, and the eight golf courses. Corridors are generally formed by smaller private/ unprotected parcels along developed reaches of Long Run Creek and tributaries. Corridors are extremely important because they provide biological conduits between hubs. However, most parcels forming corridors are not ideal green infrastructure until residents, businesses, and farmers embrace the idea of managing stream corridors. Unique to Long Run Creek watershed is a diverse system of ComEd utility corridors. Several of these corridors are being used for trails in Homer Glen but many opportunities exist to expand trails to the western half of the watershed. The Action Plan section of this report contains recommendations for implementing the Green Infrastructure Network.

Figure 31. Green Infrastructure components



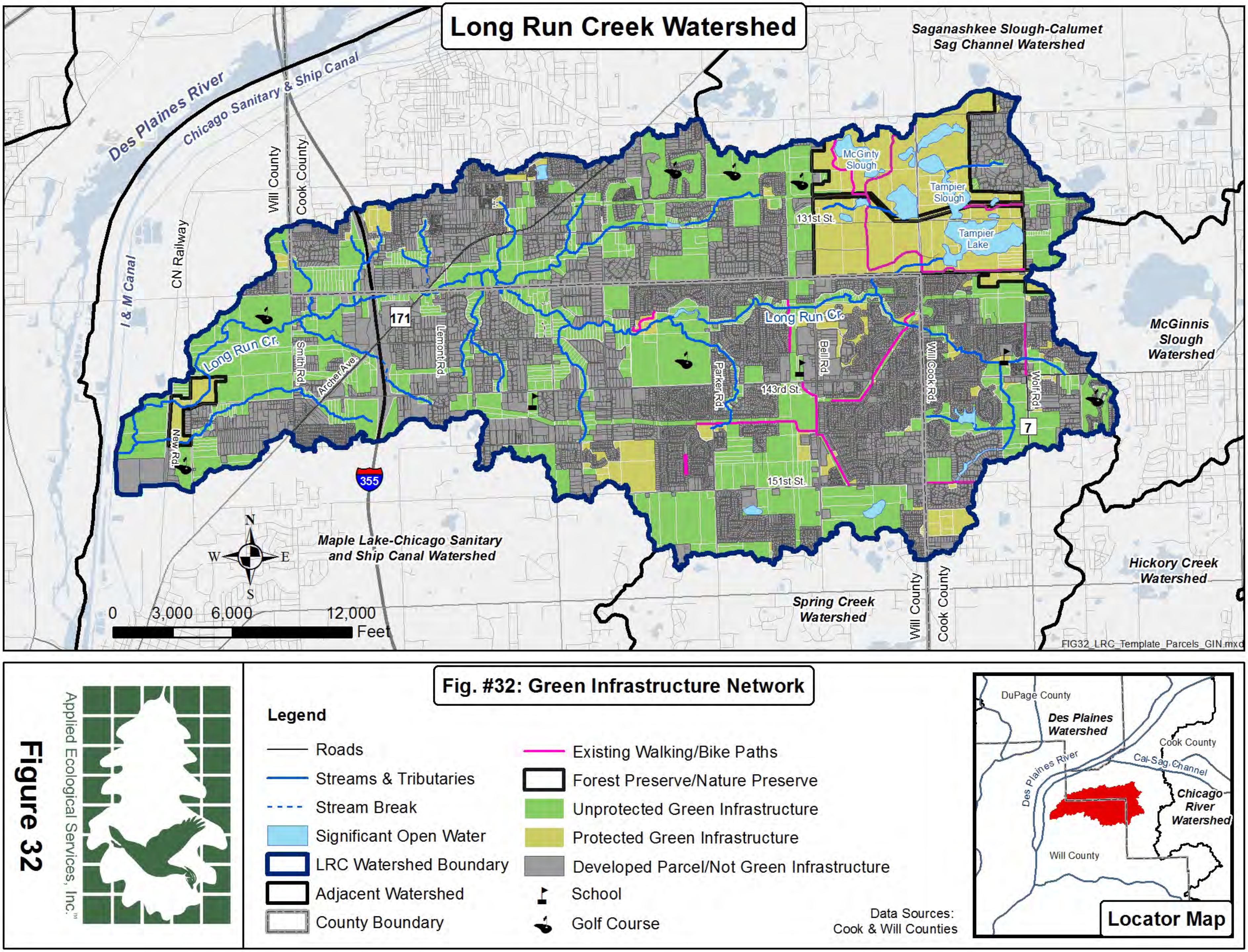


Fig. #32: Green Infrastructure Network

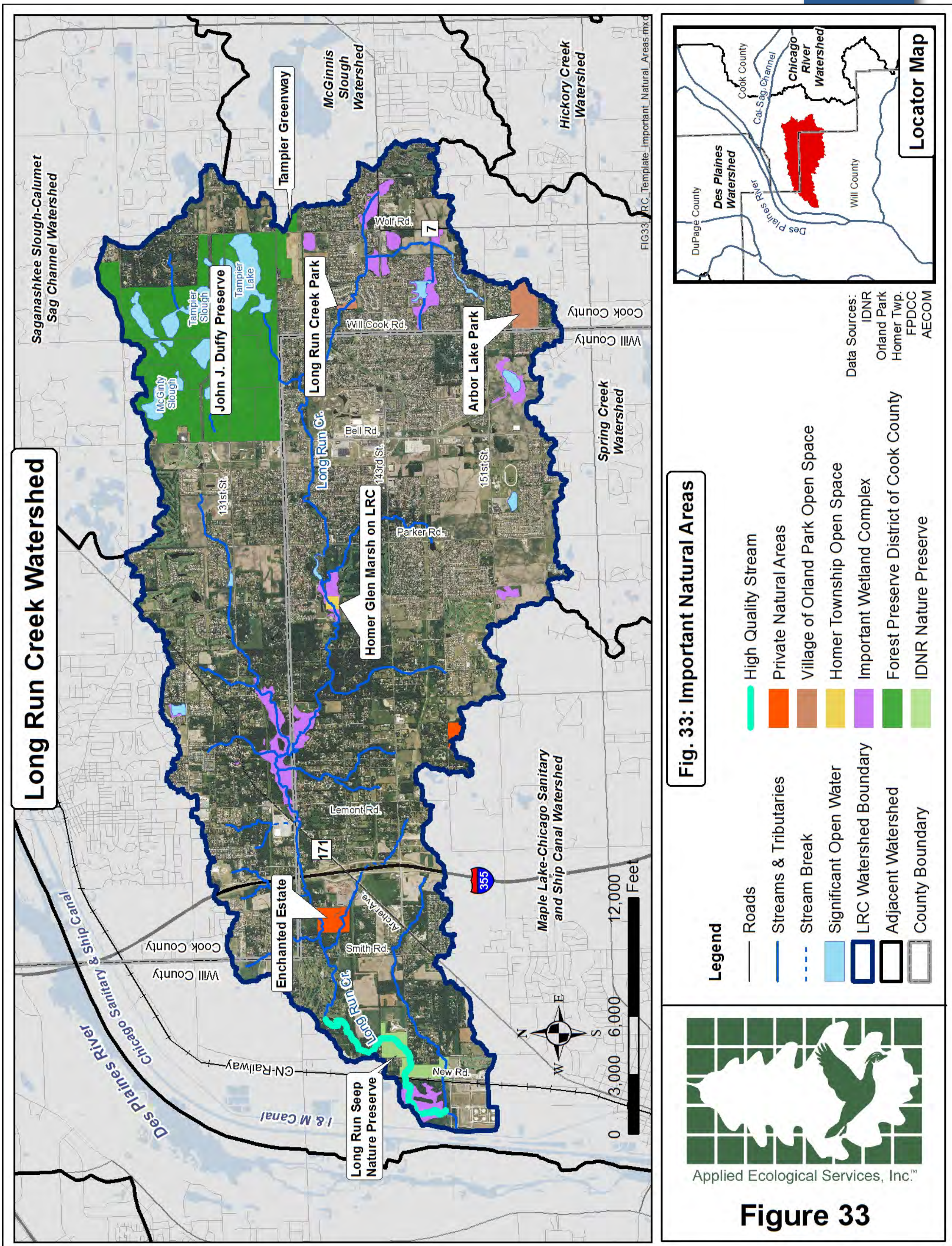
Figure 32

3.12 IMPORTANT NATURAL AREAS

For this watershed plan, "Important Natural Areas" include protected prairie, wetland, and woodlands within forest and nature preserves, high quality stream reaches, and large wetland complexes that are important to wildlife or provide exceptional flood storage (Table 12; Figure 33). Many of these areas often provide high quality habitat for and harbor uncommon or even threatened and endangered (T&E) species. Important Natural Areas also provide large greenway corridors that interconnect land and waterways, support native species, maintain natural ecological processes, and contribute to the health and quality of life for communities and people. Several Important Natural Areas are located in the watershed including 1 forest preserve, 1 nature preserve, 1 township-owned open space parcel, 12 important wetland complexes, and 2 private natural areas.

Table 12. Important Natural Area summary data.

Natural Area	Size (ac or lf)	Description
Forest Preserve District of Cook County		
John J. Duffy Preserve	1,614 ac	Large public preserve comprised of young growth and older growth woodlands, prairie, wetland sloughs, and lakes.
Illinois Department of Natural Resources		
Long Run Seep Nature Preserve	89 ac	A seep, fen, wet-mesic floodplain forest, and dry-mesic woodland plant communities are found on the site as well as the main channel of Long Run Creek and a tributary. The site also harbors the federal and state endangered Hine's Emerald Dragonfly.
Wetland Complexes		
12 Individual Complexes	450.5 ac	12 individual wetland complexes are found in the watershed that, although dominated by invasive species, provide excellent stormwater storage locations, wildlife corridors and green infrastructure connections.
Homer Township Open Space		
Homer Glen Marsh on LRC	10 ac	Parcel owned by Homer Township within larger wetland complex.
Orland Park Open Lands		
Arbor Lake Park	60 ac	Land owned by Orland Park that contains old field, prairie, woodland, and fishing ponds.
Long Run Creek Park	8.8 ac	Land owned by Orland Park that contains a riparian corridor along LRC with a park and naturalized fishing pond.
Private Natural Areas		
Enchanted Estate	55 ac	Private estate harboring old growth oak woodland and restored prairie communities. A section of LRC is located at the north end.
Private Woodland	30 ac	Private land harboring high quality dry-mesic woodland.
High Quality Stream		
Long Run Creek	11,760 lf	High quality portion of Long Run Creek extending from Old Oak Golf Course to I & M Canal with good riffle-pool development, low to no bank erosion, good aquatic substrate, and naturally meandering.


Long Run Creek Watershed
Saganashkee Slough-Calumet Sag Channel Watershed
Tampier Greenway
McGinnis Slough Watershed
Hickory Creek Watershed
John J. Duffy Preserve
McGinty Slough
Tampier Slough
Tampier Lake
Long Run Creek Park
Arbor Lake Park
Wolf Rd.
7
Will Cook Rd.
Cook County
Will County
Spring Creek Watershed
Bell Rd.
Long Run Cr.
143rd St.
151st St.
131st St.
Homer Glen Marsh on LRC
Parker Rd.
Lemont Rd.
171
355
Maple Lake-Chicago Sanitary and Ship Canal Watershed
Enchanted Estate
Archer Ave.
Smith Rd.
Des Plaines River
Chicago Sanitary & Ship Canal
CN-Railway
I & M Canal
Long Run Seep Nature Preserve
New Rd.
N
E
S
W
0 3,000 6,000 12,000 Feet
FIG33_LRC_Template_Important_Natural_Areas.mxd
Fig. 33: Important Natural Areas
Legend
Roads
Streams & Tributaries
Stream Break
Significant Open Water
LRC Watershed Boundary
Adjacent Watershed
County Boundary
High Quality Stream
Private Natural Areas
Village of Orland Park Open Space
Homer Township Open Space
Important Wetland Complex
Forest Preserve District of Cook County
IDNR Nature Preserve
Data Sources:
IDNR
Orland Park
Homer Twp.
FPDCC
AECOM
Locator Map
DuPage County
Cook County
Will County
Des Plaines Watershed
Chicago River Watershed
Cal-Sag Channel
Des Plaines River
Applied Ecological Services, Inc.™
Figure 33

Forest Preserves

The watershed planning area has 1,614 acres of land within John J. Duffy Preserve which is owned and managed by the Forest Preserve District of Cook County (FPDCC) (Table 12; Figure 33). The preserve is part of the Cal-Sag Valley, an area that formed over 10,000 years ago by the draining of a glacial lake. Today, the preserve contains a variety of natural habitats including young growth and older growth woodlands, prairie, wetland sloughs, and lakes. A slough is a wetland within a channel or series of shallow lakes that flows at least periodically. McGinty Slough and Tampier Slough are found in the northwest and east portions of the preserve, respectively, and are surrounded by several other unnamed sloughs. McGinty Slough and Tampier Slough are two of the largest wetlands in the Chicagoland region and provide for a bird watcher's paradise during spring and fall migrations when thousands of shorebirds, egrets, and waterfowl stop over. In fact, over 300 bird species have been spotted in and around John J. Duffy Preserve.

McGinty Slough

Tampier Lake is a 160 acre, human created lake, found in the southeast portion of John J. Duffy Preserve. This area was historically a series of shallow sloughs which were excavated out of peat creating a series of ponds in 1958 when the FPDCC purchased the surrounding property (IEPA, 2010). In 1962, the FPDCC dug a number of channels around the proposed lake area and a dam was constructed on a tributary of Long Run Creek creating a 75-acre lake. A three foot cap was

Tampier Slough

Fishing at Tampier Lake

added to the dam in 1964 to raise lake levels and create the 160 acre lake seen today.

Tampier Lake is used heavily for human recreation. The Sag Valley Trail runs along the south side of Tampier Lake and north/south along McGinty Slough. This trail is popular for hiking, horseback riding, and bird watching. A parking/picnic area and fishing access is found on the west side of the lake. Tampier Lake Boating Center is located on the east side of the lake. This center provides boat and canoe rentals and has a boat launch ramp. Tampier Lake is known as a premier fishing location for walleye, northern pike, channel catfish, sunfish, crappie, and largemouth bass. In addition, state endangered Ospreys, a large bird of prey that lives and breeds near wetland and lakes, is known to nest at Tampier Lake. It should also be noted that Tampier Greenway forms a connection between John J. Duffy Preserve and McGinnis Slough to the southeast. This site contains picnic areas surrounded by prairie and shrubland.

Woodland/savanna restoration at Long Run Seep

Nature Preserves

Long Run Seep is an 89-acre IDNR-Illinois Nature Preserves Commission (INPC) owned and managed site in the far western end of the watershed (Table 12; Figure 33). The original portion of the preserve between New Road and High Road was dedicated in 1990. A 40+ acre addition and buffer was added in 2004 east of High Road. Seep, fen, wet-mesic floodplain forest, and dry-mesic woodland plant communities are found on the site as well as the main channel of Long Run Creek and a tributary known locally as South Ditch. Of these communities, it is the seep and fen formed at the base of the Des Plaines River valley bluffs, that provide cold calcareous groundwater that supports many conservative plants such as spotted touch-me-not (*Impatiens capensis*), tussock sedge (*Carex stricta*), skunk cabbage (*Symplocarpus foetidus*), marsh marigold (*Caltha palustris*) shrub nannyberry (*Viburnum lentago*), grass of parnassus (*Parnassia glauca*), great Angelica (*Angelica atropurpurea*), Kalm's lobelia (*Lobelia kalmia*), and Riddell's goldenrod (*Solidago riddellii*).

Threatened and endangered (T&E) plant species found in the preserve include beaked spike rush (*Eleocharis rostellata*), grass pink orchid (*Calopogon tuberosa*), and slender bog arrow grass (*Triglochin palustris*). Four exotic plants, purple loosestrife (*Lythrum salicaria*), glossy buckthorn (*Rhamnus frangula*), reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites australis*) threaten the seep and fen communities despite efforts by INPC to cut and/or herbicide these invasives.

The addition east of High Road contains a dry-mesic oak woodland/savanna along a high quality reach of Long Run Creek. The dry-mesic woodland/savanna was cleared of invasive woody species in 2009. Future restoration efforts will be aimed at keeping invasive woody species under control and improving the condition of small seeps and fens along Long Run Creek.

Long Run Seep provides critical habitat for the Hine's Emerald Dragonfly (HED), a federal and state listed endangered species. Recent studies have documented HED larval habitat and recruitment in Long Run Seep (Soluk and Worthington, 2010). The HED is defined by its brilliant emerald-green eyes and dark brown and metallic green body, with yellow stripes on its sides (USFWS, 2006). Today, the HED is only found in a few locations in four states: Illinois, Michigan, Missouri, and Wisconsin. Its preferred habitat is calcareous spring-fed


Hine's Emerald Dragonfly
Source: Dan Kirk

marshes, seeps, fens, and sedge meadows overlaying dolomite bedrock such as that found at Long Run Seep. The HED relies on the unique water quality features of calcareous seeps where the female lays eggs that later emerge into nymphs that live in the seeps for up to 4 years before becoming a flying adult dragonfly. Habitat destruction/fragmentation, invasive species, contaminated water, and changes in groundwater hydrology are the primary threats to the species. All of these destructive forces are at play in the surface and groundwater drainage area to Long Run Seep. Future mitigation dollars from land use impacts to HED habitat such as mining, chemical spills, etc. should be limited to managing and restoring HED habitat or used to fund projects that support groundwater recharge to HED habitat. The USFWS also recommends establishment of a monitoring plan to estimate HED population size and population dynamics on an annual basis and conduct population augmentation via captive-rearing (USFWS, 2013).

Perhaps the most difficult conservation issue is the negative impact of changing groundwater quantities and quality as it relates to HED habitat and breeding areas. In 2012, INPC petitioned Illinois EPA to designate the groundwater recharge area to Long Run Seep Nature Preserve as a Class III Special Resource Groundwater Classification. Class III designation allows an area to be subjected to special water quality standards and if an impact to a protected nature preserve's groundwater resource can be shown, the Office of the Illinois Attorney General can immediately cease the source activity of the impact. A Regional Groundwater Contribution Area (GCA) was developed by the Illinois State Geological Survey (ISGS) as part of the Class III petition by INPC. The GCA extends east and south of the preserve covering a vast 26,543 acres or 41.5 square miles. The GCA is mapped and described in more detail in Section 3.14. Aside from potential future policy related to the Class III Special Resource Groundwater Classification area, it is recommended that all development activities occurring within the GCA such as residential and commercial development, road construction and maintenance, landfills, mining, municipal and private wells, and other activities that increase impervious cover/reduce groundwater recharge be subjected to additional layers of review.

Wetland complex off 127th Street

Wetland Complexes

Twelve large wetland complexes accounting for 450.5 acres were identified in the watershed as being important for stormwater storage, wildlife corridors, and/or green infrastructure connections (Table 12; Figure 33). It is important to note however that most of these wetlands are relatively low quality from an ecological point of view because they are dominated by several invasive species including purple loosestrife (*Lythrum salicaria*), common and glossy buckthorn (*Rhamnus sp.*), reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites australis*). The largest of these wetland complexes are found at the far west end of the watershed on land owned by Hanson Material Services, Inc., along Long Run Creek on mostly private land, and scattered within agricultural areas and tributaries to Long Run Creek in the west half of the watershed. Most of these wetlands are considered "Jurisdictional" by the Army Corps of Engineers thereby ensuring there preservation in the future.

Homer Glen Marsh and Long Run Creek

Homer Township Open Space

Homer Township currently has an Open Space program that was established in 1999. The Open Space Land Stewardship Committee that is leading this effort is dedicated towards preservation of the natural environment, scenic resources, geological features, and historic sites. The township currently owns a 10-acre parcel within a larger wetland complex that was donated by Illinois American in 2004 (Table 12; Figure 33). The site is largely dominated by invasive reed canary grass (*Phalaris arundinacea*) and also includes a section of Long Run Creek. This site presents excellent restoration possibilities that are explored in later sections of this plan.

Village of Orland Park Open Lands

The Village of Orland Park has an Open Lands Commission assigned to help preserve open space via purchase of land from an Open Land fund financed through a voter approved referendum that was passed in 2000. The Open Lands Commission believes in several objectives: preservation of sensitive environmental areas, linking open spaces, wildlife habitat, and preserving the overall landscape. Orland Park currently owns two sites in the watershed (Table 12; Figure 33). The first is a 60+ acre parcel in the far southeast corner of the watershed called Arbor Lake Park. The site is comprised of old field, prairie, wetlands, ponds, and woodlands. Amenities at the site include walking/bike path, picnic areas, and fishing. The second site includes nearly 9 natural and recreation acres along Long Run Creek between Will-Cook and Wolf Roads.

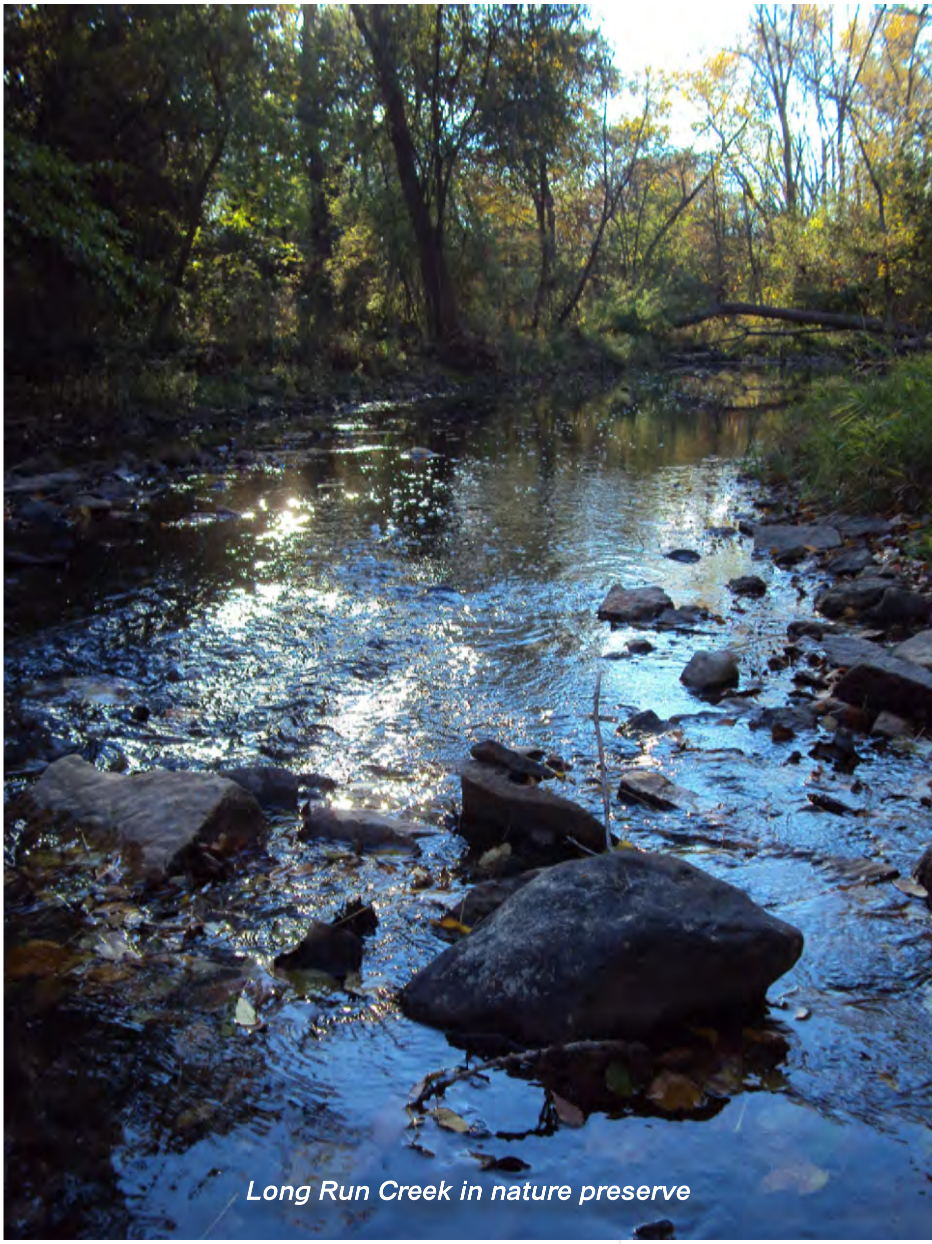
Village of Orland Park Open Lands

Private Natural Areas

Two additional natural areas are worth mentioning (Table 12; Figure 33). The first is the Enchanted Estate, a 55-acre venue located in Lockport. The estate holds weddings, socials, and corporate events. Aside from the manicured areas with ponds and waterfalls, there are acres of restored prairie and remnant old growth oak woodland/savanna. Long Run Creek also flows across the north end of the estate. The second site includes an average to high quality dry-mesic woodland complex surrounded by farmland on the south side of 147th Street along the southern boundary of Long Run Creek watershed.

High Quality Streams

An 11,760-linear foot (2.2-mile) reach of Long Run Creek extending from the west end of Big Run Golf Club and then south and west to approximately the I & M Canal is considered high quality (Table 12; Figure 33). In general, this entire reach exhibits good riffle-pool development, has minimal bank erosion, provides good aquatic substrate and habitat, and is naturally meandering. The first third of this reach is located on private land west and south of Big Run Golf Club. The second third is located within Long Run Seep Nature Preserve. There, dolomite is close to the surface providing stabile substrate and good riffle-pool complexes. The final third of the reach flows through land owned by Hanson Material Services, Inc. There, the stream gradient is flat enabling the stream to meander through the existing wetland complex.


Long Run Creek in nature preserve

3.13 WATERSHED DRAINAGE SYSTEM

3.13.1 LONG RUN CREEK HYDROLOGY & FLOW

Understanding changes in stream hydrology and flow patterns over time is important to understanding impacts of changes in climate and land use on the physical characteristics of a stream and the biological communities it supports. Via a grant provided by IDNR's C2000 program, Integrated Lakes Management, Inc. (ILM) was hired by the Village of Homer Glen in 2006 to conduct a physical and biological survey of Long Run Creek and provide a summary report (ILM, 2007). The resulting report includes a brief summary documenting changes in hydrology and flows in Long Run Creek over time. The following paragraphs are paraphrased from ILM's report.

Accurate stream flow monitoring is generally only available after 1950 for the Lower Des Plaines watershed. Long Run Creek has a stream flow-gaging station, installed in 1951, which is located on the west side of Lemont Road. Between 1951 and 1970, the 7-day annual low flow was frequently zero (i.e. the stream went to dryness for seven days at the gaging station) whereas current low flows are about 1 cubic foot per second (cfs). This increase is attributed to the conveyance of stormwater from impervious areas and the addition of treated wastewater discharge from two locations in the watershed: Derby Meadows and Chickasaw Hills waste water treatment plants.

The phrase "flow regime" is meant to convey profiling of flow conditions across a range of normal and extreme conditions. Stream systems function as import/export communities and thus flow will affect the physical characteristics of the stream, habitat, and biology. Extremes of flow and substrate will determine what types of invertebrates and fish can sustain themselves in different sectors of the stream. Further changes will potentially have a negative impact on fish, invertebrates, algae, and plants which can colonize the stream. In general Long Run Creek has gone from being an intermittent flow system to one with more sustained flows, thus supporting a sustained-flow community of life.

USGS gaging station off Lemont Road
Source: Integrated Lakes Management

The Illinois Department of Natural Resources (IDNR) conducted an assessment for the Lower Des Plaines River in 2000 to identify statistical trends for normal flows, high flows and for drought conditions in various stream systems. Via this study, IDNR produced a flow duration curve for Long Run Creek that reveals flows of eight cubic feet per second occurring about 50% of the time and one cubic feet per second occurring at least 80% of the time. The conclusion is that the percentage of increase in flow since 1960 is high in Long Run Creek. Since 1980, the character of Long Run Creek has been altered by a steady and consistent pattern of higher flows that IDNR claims will significantly impact flooding that occurs during rain events.

3.13.2 LONG RUN CREEK & TRIBUTARIES

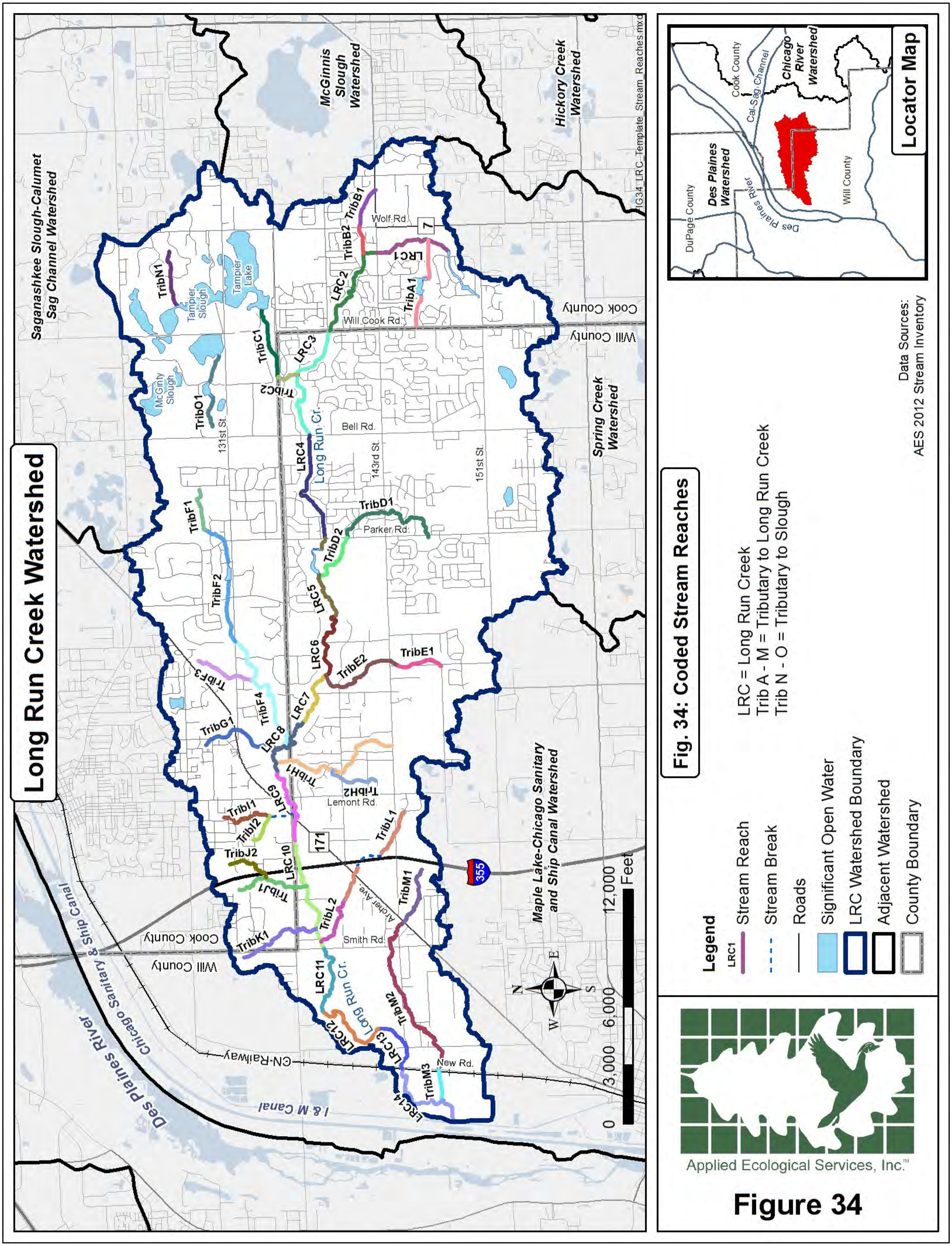
The main stem of Long Run Creek is the primary stream draining Long Run Creek watershed. Fifteen (15) tributary streams are also found in the watershed (Table 13; Figure 34). Long Run Creek alone is over 12.5 linear miles in length while the tributaries account for another 20.2 linear miles.

Long Run Creek officially begins as a ditch in an agricultural field in the southeast portion of the watershed just east of a series of created detention basins in Silo Ridge residential subdivision. From there, the stream flows north for close to a mile among several large wetland complexes before joining a tributary stream north of 143rd Street then flowing west through residential subdivisions in Orland Park. The stream continues to flow west through channelized reaches among mostly residential subdivisions in Homer Glen west of Will-Cook Road until reaching Parker Road. West of Parker Road, the stream meanders through a large wetland complex north of Old Oak Country club before flowing through low density residential development between Hickory Avenue to the north and Spring Creek Road to the south. Long Run Creek joins several small tributaries within another large wetland complex then continues west through mostly residential areas before entering Big Run Golf Club west of Smith Road. The stream turns southwest after exiting Big Run where it is higher gradient, naturally meandering, and flows through Long Run Creek Nature Preserve and land owned by Hanson Material Services, Inc. and Chevron prior to joining the Illinois and Michigan (I & M) Canal.

Table 13. Summary of Long Run Creek and tributary reaches and length.

Stream or Tributary Name	Abbreviation	Number of Reaches	Stream Length Assessed (ft)	Stream Length Assessed (mi)
Long Run Creek	LRC	14	66,089	12.5
Tributary A	TribA	1	4,004	0.8
Tributary B	TribB	2	3,563	0.7
Tributary C	TribC	2	4,844	0.9
Tributary D	TribD	2	9,518	1.8
Tributary E	TribE	2	7,229	1.4
Tributary F	TribF	4	18,579	3.5
Tributary G	TribG	1	4,539	0.9
Tributary H	TribH	2	10,308	1.9
Tributary I	TribI	2	4,387	0.8
Tributary J	TribJ	2	6,454	1.2
Tributary K	TribK	1	4,674	0.9
Tributary L	TribL	2	7,407	1.4
Tributary M	TribM	3	14,690	2.8
Tributary N	TribN	1	2,960	0.6
Tributary O	TribO	1	3,265	0.6
Totals		**42**	**172,510**	**32.7**

Note: Illinois EPA does not monitor to the level of detail included in this plan. A localized waterbody code system was developed for this plan and therefore, the codes used are not found in the Illinois EPA's *Illinois Integrated Water Quality Report and Section 303d List.*



Long Run Creek Watershed
Saganashkee Slough-Calumet Sag Channel Watershed
McGinnis Slough Watershed
Hickory Creek Watershed
Spring Creek Watershed
Maple Lake-Chicago Sanitary and Ship Canal Watershed
Des Plaines River
Chicago Sanitary & Ship Canal
I & M Canal
CN-Railway
Cook County
Will County
Tampier Slough
Tampier Lake
McGinty Slough
Wolf Rd.
Will Cook Rd.
131st St.
Bell Rd.
143rd St.
151st St.
Parker Rd.
Lemont Rd.
Archer Ave.
Smith Rd.
New Rd.
Long Run Cr.
LRC1
LRC2
LRC3
LRC4
LRC5
LRC6
LRC7
LRC8
LRC9
LRC 10
LRC11
LRC12
LRC13
LRC14
TribA1
TribB1
TribB2
TribC1
TribC2
TribD1
TribD2
TribE1
TribE2
TribF1
TribF2
TribF3
TribF4
TribG1
TribH1
TribH2
TribI1
TribI2
TribJ1
TribJ2
TribK1
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N E S W
FIG34_LRC_Template_Stream_Reaches.mxd
Locator Map
Cook County
Cal-Sag Channel
Chicago River Watershed
DuPage County
Des Plaines Watershed
Des Plaines River
Will County
Fig. 34: Coded Stream Reaches
LRC = Long Run Creek
Trib A - M = Tributary to Long Run Creek
Trib N - O = Tributary to Slough
Legend
LRC1
Stream Reach
Stream Break
Roads
Significant Open Water
LRC Watershed Boundary
Adjacent Watershed
County Boundary
Data Sources:
AES 2012 Stream Inventory
Applied Ecological Services, Inc.™
Figure 34

In fall 2012, Applied Ecological Services, Inc. (AES) completed a field inventory of Long Run Creek and its tributaries. All streams and tributaries were assessed based on divisions into "Stream Reaches" (Table 13; Figure 34). Reaches are defined as stream segments having similar hydraulic, geomorphic, riparian condition, and adjacent land use characteristics. Methodology included walking all or portions of the stream and tributary reaches, collecting measurements, taking photos, and noting channel, streambank, and riparian corridor conditions on Stream Inventory/BMP Data Forms. AES also reviewed and incorporated results of a 2007 Long Run Creek Profile report completed by Integrated Lakes Management (ILM, 2007).

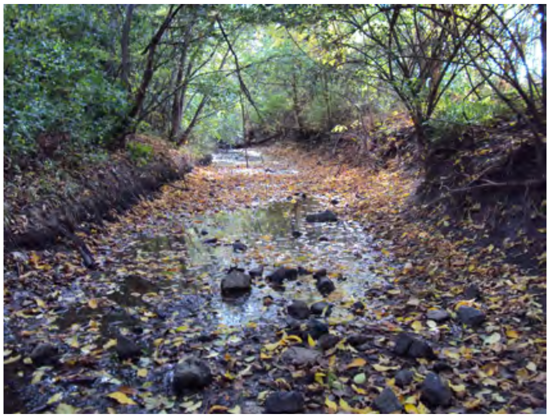
Numerous municipal stormwater point discharges were also encountered during the inventory but were not surveyed due to time and budget constraints. However, two NPDES wastewater treatment plant point sources were documented. Detailed notes were also recorded related to potential Management Measure recommendations and their corresponding priority for eventual inclusion into the Action Plan section of this report. Results of the inventory including completed data sheets, photos, and maps of each stream reach can be found in Appendix B.

Long Run Creek

Long Run Creek (Reach Code LRC) was divided into 14 distinct "Stream Reaches" beginning at the headwaters near Silo Ridge residential subdivision and ending at the I & M Canal (Table 13; Figure 34).

Long Run Creek Reach 1 (LRC1) begins in an agricultural area just east of Silo Ridge residential subdivision and continues north for 4,207 linear feet to 143rd Street. This reach is highly channelized, exhibits low quality pools and riffles, has moderate streambank erosion, and moderate to high sediment accumulation along the channel bottom. The immediate riparian area consists of a narrow band of invasive grasses, trees, and shrubs surrounded by agricultural land.

Long Run Creek Reaches 2, 3, and 4 (LRC2, LRC3, & LRC4) are similar. Reach 2 begins at 143rd Street and continues northwest for 5,787 linear feet to Will-Cook Road. Reach 3 is 7,031 linear feet between Will-Cook Road and Bell Road. Reach 4 continues west for 6,119 linear feet to Parker Road. All of these reaches are highly channelized with somewhat poor riffle-pool development and moderate streambank erosion. Sediment accumulation is only moderate but the riparian area is in poor condition as it is narrow and dominated by invasive shrubs and trees through mostly residential areas in Orland Park and Homer Glen. Problematic debris blockages are not common in these reaches. In addition, Orland Park owns a 10-acre parcel along Long Run Creek with preserved and restored vegetation and a park west of Long Run Drive in Reach 2. It is also important to note that Derby Meadows Wastewater Treatment Plant discharges to Long Run Creek Reach 3 west of Will-Cook Road. Chickasaw Wastewater Treatment Plan discharges to Reach 4 just east of Parker Road. Both wastewater treatment plants are Illinois EPA National Pollution Discharge Elimination (NPDES) permitted point discharges.



LRC Reach 2

Long Run Creek Reach 5 (LRC5) flows west for 3,123 linear feet through a wetland complex to approximately the end of Dublin Drive at Erin Hills residential subdivision. The upper portion of Long Run Creek is dammed creating a 1-acre impoundment. Downstream from the dam, Long Run Creek is moderately channelized and downcut into the surrounding

Dam/impoundment along LRC Reach 5

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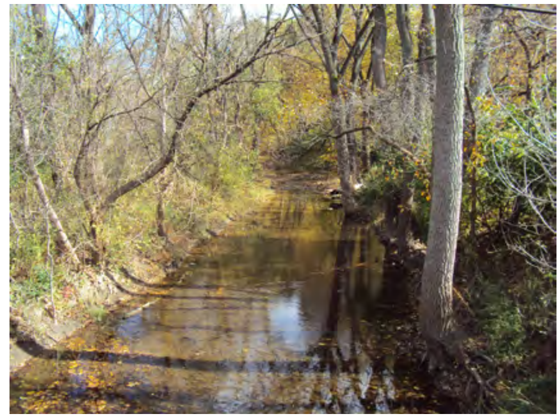
wetland by several feet, thereby disconnecting the stream hydrologically from the surrounding wetland/floodplain. In addition, streambank erosion is on average moderate with areas exhibiting severe erosion and sediment accumulation is high along the channel bottom. Homer Township owns a 10-acre parcel at the downstream end of this reach. This reach also presents excellent restoration and floodplain connection opportunities.

LRC Reach 5

Long Run Creek Reaches 6 & 7 (LRC6 & LRC7) continue west for 4,219 linear feet and 3,259 linear feet respectively through low density residential development between Hickory Avenue to the north and Spring Creek/Creek View Roads to the south. These reaches are naturally meandering with average quality riffle-pool development, low to moderate streambank erosion, and low to moderate levels of sediment deposition. The riparian area along these reach is low quality because several residential lawns back up to the stream while other riparian areas are dominated by invasive shrubs. A unique feature of Reach 7 is the "braided" nature of the stream through a large wetland complex where the stream separates into several branches that wind through the wetland then rejoin at the downstream end of the wetland.

Long Run Creek Reaches 8, 9, and 10 (LRC8, LRC9, & LRC10) exhibit similar characteristics. Reach 8 flows for 4,359 linear feet from approximately the end of Creek View Drive to several hundred feet east of Lemont Street. Reach 9 then continues another 4,360 linear feet under Lemont Street and Archer Avenue (Route 171). Reach 10 (LRC7) extends another 6,436 linear feet while flowing west under Illinois Interstate 355 and ends at Smith Road. These reaches are naturally meandering with moderate quality riffle-pool development and moderate to highly eroded streambanks. The riparian areas are moderate quality as they consist mostly of natural but overgrown floodplain forest and areas of residential lawn. In addition, a portion of Long Run Creek at the northwest intersection of 135th Street and Archer Avenue is being rerouted to accommodate construction being implemented to widen the road and solve constant and reoccurring flooding issues.



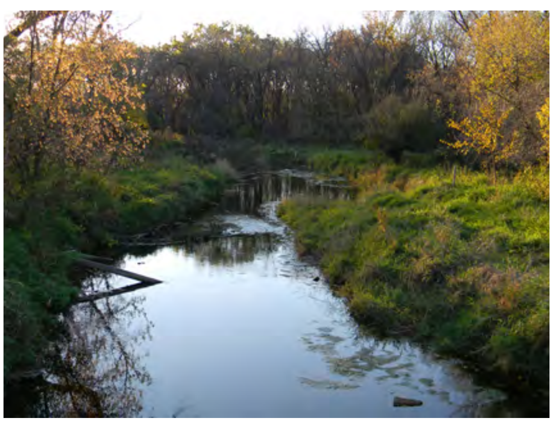
LRC Reach 10

The 11th reach of Long Run Creek (LRC11) flows west for 3,938 linear feet through Big Run Golf Club. This reach is naturally meandering but streambanks on average are highly eroded. The riparian area is also in poor ecological condition because much alteration has been done to accommodate the needs of the golf course. Reach 11 presents many opportunities to stabilize stream banks and restore riparian areas.

LRC Reach 11

Long Run Creek Reaches 12, 13, and 14 (LRC12, LRC13, LRC14) make up the remaining length of stream prior to Long Run Creek entering the I & M Canal. Reach 12 flows to the southwest for 4,669 linear feet after existing Big Run Golf Club and ends at Long Run Creek Nature Preserve. Reach 13 flows south then west for 3,130 linear feet through the nature preserve before flowing under New Road where it becomes Reach 14 as it winds through a wetland complex for 5,450 linear feet on land owned by Hanson Material Services, Inc. and Chevron. All of these reaches are generally considered higher quality because they naturally meander through open space that is at least moderate quality. Bank erosion is low to moderate among these reaches and substrate is stabile because it consists of cobble, boulders, and shallow limestone bedrock.

LRC Reach 13



LRC Reach 14

Tributary Streams

Fifteen (15) tributary streams are found in the watershed (Table 13; Figure 34). Thirteen (13) of these tributaries flow directly into Long Run Creek. The remaining two tributaries flow to slough areas within John J. Duffy Preserve. A brief description of each tributary stream is included below.

Tributary A (TribA): This tributary flows for 4,004 linear feet east from Will-Cook Road where it then passes through a large wetland complex on its way to Long Run Creek Reach 1.

Tributary B (TribB): This 3,562-linear foot tributary flows west though a channelized drainage ditch and large wetland complex prior to joining Long Run Creek Reach 2 just north of 143rd Street.

Tributary C (TribC): Tributary C begins at the dam/spillway at Tampier Lake and flows west for 3,714 linear feet through John J. Duffy Preserve then south for another 1,130 linear feet through a residential subdivision before entering Long Run Creek Reach 3.

Tributary D (TribD): This tributary flows north and on the east side of Parker Road through primarily residential areas prior to joining Long Run Creek Reach 5. The tributary is 9,517 linear feet long. Portions of this tributary's banks are highly eroded.

Tributary E (TribE): Tributary E begins at 147th Street and flows north for 7,229 linear feet before entering Long Run Creek Reach 6. This tributary is primarily surrounded by low density residential development.

Tributary F (TribF): This tributary is 16,209 linear feet making it the second longest tributary in the watershed. It begins in an agricultural area north of 131st Street and flows west through residential areas and a golf course prior to joining Reach 8 of Long Run Creek. A small secondary tributary also joins Tributary F east of the intersection of Archer Avenue and 131st Street. The upper reaches of Tributary F are highly channelized.

Tributary F near 131st Street

Tributary G (TribG): Tributary G begins at a detention basin and flows south for 4,539 linear feet before joining Long Run Creek Reach 8.

Tributary H (TribH): This tributary begins at 143rd Street and flows north for 7,631 linear feet through low density residential development prior to joining Long Run Reach 8. There is also a small secondary tributary that joins Tributary H on its west side just north of 130th Street.

Tributary I (TribI): Tributary I consists of two small tributaries totaling 4,386 linear feet that join just north of a commercial/retail center at the northwest corner of Archer Avenue and 135th Street. After joining, the tributary is apparently piped south under the commercial/retail center to Long Run Creek Reach 9. Portions of this tributary's banks are highly eroded.

Tributary J (TribJ): Two small tributaries that both originate at detention basins come together just west of Illinois Interstate 355 before flowing south to Long Run Creek Reach 10. Combined this tributary is 6,454 linear feet in length. Portions of this tributary's banks are highly eroded.

Tributary K (TribK): This tributary flows south for 4,674 linear feet through low density residential areas then joins Long Run Creek Reach 10 east of Smith Road. All of the banks along this tributary are highly eroded.

Tributary L (TribL): Tributary L begins south of 143rd Street and flows northwest under Illinois Interstate 355 and continues northwest along commercial and low density residential development prior to joining Long Run Creek at the end of Reach 10.

Tributary M west of High Road

Tributary M (TribM): Tributary M is the longest in the watershed at 14,689 linear feet. This tributary is also known locally as South Ditch. It drains a large subwatershed area in the far southwest corner of the watershed prior to joining Long Run Creek Reach 14 just east of Long Run Creek's confluence with the I & M Canal. Most of the streambanks along this tributary are highly eroded.

Tributary N (TribN): This tributary begins in a residential subdivision in the far northeast corner of the watershed and flows west for 2,960 linear feet before entering Tampier Slough within John J. Duffy Preserve.

Tributary O (TribO): Tributary O is located entirely within John J. Duffy Preserve. It flows east for 3,265 linear feet and through a large wetland complex and then to an unnamed slough.

Stream Channelization

Naturally meandering streams generally provide riffles and pools that benefit the system by providing various habitats while oxygenating the water during low flow or summer heat. Channelized or ditched streams are often void of or have low quality riffles and pools. Berms are also common along channelized streams where landowners spoiled soils excavated from the channel. These spoil piles often inhibit natural flooding into adjacent floodplains.

Channelization along LRC Reach 4

Each stream reach in the watershed was characterized as either having none or low channelization (highly sinuous, no human disturbance), moderate channelization (some sinuosity but altered), or highly channelized (straightened by humans) (Table 14; Figure 35). According to the stream inventory, 67% (115,826 lf) of stream and tributary length is naturally meandering; approximately 14% (24,060 lf) is moderately channelized; 19% (32,624 lf) is highly channelized. The most severe channelization is found along Long Run Creek east of Parker Road and along the upper reaches of Tributary F where agricultural ditching practices were once common.

Channelized areas present opportunities for Management Measure projects such as artificial riffle and pool restoration and regrading or breaking of adjacent spoil piles for reconnection of the stream to adjacent floodplains. The Action Plan section of this report addresses opportunities for improving many of the channelized stream reaches.

Table 14. Summary of stream and tributary channelization.

Stream or Tributary Name	Abbreviation	Stream Length Assessed (ft)	None or Low Channelization		Moderate Channelization		High Channelization	
			(feet)	(%)	(feet)	(%)	(feet)	(%)
Long Run Creek	LRC	66,089	39,820	60	3,123	5	23,144	35
Tributary A	TribA	4,004	4,004	100	0	0	0	0
Tributary B	TribB	3,563	3,563	100	0	0	0	0
Tributary C	TribC	4,844	0	0	4,844	100	0	0
Tributary D	TribD	9,518	6,301	66	3,216	34	0	0
Tributary E	TribE	7,229	4,824	67	2,405	33	0	0
Tributary F	TribF	18,579	3,192	17	7,511	41	7,876	42
Tributary G	TribG	4,539	4,539	100	0	0	0	0
Tributary H	TribH	10,308	10,308	100	0	0	0	0
Tributary I	TribI	4,387	4,387	100	0	0	0	0
Tributary J	TribJ	6,454	6,454	100	0	0	0	0
Tributary K	TribK	4,674	4,674	100	0	0	0	0
Tributary L	TribL	7,407	7,407	100	0	0	0	0
Tributary M	TribM	14,690	13,087	89	0	0	1,603	11
Tributary N	TribN	2,960	0	0	2,960	100	0	0
Tributary O	TribO	3,265	3,265	100	0	0	0	0
Totals		**172,510**	**115,826**	**67**	**24,060**	**14**	**32,624**	**19**

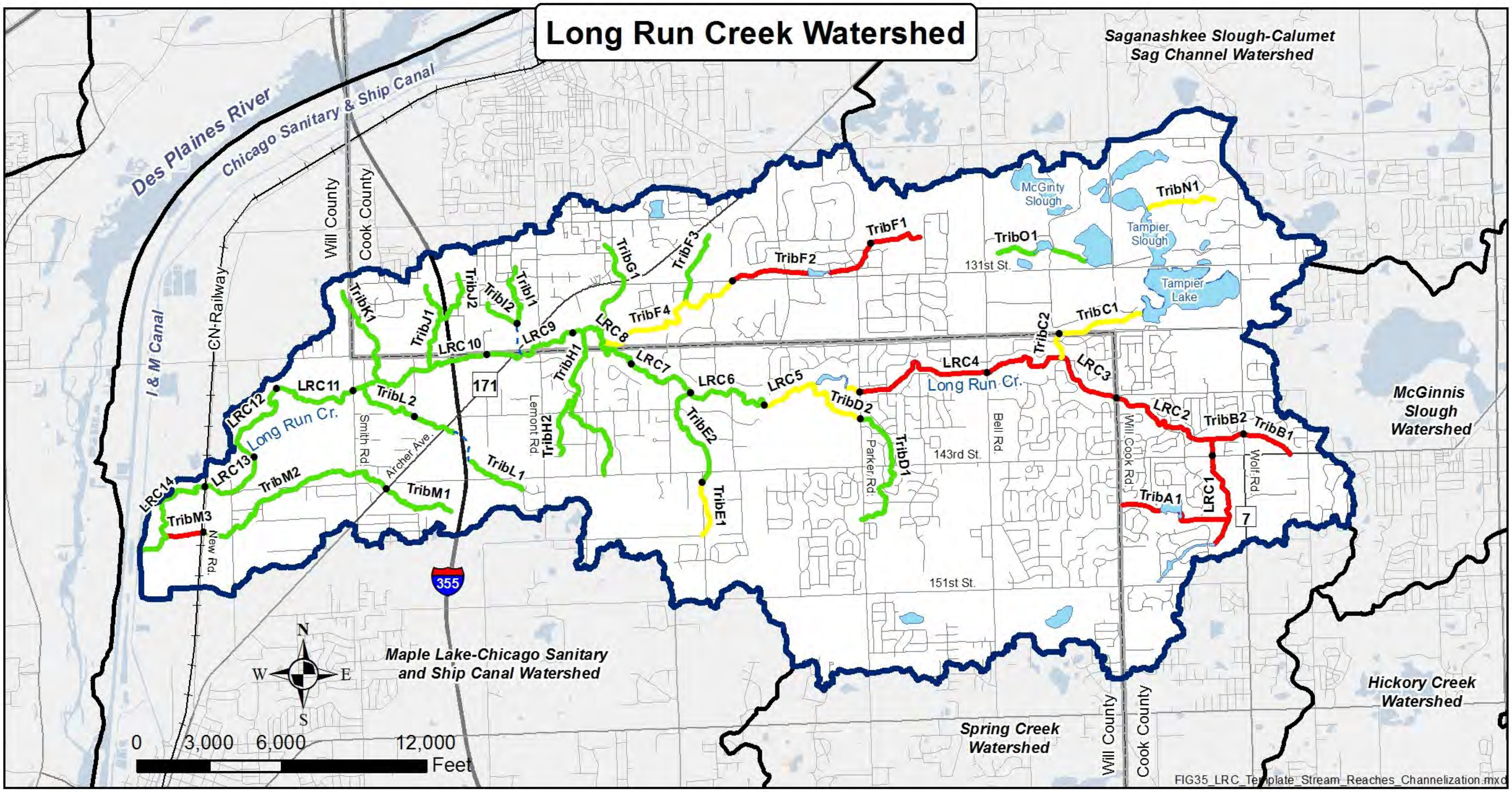


Fig. 35: Degree of Stream Channelization

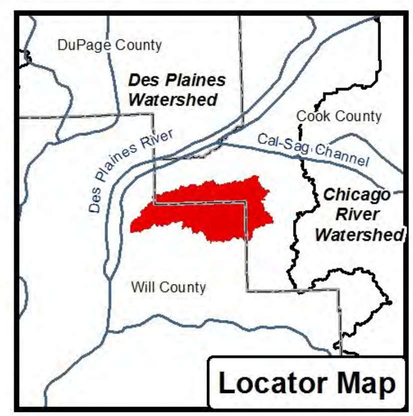
Legend

- Stream Break
- Roads
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary
- Stream Reach End Point

Degree of Channelization

- None/Low
- Moderate
- High

Data Sources:
AES 2012 Stream Inventory



Applied Ecological Services, Inc.™

Figure 35

Streambank Erosion

Unnatural streambank erosion generally results following an instability in flow rate or volume in the stream channel, human alteration such as channelization, or change in streambank vegetation. Resulting sediment accumulation and transportation downstream can cause significant water quality problems. Streambank erosion is moderate on average throughout the watershed and is a reflection of increased impervious cover and stormwater runoff. Watershed pollutant loading data (see Section 4.2) indicates that streambank erosion is one of the leading causes of sedimentation.

Highly eroded streambank along LRC Reach 5

The location and severity of streambank erosion in the watershed is summarized in Table 15 and depicted on Figure 36. Approximately 35% (60,129 lf) of the total stream and tributary length exhibits no or low bank erosion while moderate erosion is occurring along 45% (77,461 lf) of streambanks. Highly eroded streambanks are most common in the far western portion of the watershed accounting for 20% (34,920 lf) of the total stream length. Many highly eroded reaches are considered "Critical Areas" because they are actively contributing significant sediment loads downstream.

All highly eroded and some moderately eroded streambanks provide excellent opportunities for streambank stabilization projects. The Action Plan section of this report addresses and prioritizes opportunities for reducing streambank erosion.

Table 15. Summary of stream and tributary bank erosion.

Stream or Tributary Name	Abbreviation	Stream Length Assessed (ft)	None or Low Erosion		Moderate Erosion		High Erosion	
			(feet)	(%)	(feet)	(%)	(feet)	(%)
Long Run Creek	LRC	66,089	11,840	18%	45,950	70%	8,299	12%
Tributary A	TribA	4,004	4,004	100%	0	0%	0	0%
Tributary B	TribB	3,563	3,563	100%	0	0%	0	0%
Tributary C	TribC	4,844	4,844	100%	0	0%	0	0%
Tributary D	TribD	9,518	0	0%	6,302	66%	3,216	34%
Tributary E	TribE	7,229	2,405	33%	4,824	67%	0	0%
Tributary F	TribF	18,579	18,579	100%	0	0%	0	0%
Tributary G	TribG	4,539	0	0%	4,539	100%	0	0%
Tributary H	TribH	10,308	2,677	26%	7,631	74%	0	0%
Tributary I	TribI	4,387	0	0%	2,771	63%	1,616	37%
Tributary J	TribJ	6,454	0	0%	2,425	38%	4,029	62%
Tributary K	TribK	4,674	0	0%	0	0%	4,674	100%
Tributary L	TribL	7,407	4,388	59%	3,019	41%	0	0%
Tributary M	TribM	14,690	1,604	11%	0	0%	13,086	89%
Tributary N	TribN	2,960	2,960	100%	0	0%	0	0%
Tributary O	TribO	3,265	3,265	100%	0	0%	0	0%
Totals		**172,510**	**60,129**	**35%**	**77,461**	**45%**	**34,920**	**20%**

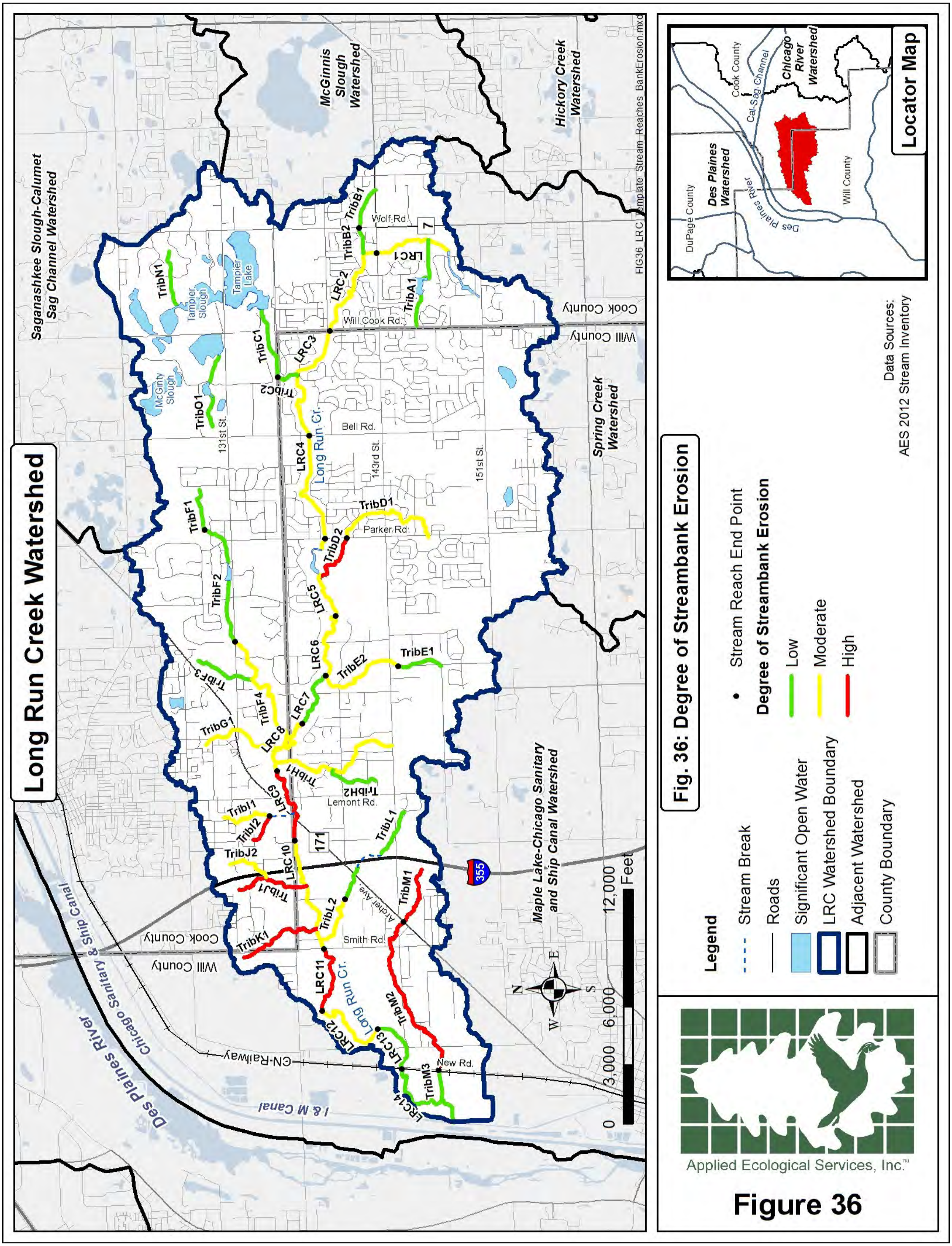
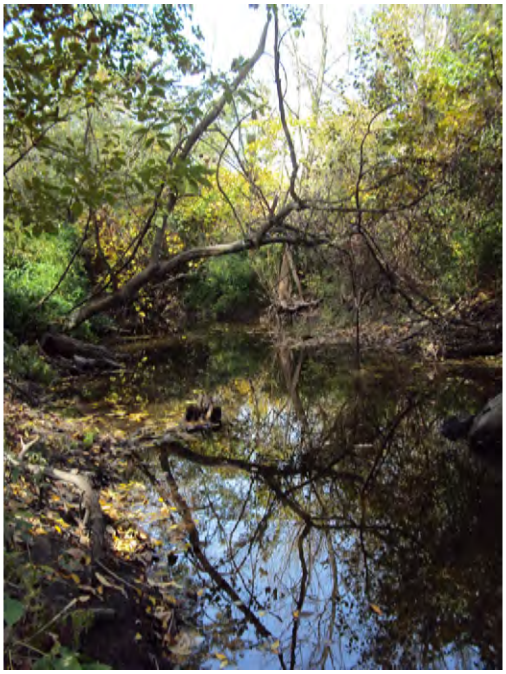


Fig. 36: Degree of Streambank Erosion

Riparian Area Condition

Riparian areas buffer streams by filtering pollutants, providing beneficial wildlife habitat, and connecting green infrastructure. Riparian areas along streams and tributaries were assessed during the stream inventory by noting the "Condition" as it relates to function and quality of plant communities present. Areas in "Good" condition connect hydrologically with streams and tributaries during flood events and have remnant or restored wetland plant communities. "Average" condition riparian areas retain some hydrological connection to the adjacent stream with somewhat degraded plant communities. Areas in "Poor" condition are usually found along channelized streams that have been heavily farmed in the past causing degraded plant communities to establish.

The location and condition of riparian areas in the watershed is summarized in Table 16 and Figure 37. Approximately 63% of the riparian areas are at least "Moderate" quality and are found in the western half of the watershed and within John J. Duffy Preserve. The remaining 37% of riparian areas are in "Poor" condition and found in the eastern half of the watershed; these correlate closely with stream reaches that are highly channelized. There are no riparian areas that are in "Good" condition. Invasive species including common reed (*Phragmites australis*), reed canary grass (*Phalaris arundinacea*), common buckthorn (*Rhamnus cathartica*), and box elder (*Acer negundo*) contribute most to degraded conditions. Fortunately, ecological restoration helps eradicate these species and encourages native plant establishment. The Action Plan lists and prioritizes opportunities for improving riparian areas.



Degraded riparian area at LRC Reach 3

Table 16. Summary of stream and tributary area riparian condition.

Stream or Tributary Name	Abbreviation	Stream Length Assessed (ft)	Good Condition		Average Condition		Poor Condition	
			(feet)	(%)	(feet)	(%)	(feet)	(%)
Long Run Creek	LRC	66,089	0	0	31,663	48	34,424	52
Tributary A	TribA	4,004	0	0	0	0%	4,004	100
Tributary B	TribB	3,563	0	0	0	0%	3,563	100
Tributary C	TribC	4,844	0	0	3,714	77	1,130	23
Tributary D	TribD	9,518	0	0	6,302	66	3,216	34
Tributary E	TribE	7,229	0	0	4,824	67	2,405	33
Tributary F	TribF	18,579	0	0	10,703	58	7,876	42
Tributary G	TribG	4,539	0	0	4,539	100	0	0
Tributary H	TribH	10,308	0	0	10,308	100	0	0
Tributary I	TribI	4,387	0	0	4,387	100	0	0
Tributary J	TribJ	6,454	0	0	4,029	62	2,425	38
Tributary K	TribK	4,674	0	0	0	0%	4,674	100
Tributary L	TribL	7,407	0	0	7,407	100	0	0
Tributary M	TribM	14,690	0	0	14,690	100	0	0
Tributary N	TribN	2,960	0	0	2,960	100	0	0
Tributary O	TribO	3,265	0	0	3,265	100	0	0
Totals		**172,510**	**0**	**0**	**108,792**	**63**	**63,718**	**37**

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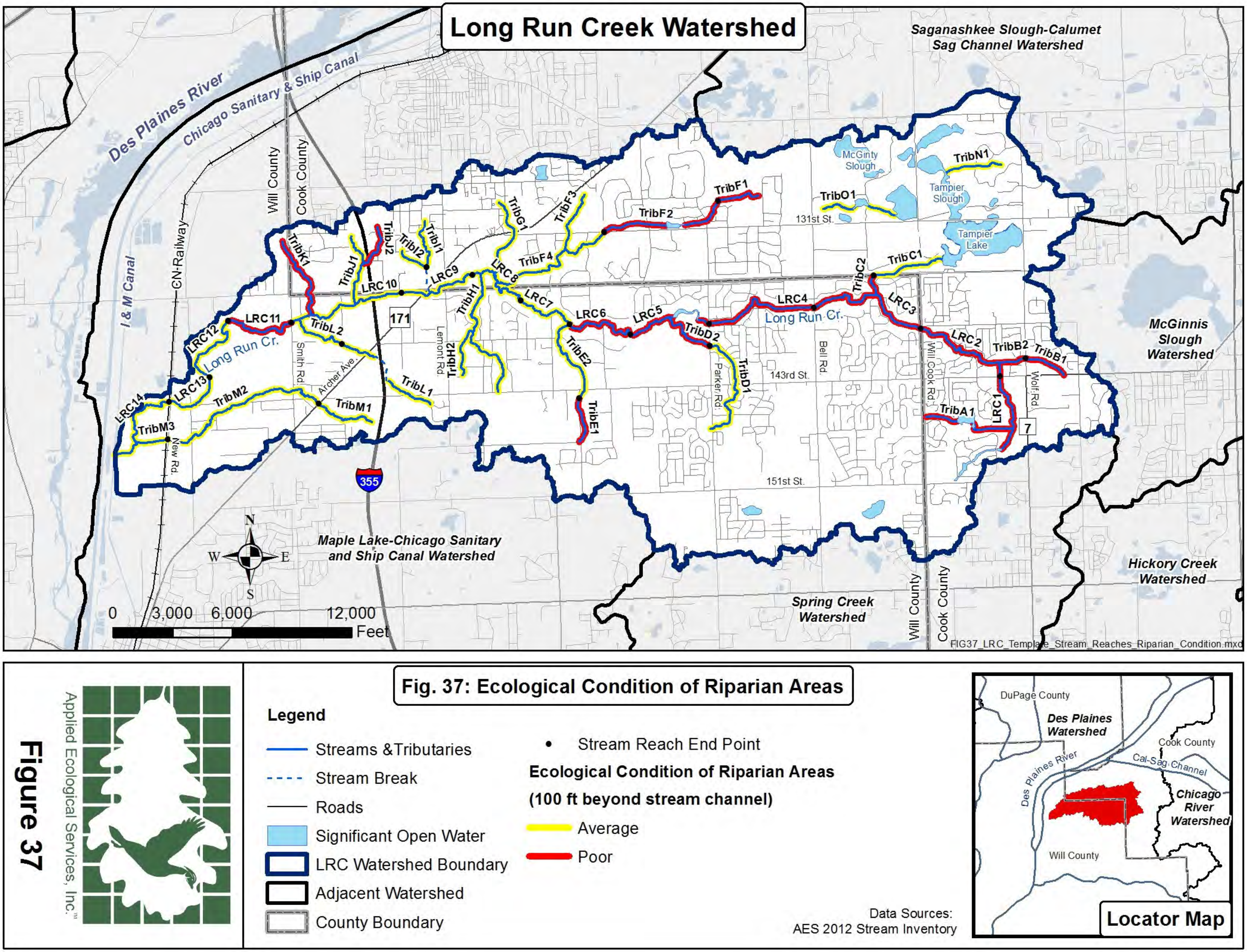


Fig. 37: Ecological Condition of Riparian Areas

Figure 37

3.13.3 DETENTION BASINS

Ecologically designed basin at Erin Hills Subdivision

Over the past 30+ years, the drainage system in Long Run Creek watershed has changed from farmland driven drain tiles, channels, and ditches to one that is driven by runoff from developed areas. Planners and engineers quickly realized the benefits of storing stormwater runoff in detention basins near development. A detention basin is a human-made structure for the temporary storage of stormwater runoff with a controlled release rate. For example, the required controlled release rate for basins in the Will County portion of the watershed is regulated by the Will County Stormwater Ordinance at 0.04 cfs/acre for the 2-year frequency rain event. Detention basins can also provide excellent wildlife habitat and improve water quality if designed with the proper configuration, slopes, and water depths then planted with native prairie and wetland vegetation. Today, detention basins capture runoff from at least 50% of the watershed making the quality and quantity of water leaving these basins critically important to the health of Long Run Creek.

Detention basins can be designed and constructed as wet bottom, wetland bottom, or dry bottom and planted with various types of natural or manicured vegetation. Wet and wetland bottom basins typically hold water that is controlled by the elevation of the outlet structure. This design promotes water quality treatment and supports wildlife. Wet bottom basins are usually greater than 3 feet deep and do not have emergent vegetation throughout whereas wetland bottom detention basins are shallow enough to be dominated by emergent wetland plants. Dry bottom basins are designed to drain completely after temporarily storing stormwater following rain events. They can be planted to either turf grasses or naturalized with native species.

Long Run Creek watershed has 185 known detention basins (Figure 38). Applied Ecological Services, Inc. completed a basic assessment of each detention basin in fall 2012. Assessment methodology included a visit to each site and collection of data relevant to existing conditions. Detailed notes were recorded related to existing ecological/water quality improvement condition and potential retrofit Management Measures for eventual inclusion into the Action Plan section of this report. Results of the inventory and detailed summaries of each detention basin can be found in Appendix B. The inventory resulted in 77 dry bottom with turf slopes, 79 wet /wetland bottom with turf slopes, 26 naturalized wet/wetland bottom, and 3 naturalized dry bottom basins (Figure 38).

Of the 185 basins, only 20 (11%) likely provide "Good" ecological and water quality benefits while 40 basins (22%) likely provide "Average" benefits. The remaining 125 basins (69%) likely provide "Poor" ecological and water quality benefits because most were designed simply to meet stormwater storage volume requirements. Designs that also improve water quality and wildlife habitat were not necessarily considered because they are not required under local and federal regulations. Will and Counties require that Best Management Practices (BMPs) such as detention basins be part of permitted developments to provide green infrastructure, sustainability, minimize human intervention, and to treat stormwater as a multiple use resource. However, other than required volume and release rates, detailed examples and standardized specifications are not provided leaving a great deal of ambiguity regarding what is actually required.

The majority of dry bottom detention basins are located within the Village limits of Lemont and Homer Glen. Of the 80 dry bottom basins in the watershed 77 are planted with turf grass that provides little to no water quality benefits, wildlife habitat, or infiltration to replenish groundwater. Dry bottom basins planted with turf grass hold water for shorter periods following rain events and infiltrate less water compared to dry bottom basins naturalized with deep rooted vegetation such as the naturalized basin at Bambrick Park in Lemont. In addition, many of the dry bottom basins are constructed with either concrete low flow channels that run directly from the inlet to the outlet or have outlet drains flush with the

Naturalized dry bottom detention at Bambrick Park, Lemont area

Typical dry bottom basin w/concrete channel behind Aldi, Lemont

Typical wet bottom detention with turf slopes at Shadow Ridge Estates, Palos Park bottom of the basin. In these cases, polluted stormwater runoff following smaller rain events travels directly through the basin without being stored, treated, or infiltrated. These designs should be avoided in the future. Many of the dry bottom basins in the watershed present excellent retrofit opportunities. Most dry bottom basins are relatively easy to naturalize with native plantings and concrete structures and drains can be manipulated to store and infiltrate water as desired.

Wet and wetland bottom detention basins are also common in the watershed and concentrated in Homer Glen and Orland Park. Individual development sites tend to have basins that are all similarly planted. For example, most wet and wetland bottom basins in a development are planted with either turf grass along the basin slopes or are naturalized with native vegetation along the slopes and emergent edge. Basins planted with turf grass were designed with aesthetics in mind and not necessarily the potential water quality and habitat benefits. Because of this, most homeowner and business associations will likely disapprove of installing water quality retrofits such as native plant buffers unless they can be designed to look formal and need minimal maintenance. Twenty six (26) of the 105 wet and wetland bottom detention basins in the watershed are naturalized with native vegetation. Most of these are located in Homer Glen. Like most dry bottom basins, the side slopes and emergent areas of wet and wetland bottom basins can be retrofitted with native vegetation relatively easily.

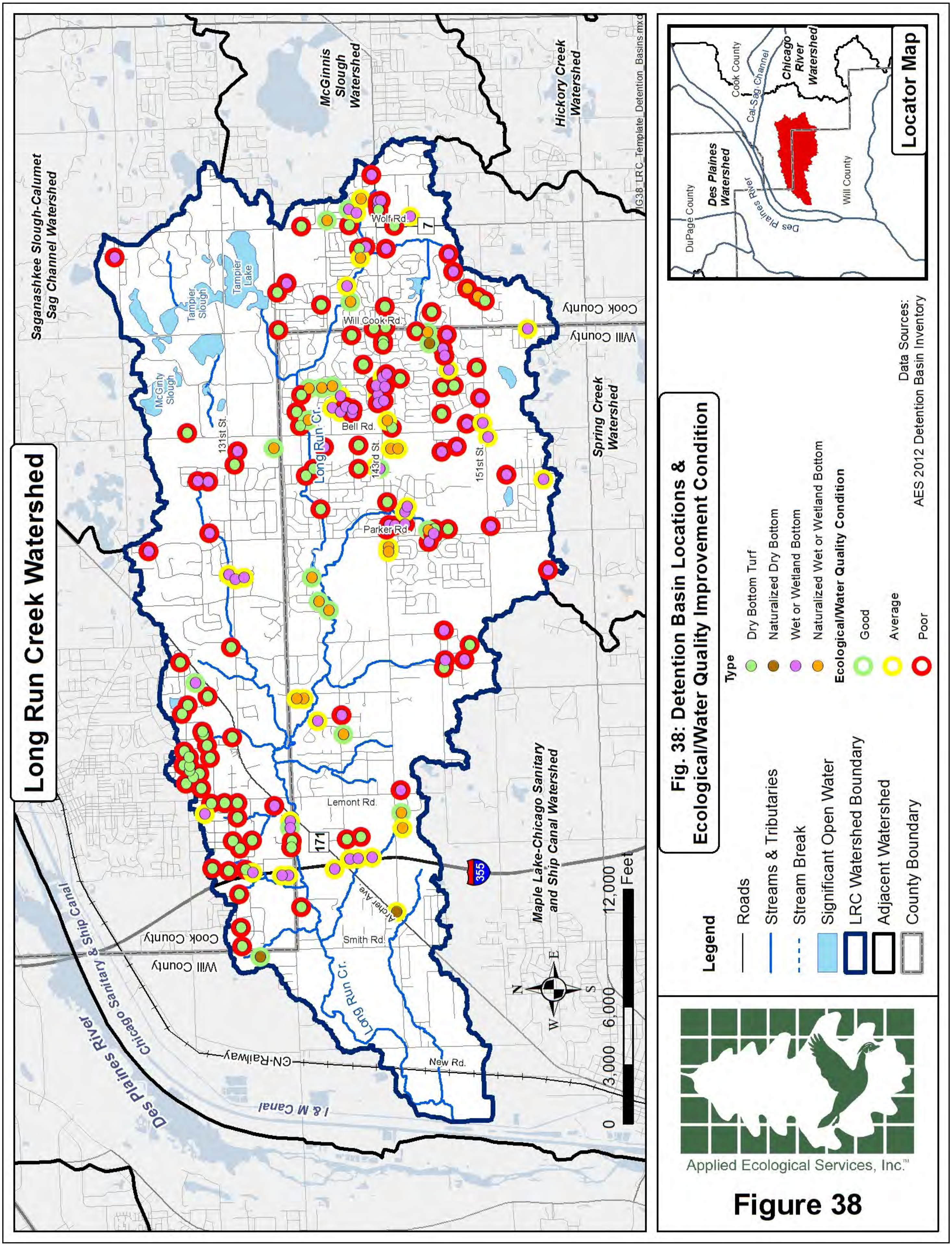


Fig. 38: Detention Basin Locations & Ecological/Water Quality Improvement Condition

3.13.4
TAMPIER LAKE

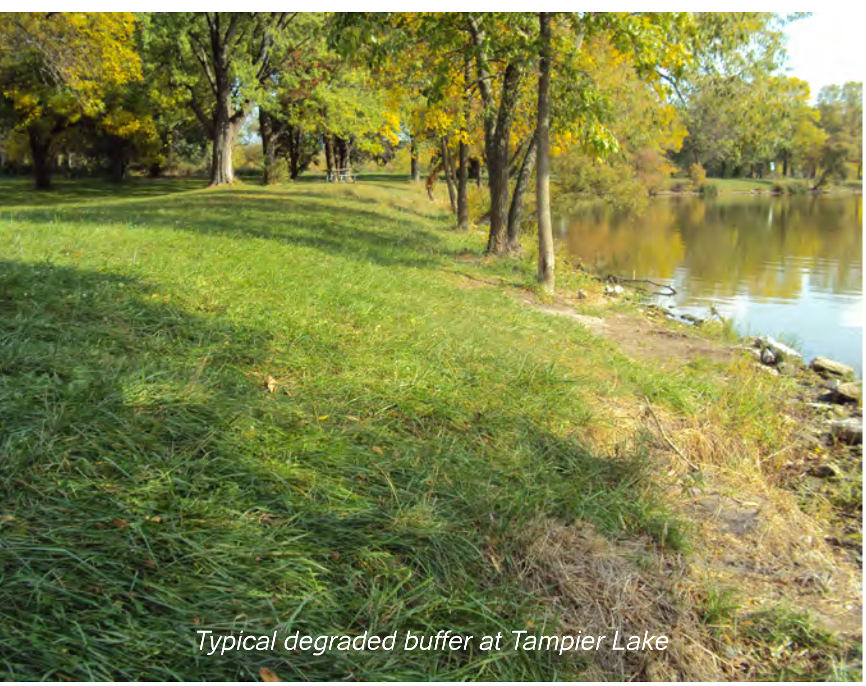
Dam at southwest end of Tampier Lake

Tampier Lake is a 160-acre eutrophic (fertile), human created lake, found in the southeast portion of John J. Duffy Preserve and is considered the only true lake in Long Run Creek watershed. The maximum depth of the lake is 16 feet with an average depth of 6 feet. 1,577 acres of mostly forest/shrubland/grassland, medium density residential in Palos Park, open water sloughs, and row crop agricultural land within Subwatershed Management Unit 5 (see Section 3.8) drain to the lake. The area now containing the lake was historically a series of shallow sloughs which were excavated out of peat around 1958 when the Forest Preserve District of Cook County (FPDCC) purchased the surrounding property (IEPA, 2010). In 1962, the FPDCC dug a number of channels around the proposed lake and a dam was constructed on a tributary of Long Run Creek creating a 75-acre lake. A three foot cap was later added to the dam in 1964 to raise lake levels and create the footprint of the lake as seen today. The open water area extending north under the 131st Street bridge is referred to as Tampier Slough.

Aerial image of Tampier Lake within John J. Duffy Preserve. Source: Google Maps.

Lotus plants at Tampier Lake

Cove at Tampier Lake



Typical degraded buffer at Tampier Lake

Tampier Lake and surrounding preserve are used heavily by humans for recreation. The Sag Valley Trail runs along the south side of Tampier Lake and is popular for hiking, horseback riding, and bird watching. A parking/picnic area and fishing access is found on the west side of the lake in an area called Tampier Lake-West. Tampier Lake Boating Center is located on the east side of the lake and provides boat and canoe rentals and also a boat launch. Tampier Lake is known locally for it fishery and waterfowl populations. Walleye, northern pike, channel catfish, sunfish, crappie, and largemouth bass are common catches in the Lake. Waterfowl are highly abundant, especially during spring and fall migration. The state endangered Ospreys, a large bird of prey that lives and breeds near wetlands and lakes, is known to nest at Tampier Lake. In addition, the lake supports a population of a relatively uncommon emergent plant called lotus (*Nelumbo lutea*).

The most comprehensive study of Tampier Lake was conducted in 2010 by Illinois EPA-Bureau of Water as part of a Total Maximum Daily Load (TMDL) report for the lake (IEPA, 2010). A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. The report was generated because Tampier Lake (IEPA code RGZO) was listed by Illinois EPA as "Impaired" (303(d) listed) in Illinois EPA's Integrated Water Quality Report issued in March 2008. It is also listed as impaired in the most recent 2012 Illinois EPA report. Tampier Lake is listed for impairment of *Aesthetic Quality* due to total suspended solids (TSS), aquatic plants, aquatic algae, and total phosphorus (TP) originating from multiple sources including waterfowl and runoff from forest/grassland/ parkland, agriculture, and urban areas. A more detailed discussion of water quality issues impacting Tampier Lake can be found in Section 4.0.

Illinois EPA's 2010 TMDL report lists various external and internal Management Measures that can be implemented to potentially reduce non-point sources of pollution, particularly phosphorus. These include:

1. Filter strips
2. Riparian buffers
3. Wetlands
4. Nutrient management
5. In-lake management measures

The condition of the shoreline and buffer around much of the western and northern portions of Tampier Lake within park areas is degraded. Installing riparian buffers around much of this area is perhaps the best short term project that might result in significant pollutant load reductions to the lake. Installation of native plant buffers would increase infiltration of surrounding runoff, stabilize eroded shoreline areas, improve habitat, and even deter geese from feeding and defecating along the shoreline. Trails and fishing access areas could also be incorporated into buffer designs.

Restored buffer at Morton Arboretum

Noteworthy- Tampier Lake TMDL

It is important to note that the Illinois EPA clearly states in their 2010 TMDL report for Tampier Lake that all programs discussed in the "Implementation Plan" section are voluntary. In other words, entities with jurisdiction in portions of Tampier Lake's subwatershed including Palos Park, Orland Park, Palos Township, Orland Township, and the Forest Preserve District of Cook County are not required to implement projects recommended by Illinois EPA in their 2010 TMDL report or the Long Run Creek Watershed-Based Plan.

SECTION 3.0

3.13.5 WETLANDS & POTENTIAL WETLAND RESTORATION SITES

A diverse network of wetlands remained intact in Long Run Creek watershed until the late 1830s when European settlers began to alter significant portions of the watershed's natural hydrology and wetland processes. Where it was feasible, sedge meadow, wet prairie, and marsh communities were drained, streams channelized, and existing vegetation cleared to farm the rich soils. There were approximately 3,312 acres of wetlands in the watershed prior to European settlement based on the most up to date hydric soils mapping provided by the USDA Natural Resources Conservation Service (NRCS). According to existing wetland inventories, about 1,191 acres or 36% of the pre-European settlement wetlands remain (Figure 39). A more detailed discussion of important natural area wetlands can be found in Section 3.12.

Functional wetlands do more for water quality improvement and flood reduction than any other natural resource. In addition, intact wetlands typically provide habitat for a wide variety of plant and animal species. They also provide groundwater recharge, filter sediments and nutrients, and slowly discharge to streams thereby maintaining water levels in streams during drought periods. General wetland information and mapping is available for Long Run Creek watershed via the United States Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI). Applied Ecological Services, Inc. updated the NWI wetland boundaries and noted the location of wetlands not included in the NWI during a field inventory of the watershed conducted in fall 2012. The wetland data collected during the field inventory was used to map and describe the existing wetlands in the watershed and to help locate potential wetland restoration sites.

Most of the smaller wetlands that were scattered about the watershed and most of the remaining wetlands along Long Run Creek and tributaries were drained or degraded by farming practices at some point in the last 150 years to the extent that hydrology has changed and invasive species such as purple loosestrife (*Lythrum salicaria*), common and glossy buckthorn (*Rhamnus sp.*), reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites*

From top to bottom: *Tampier Slough north of 131st Street; Large wetland complex along LRC Reach 5; Egrets and other waterbirds at Tampier Slough.*

australis) now dominate. Twelve large wetland complexes accounting for about 450 acres remain in areas surrounding Long Run Creek and several tributaries. These wetlands were identified in the watershed as being important for stormwater storage, wildlife corridors, and/or green infrastructure connections.

Some of the largest and higher quality wetland areas are found at McGinty Slough, Tampier Slough, and various other unnamed sloughs in John J. Duffy Preserve. These shallow, swamp-like wetlands are among the largest in the region and provide ample habitat for shorebirds, egrets, herons, ducks, and other waterbirds during spring and fall migrations.

The highest quality wetland in the watershed is found at Long Run Seep Nature Preserve. There seeps and fen wetlands formed at the base of the Des Plaines River valley bluffs provide cold calcareous groundwater that supports many conservative and rare plants. The seeps also provide critical habitat for the Hine's Emerald Dragonfly (HED), a federal and state listed endangered species.

Noteworthy- Wetland Protection

Wetlands connected to "Waters of the United States" are protected in Will and Cook Counties by the U.S. Army Corps of Engineers (USACE)-Chicago District via section 404 of the Clean Water Act. The USACE will generally require an Individual Permit (IP) for modifications to high quality wetlands although most high quality wetlands are generally considered unmitigatable. In rare cases where mitigation is allowed, as much as a 5:1 mitigation ratio is required. Additionally, high quality wetlands located within developed areas require a 100-foot buffer to aid in protection. Mitigation for impacts to low quality wetlands is set at a 1.5:1 ratio.

The USACE does not have jurisdiction over "Isolated Wetlands." Counties and municipalities have jurisdiction over isolated wetlands via countywide ordinances. However, these ordinances do not prevent the net loss of isolated wetlands. It is recommended that local municipalities and counties pass local ordinances to protect isolated wetlands.

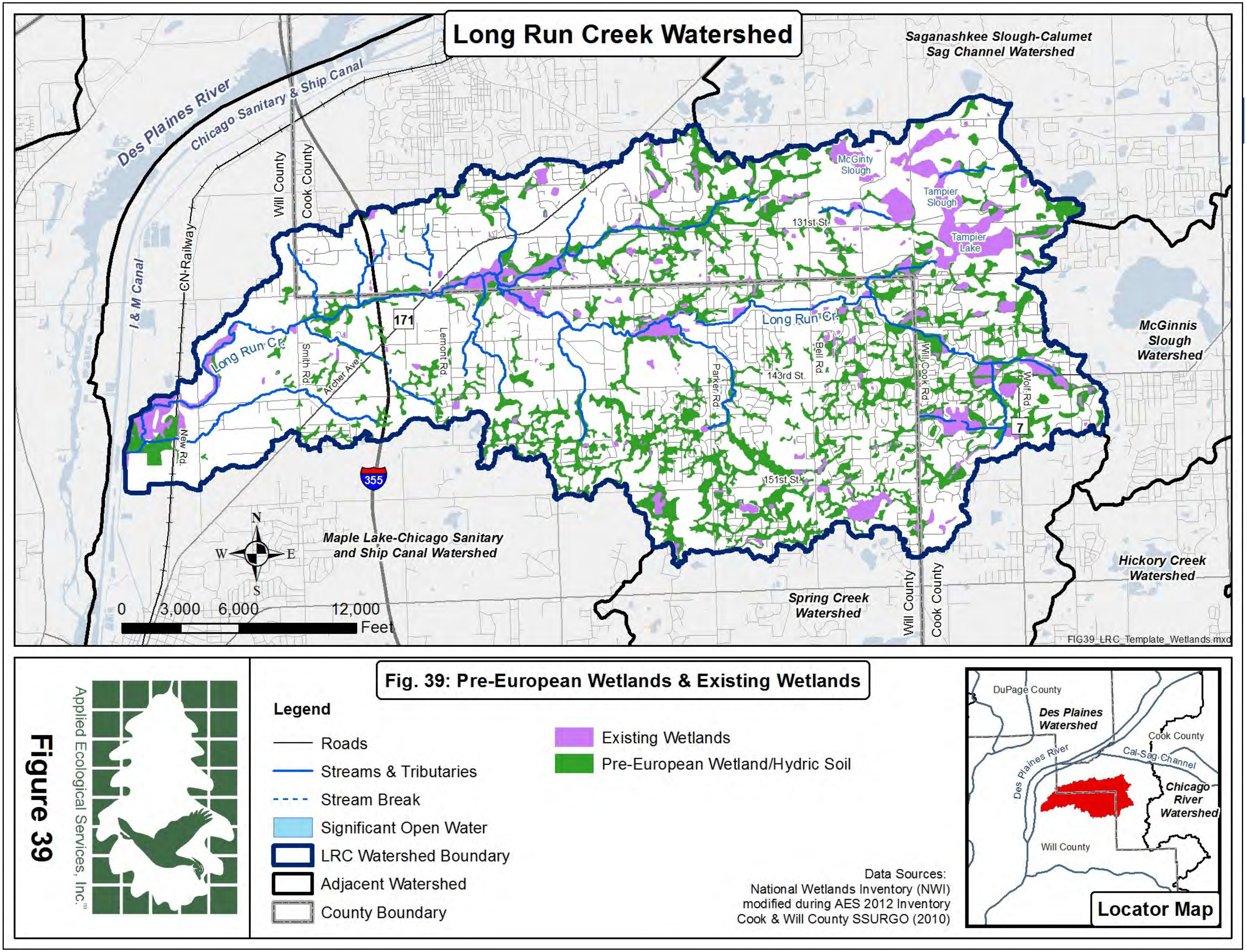


Fig. 39: Pre-European Wetlands & Existing Wetlands

Figure 39

Potential Wetland Restoration Sites

Wetland restoration projects are among the most beneficial in the context of improving watershed health. Wetlands are vitally important because they improve basic environmental functions such as storing floodwaters, increasing biodiversity, creating green infrastructure, and improving water quality. The wetland restoration process involves returning hydrology (water) and vegetation to soils that once supported wetlands but no longer do because of human impacts such as tile and ditch draining and/or filling. Potential wetland restoration sites were identified using a Geographic Information Systems (GIS) exercise whereby sites were selected that include at least 3 acres of drained hydric soils located on an open or partially open parcel where no wetlands currently exist.

The GIS exercise resulted in 116 sites meeting the above criteria. However, the extent of development in Long Run Creek watershed limits the number and size of potential wetland restoration sites. Of the original 116 sites, only 30 (accounting for 545 acres) were determined to be potentially feasible or have at least limited feasibility after careful review of each site using 2012 aerial photography, open space inventory results, existing (2012) land use, and field visits where appropriate (Table 17; Figure 40). Of the 30 sites, 23 are "Potentially Feasible," and 7 have "Limited Feasibility." Most of the potentially feasible sites are located on large blocks of undeveloped land such as agricultural fields. Sites with limited feasibility are generally smaller and more closely associated with nearby development. Most of the sites that were eliminated were found in partially open areas where the proximity of existing development simply would not allow for wetland restoration. It is important to note that 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. In addition, potential wetland restoration sites located within ComEd right-of-ways may not be feasible if the restoration affects access to structures or creates standing water conditions.

A detailed summary of wetland restoration recommendations is included and prioritized in the Action Plan section of this report. Site #s 1, 2, 3, 8, 9, 13, 14, 16, 17, 18, 19, 21, and 22 are among the highest priority because of their location, size, or potential to remediate watershed problems and/or potential as wetland mitigation banks. Municipalities should strongly consider "Conservation Design" that incorporates wetland restoration on parcels slated for future development and parks. Another potential option is to restore wetlands as part of a wetland mitigation bank. In this case, wetlands are restored on private or public land and must meet certain performance criteria before they become "fully certified." Following certification, developers are able to buy wetland mitigation credits from the wetland bank for wetland impacts occurring elsewhere in the watershed. A fully certified acre of restored wetland can sell between $40 and $100 thousand dollars. Although this may seem like an enormous expense to a developer, it is often cheaper than going through a long permitting process to impact wetlands and provide mitigation on the development site. It is also possible that in the future Illinois EPA may require more strict nutrient policies for wastewater treatment plants. Wetland banks may provide an opportunity for plant owners to buy "water quality trading credits."

Potential wetland restoration opportunity at Site 16. Source: Google Maps

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Table 17. Size, feasibility, and existing condition of potential wetland restoration sites.

Map ID #	Area (ac)	Feasibility	Existing Condition
1	14.7	Potentially Feasible	Located on private agricultural land at northeast corner of Will-Cook Rd. and 151st St. Area is slated for future residential development.
2	23.4	Potentially Feasible	Located on private agricultural land in far southeast corner of watershed
3	24.0	Potentially Feasible	Two sites on private agricultural land at headwaters of Long Run Creek
4	4.8	Limited Feasibility	Located on private residential lot
5	4.9	Potentially Feasible	Located at northeast corner of Long Run Creek and Wolf Road on private land within floodplain in Orland Township
6	5.3	Potentially Feasible	Northern portion located within Tampier Lake Greenway; southern portion located within ComEd utility easement
7	11.1	Limited Feasibility	Located on private agricultural land split by ComEd utility easement
8	9.5	Potentially Feasible	Located on private agricultural land east of Tampier Lake
9	9.3	Potentially Feasible	Located on private agricultural land east of Tampier Lake
10	7.5	Potentially Feasible	Located at northeast end of Tampier Lake. Area is split between John J. Duffy Preserve, ComEd utility easement and private agricultural land
11	5.2	Potentially Feasible	Located at northeast end of Tampier Lake within John J. Duffy Preserve
12	5.6	Potentially Feasible	Located in floodplain area surrounded by residential development
13	40.7	Potentially Feasible	Located within John J. Duffy Preserve
14	25.9	Potentially Feasible	Series of sites surrounding existing wetland complex on private agricultural land at southeast corner of Bell Rd. and 151st St. Area is slated for future commercial & residential development.
15	10.1	Potentially Feasible	Located on private agricultural land and ComEd utility easement
16	84.0	Potentially Feasible	Large site located primarily on private
17	74.6	Potentially Feasible	Two locations located on private
18	26.7	Potentially Feasible	Located on Homer Glen open space (formerly Woodbine Golf Course) at headwaters of Tributary D
19	21.8	Potentially Feasible	Series of locations on private agricultural land
20	10.5	Limited Feasibility	Located on private agricultural land and ComEd utility easement. Site is situated between Gleneagles Country Club and Bell Road.
21	25.2	Potentially Feasible	Located on private agricultural land at headwaters of Tributary F. Area is slated for future “Conservation Development” by Village of Lemont.
22	30.1	Potentially Feasible	Series of locations on private agricultural land. Area is slated for future “Conservation Development” by Village of Lemont.
23	7.2	Potentially Feasible	Located on private agricultural land
24	4.4	Limited Feasibility	Located on private agricultural/pasture land (Honeyman Farms) at headwaters of Tributary H
25	31.4	Potentially Feasible	Located on private lots surrounding Long Run Creek; most of south portion is located on Narnia Estate
26	6.7	Limited Feasibility	Located primarily within ComEd utility easement
27	3.9	Potentially Feasible	Located on private agricultural land
28	5.2	Limited Feasibility	Located on private agricultural area along I-355 corridor at headwaters of Tributary M (South Ditch)
29	3.6	Potentially Feasible	Located on private agricultural land; could benefit flooding problems on Big Run Golf Course
30	8.0	Limited Feasibility	North half located on Big Run Golf Course; south half within ComEd utility easement and private agricultural/pasture land

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

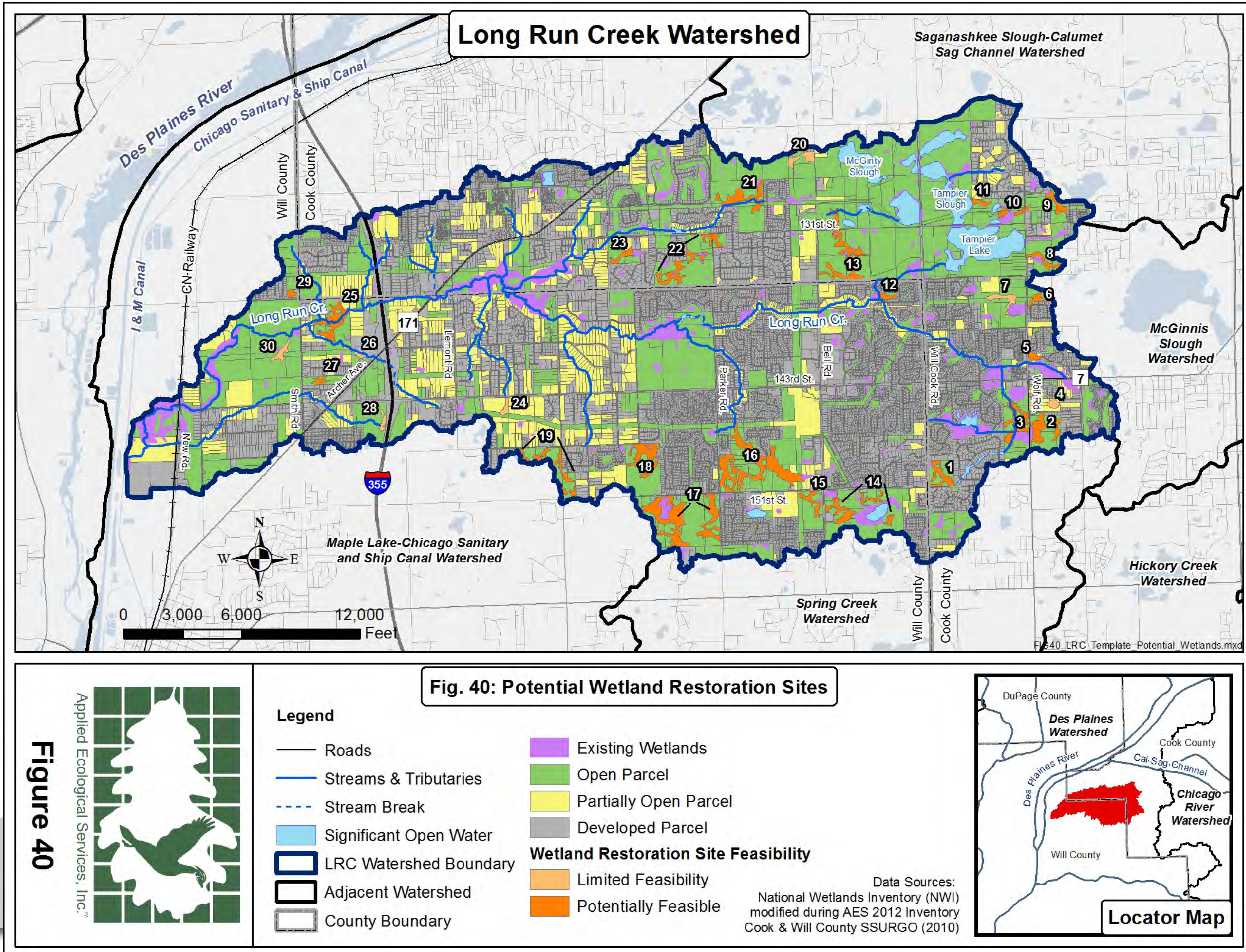

Fig. 40: Potential Wetland Restoration Sites

Figure 40

3.13.6 FLOODPLAIN & FLOOD PROBLEM AREAS

FEMA 100-Year Floodplain

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 following 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 and flood insurance 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 41 depicts the 100-year floodplain and floodway in relation to a hypothetical stream channel.

As expected, the mapped floodplain in the watershed closely follows Long Run Creek and its tributaries. Figure 42 depicts the 100-year floodplain which occupies 1,152 acres or about 7% of the watershed. The most extensive floodplain areas are associated with larger wetland complexes along Long Run Creek such as west of Wolf Road, between Parker Road and Cedar Road, between King Road and Lemont Road, through Big Run Golf Course, and the area west of New Road.

Documented Flood Problem Areas

For this report, a Flood Problem Area (FPA) is defined as a location where documented flooding can or does cause structural damage or other problems such as flooding roads. Information about the location and condition of documented FPAs was obtained from the "Long Run Creek Watershed Plan" created by Long Run Creek Watershed Planning Committee in 2001 (LRCWPC, 2001) and from information provided by watershed stakeholders.

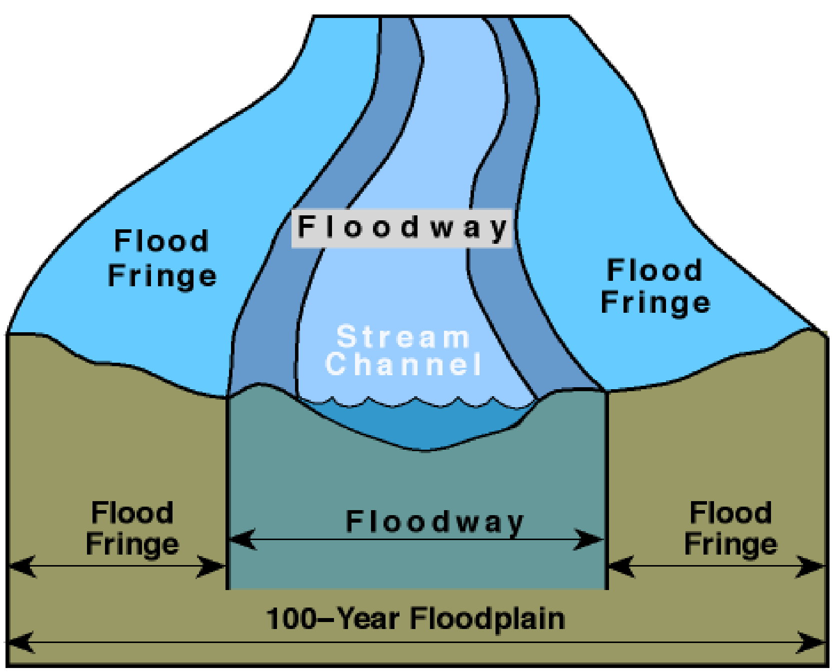

Figure 41. 100-year floodplain and floodway depiction.

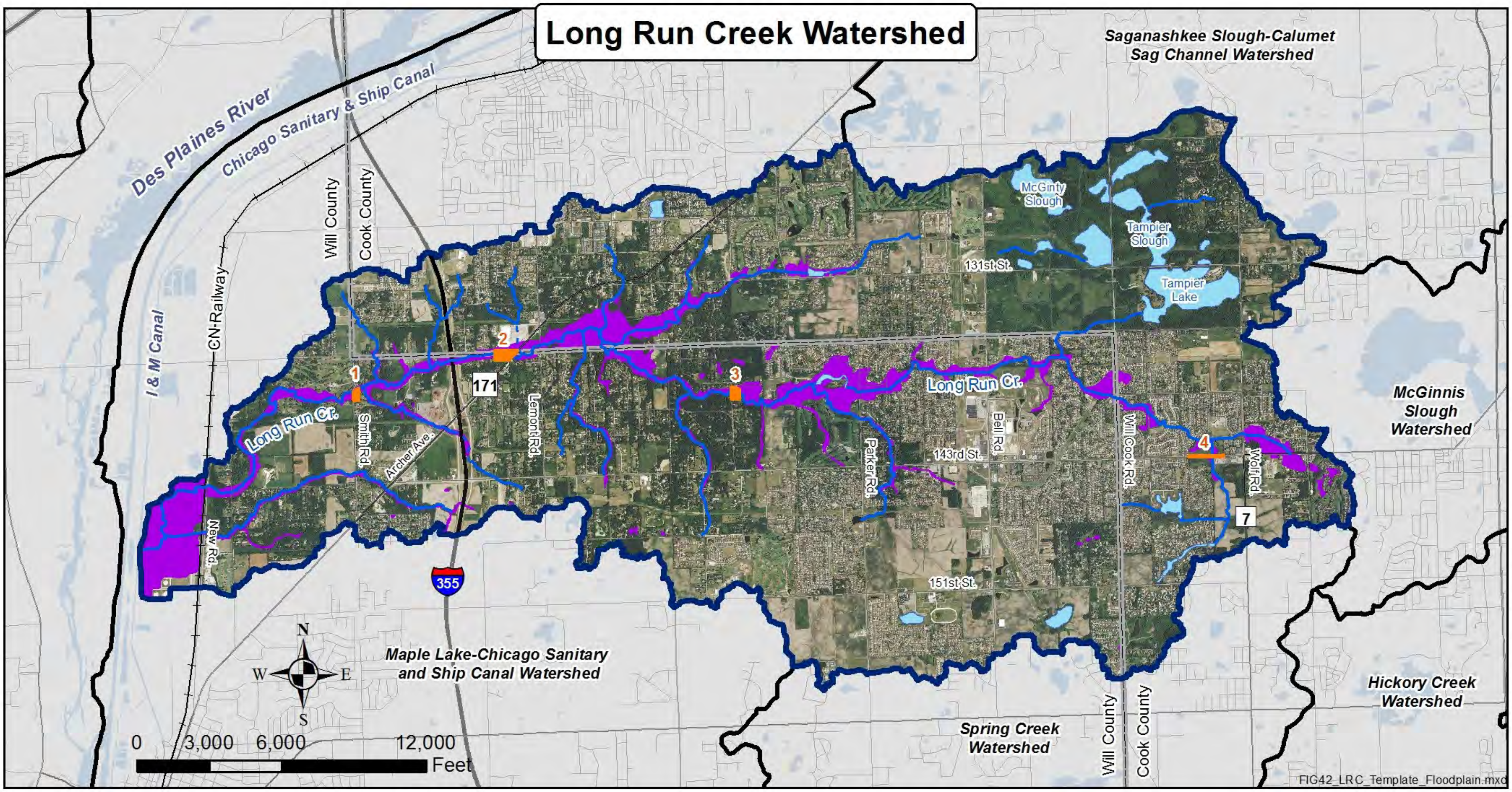

Figure 42

Applied Ecological Services, Inc.™

Fig. 42: FEMA 100-Year Floodplain and Flood Problem Areas

Legend

- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary
- Documented Flood Problem Areas
- FEMA 100-Year Floodplain

Data Sources:
Will County (2004)
FEMA (Cook County, 2012)

Four documented FPAs were identified in Long Run Creek watershed (Figure 42). Information about each FPA is included in Table 18. FPA #1 is located at the southeast corner of Long Run Creek and Smith Road. There, a residential home and small business building occasionally flood when Long Run Creek overtops its banks. Flooding at this location appears to be the result of development that occurred within the 100-year floodplain. There are no obvious mitigation opportunities at this site other than to flood proof individual structures.

FPA #2 is located at the intersection of 135th Street and Archer Avenue. The roads in this area are located relatively low within the 100-year floodplain. During high water events, Long Run Creek overtops its banks and floods the roads. A project was begun in fall 2012 via Will County Department of Highways to implement improvements along 135th Street including the relocation of Long Run Creek. The project was completed in late summer 2013. The relocation is necessary to improve traffic safety at the intersection of 135th Street and Archer Avenue. The new stream channel is designed to improve aquatic habitat for a variety of wildlife species by including riffles and wetland vegetation along the riparian areas. It is not yet known if the project will alleviate flooding in the area.

FPA #3 is located at the northeast and southeast corners of Long Run Creek's intersection with Cedar Road within Homer Glen. Residential homes on the north and south side of Long Run Creek are located in or near the 100-year floodplain and are known to flood on occasion. Flood mitigation opportunities at this site include flood proofing of individual structures and potential flood storage projects upstream such as that located within a large wetland complex south of Erin Hills Subdivision.

FPA #4 is located along 143rd Street and west of Wolf Road within Orland Park. There, water overtops 143rd Street during high water events when the surrounding wetland complex becomes inundated. It appears that the road floods because its elevation in this location is within the floodplain. The obvious mitigation opportunity is to raise the elevation of 143rd Street and possibly the culvert size where Long Run Creek passes under 143rd.

Table 18. Documented Flood Problem Areas.

Flood Problem Area #	Type of Flooding	Location/Description	Potential Mitigation Measures
1	Overbank-Residential Homes	Southeast corner of Long Run Creek and Smith Road	Flood proof individual structures
2*	Overbank-Roads	Intersection of 135th Street and Archer Avenue	Improve 135th Street and relocate a portion of Long Run Creek
3	Overbank-Residential Homes	Northeast and southeast corners of Long Run Creek's intersection with Cedar Road	Flood proof individual structures and/or implement flood storage project upstream in wetland complex south of Erin Hills Subdivision
4	Wetland Inundation-Roads	Along 143rd Street and west of Wolf Road	Raise the elevation of 143rd Street and possibly the culvert size where Long Run Creek passes under 143rd

* Project was implemented in 2013 but flood reduction benefits are not yet known.

3.14 GROUNDWATER AQUIFERS, RECHARGE, & COMMUNITY WATER SUPPLY

Groundwater Aquifers

Groundwater is water that saturates small spaces between sand, gravel, silt, clay particles, or crevices in underground rocks. Groundwater is found in aquifers or underground formations that provide readily available quantities of water to wells, springs, or streams. Groundwater sources available to Northeastern Illinois are found in shallow aquifer units and deep aquifer units (Figure 43). The shallow aquifers are found in unconsolidated sand and gravels within the Quaternary Unit. An impermeable layer of bedrock separates the shallow aquifers from the deep aquifers found in layers of sandstone within the Ancell Unit, Ironton-Galesville Unit, and Mt. Simon Unit. Both shallow and deep aquifers are tapped and used by residences, farms, or entire communities.

Groundwater modeling studies conducted for the 11-county Northeastern Illinois Regional Water Supply Planning area by the Illinois State Water Survey (ISWS) (ISWS, 2012) suggests that by 2005 groundwater drawdown levels in the Ancell and Ironton-Galesville aquifer Units fell by 500 feet and over 1,100 feet respectively in northern Will County/Long Run Creek watershed area since pumping began in the 1860s. These deep aquifer Units are the principal deep aquifers in the region. Modeling also suggests that drawdown will reach 800 feet in the Ancell Unit and over 1,500 feet in the Galesville Unit by 2050 (Figure 44). Ultimately, groundwater models suggest that additional drawdown, reduction in stream base flow, and changes in the quality of groundwater from deep wells are all possible in the future (ISWS, 2012).

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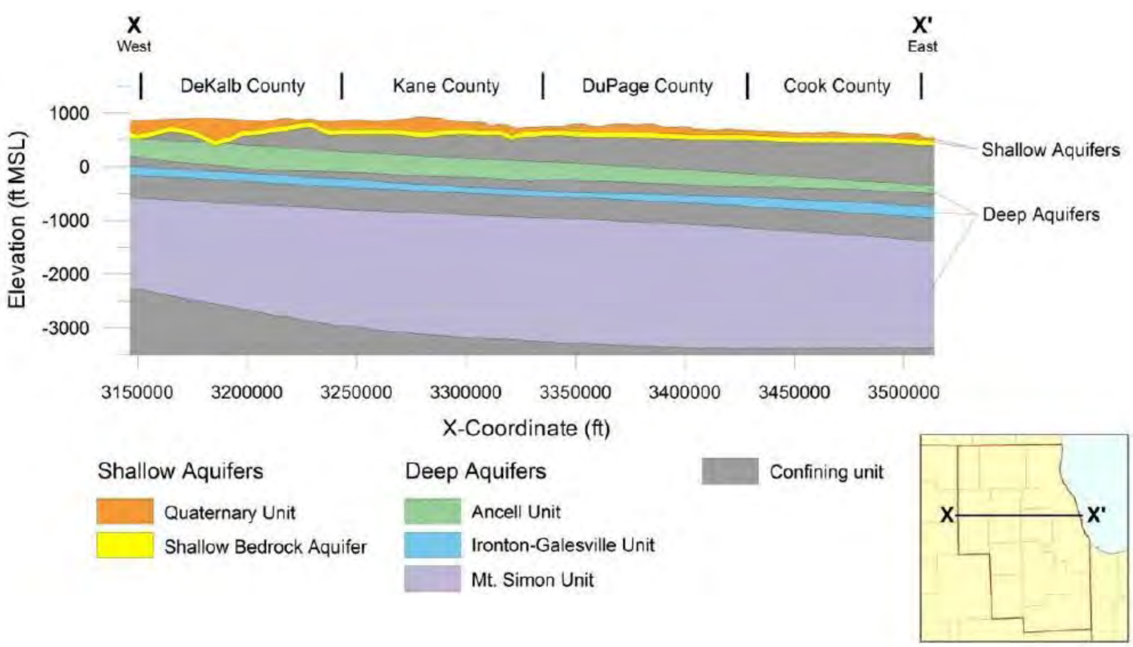

Figure 43. Northeastern Illinois deep and shallow aquifer units. Source: ISWS 2012.

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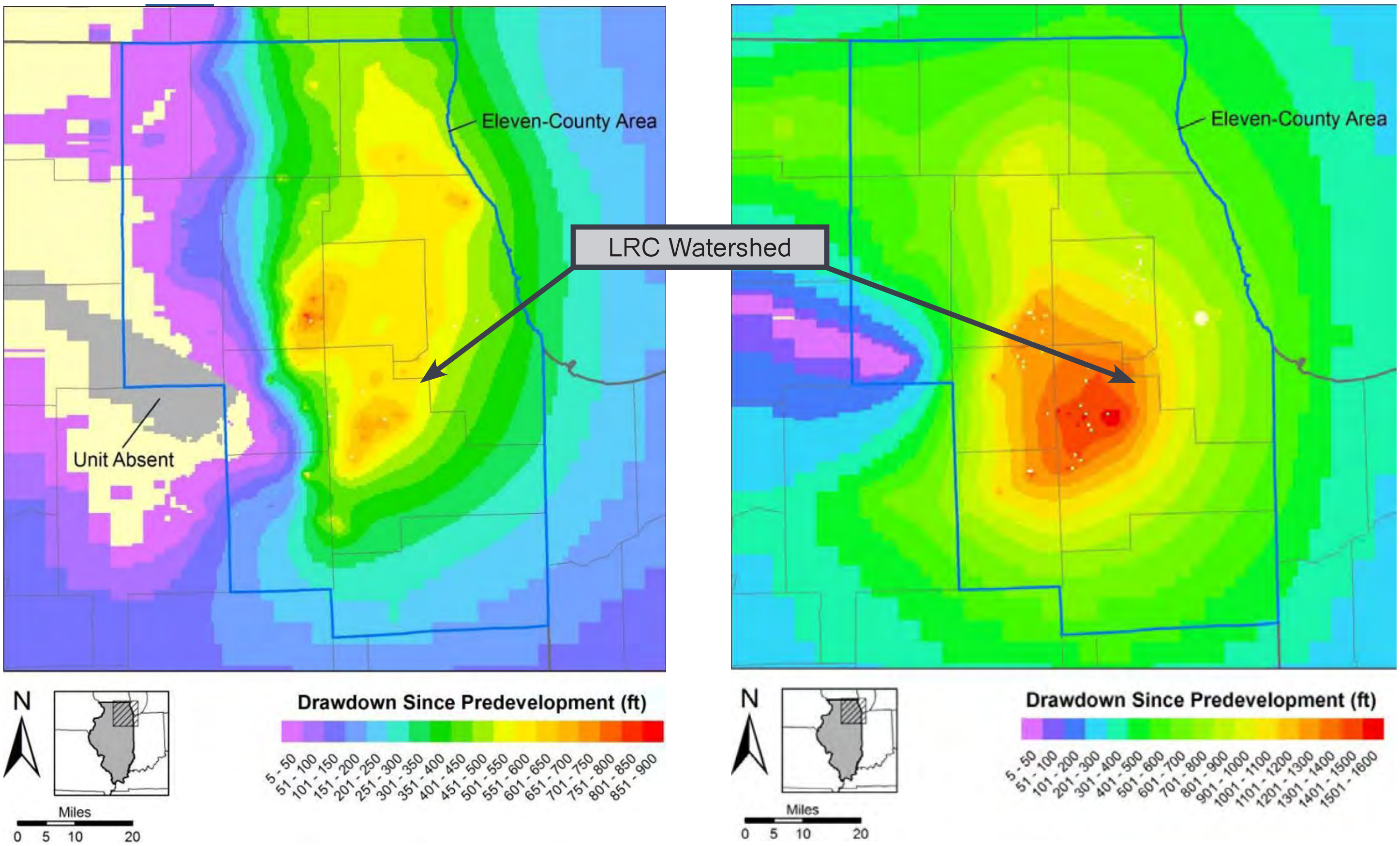
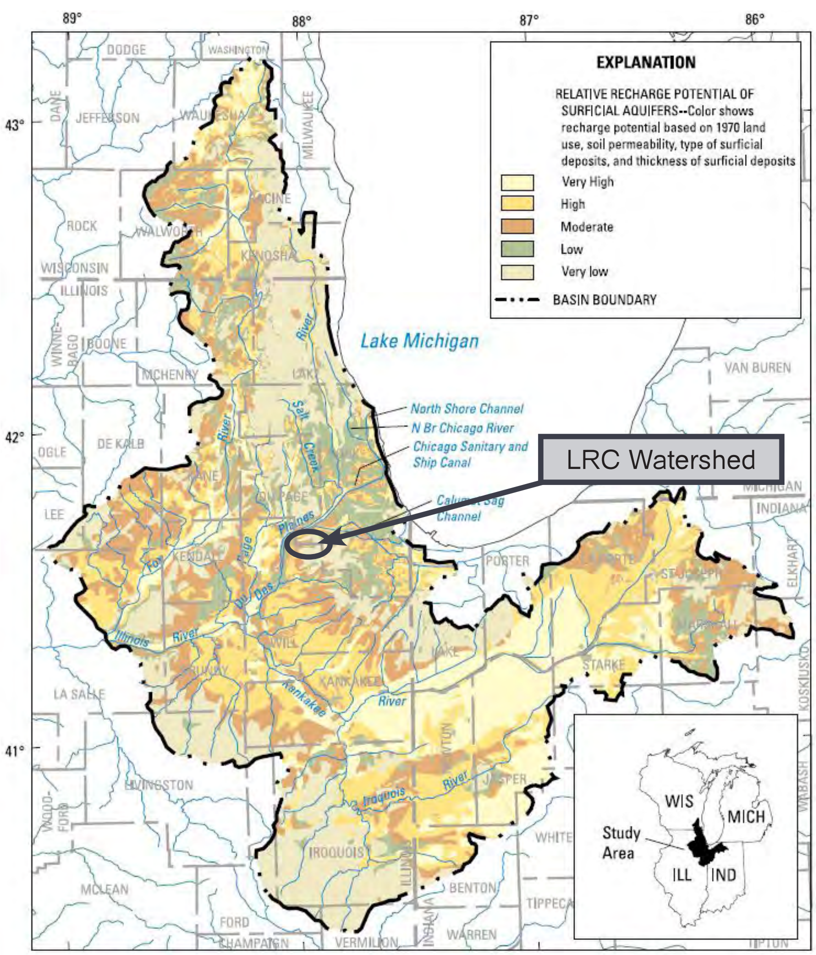


Above: Figure 44. Year 2050 modeled groundwater drawdown in the Ancell Unit (left) and Ironton-Galesville Unit (right). Source: ISWS 2012.**Below: Figure 45.** Groundwater recharge potential. Source: USGS 2000.



Groundwater Recharge

Groundwater aquifer recharge is the process by which precipitation reaches and re-supplies the groundwater aquifers. Conversely, groundwater discharge occurs when groundwater water seeps out though permeable soils to low areas such as stream channels and wetlands. In 2000 the United States Geological Survey (USGS) developed a groundwater recharge model for the Upper Illinois River Basin (USGS, 2000). The model suggests the west half of Long Run Creek watershed has moderate to high recharge potential while the east half has low recharge potential (Figure 45). The implication is relatively straight forward; traditional existing and future development in the west half of the watershed reduces groundwater recharge to shallow aquifers due to the effect of impervious surfaces. This is why it is critical for future development and redevelopment to incorporate practices that better infiltrate stormwater.

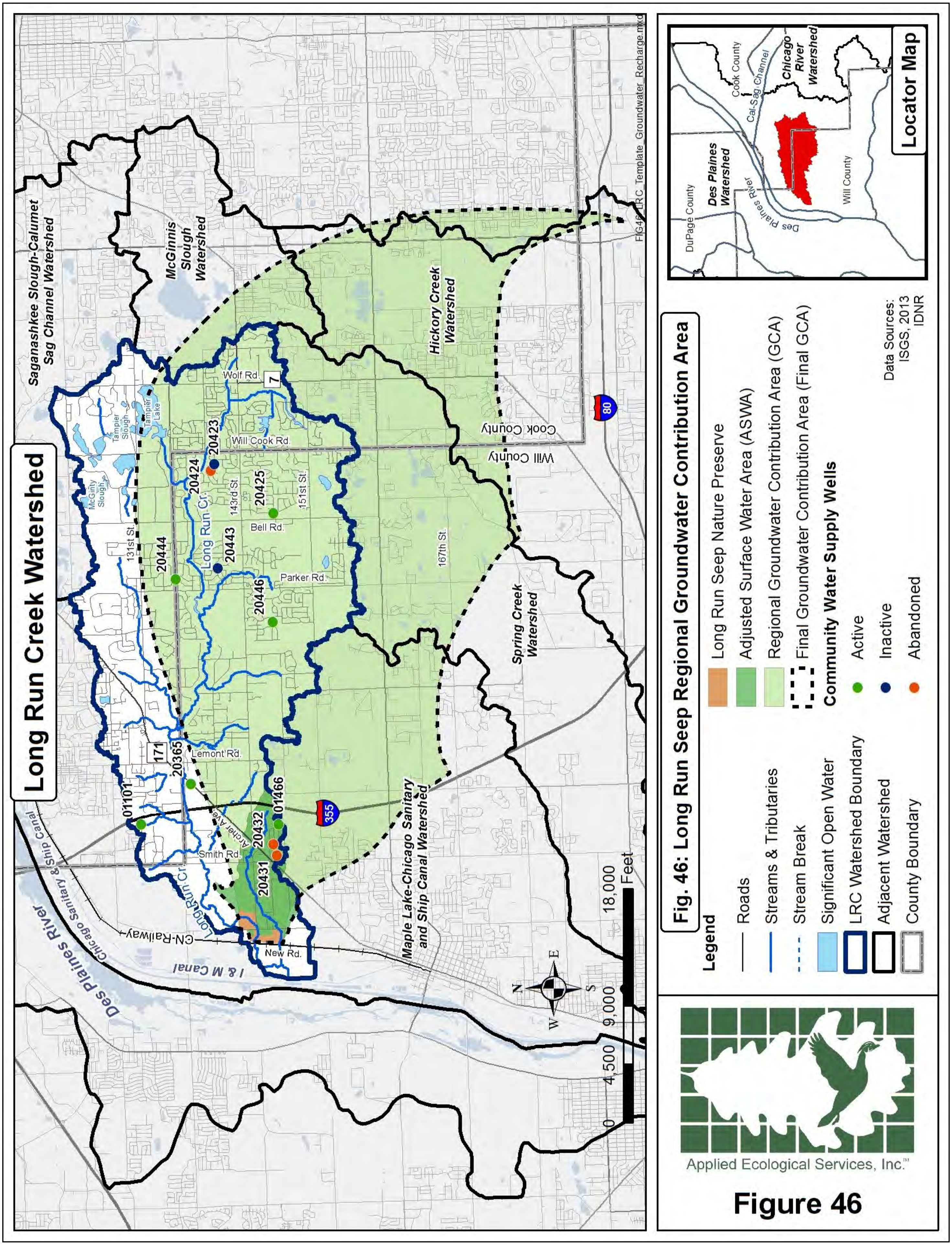
Long Run Seep Nature Preserve Groundwater Recharge Area

Long Run Seep is an 89-acre Illinois Nature Preserve located in the far western side of the watershed along the Des Plaines River valley bluffs. The preserve harbors rare seep and fen communities that supply cold calcareous groundwater that provides critical habitat for the Hine's Emerald Dragonfly (HED), a federal and state listed endangered species. Both the HED and its habitat, including the groundwater recharge area and surface water drainage area to the preserve, are protected under the Illinois Natural Areas Preservation Act. Until recently, the estimated groundwater recharge area supplying Long Run Seep was not known.

In 2012, Illinois Nature Preserves Commission (INPC) petitioned Illinois EPA to designate the groundwater recharge area to Long Run Seep Nature Preserve as a Class III Special Resource Groundwater Classification. Class III designation allows an area to be subjected to special water quality standards and if an impact to a protected nature preserve's groundwater resource can be shown, the Office of the Illinois Attorney General can immediately cease the source activity of the impact. INPC's petition process involves enlisting help from the Illinois State Geological Survey (ISGS) to compile a Special Resource Groundwater report entitled "*Selected Scientific and Technical Information about Long Run Seep Nature Preserve* (ISGS, 2012)." In this report, ISGS identifies a Regional Groundwater Contribution Area (GCA) and Adjusted Surface Water Area (ASWA) to Long Run Seep Nature Preserve.

The GCA and ASWA are combined to form a Final GCA. The Final GCA extends east covering the southern 2/3 of Long Run Creek watershed and south into several adjacent watersheds (Figure 46). The total area is a vast 26,543 acres or 41.5 square miles. Note: The Final GCA is not considered a Class III area until it is designated as such by Illinois EPA.

It is still extremely important that future development and redevelopment within the Final GCA to Long Run Seep Nature Preserve incorporate practices that better clean and infiltrate stormwater that recharges to the shallow aquifers. Future mitigation dollars from impacts to HED habitat such as mining, chemical spills, etc. should be limited to managing and restoring HED habitat or used to fund projects that support groundwater recharge within the Final GCA. There is also the issue of private and public community water supply wells located within the Final GCA (Figure 46) and how these wells form cones of depression that might affect groundwater supply to Long Run Seep Nature Preserve. It is possible that future action could be taken against owners of wells that are determined to negatively affect the HED and its habitat. This would likely lead to an increased need for Lake Michigan water.



Long Run Creek Watershed
Saganashkee Slough-Calumet Sag Channel Watershed
McGinnis Slough Watershed
Hickory Creek Watershed
Spring Creek Watershed
Maple Lake-Chicago Sanitary and Ship Canal Watershed
Des Plaines River
Chicago Sanitary & Ship Canal
I & M Canal
CN-Railway
Long Run Cr.
McGinty Slough
Tampier Slough
Tampier Lake
Wolf Rd.
Will Cook Rd.
143rd St.
151st St.
131st St.
Bell Rd.
Parker Rd.
167th St.
Lemont Rd.
Archer Ave.
Smith Rd.
New Rd.
Cook County
Will County
7
171
355
80
20423
20424
20425
20443
20444
20446
20365
01101
101466
20432
20431
0 4,500 9,000 18,000 Feet
N E S W
FIG46_LRC_Template_Groundwater_Recharge.mxd
Fig. 46: Long Run Seep Regional Groundwater Contribution Area
Legend
Roads
Streams & Tributaries
Stream Break
Significant Open Water
LRC Watershed Boundary
Adjacent Watershed
County Boundary
Long Run Seep Nature Preserve
Adjusted Surface Water Area (ASWA)
Regional Groundwater Contribution Area (GCA)
Final Groundwater Contribution Area (Final GCA)
Community Water Supply Wells
Active
Inactive
Abandoned
Data Sources: ISGS, 2013 IDNR
Locator Map
DuPage County
Des Plaines Watershed
Des Plaines River
Cook County
Cal-Sag Channel
Chicago River Watershed
Will County
Applied Ecological Services, Inc.™

Figure 46

Community Water Supply

Groundwater is an essential resource to much of south Cook County and northern Will County as underlying aquifers provide the drinking water supply for many people. The Village of Lemont's water supply comes primarily from deep wells. Lockport's water comes from both deep and shallow wells. Orland Park, Palos Park, and the eastern half of Homer Glen obtain most of their water from Lake Michigan. One interesting fact is that Palos Park obtains over 90% of its water from Lake Michigan but that as much as 65% of residents use old wells for watering purposes (personal communication with Palos Park Public Works). The western half of Homer Glen and most unincorporated areas in the watershed get water from private wells. Eleven (11) community water supply wells are located within Long Run Creek watershed but only six are active (Table 19; Figure 46). It is important to note that future development projects that include infiltration best management practices will mostly benefit the shallow aquifers and not deep aquifers.

In addition, it is likely that future groundwater wells will be proposed and the only way to determine the impacts of the pumping on Hine's Emerald Dragonfly critical habitat within Long Run Seep Nature Preserve would be via a groundwater model. Once a model is run, the location of the pumping can be tested at the proposed location and alternate locations can be recommended if needed to minimize impacts.

Table 19. Community water supply wells within Long Run Creek watershed.

Well ID	Facility	Depth (ft)	Status	Aquifer Status
01101	Lemont	1,675	Active	Confined
20365	Busy Bee MHP	100	Active	Confined
20431	Lockport HTS SNDST	220	Abandoned	Confined
20432	Lockport HTS SNDST	265	Abandoned	Confined
01466	Lockport	400	Active	Confined
20446	IL American-Homer Glen	320	Active	Confined
20444	IL American – Homer Township	360	Active	Confined
20443	IL American Chickasaw	325	Inactive	Confined
20425	IL American –Homer Township	408	Active	Confined
20424	IL American – Homer Township	410	Abandoned	Confined
20423	IL American – Derby Meadows	403	Inactive	Confined

Source: Illinois State Water Survey

3.15 WASTEWATER TREATMENT PLANTS & SEPTIC SYSTEMS

Wastewater Treatment Plants

There are two National Pollution Discharge Elimination System (NPDES) permitted wastewater treatment plant (WWTP) discharges to Long Run Creek. Studies conducted by Integrated Lakes Management (ILM, 2007) and Baetis Environmental Services, Inc. (Baetis, 2005) point to these two discharges as a cause of nutrient enrichment in Long Run Creek. Illinois American Water Company owns Chickasaw Hills WWTP which discharges under NPDES Permit No. IL0031984 to Long Run Creek just east of Parker Road. It currently has a designed average flow of 0.70 million gallons per day (MGD) and design maximum flow of 1.75 MGD. The plant's current treatment consists of screening, two-stage activated sludge, chlorine disinfection, post aeration, excess flow treatment, aerobic digestion, and gravity sludge thickening.

The existing Chickasaw Hills WWTP is currently running above capacity (0.91 MGD: 2005-2012 data) and this coupled with expected growth in the area lead to the conclusion by Illinois American Water Company to expand the plant so that current and future residents have adequate sewage treatment. In April 2009, The Chicago Metropolitan Agency for Planning (CMAP) approved a plant expansion request for the Chickasaw Hill WWTP. The proposed facility would discharge 1.27 MGD with a designed maximum 4.37 MGD. The proposed expansion includes a nitrifying treatment removal system that will employ ultra-violet radiation disinfection therefore eliminating the need for chlorine. It will also use screening, activated sludge (oxidation ditches), final clarifiers, phosphorus removal, post aeration, excess

Chickasaw Hills Waste Water Treatment Plant facility east of Parker Road. Source: Google.

flow treatment, aerobic digestion, and gravity sludge thickening. The upgraded treatment process is expected to significantly reduce nutrients and eliminate chlorine from entering Long Run Creek. It is also important to note however that Homer Glen reviewed the plant expansion plan and determined that other actions can be taken to reduce the loading to the plant such as rerouting wastewater from several areas to a Metropolitan Water Reclamation District of Greater Chicago (MWRD) facility or the recently expanded Oak Creek plant. It was also determined by Homer Glen that future development serviced by Chickasaw Hills WWTP would be limited

Chickasaw Hills WWTP is currently required to monitor carbonaceous biochemical oxygen demand (CBOD), suspended solids, pH, fecal coliform, dissolved oxygen, chlorine residual, and ammonia nitrogen. Post expansion monitoring will include the addition of phosphorus and total nitrogen. Both the existing and proposed NPDES permit standards for Chickasaw Hills WWTP are included in Table 20.

Table 20. Existing and proposed NPDES permit limits for the Chickasaw Hills WWTP.

	Load Limits - lbs/day		Concentration Limits - mg/L	
WWTP/Parameter	**Monthly Ave. (lbs/day)**	**Daily Max. (lbs/day)**	**Monthly Ave. (mg/L)**	**Daily Max. (mg/L)**
Chickasaw Hills WWTP (Existing): 0.70 MGD ave. & 1.75 MGD max.				
CBOD	58 (146)	117 (292)	10	20
Suspended Solids	70 (175)	140 (350)	12	24
pH	Shall be in the range of 6 to 9 Standard Units			
Fecal Coliform	Monthly mean 200 per 100 mL (May through October); 400 per 100mL			
Dissolved Oxygen	Monthly average 5.5 mg/L (August-February); weekly average 6.0 mg/L (March-July) & 4.0 mg/L (August-February); daily min. 5.0 mg/L (March-July) & 3.5 mg/L (August-February)			
Chlorine Residual	-	-	-	0.05
Ammonia Nitrogen				
April-October	8.8 (22)	18 (44)	1.5	3.0
November-February	23 (58)	47 (117)	4.0	8.0
March	23 (57)	47 (117)	3.9	8.0
Chickasaw Hills WWTP (Proposed): 1.27 MGD ave. & 4.37 MGD max.				
CBOD	106 (364)	212 (729)	10	20
Suspended Solids	127 (437)	254 (875)	12	24
pH	Shall be in the range of 6 to 9 Standard Units			
Fecal Coliform	Monthly mean 200 per 100 mL (May through October); 400 per 100mL			
Dissolved Oxygen	Monthly average 5.5 mg/L (August-February); weekly average 6.0 mg/L (March-July) & 4.5 mg/L (August-February); daily min. 5.0 mg/L (March-July) & 4.5 mg/L (August-February)			
Ammonia Nitrogen				
April-October	15 (51)	32 (109)	1.4	3.0
June-August	3.2(11)/8.5(29) wk	19 (66)	0.3/0.8wk ave.	1.8
November-February	31 (106)	50 (171)	2.9	4.7
March	15 (51)	34 (117)	1.4	3.2
Phosphorus	11 (36)		1.0	
Total Nitrogen	Monitoring only			

NPDES Permit No. IL0031984; Values in ( ) are limits based on design maximum flow (DMF).

Derby Meadows Waste Water Treatment Plant facility. Source: Google.

The second WWTP, Derby Meadows, is also owned by Illinois American Water Company. This facility discharges under NPDES Permit No. IL0045993 to Long Run Creek west of Will-Cook Road. It has a designed average flow of 0.9 MGD and design maximum flow of 2.655 MGD. The plant discharges 0.66 MGD based on data from 2005-2012. The plant's current treatment consists of screening, grit removal, activated sludge, clarification, chlorination, aerobic digestion, and sludge dewatering. Derby Meadows WWTP is required to monitor CBOD, suspended solids, pH, fecal coliform, dissolved oxygen, chlorine residual, and ammonia nitrogen (Table 21). Phosphorus monitoring is not currently required.

The water quality and pollutant loading sections of this report (Sections 4.1 & 4.2) contain detailed summaries of water quality monitoring results for the two WWTPs and contribution to overall pollutant loading in the watershed.

Table 21. NPDES permit limits for Derby Meadows WWTP.

	Load Limits - lbs/day		Concentration Limits - mg/L	
WWTP/Parameter	**Monthly Ave. (lbs/day)**	**Daily Max. (lbs/day)**	**Monthly Ave. (mg/L)**	**Daily Max. (mg/L)**
Chickasaw Hills WWTP (Existing): 0.9 MGD ave. & 2.655 MGD max.				
CBOD	75 (221)	150 (443)	10	20
Suspended Solids	90 (266)	180 (531)	12	24
pH	Shall be in the range of 6 to 9 Standard Units			
Fecal Coliform	Monthly mean 200 per 100 mL (May through October)			
Dissolved Oxygen	Monthly average 5.5 mg/L (August-February); weekly average 6.0 mg/L (March-July) & 4.0 mg/L (August-February); daily min. 5.0 mg/L (March-July) & 3.5 mg/L (August-February)			
Chlorine Residual	-	-	-	0.05
Ammonia Nitrogen				
April-October	11 (31)	23 (66)	1.4	3.0
November-February	30 (89)	60 (177)	4.0	8.0
March	24 (71)	60 (177)	3.2	8.0

NPDES Permit No. IL0045993; Values in ( ) are limits based on design maximum flow (DMF).

Septic Systems

Septic systems are common within Long Run Creek watershed, especially in some older municipal developments and most unincorporated areas. When septic systems are not maintained and fail they pose real threats to groundwater and surface water quality, especially when they are located near streams or other water bodies. Failing septic systems can contribute high levels of nutrients (phosphorus and nitrogen) and bacteria (fecal coliform) to the environment. The failure rate of septic systems in the watershed is unknown. However, literature sources from USEPA indicate a failure rate of between 2% and 5%.

The 1990 U.S. Census provides the most recent data related to number and type of sewage disposal systems serving households. It is difficult, however to accurately extrapolate this data to Long Run Creek watershed. What the census does provide is the number of households that do not use public sewer for each township in the watershed (Table 22). This information suggests that Lockport, Homer, and Lemont Townships have the highest percentage of households on septic systems.

The Will County sewage treatment and disposal ordinance includes a requirement to maintain a service contract and have routine inspections and sampling completed at least every six months. A 1997 survey conducted by Will County revealed that 67% percent of septic systems surveyed were in violation of at least one ordinance standard because of lack of maintenance and/or inadequate sizing. The Cook County Department of Public Health inspects septic systems to ensure that they are designed and operating properly. Failure to comply by homeowners results in prosecution.

The United States Environmental Protection Agency (USEPA) provides an excellent guide for septic system owners called "A Homeowner's Guide to Septic Systems" (USEPA, 2005). The guide makes it clear that septic system maintenance is the responsibility of the owner. The guide also explains how septic systems work, why and how they should be maintained, and what makes a system fail. Septic system owners or those proposing to install new systems are encouraged to regularly maintain septic systems and seek guidance from Will or Cook County as needed.

Table 22. Number and percent of households by township using septic systems in 1990.

Township	Households per Township	% of Households on Septic
DuPage	17,472	2.5
Lockport	10,878	11.3
Homer	6,355	35.7
Lemont	4,012	24.7
Palos	19,213	6.8
Orland	23,207	3.9

Source: 1990 U.S. Census

SECTION 3.0

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4.0 WATER QUALITY & POLLUTANT MODELING ASSESSMENT

4.1 WATER QUALITY

The primary goal of this watershed plan is to guide efforts to protect and restore surface water quality in Long Run Creek watershed. Section 305(b) of the Federal Clean Water Act requires Illinois and all other states to submit to the USEPA a biennial report of the quality of the state's surface and groundwater resources called the *Illinois Integrated Water Quality Report and Section 303(d) List*. These reports must also describe how Illinois waters meet or do not meet water quality standards specific to each "Designated Use" as defined by the Illinois Pollution Control Board (IPCB). When a waterbody is determined to be impaired, Illinois EPA must list potential causes and sources 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 Long Run Creek and Tampier Lake: *Aquatic Life, Fish Consumption, Primary Contact, Secondary Contact, and Aesthetic Quality*.

According to Illinois EPA's most recent 2012 *Integrated Water Quality Report and Section 303(d) List*, Long Run Creek (IEPA Segment Code: ILGHE-01) is "Fully Supporting" for *Aquatic Life* (Table 23). It is important to note however that Long Run Creek was last studied by Illinois EPA in 1997. More recent data suggests moderate impairment.

Tampier Lake (IEPA Code: ILRGZO) is "Fully Supporting" for *Aquatic Life* but "Not Supporting" (impaired) for *Aesthetic Quality* caused by total suspended solids (TSS), total phosphorus (TP), aquatic plants, and aquatic algae (Table 23). The sources of impairment are identified as agriculture, waterfowl, urban runoff/storm sewer; and runoff from forest/grassland/parkland. Other "Designated Uses" for Tampier Lake were not assessed. Illinois EPA completed a Total Maximum Daily Load

(TMDL) report for Tampier Lake in March 2010 which is discussed in more detail below.

A variety of chemical and biological monitoring stations have been sampled in recent years in an attempt to document the baseline conditions of Long Run Creek. Table 24 lists all known water quality and biological data collected in the watershed while Figure 47 depicts the location of each monitoring station where the data was collected.

Macroinvertebrate, fish, and mussel data are examined in the *Biological Monitoring* subsection. Biological data suggests that Long Run Creek is moderately impaired but is still a "Fair" quality aquatic resource. Nutrients (nitrogen and phosphorus) and suspended solids are specifically examined under the *Water Quality Monitoring* subsection as these were identified via monitoring as the primary causes of water quality impairment in the watershed. Water chemistry sampling indicates that Long Run Creek has elevated levels of phosphorus, nitrogen, and total suspended solids that exceed recommended standards. Phosphorus exceeds recommended levels in Tampier Lake. As expected, data from wastewater treatment plant (WWTP) outfalls reveals high levels of phosphorus and nitrogen.

Table 23. Illinois EPA Designated Uses and impairments for Long Run Creek and Tampier Lake.

Designated Use	Use Attainment	Impaired?	Cause of Impairment	Source of Impairment
Long Run Creek: ILGHE01				
Aquatic Life	Fully Supporting	No	None	None
Fish Consumption	Not Assessed	-	-	-
Primary Contact	Not Assessed	-	-	-
Secondary Contact	Not Assessed	-	-	-
Aesthetic Quality	Not Assessed	-	-	-
Tampier Lake: ILRGZO				
Aquatic Life	Fully Supporting	No	None	None
Fish Consumption	Not Assessed	-	-	-
Primary Contact	Not Assessed	-	-	-
Secondary Contact	Not Assessed	-	-	-
Aesthetic Quality	Not Supporting	Yes	Total Suspended Solids; Total Phosphorus; Aquatic Plants; Aquatic Algae	Agriculture; Waterfowl; Urban Runoff/Storm Sewer; Runoff from Forest/Grassland/Parkland

Source: 2012 Illinois EPA 303(d) list

Table 24. List of chemical and biological surface water monitoring stations.

*Station	Date(s) Collected	Sampling Entity & Location(s)	Parameters & Purpose
Chemical Monitoring Stations			
AES-1	October 14, 2012 & January 30, 2013	Applied Ecological Services, Inc. (AES) sampled at Long Run Creek near confluence with I & M Canal	Chemical and turbidity samples collected to establish post storm event
AES-2 &3	October 10, 2012	Applied Ecological Services, Inc. (AES) sampled at Chickasaw Hills & Derby Meadows WWTP outfalls	Chemical samples collected to measure WWTP discharge
ILM-LRC; ILM-SD	Quarterly from April 2007 to October 2008	Integrated Lakes Management, Inc. (ILM) sampled at Long Run Creek and Tributary M (South Ditch) within Long Run Seep Nature Preserve	Chemical samples collected to establish baseline
ILM-Wells 1-9	Quarterly from April 2007 to October 2008	Integrated Lakes Management, Inc. (ILM) sampled at nine groundwater wells within Long Run Seep at Long Run Seep Nature Preserve	Chemical samples collected to define contributing aquifer to Long Run Seep
IEPA GHE-01	1997	Illinois EPA sampled Long Run Creek at High Rd. as part of Facility Related Stream Survey program	Chemical samples as part of Facility Related Stream Survey Program
RGZO 1-3	1992-2010	Illinois EPA sampled Tampier at three locations as port of Ambient Lake Monitoring Program (ALMP)	Chemical samples as part of Ambient Lakes Monitoring Program (ALMP)
Biological Monitoring Stations			
ILM- BS2, 5, 7, 10, 12, 13, 14, 15, USGS	July to August 2006	Integrated Lakes Management, Inc. (ILM) sampled at eight Bioscout Stations along Long Run Creek. Support was given by John G. Shedd Aquarium.	Mussel, fish, and macroinvertebrates collected to provide baseline data
LR1-4	2005	Baetis Environmental Services, Inc. sampled at four locations along Long Run Creek	Macroinvertebrate samples collected to assess the effects WWTPs on benthic life
R0209501; R0209502	R0209501: 1998-2001; R0209501: 1998-2000	RiverWatch volunteers sampled at two locations along Long Run Creek	Macroinvertebrates collected to establish baseline data through time
USGS	2001	United States Geological Survey (USGS) at Smith Rd. on Long Run Creek	Fish sampled to establish baseline
IDNR GHE-01	1983, 1997	Illinois Department of Natural Resources (IDNR) sampled at High Rd. on Long Run Creek	Fish sampled to establish baseline
CFM	1955, 1995	Chicago Field Museum sampled at Smith Road on Long Run Creek	Fish sampled to establish baseline

*Station= Internal code assigned to a sample site by the agency or entity collecting the data.

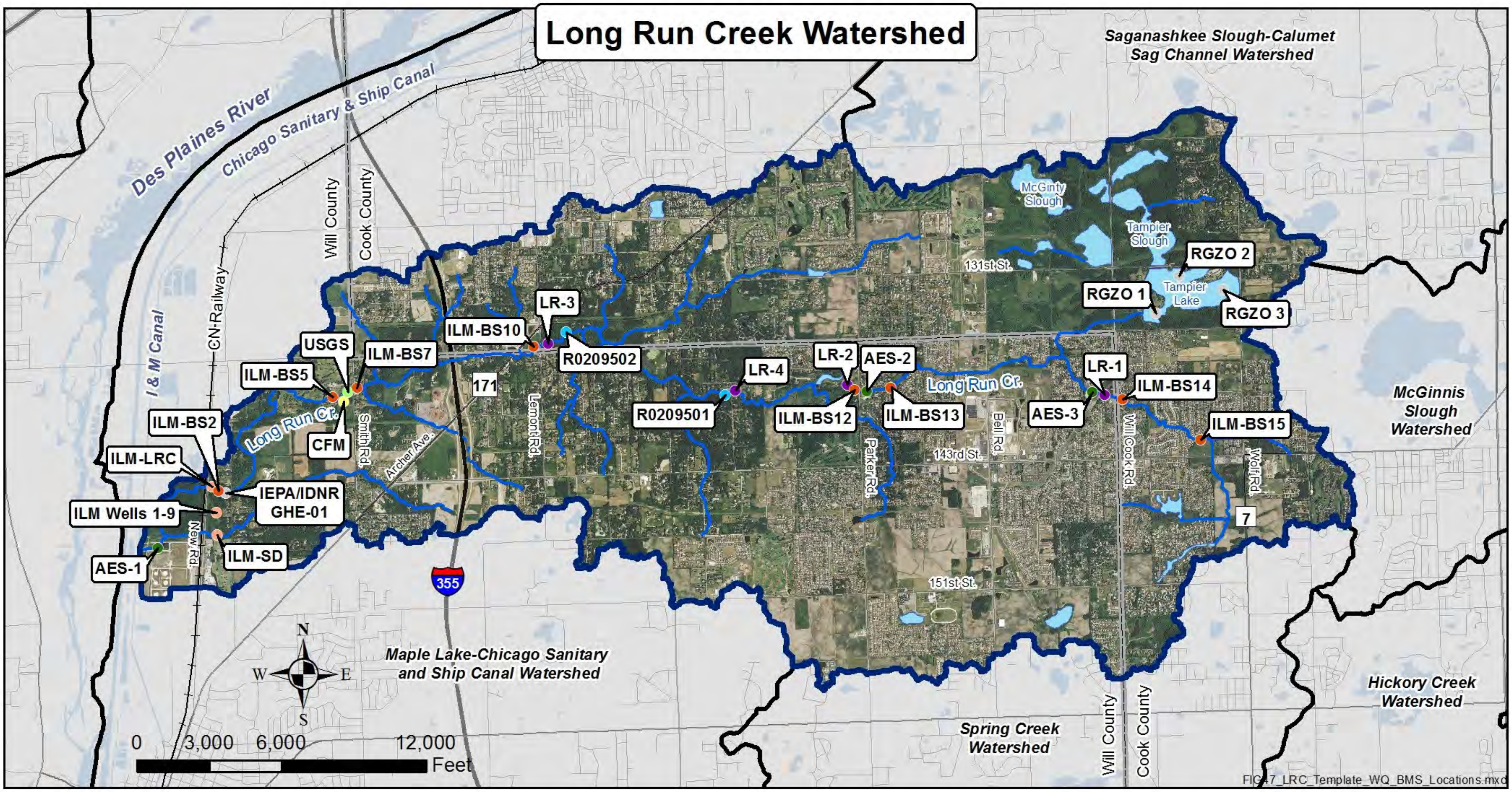


Figure 47

Applied Ecological Services, Inc.™

Fig. 47: Water Quality and Biological Monitoring Stations

Legend

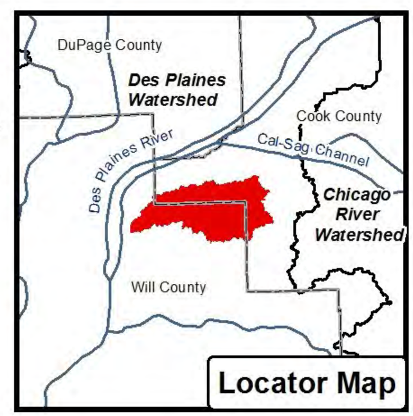
- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Biological Sample Stations

- Baetis Environmental Svcs.
- Chicago Field Museum
- Integrated Lakes Mgmt.
- River Watch
- US Geological Survey

Chemical Sample Stations

- Applied Ecological Svcs.
- Illinois EPA
- Integrated Lakes Mgmt.



Biological Monitoring

Biological data provides the primary basis for determining the level of *Aquatic Life* support in streams and is a major source of information for Illinois EPA's *Illinois Integrated Water Quality Report and Section 303(d) List*. Illinois EPA utilizes two indices based on aquatic macroinvertebrate and fish communities in streams. The Macroinvertebrate Biotic Index (MBI) and fish Index of Biotic Integrity (fIBI) are used to evaluate water quality and biological health 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 25. In addition, the Illinois Department of Natural Resources (IDNR) uses a "Mussel Resource Value" to rate the value of the biotic community.

Caddisfly larvae found in LRC

Macroinvertebrate Community Monitoring

Integrated Lakes Management, Inc., Baetis Environmental, Inc., and RiverWatch volunteers monitored the macroinvertebrate community at fifteen locations along Long Run Creek between 1998 and 2006 (Table 26; Figure 47). Aquatic macroinvertebrates are insects that spend all or a portion of their life span in water. Macroinvertebrate Biotic Index scores (MBI) were also calculated (Table 26). The MBI is 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, macroinvertebrate data for Long Run Creek indicates that there is moderate impairment but that the resource quality is "fair."

Macroinvertebrate studies conducted by ILM (ILM, 2007) and Baetis Environmental (Baetis, 2005) were conducted in part to examine the effects of the Derby Meadows and Chickasaw Hills WWTPs since both discharge effluent into Long Run Creek. ILM's study found significantly high numbers of bloodworms immediately downstream from Chickasaw Hills WWTP. Bloodworms are an indicator of poor water quality. Also, more pollution tolerant species were found downstream than upstream of the Chickasaw plant. Baetis Environmental found no obvious water quality impairments overall but did find evidence of nutrient enrichment just downstream of the two WWTPs that tends to diminish with downstream distance.

Table 25. 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 < fIBI< 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: 2012 *Illinois Integrated Water Quality Report and Section 303(d) List*

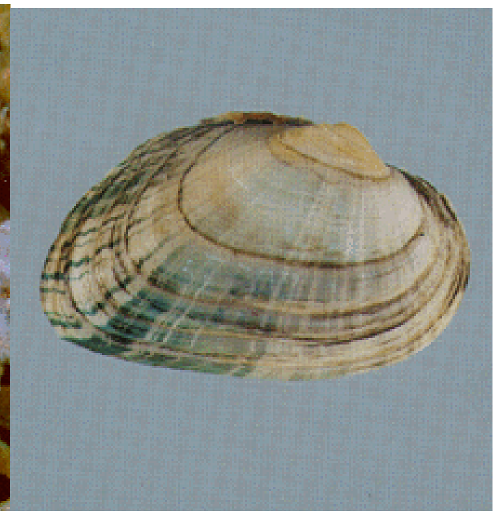
Table 26. Macroinvertebrate Biotic Index (MBI) summary data.

Station	Year	Stream & Location	MBI Score	Resource Quality
Baetis Environmental Services				
LR1	2005	LRC	5.9	Fair
LR2	2005	LRC	5.8	Fair
LR3	2005	LRC	4.2	Very Good
LR4	2005	LRC @ Cedar Rd.	5.8	Fair
Illinois RiverWatch				
R0209501	1996	LRC @ Cedar Rd.	7.85	Fair
R0209501	1997	LRC @ Cedar Rd.	7.74	Fair
R0209501	1998	LRC @ Cedar Rd.	6.51	Fair
R0209501	1999	LRC @ Cedar Rd.	6.11	Fair
R0209501	2000	LRC @ Cedar Rd.	6.18	Fair
R0209501	2001	LRC @ Cedar Rd.	5.48	Good
R0209502	1998	LRC @ Lemont Rd.	6.26	Fair
R0209502	1999	LRC @ Lemont Rd.	5.27	Good
R0209502	2000	LRC @ Lemont Rd.	5.41	Good
Integrated Lakes Management				
ILM-BS2	2006	LRC @ New Rd.	6.36	Fair
ILM-BS3	2006	LRC @ Nature Preserve	Not calculated	Not evaluated
ILM-BS5	2006	LRC @ Big Run Golf Course	4.83	Good
ILM-BS7	2006	LRC @ Smith Road	5.48	Good
ILM-BS12	2006	LRC @ Parker Road	7.33	Fair
ILM-BS13	2006	LRC @ Hiawatha	5.42	Good
ILM-BS14	2006	LRC @ 139th St.	6.19	Fair
ILM-BS15	2006	LRC @ Long Run Dr.	6.16	Fair
ILM-USGS	2006	LRC @ Lemont Road	6.16	Fair

Fish Community Monitoring

The fIBI assesses 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 stations has been collected, values for the metrics are compared to high quality reference conditions and a rating is assigned to each metric. 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 indicates a stream is not “Fully Supporting” *Aquatic Life*.

Available fish community data for Long Run Creek was collected by the Chicago Field Museum in 1955 and 1995, Illinois DNR in 1983 and 1997, USGS in 2001, and ILM in 2006 (Table 24; Figure 47). Unfortunately, fIBI scores were not calculated for any of these studies. But, some information related to the quality of the fish community can be derived by examining species lists. Twelve species were documented near Smith Road in 1955. Between seven and nine species were found in 1983, 1995, 1997, and 2001 studies. In contrast, ILM found 15 species in 2006 but most were pollution tolerant.

Left: *Rainbow darters were once found in LRC near Smith Road. Source: IDNR.* **Right:** *Endangered Slippershell mussel once found in LRC. Source: Ohio Department of Natural Resources*

The Field Museum's data indicates that sensitive species including mottled sculpin (*Cottus bairdii*), rainbow darters (*Etheostoma caeruleum*), fantail darters (*Etheostoma flabellare*), creek chubsuckers (*Erimyzon oblongus*), and stonecat catfish (*Noturus sp.*) were present in Long Run Creek near Smith Road in 1955. The absence of these species in more recent surveys is suggestive of progressive deterioration of the water quality and habitat of the stream. Mottled sculpin and rainbow darters for example are indicative of stream systems with high water clarity, significant contributions of water from highly oxygenated spring fed sources, and riffle habitats.

The stream as it currently exists has a significant silt load and it is likely to experience the influence of WWTP effluent during low flow episodes when nutrient concentrations rise. As a result, conservative species have been replaced by more pollution tolerant species. The overall condition of the stream system based upon fish assemblage is "poor" (ILM, 2006). The best biology in the system occurs near Long Run Seep Nature Preserve.

Mussel Community Monitoring

The most recent mussel survey data for Long Run Creek was conducted by ILM with support from John G. Shedd Aquarium in 2006 (ILM, 2006) (Table 24; Figure 47). Six locations were surveyed using protocols developed by Illinois Department of Natural Resources. A relic shell for the Illinois State Threatened slippershell mussel (*Alasmidonta viridis*) was the most significant find near New Road. Several relic shells of this species were also found near Lemont Road. Also near Lemont Road were two common species: giant floater (*Pyganodon grandis*), and white heelsplitter (*Lasmigona complanata*). Other relics found include those for cylinder (*Anodontoides ferussacianus*) and creek heelsplitter (*Lasmigona compressa*). Live specimens were found for fat mucket (*Lampsilis siliquoidea*), giant floater, and lilliput (*Toxolasma parvus*). An abundance of exotic Asiatic clams (*Corbicula fluminea*) were also recorded near New Road.

A "Mussel Resource Value" has been developed by the IDNR and was used to rate the value of the biotic community based upon the quality and quantity of mussel species present. To summarize, the general mussel assemblage in Long Run Creek is poor and the stream resource is graded as "restricted" or "limited."

Water Chemistry Monitoring

Long Run Creek

The Illinois EPA does not list Long Run Creek as being impaired for any "Designated Uses" according to the 2012 *Integrated Water Quality Report and Section 303(d) List* (Table 23). Illinois EPA's most recent data collection for Long Run Creek, however, is from 1997. The watershed has undergone drastic changes in land use since 1997. More recent water quality data for Long Run Creek indicates moderate overall impairment from elevated total phosphorus, total nitrogen, and total suspended solids (sediment).

Elevated phosphorus and nitrogen levels are a problem under the right conditions and can lead to a chain of undesirable events in streams and lakes such as accelerated plant growth, algae blooms, low dissolved oxygen, and death of some aquatic organisms. High suspended sediment levels are problematic when light penetration is reduced, oxygen levels decrease, fish and macroinvertebrate gills are clogged, visual needs of aquatic organisms are reduced, and when sediment settles to the bottom.

A search for available water chemistry data for Long Run Creek resulted in only one known study conducted by Integrated Lakes Management, Inc.(ILM) at station ILM-LRC where ILM sampled quarterly during base flow conditions from April 2007 to October 2008 (Table 27; Figure 47). To supplement ILM's data, Applied Ecological Services, Inc. (AES) collected water chemistry samples from station AES-1 at Long Run Creek after a 1.0+ inch storm event on October 14, 2012. AES collected the sample just prior to water levels cresting at about 1.2 feet/18 cfs (based on USGS gage station at Lemont Ave.) in order to capture the first flush of pollutants (Figure 48). This sample was collected near Long Run Creek's confluence with the I & M Canal (Table 27; Figure 47) in an attempt to capture a snapshot of water quality near the point where water leaves the watershed. AES collected turbidity readings using a turbidity tube during base flow conditions on September 28 and October 10, 2012, and on October 14, 2012 following a 1.0+ inch storm event. A fourth turbidity measurement was collected following

AES staff collecting water quality samples along LRC

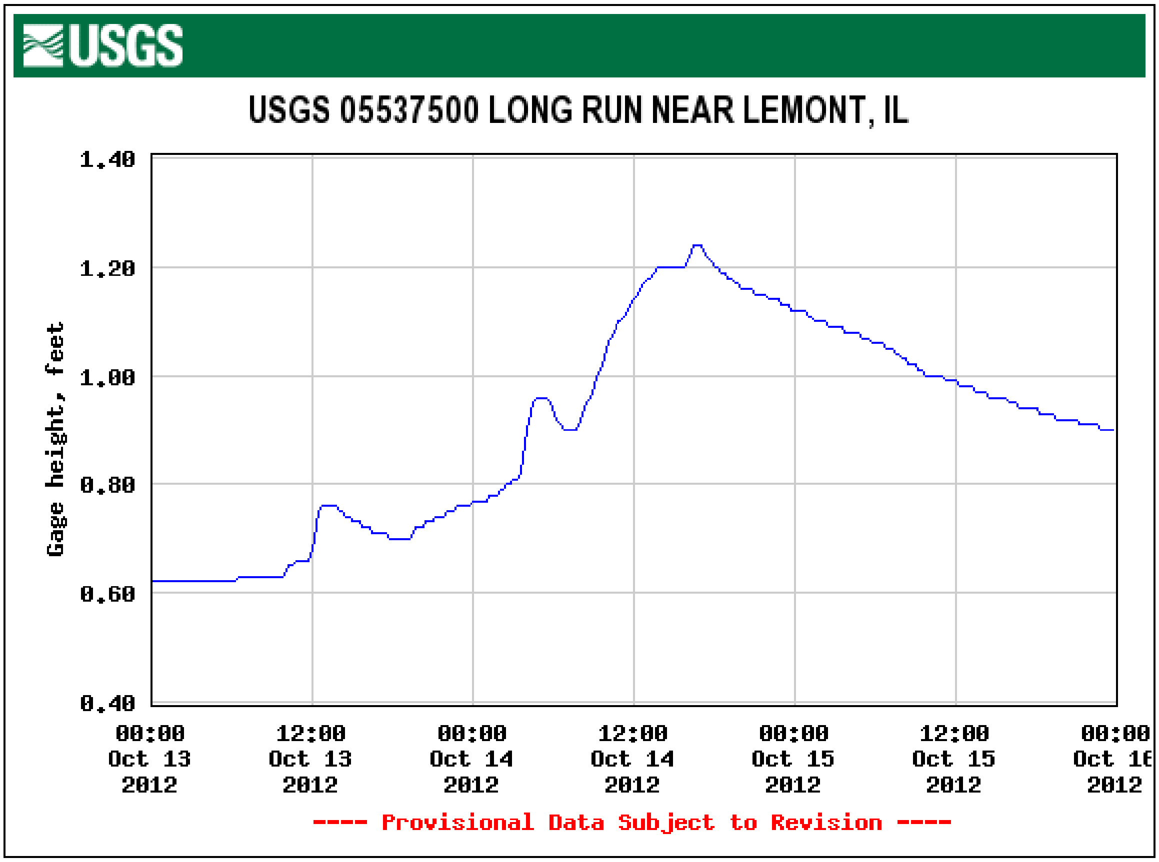


Figure 48. USGS gage station at Lemont Rd. used to time October 14, 2012 water chemistry sample.

a 2.5+ inch storm event on January 30, 2013.

AES's water samples were collected using Illinois EPA protocol then taken to a certified laboratory and tested for total phosphorus, nitrate, nitrite, ammonia nitrogen, total Kjeldahl nitrogen, total suspended solids, pH, conductivity, and biological oxygen demand. Turbidity was sampled in the field using a turbidity tube. AES and ILM water chemistry results are summarized in Table 27.

ILM and AES's water chemistry data results found no *statistical*, *numerical*, or Illinois EPA General Use guideline exceedances for dissolved oxygen, pH, chloride, ammonia-nitrogen, biological oxygen demand, or conductivity. Total phosphorus and total nitrogen levels exceeded the recommended USEPA Ecoregion VI guideline (USEPA, 2000) of 0.0725 mg/l and 2.461 mg/l respectively during ILM's base flow sampling and during AES's post storm event sampling. AES also found total suspended solid levels exceeding the USGS Ecoregion VI guideline (USGS, 2006) of <19 mg/l. Total suspended solid levels were approximately 50 mg/l when averaged over base flow, after a 1.0+ inch storm event, and following a 2.5+ inch storm event. It is interesting to note that total suspended solids were low (<10 mg/l) at base flow and following a 1.0+ inch rain event but around 200 mg/l following a 2.0+ inch storm event that occurred on January 31, 2013 when water levels rose to about 4.5 feet/275cfs based on the USGS gage station at Lemont Ave. This seems to demonstrate that total suspended solids are only a problem following storm events that exceed about 2.0 inches with the source of this sediment originating primarily from eroding streambanks.

To summarize water quality data in Long Run Creek, a 64.4% decrease in total phosphorus and 58.1% decrease in total nitrogen are needed to reach target levels based on recommended *numeric* criteria proposed by USEPA (USEPA, 2000). A 62% or greater decrease in total suspended solids (TSS) is needed to reach target levels based on USGS *numeric* standards. Section 5.0 of this report includes detailed information related to developing pollutant load reduction/impairment targets for Long Run Creek and addressing "Critical Areas" to reach these targets.

Table 27. ILM and AES water chemistry data summary for stations on Long Run Creek.

Parameter	Statistical, Numerical, or General Use Guidelines	Station (Date)		Average
		AES-1 (10/14/12)	ILM-LRC (2007/2008)	
Dissolved Oxygen (DO)	>5.0 mg/l*	-	11.5 mg/l	11.5 mg/l
pH	>6.5 or <9.0*	7.96	8.3	8.25
Chloride	<500 mg/l*	383 mg/l	180 mg/l	221 mg/l
Total Phosphorus (TP)	<0.0725 mg/l**	0.37 mg/l	0.23 mg/l	0.2036 mg/l
Total Nitrogen (TN)	<2.461 mg/l**	14.97 mg/l	3.59 mg/l	5.872 mg/l
Ammonia-Nitrogen	<15 mg/l*	0.2 mg/l	0.41 mg/l	0.37 mg/l
Total Suspended Solids (TSS)/ Turbidity	<19 mg/l***	6 mg/l ~50 mg/l****	-	 ~50 mg/l****
Bio. Oxygen Demand (BOD)	<5.0 mg/l*	4.5 mg/l	-	4.5 mg/l
Conductivity	<1,667 µmhos/ cm	1,191 µmhos/cm	1,066 µmhos/cm	1,091 µmhos/ cm

-Cells highlighted in red exceed recommended statistical, numerical, or General Use guidelines
* Illinois EPA General Use Standard
** Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion VI (USEPA 2000)
*** Present and Reference Concentrations and Yields of Suspended Sediment in Streams in the Great Lakes Region and Adjacent Areas (USGS 2006)
**** AES converted & averaged NTU to approximate TSS from turbidity readings collected on October 10, & 14, 2012 & January 30, 2013.

NOTEWORTHY - Numeric Water Quality Standards

USEPA expects states to establish *numeric* water quality standards for nutrients (phosphorus and nitrogen) in lakes and streams. Currently, Illinois EPA has a numeric phosphorus standard for lakes and is working on developing nutrient criteria for streams. To date, Illinois EPA has not developed *numeric* standards for turbidity/total suspended solids (TSS) in streams. *Numeric* criteria has been proposed by USEPA (USEPA, 2000) for nutrients based on a reference stream method for the Corn Belt and Northern Great Plains Ecoregion (Ecoregion VI) which includes Long Run Creek watershed. The values presented in this document generally represent nutrient levels that protect against adverse effects of nutrient overenrichment. The USGS has published a document outlining recommended *numeric* criteria for sediment in streams for Ecoregion VI (USGS, 2006). These criteria are used in this report to assess the quality of Long Run Creek and tributaries to develop pollution reduction targets and measure future successes, even though Illinois EPA has not adopted these criteria as standards.

Illinois EPA and others have developed *statistical* guidelines for various pollutants other than nutrients and suspended sediment. Illinois also provides General Use water quality standards that apply to almost all waters and are intended to protect aquatic life, wildlife, agriculture, primary contact, secondary contact, and most industrial uses. *Statistical* guidelines and General Use water quality guidelines are also used in this report as a means to measure impairment and to determine pollutant reduction needs in Long Run Creek watershed.

Tampier Lake

The Illinois EPA determined that Tampier Lake is impaired for not meeting all of its "Designated Uses" according to recent (2008, 2010, & 2012) *Integrated Water Quality Report and Section 303(d) Lists* (Table 28). Tampier Lake is not supporting for *Aesthetic Quality* caused by total suspended solids, total phosphorus, aquatic plants, and aquatic algae. The sources of impairment are identified as agriculture, waterfowl, urban runoff/storm sewer; and runoff from forest/grassland/parkland. Other "Designated Uses" for Tampier Lake were not assessed by Illinois EPA.

Extensive water quality sampling data has been conducted at Tampier Lake via Illinois EPA's Ambient Lake Monitoring Program (ALMP). ALMP collected multiple samples at three locations (RGZO1-3) (Table 28; Figure 47) from May-October in 1992, 2001, 2006, and 2010. Data was obtained from 2001, 2006, and 2010 ALMP monitoring stations via Illinois EPA's Storage and Retrieval (STORET) database and averaged for each water quality parameter (Table 28). The 1992 data is considered outdated and therefore is not included in the averages.

First, data from 2001, 2006, and 2010 indicates that total suspended solids are not problematic in Tampier Lake as documented by Illinois EPA. Illinois does not have a *numeric* standard for total suspended solids and literature indicates levels less than 30 mg/l are not problematic. Total phosphorus is on average 0.073 mg/l in Tampier Lake, exceeding the 0.05 mg/l *numeric* Illinois General Use standard for lakes.

In March 2010 Illinois EPA completed a Total Maximum Daily Load (TMDL) study for Tampier Lake focusing on phosphorus (IEPA, 2010). Illinois EPA has established *numeric* standards for total phosphorus but not for total suspended solids, aquatic plants, and aquatic algae. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. TMDL goals for Tampier Lake include developing a TMDL, describing the necessary elements of the TMDL, developing an implementation plan for each TMDL, and gaining public acceptance of the process.

Illinois EPA used ALMP data from 1992, 2001, and 2006 to establish a total phosphorus concentration of 0.085 mg/l for Tampier Lake. This is slightly higher than 0.073 mg/l when averaging in 2010 data but still higher that the 0.05 mg/l standard. Illinois EPA estimates that the total phosphorus load generated from Tampier Lake's surrounding watershed and internal cycling is 2.7 lbs/day under existing conditions. So, a 51% reduction in total phosphorus load (TMDL: 1.3 lbs/day phosphorus allowed) to Tampier Lake is needed to comply with the water quality standard of 0.05 mg/l. It is important to note however that 59% of the allowable phosphorus load was allocated to internal sources according to Illinois EPA while 41% of the allowable phosphorus load is allocated to external sources. Mitigating for internal sources of phosphorus is difficult and not recommended as a viable option in this plan. However, much of the external source of phosphorus can be reduced with Management Measures such as lake buffers, wetland restoration, etc. Section 6.0 of this report includes additional information related to implementation of Management Measure projects to address "Critical Areas" to reach phosphorus targets.

Table 28. Illinois EPA: ALMP (2001, 2006, & 2010) water quality data for Tampier Lake.

Parameter	Statistical, Numerical, or General Use Guideline	IEPA ALMP (2001, 2006, 2010 ave.)
Chloride	<500 mg/l*	75.0 mg/l
Total Nitrogen (TN)	No applicable standard	1.161 mg/l
Total Phosphorus (TP)	<0.05 mg/l*	0.073/0.085*** mg/l
Total Suspended Solids (TSS)	<30 mg/l**	20.1 mg/l
Turbidity	<20 NTU	15.5 NTU
Conductivity	<1,667 µmhos/cm**	579.4 µmhos/cm
Temperature (F)	<90 F*	69.3 F
pH	>6.5 or <9.0*	7.7
Secchi Depth	>18 in. (eutrophic status)**	24.5 in.
Dissolved Oxygen	>5.0 mg/l*	7.6 mg/l

Cells highlighted in red exceed recommended statistical, numerical, or General Use guideline
* IEPA General Use Standard; **Other literature values; ***Phosphorus average from 1992, 2001, & 2006 TMDL (IEPA, 2010)

Wastewater Treatment Plants

There are two National Pollution Discharge Elimination System (NPDES) permitted wastewater treatment plant (WWTP) discharges to Long Run Creek. Illinois American Water Company owns and operates both plants. Chickasaw Hills WWTP discharges under NPDES Permit No. IL0031984 east of Parker Road. Derby Meadows WWTP discharges to Long Run Creek under NPDES Permit No. IL0045993 west of Will-Cook Road. Each plant is required to monitor chlorine residual, biological oxygen demand, fecal coliform, ammonia nitrogen, suspended solids, pH, and dissolved oxygen. The plants are not required to monitor total nitrogen or total phosphorus as neither is regulated. Additionally, neither plant is required to meet the 1.0 mg/l phosphorus effluent limit established by Illinois EPA on February 2, 2006 for any plant that undergoes upgrades which results in effluent exceeding 1.0 MGD (35 Ill. Adm. Code 304.123 (g)). In October, 2012, effluent samples were collected from the two WWTPs in an attempt to get a snapshot of total nitrogen and total phosphorus. This data is also important for generating nutrient loading as discussed in Section 4.0.

Chickasaw Hills WWTP met all NPDES load limit requirements when averaging effluent monitoring data from January 2005 to July 2012 (Table 29). This data was obtained via a FOIA request from USEPA. A close look at the raw data also reveals very few daily compliance issues. As stated earlier, Chickasaw Hills WWTP is not required to monitor total nitrogen or total phosphorus. Effluent sampling by AES in October 2012 found total nitrogen levels at 33.22 mg/l and total phosphorus levels at 3.45 mg/l. These levels are high but fall within typical levels for WWTP effluent based on literature (IEPA, 2009).

Derby Meadows WWTP also met all NPDES load limit requirements when averaging effluent monitoring data from January 2005 to July 2012 (Table 30). The plant had very few daily compliance issues. Like Chickasaw Hill WWTP, Derby Meadows WWTP is not required to monitor total nitrogen or total phosphorus. Effluent sampling by AES in October 2012 found total nitrogen levels at 21.44 mg/l and total phosphorus levels at 5.02 mg/l. These levels are high but fall within typical levels based on literature (IEPA, 2009).

Table 29. Chickasaw Hills WWTP effluent water quality (January 2005 to July 2012).

Parameter	NPDES Requirement	Chickasaw Hills WWTP
Chlorine Residual	0.05 mg/l daily max.	No exceedances
BOD	146 lbs/day mo. ave. 10 mg/l mo. ave.	30.0 lbs/day 4.0 mg/l
Fecal Coliform	≤200/100 mL mo. mean	9.7/100 mL
Ammonia Nitrogen (April-Oct.)	22 lbs/day mo. ave. 1.5 mg/l mo. ave	3.7 lbs/day 0.5 mg/l
Ammonia Nitrogen (Nov.-Feb.)	58 lbs/day mo. ave. 4.0 mg/l mo. ave.	7.1 lbs/day 0.8 mg/l
Ammonia Nitrogen (March)	57 lbs/day mo. ave. 3.9 mg/l mo. ave	5.9 lbs/day 0.7 mg/l
Total Nitrogen (TN)	Not applicable	*33.22 mg/l
Total Phosphorus (TP)	Not applicable	*3.45 mg/l
Total Suspended Solids (TSS)	175 lbs/day mo. ave. 12 mg/l mo. ave	28.5 lbs/day 3.7 mg/l
pH	>6.0 or <9.0	7.3
Dissolved Oxygen	>6.0/4.0 mg/l wk. ave.	6.8 mg/l

* Data collected via one-time effluent sampling by AES on October 10, 2012.

Table 30. Derby Meadows WWTP effluent water quality (January 2005 to July 2012).

Parameter	NPDES Requirement	Derby Meadows
Chlorine Residue	0.05 mg/l daily max.	No exceedances
BOD	221 lbs/day mo. ave. 10 mg/l mo. ave.	16.5 lbs/day 3.2 mg/l
Fecal Coliform	≤200/100 mL mo. mean	1.2/100 mL
Ammonia Nitrogen (April-Oct.)	31 lbs/day mo. ave. 1.4 mg/l mo. ave.	4.3 lbs/day 1.1 mg/l
Ammonia Nitrogen (Nov.-Feb.)	89 lbs/day mo. ave. 4.0 mg/l mo. ave.	7.6 lbs/day 1.2 mg/l
Ammonia Nitrogen (March)	71 lbs/day 3.2 mg/l mo. ave.	3.5 lbs/day 0.5 mg/l
Total Nitrogen (TN)	Not applicable	*21.44 mg/l
Total Phosphorus (TP)	Not applicable	*5.02 mg/l
Total Suspended Solids (TSS)	266 lbs/day mo. ave. 12 mg/l mo. ave	11.9 lbs/day 2.2 mg/l
pH	>6.0 or <9.0	7.2
Dissolved Oxygen	>6.0/4.0 mg/l wk. ave.	7.4 mg/l

* Data collected via one-time effluent sampling by AES on October 10, 2012.

4.2 POLLUTANT LOADING ANALYSIS

The USEPA 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 Long Run Creek watershed as a whole and by individual Subwatershed Management Unit (SMU). The model uses land use/cover category types, precipitation, soils information, existing best management practices, and other data input information. The model outputs average annual pollutant load for each of the land use/cover types. The results of this analysis combined with known outfall information from two wastewater treatment plants (WWTP) was used to estimate the total watershed load for nitrogen, phosphorus, and sediment and to identify and map pollutant load "Hot Spot" SMUs. It is important to note that STEPL is not a calibrated model.

The results of the STEPL model run at the watershed scale combined with point source WWTP loading indicates that Long Run Creek watershed produces 206,408 lbs/yr of nitrogen, 42,068 lbs/yr of phosphorus, and 9,550 tons/yr of sediment (Table 32; Figure 49).

Chickasaw Hills and Derby Meadows WWTPs contribute the highest nutrient (nitrogen and phosphorus) loading in Long Run Creek watershed (Table 31 & Table 32). Annual nitrogen and phosphorus loading from Chickasaw Hills WWTP is estimated at 91,960 lbs/yr and 9,550 lbs/yr respectively. Loading from Derby Meadows WWTP is approximately 43,045 lbs/yr for nitrogen and 10,079 lbs/yr for phosphorus. The WWTPs combined to produce 135,005 lbs/yr of nitrogen and 19,629 lbs/yr phosphorus. This accounts for about 65% of the total annual load for nitrogen and 56% of the total annual load for phosphorus. The annual load for total suspended solids/ sediment (TSS) from the treatments plants is low compared to other sources.

Urban land uses contribute the second highest load of nitrogen (43,954 lbs/yr: 21%) and phosphorus (6,878 lbs/yr: 19.7%) and third highest load of sediment (799 t/yr: 8%). Urban land is expected to be a significant pollutant contributor since it makes up more than 50% of the watershed. Streambank erosion contributes the highest sediment load (7,848 tons/yr: 82%) to Long Run Creek and also contributes significantly to nitrogen (12,558 lbs/yr: 6%) and phosphorus (4,835 lbs/yr: 13.9%) loading. Remaining agricultural cropland in the watershed contributes the third highest nitrogen load (13,264 lbs/yr: 6%), fourth highest phosphorus load (2,994 lbs/ yr: 8.6%), and second highest sediment load (881 t/yr: 9%). As expected, the STEPL model suggests that very few pollutants originate from pastureland, forest/grassland/ and water/ wetland. Complete STEPL Model results can be found in Appendix D.

Table 31. Estimated annual pollutant load from wastewater treatment plants.

Wastewater Treatment Plant	Flow MGD	Concentration (mg/l)			Pollutant Load		
		TN (mg/l)	TP (mg/l)	TSS (mg/l)	TN Load (lbs/yr)	TP Load (lbs/yr)	TSS (t/yr)
Chickasaw Hills	0.91	33.22	3.45	3.7	91,960	9,550	5.1
Derby Meadows	0.66	21.44	5.02	2.2	43,045	10,079	2.2
Total	**1.57**	**54.66**	**8.47**	**5.9**	**135,005**	**19,629**	**7.3**

Average daily flow (MGD) × average concentration (mg/l) × 3,042 (L-d-lb/gal-y-mg) = average annual load (lb-t/y)

Table 32. Estimated existing (2012) annual pollutant load by source at the watershed scale.

STEPL Source	N Load (lbs/yr)	% of Total Load	P Load (lbs/yr)	% of Total Load	Sediment (tons/yr)	% of Total Load
Urban	43,954	21.3	6,878	19.7	799	8.4
Cropland	13,264	6.4	2,994	8.6	881	9.2
Pastureland	669	0.3	58	0.02	8	0.08
Forest & Grassland	647	0.3	319	0.9	14	0.1
Water/Wetland	311	0.02	155	0.4	<1	0.01
Streambank Erosion	12,558	6.1	4,835	13.9	7,848	82.2
*Wastewater	135,005	65.4	19,629	56.3	7.3	0.08
Total	**206,408**	**100**	**34,868**	**100**	**9,550**	**100**

*Not included in STEPL model

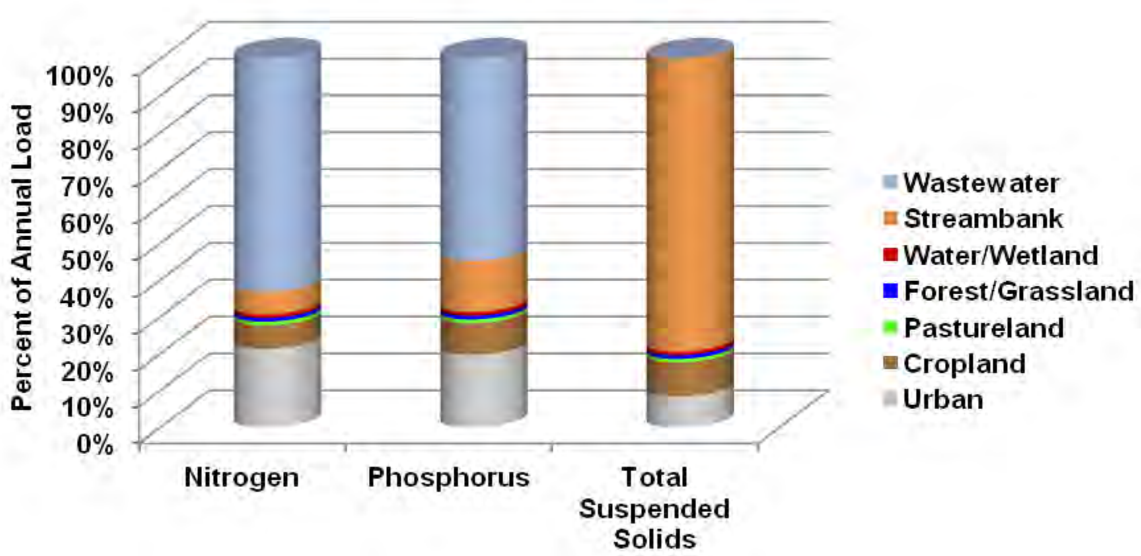


Figure 49. Estimated percent contributions to existing (2012) pollutant load by source.

The results of the STEPL model were also analyzed for nonpoint source pollutant loads at the Subwatershed Management Unit (SMU) scale. **This analysis does not incorporate point sources from the two WWTPs.** This allows for a more refined breakdown of nonpoint pollutant sources and leads to the identification of pollutant load "Hot Spots". Hot Spot SMUs were selected by examining pollutant load concentration (load/acre) for each pollutant. Next, pollutant concentrations exceeding the 75% quartile and 50% quartile were calculated resulting in "High Concentration" and "Moderate Concentration" nonpoint source pollutant load Hot Spot SMUs. Any SMU exhibiting pollutant load concentrations below the 50% quartile contribute a "Low Concentration" of pollutants relative to other SMUs. Table 33 and Figure 50 depict and summarize the results of the SMU scale pollutant loading analysis. Five of the 20 SMUs comprising Long Run Creek watershed are considered "High Concentration" pollutant load Hot Spots for nitrogen, phosphorus, and sediment based on STEPL modeling. Eight SMUs are considered "Moderate Concentration" pollutant load Hot Spots for various combinations of nitrogen, phosphorus, and sediment. The remaining seven SMUs contribute "Low Concentrations" based on modeling.

Table 33. Pollutant load "Hot Spot" SMUs.

Hot Spot SMU*	Size (acres)	N Load (lbs/yr)	N Load (lbs/yr)/ acre	P Load (lbs/yr)	P Load (lbs/yr)/ acre	Sediment Load (t/yr)	Sediment Load (t/yr)/ acre
High Concentration Hot Spot SMUs							
SMU 14	549	3,249	5.92	771	1.40	670	1.22
SMU 15	362	2,106	5.81	497	1.37	453	1.25
SMU 16	215	1,437	6.68	380	1.77	392	1.82
SMU 17	281	2,058	7.32	609	2.16	737	2.62
SMU 20	907	7,313	8.06	1,924	2.12	1,943	2.14
Moderate Concentration Hot Spot SMUs							
SMU 3	1,218	-	-	1,147	0.94	607	0.50
SMU 7	1,291	-	-	-	-	574	0.44
SMU 8	1,969	9,577	4.86	1,965	1.00	1,071	0.54
SMU 9	1,037	-	-	-	-	453	0.44
SMU 10	773	3,451	4.47	654	0.85	-	-
SMU 13	446	2,118	4.75	436	0.98	228	0.51
SMU 18	545	2,448	4.49	-	-	-	-
SMU 19	780	3,646	4.68	1,924	2.12	1,943	1.12

High Concentration Hot Spot SMUs exceed the 75% quartile: N=5.10 lbs/yr/acre, P=1.23lbs/yr/acre, Sediment= 1.15 t/yr/acre
Moderate Concentration Hot Spot SMUs exceed the 50% quartile: N=4.41 lbs/yr/acre, P=0.83lbs/yr/acre, Sediment= 0.44 t/yr/acre

A brief summary of "High Concentration" pollutant loading Hot Spots follows:

- SMU 14 comprises 549 acres. Nonpoint source pollutants in this SMU originate in part for a relatively high concentration of residential development but primarily due to moderate and severe bank erosion along Long Run Creek. Eroded sediment carries with it attached nitrogen and phosphorus.

- Pollutants coming from SMU 15 originate primarily from commercial, residential, and moderately to highly eroded streambanks along Tributary I.

- SMU 16 is relatively small (215 acres) compared to other SMUs in the watershed but contributes pollutants at high concentrations from mostly transportation (roads), residential areas, and moderate to highly eroded streambanks along Tributary J.

- SMU 17 is also small (281 acres) but contributes pollutants at high concentrations from highly eroded streambanks along Tributary K.

- SMU 20 drains Tributary M (South Ditch) in the far southwest corner of the watershed. This SMU is large (907 acres) and has a high concentration of pollutants from cropland and highly eroded streambanks along Tributary M.

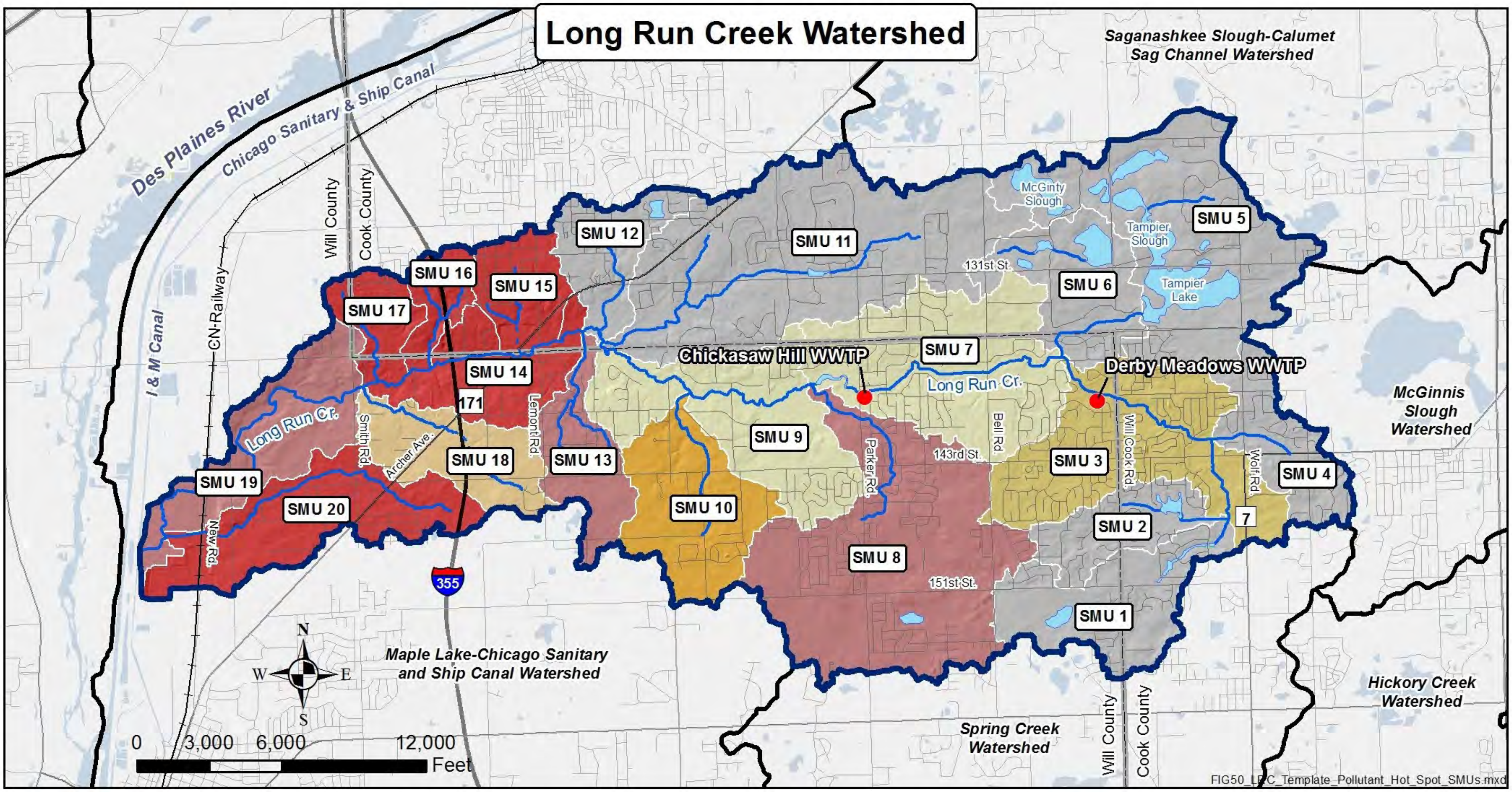


Figure 50

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Fig. 50: Nonpoint Source Pollutant Loading "Hot Spot" SMUs

Legend

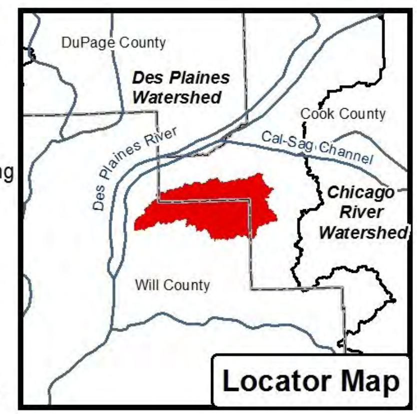
- Roads
- Streams & Tributaries
- Stream Break
- Significant Open Water
- LRC Watershed Boundary
- Adjacent Watershed
- County Boundary

Pollutant Load Hot Spot SMUs

- High Concentration - Nitrogen, Phosphorus, Sediment Loading
- Moderate Concentration - Nitrogen, Phosphorus, Sediment Loading
- Moderate Concentration - Nitrogen, Phosphorus Loading
- Moderate Concentration - Phosphorus, Sediment Loading
- Moderate Concentration - Nitrogen Loading
- Moderate Concentration - Sediment Loading
- Low Concentrations

* Note: WWTP data is not included in this analysis.

Data Sources: AES



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5.0 CAUSES & SOURCES OF IMPAIRMENT & REDUCTION TARGETS

5.1 CAUSES & SOURCES OF IMPAIRMENT

According to Illinois EPA's most recent 2012 *Integrated Water Quality Report and Section 303(d) List*, Long Run Creek (IEPA Segment Code: ILGHE-01) is "Fully Supporting" for *Aquatic Life*, the stream's only Illinois EPA assigned Designated Use. It is important to note however that Long Run Creek was last studied by Illinois EPA in 1997. More recent data suggests moderate impairment caused primarily from wastewater treatment plant nutrient loading, streambank erosion, and channel modification in the upper reaches.

Tampier Lake (IEPA Code: ILRGZO) is "Fully Supporting" for *Aquatic Life* but "Not Supporting" (impaired) for *Aesthetic Quality* caused by total suspended solids (TSS), total phosphorus (TP), aquatic plants, and aquatic algae. The sources of impairment are identified as agriculture, waterfowl, urban runoff/storm sewer; and runoff from forest/grassland/parkland.

There are also non-water quality related impairments in the watershed such as habitat degradation, loss of open space, hydrologic and flow changes, reduced groundwater infiltration, and structural flood damage. Many different causes and sources are related to these impairments.

Table 34 summarizes all *known* or *potential* causes and sources of watershed impairment as documented by Illinois EPA, items identified via Applied Ecological Service's watershed resource inventory, and input from Long Run Creek Watershed Planning Committee (LRCWPC) stakeholders who met during the planning process to discuss impairments.

Table 34. *Known* and *potential* causes and sources of watershed impairment.

Illinois EPA or other Impairment	Cause of Impairment	Known or Potential Source of Impairment
Long Run Creek		
Water Quality: Aquatic Life	Nutrients- *known impairment:* (Phosphorus & Nitrogen)	Wastewater treatment plants; Streambank erosion; Agricultural row crop runoff; Residential, Ag, and commercial lawn fertilizer; Failing septic systems; Inadequate policy; Level of landowner education; Livestock & horse farm operations (manure); Tree service operations (mulch leachate)
Water Quality: Aquatic Life	Sediment- *known impairment* (Total Suspended Solids/turbidity)	Streambank erosion; Construction sites & utility corridor work; Existing & future urban runoff; Agricultural row crop runoff
Water Quality: Aquatic Life	Chlorides (salinity)- *potential impairment*	Deicing operations on roads & other pavement; Inadequate policy; Level of public education
Water Quality: Aquatic Life	Low dissolved oxygen- *potential impairment*	Heated stormwater runoff from urban areas; Lack of natural riffles in upper stream reaches Tree service operations (mulch leachate)
Water Quality: Aquatic Life, Primary and Secondary Contact	Petroleum hydrocarbons (oil & grease)- *potential impairment*	CN Railway derailments; Trucking cargo spills along major roads; General gas station, urban, and highway runoff; Illicit dumping
Habitat Degradation	Invasive/non-native plant species in riparian and other natural areas- *known impairment*	Spread from existing and introduced populations; Level of public education
Habitat Degradation	Loss and fragmentation of open space/natural habitat due to development & groundwater changes- *known impairment*	Inadequate protection policy; Lack of land acquisition funds; Pre-existing land development agreements; Traditional development design; Streambank, channel, and riparian area modification; Lack of appropriate land management; Lack of restoration and maintenance funds; Wetland loss
Hydrologic and Flow Changes in Long Run Creek	Impervious surfaces- *known impairment*	Water treatment plant effluent; Low head dams/impoundments; Existing & future urban runoff; Wetland loss
Aquifer Drawdown	Reduced infiltration & human use- *known impairment*	Wells; Existing and future urban impervious surfaces; Inadequate protection policy; Level of public education; Wetland loss
Structural Flood Damage	Encroachment in 100-year floodplain- *known impairment*	Poor detention basin design & function; Existing and future urban impervious surfaces; Channelized streams; Wetland loss; Debris jams in streams; Agricultural drain tiles
Tampier Lake		
Aesthetic Quality	Total Suspended Solids, Total Phosphorus, aquatic plants, aquatic algae- *known impairment*	Agriculture; Waterfowl; Urban runoff/storm sewer; Forest/grassland/parkland runoff

5.2 CRITICAL AREAS, MANAGEMENT MEASURES & ESTIMATED IMPAIRMENT REDUCTIONS

For this watershed plan a "Critical Area" is best described as a location in the watershed where existing or potential future causes and sources of an impairment or existing function are significantly worse than other areas of the watershed. Seven Critical Area types were identified in Long Run Creek watershed and include:

1. wastewater treatment plants with elevated nutrients in effluent;
2. highly degraded stream reaches;
3. highly degraded riparian areas and lake buffers;
4. large drained wetland complexes;
5. poorly designed/functional detention basins or detention needs;
6. large agricultural areas; and
7. green infrastructure protection areas.

Short descriptions of each Critical Area type are included below. Table 35 includes summaries of the current condition at each Critical Area (by type) and recommended Management Measures with estimated nutrient and sediment load reductions expected. The list of Critical Areas is derived from a comprehensive list of measures found in the Action Plan section of this report. Figure 51 maps the location of each Critical Area.

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 nutrient and sediment load reductions from the implementation of *agricultural* Management Measures. Estimate of nutrient and sediment load reduction from implementation of *urban* Management Measures is based on efficiency calculations developed by Illinois EPA. Illinois EPA pollutant load reduction worksheets for each Critical Area Management Measure are located in Appendix D.

Critical Wastewater Treatment Plants

There are two National Pollution Discharge Elimination System (NPDES) permitted wastewater treatment plant (WWTP) discharges to Long Run Creek (Figure 51). The first is Chickasaw Hills WWTP located east of Parker Road. The second is Derby Meadows WWTP located west of Will-Cook Road. Both are owned and operated by Illinois American Water Company. These plants are considered Critical Areas because combined they contribute over 65% of the total nitrogen loading and over 56% of the total phosphorus loading to Long Run Creek based on water quality sampling and modeling data. The best recommendation for these plants is to upgrade with facilities that reduce nutrients in effluent water so that phosphorus is less than 1.0 mg/l and nitrogen is less than 5.5 mg/l. Section 3.15 includes a detailed discussion about wastewater treatment plants.

Critical Stream Reaches

Critical stream reaches are those with highly eroded streambanks and/or highly degraded channel conditions that are a major source of total suspended solids (sediment) carrying attached phosphorus and nitrogen. Streambank stabilization using bioengineering and installation of artificial riffles in Critical Area stream reaches will greatly reduce sediment and nutrient transport downstream while improving habitat and increasing oxygen levels. Six stream reaches (LRC5, LRC9, LRC11, TribF1, TribM1, and TribM2) totaling 26,789 linear feet were identified as Critical Areas. Section 3.13 includes a complete summary of streams and tributaries in the watershed.

Critical Riparian Areas & Lake Buffers

Critical riparian areas and lake buffers are select locations adjacent to stream reaches and lakes that are in poor ecological condition or areas lacking a buffer but with excellent ecological restoration and remediation potential to improve water quality and habitat conditions. Four riparian areas (LRC2, LRC11, TribF1, and TribN1) totaling 14,966 linear feet and a section of shoreline along Tampier Lake totaling 9,650 linear feet are considered Critical Areas. It is important to note that the 2,960 linear foot riparian corridor along Tributary N Reach 1 (TribN1) and the 9,650 linear foot buffer recommendation along Tampier Lake are located in the subwatershed to Tampier Lake, a TMDL waterbody. Section 3.13 includes a full summary of the riparian areas in the watershed.

Critical Wetland Restoration Sites

Critical wetlands restoration sites are generally associated with large areas that were historically wetland prior to European settlement in the 1830s but were drained for agricultural purposes. Many of these historic wetlands can be restored by breaking existing drain tiles and planting with native vegetation. Wetland restorations are among the most recommended projects to improve water quality, reduce flooding, and improve wildlife habitat. Critical Area status was assigned based on location, size, and restoration potential. In addition, all "potentially feasible" wetland restoration sites within the subwatershed to Tampier Lake are considered Critical Areas because of the Lake's TMDL status. There are 13 critical wetland restoration areas totaling 355 acres. A detailed summary of the extent of drained wetlands and potential wetland restoration opportunities in the watershed is included in Section 3.13.

Critical Detention Basins

Critical detention basins are generally defined as existing basins that provide poor ecological and water quality benefits in areas where these attributes are needed. One site was also identified where detention is needed to improve water quality runoff from Homer Tree Service where large mulch piles are stored. Over time, mulch piles begin to decompose, releasing a dark brown organic liquid. This liquid, or leachate, may contain high levels of tannins, organic acids, and other contaminants. Due to its potentially acidic nature, leachate from wood material can degrade the quality of nearby water sources by reducing the pH, mobilizing metals within the soil, lowering the level of dissolved oxygen in surface water, and may also contain nutrients and organic material. This in turn can kill fish and other aquatic organisms, and impair wildlife habitats (PA Department of Environmental Protection, 2003).

Twenty two (22) detention basins meet the criteria of a Critical Area based of their location, function, and size. Many of the Critical Area detention basin retrofit recommendations are located at the headwaters of tributaries to Long Run Creek and along Reach 3 and 4 of Long Run Creek where opportunities exist to enhance existing detention along the floodplain. Three detention basin retrofit opportunities within Tampier Lake's subwatershed were also considered Critical Areas due to the potential to remove pollutants prior to water making its way to the lake. The most common recommendation is to naturalize basins with native vegetation that are currently turf grass to provide better water quality improvement, greater infiltration of water, and wildlife habitat. A summary of the detention basins in the watershed is included in Section 3.13.

Critical Agricultural Land

It is well documented that agricultural land is a significant contributor of nutrients and sediment in watersheds. According to modeling, agricultural areas contribute between 6% and 8% of the nutrient load and nearly 10% of the sediment load in the watershed. There are currently 2,011 acres of row crop/hay land and 101 acres of land used to raise livestock in Long Run Creek watershed. Fifteen (15) agricultural areas totaling 1,306 acres were identified as Critical Areas based on their size and/or location in the watershed. The extent of existing row crop erosion and nutrient reduction practices in the watershed is not well known beyond the observed grassed swales and waste (manure) management for livestock areas is minimal. Critical agricultural lands are those for which application of agricultural measures would reduce pollutant loading. Practices explored in this plan include conservation tillage (no till) for crop land and manure management on livestock operations.

Critical Green Infrastructure Protection Areas

Chicago Metropolitan Agency for Planning (CMAP) defines a "Protection Area" as an area that represents subsections of a watershed that have valuable characteristics; valuable either in the sense that (1) they contain resources and characteristics that may need to be protected and/or (2) property ownership or land use characteristics make the subsection a strong candidate for action (CMAP 2007). Information obtained from predicted future land use data, location of large undeveloped parcels within the proposed Class III Groundwater Recharge Area, and green infrastructure sections of this plan led to identification of 19 critical green infrastructure protection areas totaling 2,686 acres. Most of the green infrastructure protection areas in the eastern half of the watershed are essentially undeveloped parcels located on existing agricultural land where future development is predicted. The implementation of conservation or low impact development designs in these areas will help protect the future health of the watershed as development continues.

Many of the protection area recommendations in the western half of the watershed occur on parcels that the Forest Preserve District of Will County (FPDWC) has identified in their 1996 Preservation Plan. With these parcels identified, FPDWC can respond to proposals in the event that someone wants to develop the parcels and information can then be passed along to municipalities and other interested parties. In addition, the FPDWC occasionally receives inquiries from landowners wishing to sell their properties to the FPDWC. If it is determined that the land is in an area that is worthy of protection, then the FPDWC will consider the offer to purchase.

It is also important to note that Sites GI 3, GI 4, and GI 5 in Orland Park are part of a court ordered settlement in the 1990s that among other items set density minimums for the land and may limit the conservation or low impact development designs that can be used. Site GI 2, also in Orland Park, is zoned for single family residential but the more sensitive portions have been set aside for future dedication to the Forest Preserve District of Cook County.

Table 35. Critical Areas, existing conditions, recommended Management Measures, & estimated nutrient and sediment load reductions.

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction
Wastewater Treatment Plants			
Chickasaw Hills WWTP	WWTP facility with effluent measuring 33.22 mg/l (91,960 lb/yr) total nitrogen and 3.45 mg/l (9,550 lbs/yr) total phosphorus	*Implement plant upgrades for total nitrogen (<5.5 mg/l) and total phosphorus (< 1.0 mg/l (goal = 0.6 mg/l) removal benefits	TN= 76,735 lbs/yr TP= 7,889 lbs/yr TSS= na
Derby Meadows WWTP	WWTP facility with effluent measuring 21.44 mg/l (43,045 lb/yr) total nitrogen and 5.02 mg/l (10,079 lbs/yr) total phosphorus	*Implement plant upgrades for total nitrogen (<5.5 mg/l) and total phosphorus (< 1.0 mg/l (goal = 0.6 mg/l) removal benefits	TN= 33,002 lbs/yr TP= 8,874 lbs/yr TSS= na
Stream Reaches			
Long Run Creek Reach 5 (LRC5)	3,123 lf of stream on private and public (Homer Twp) land with moderately to highly eroded streambanks and moderate channelization	Restore streambanks using bioengineering techniques and improve channel using riffles; install grade control at downstream end to help reconnect stream to adjacent floodplain	TN= 311 lbs/yr TP= 155 lbs/yr TSS= 155 tons/yr
Long Run Creek Reach 9 (LRC9)	4,360 lf of stream on private residential land with highly eroded streambanks	Restore streambanks using bioengineering techniques	TN= 1,067 lbs/yr TP= 534 lbs/yr TSS= 534 tons/yr
Long Run Creek Reach 11 (LRC11)	3,938 lf of stream on Big Run Golf Course with highly eroded streambanks	Restore streambanks using bioengineering techniques; combine with Critical Riparian Area Project along LRC11.	TN= 964 lbs/yr TP= 482 lbs/yr TSS= 482 tons/yr
Tributary F Reach 1 (TribF1)	2,281 lf of headwater stream on private agricultural land that is highly channelized and actively eroding caused by water from detentions in new subdivision upstream	Create bed and streambanks using bioengineering techniques; combine with Critical Riparian Area project TribF1.	TN= 10 lbs/yr TP= 5 lbs/yr TSS= 5 tons/yr
Tributary M Reach 1 (TribM1)	3,292 lf of headwater stream on private land with highly eroded streambanks; tributary flows through Long Run Seep Nature Preserve	Restore streambanks using bioengineering techniques and use of grade controls in channel	TN= 806 lbs/yr TP= 403/yr TSS= 403 tons/yr
Tributary M Reach 2 (TribM2)	9,794 lf of stream on private land with highly eroded streambanks; tributary flows through Long Run Seep Nature Preserve	Restore streambanks using bioengineering techniques and use of grade controls in channel	TN= 2,396 lbs/yr TP= 1,199 lbs/yr TSS= 1,199 tons/yr
Riparian Areas & Lake Buffers			
Along Long Run Creek Reach 2 (LRC2)	5,787 lf of highly degraded riparian area on private & public (Orland Park Open Lands) land along Long Run Creek Reach 2 (LRC2)	Remove invasive woody species and restore degraded riparian area using a natural ecological restoration approach	TN= 330 lbs/yr TP= 52 lbs/yr TSS= 15 tons/yr

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction
Along Long Run Creek Reach 11 (LRC11)	3,938 lf of narrow/degraded riparian area along Long Run Creek Reach 11 (LRC11) within Big Run Golf Course	Restore degraded riparian area using a natural ecological restoration approach; combine with Critical Stream Reach project LRC11.	TN=11 lbs/yr TP= 8 lbs/yr TSS= 1 tons/yr
Along Tributary F Reach 1 (TribF1)	2,281 lf of stream with no riparian buffer through private agricultural area along Tributary F Reach 1 (TribF1)	Create riparian buffer through agricultural area using a natural ecological restoration approach; combine with Critical Stream Reach project TribF1.	TN=58 lbs/yr TP= 5 lbs/yr TSS= 3.5 tons/yr
Tributary N Reach 1 (TribN1)	2,960 lf along Tributary N Reach 1 (TribN1) draining to Tampier Slough/Lake with poor riparian buffer	Restore degraded riparian area using a natural ecological restoration approach	TN=190 lbs/yr TP= 30 lbs/yr TSS= 9 tons/yr
Along Tampier Lake	9,650 lf along the west and north portions of Tampier Lake with poor buffer consisting mostly of mowed turf grass	Install 30 foot wide natural buffer along 9,650 lf to filter pollutants and discourage waterfowl use along shoreline	TN=4 lbs/yr TP= 3 lbs/yr TSS= 0.5 tons/yr
Wetland Restoration Sites			
W1, W2 , W3, & W14	14.7 acres (W1), 23.4 acres (W2), 24 acres (W3), and 25.9 acres (W14) of drained wetlands on private agricultural land at headwaters and along Long Run Creek Reach 1 (LRC1); areas are slated for future residential development	Incorporate wetland restoration into future Conservation Development plans by using areas as wetland detention & mitigation	TN= 144 lbs/yr TP= 52 lbs/yr TSS= 52 tons/yr
W8 & W9	9.5 acres (W8) and 9.3 acres (W9) of drained wetlands on private agricultural land east/northeast of & draining to Tampier Lake	Incorporate wetland restoration into future Conservation Development plans by using areas as wetland detention & mitigation	TN= 6 lbs/yr TP= 8 lbs/yr TSS= 8 tons/yr
W10 & W11	7.5 acres (W10) and 5.3 acres (W11) of drained wetlands north/northeast of Tampier Lake primarily on FPDCC land	Restore wetlands	TN= 54 lbs/yr TP= 16 lbs/yr TSS= 6 tons/yr
W16 & W17	84 acres (W16) and 74.6 acres (W17) of drained wetlands primarily on private agricultural land at headwaters of Tributary D); areas are slated for future residential development	Incorporate wetland restoration into future Conservation Development plans by using areas as wetland detention & mitigation	TN= 318 lbs/yr TP= 73 lbs/yr TSS= 36 tons/yr
W19	21.8 acres of drained wetland primarily on private agricultural land at headwaters of Tributary E; area is slated for future residential development	Incorporate wetland restoration into future Conservation Development plans by using areas as wetland detention & mitigation	TN= 66 lbs/yr TP= 15 lbs/yr TSS= 7.5 tons/yr
W21 & W22	25.2 acres (W21) and 30.1 acres (W22) of drained wetlands primarily on private agricultural land at headwaters of Tributary F; areas are slated to be Conservation Development by Village of Lemont	Incorporate wetland restoration into future Conservation Development plans by using areas as wetland detention & mitigation	TN= 420 lbs/yr TP= 94 lbs/yr TSS= 49 tons/yr

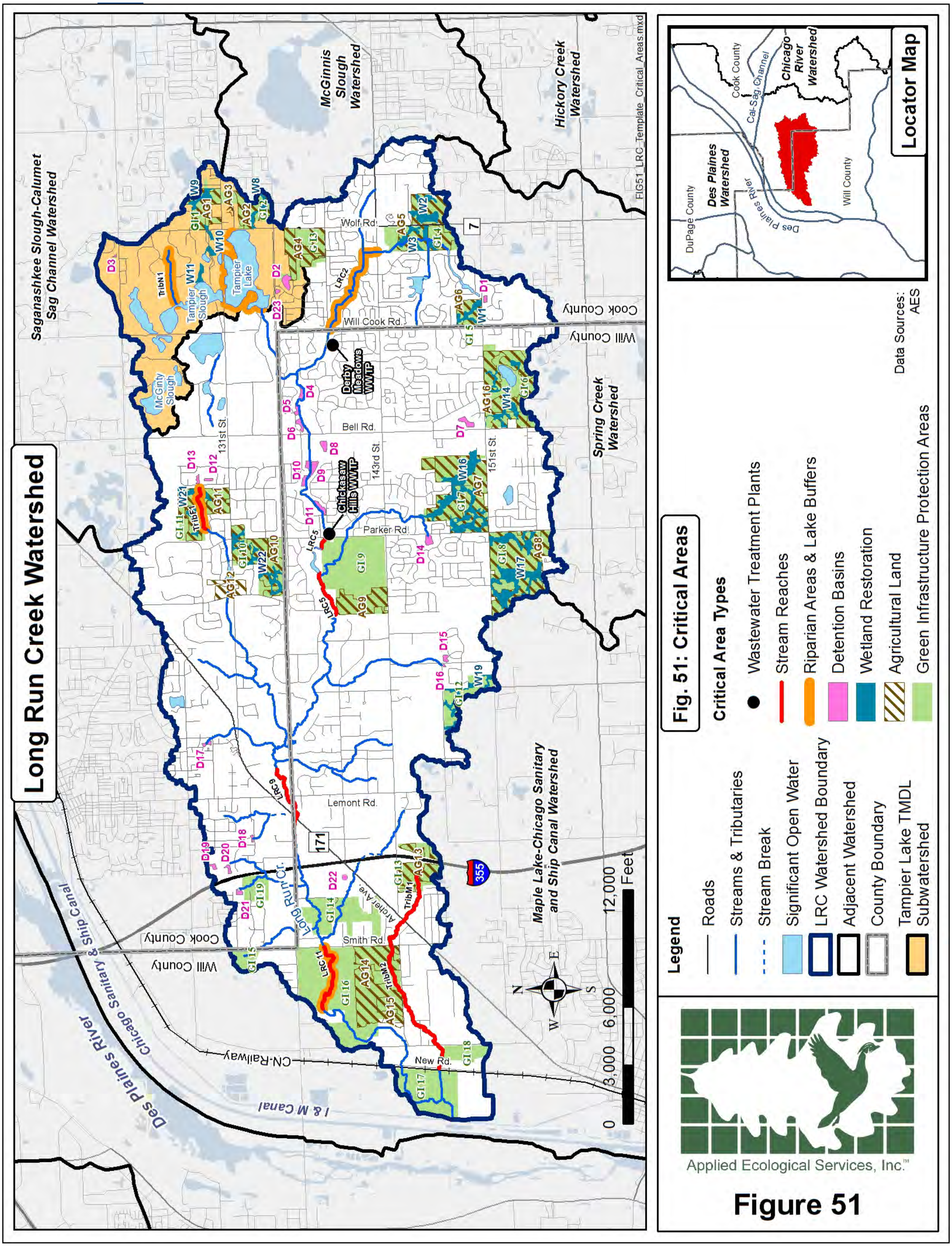
Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction
Detention Basins			
D1	1.3 acre dry bottom turf grass detention at headwaters of Long Run Creek Reach 1 (LRC1)	Naturalize basin with native vegetation and determine if outlets can be raised to create wetland detention	TN= 72 lbs/yr TP= 8 lbs/yr TSS= 3.5 tons/yr
D2	5.4 acre wet bottom turf grass lined detention servicing residential subdivision; basin is located in Tampier Lake TMDL subwatershed	Retrofit slopes and emergent zones with native vegetation to create wetland detention	TN= 81 lbs/yr TP= 9 lbs/yr TSS= 4 tons/yr
D3	0.3 acre wet bottom turf grass lined detention basin servicing Shadow Ridge Estates Subdivision; basin is located in Tampier Lake TMDL subwatershed	Retrofit slopes and emergent zones with native vegetation to create wetland detention	TN= 36 lbs/yr TP= 11 lbs/yr TSS= 3.5 tons/yr
D4, D5, & D6	12 acres of dry bottom turf grass detention in three separate areas within floodplain along Long Run Creek Reach 4 (LRC4)	Selectively break berms along stream and naturalize detention areas with native vegetation.	TN= 2,373 lbs/yr TP= 224 lbs/yr TSS= 225 tons/yr
D7	4.5 acre wet bottom turf grass lined detention basin in common area of ComEd utility with adjacent trails	Retrofit slopes and emergent zones with native vegetation to create wetland detention; create fishing access; incorporate design into surrounding open space and trails	TN= 240 lbs/yr TP= 26 lbs/yr TSS= 15.5 tons/yr
D8	3.0 acre wet bottom turf grass lined detention basin servicing Menards	Retrofit slopes and emergent zones with native vegetation to create wetland detention and to create green infrastructure along ComEd Utility corridor	TN= 336 lbs/yr TP= 46 lbs/yr TSS= 37 tons/yr
D9, D10, & D11	11.6 acres of dry bottom turf grass detention in three separate areas within floodplain along Long Run Creek Reach 3 (LRC3)	Selectively break berms along stream and naturalize detention areas with native vegetation. Note: This project may not be feasible due to platting and flood concerns.	TN= 1,780 lbs/yr TP= 168 lbs/yr TSS= 169 tons/yr
D12 & D13	Two wet bottom turf grass lined detentions totaling 2.5 acres servicing Glens of Connemara Subdivision at headwaters of Tributary F; eroded channel has formed in agricultural field as a result of detention outlets	Retrofit slopes and emergent zones with native vegetation to create wetland detention	TN= 90 lbs/yr TP= 27 lbs/yr TSS= 9 tons/yr
D14	3.8 acre wet bottom turf grass lined detention basin at Culver Memorial Park (Homer Twp); forms headwaters of Tributary D	Retrofit slopes and emergent zones with native vegetation to create wetland detention; create fishing and trail access; study potential to put restrictor on basin outlet	TN= 846 lbs/yr TP= 92 lbs/yr TSS= 46 tons/yr
D15	1.9 acre wet bottom turf grass lined detention basin servicing Woodbine West Estates Subdivision; basin is located at headwaters of Tributary E	Retrofit slopes and emergent zones with native vegetation to create wetland detention	TN= 90 lbs/yr TP= 11 lbs/yr TSS= 4.5 tons/yr
D16	0.4 acre dry bottom turf grass basin with concrete channel from inlet to outlet; basin services Stadtler Ridge Subdivision and is at headwaters of Tributary E	Retrofit basin by breaking/disrupting channel and planting with native vegetation	TN= 47 lbs/yr TP= 5 lbs/yr TSS= 2.5 tons/yr

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction
D17	1.5 acre dry bottom turf grass detention basin servicing Ashbury Woods Subdivision; basin is located at headwaters of Tributary G	Raise bottom outlet elevations and plant with native vegetation to create wetland bottom detention that also forms green infrastructure connection to Tributary G	TN= 36 lbs/yr TP= 18 lbs/yr TSS= 6 tons/yr
D18	1.0 acre dry bottom turf grass detention basin servicing residential subdivision; basin is located at headwaters of Tributary I; eroded channel has formed at outlet	Raise bottom outlet elevations and plant with native vegetation to create wetland bottom detention that also forms green infrastructure connection to Tributary I	TN= 60 lbs/yr TP= 11 lbs/yr TSS= 3.5 tons/yr
D19 & D20	Two 1.7 acre dry bottom turf grass detentions servicing Lemont Park District facility at headwaters of Tributary J; eroded channel has formed at outlet of 9I	Raise bottom outlet elevations and plant with native vegetation to create wetland bottom detentions that also forms natural green infrastructure connection to Tributary J	TN= 60 lbs/yr TP= 20 lbs/yr TSS= 13.5 tons/yr
D21	1.5 acre dry bottom detention basin servicing Mayfair Estates Subdivision; basin is located at headwaters of Tributary J	Raise bottom outlet elevations and plant with native vegetation to create wetland bottom detentions that also forms natural green infrastructure connection to Tributary J	TN= 36 lbs/yr TP= 11 lbs/yr TSS= 3.5 tons/yr
D22	50 acres owned by Homer Tree Service; mulch piles are stored here with no detention	Create wetland detention basin(s) to treat runoff	TN= 210 lbs/yr TP= 29 lbs/yr TSS= 23 tons/yr
D23	0.9 acre dry bottom detention basin servicing adjacent subdivision. Basin is comprised of mown turf and has a concrete low flow channel from inlet to outlet; basin drains north to Tampier Lake	Disrupt concrete channel and retrofit basin with native vegetation to create wetland bottom detention	TN= 18 lbs/yr TP= 5 lbs/yr TSS= 2 tons/yr
Agricultural Land			
AG1 & AG2	48 acres (AG1) and 51 acres (AG2) of agricultural land in row crop production; land is located in Tampier Lake TMDL subwatershed	Implement conservation tillage (no till) with filter strips	TN= 456 lbs/yr TP= 233 lbs/yr TSS= 163 tons/yr
AG3	2 acre livestock area with approximately 12 sheep; land is located in Tampier Lake TMDL subwatershed	Implement manure management system to reduce nutrient and sediment runoff to Tampier Lake.	TN= 28 lbs/yr TP= 3 lbs/yr TSS= na
AG4	66 acres of agricultural land in row crop production; land is partially in Tampier Lake TMDL subwatershed	Implement conservation tillage (no till) with filter strips	TN= 296 lbs/yr TP= 151 lbs/yr TSS= 105 tons/yr
AG5, AG6, & AG16	130 acres (AG5), 31 acres (AG6), and 146 acres (AG16) of agricultural land in row crop production along and at headwaters of Long Run Creek Reach 1 (LRC1)	Implement conservation tillage (no till) with filter strips	TN= 1,320 lbs/yr TP= 277 lbs/yr TSS= 460 tons/yr
AG7 & AG8	229 acres (AG7) and 228 acres (AG8) of agricultural land in row crop production at headwaters of Tributary D	Implement conservation tillage (no till) with filter strips	TN= 1,796 lbs/yr TP= 916 lbs/yr TSS= 615 tons/yr

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction
AG9	59 acres of agricultural land is row crop production along Long Run Creek Reach 5 (LRC5)	Implement conservation tillage (not till) with filter strips	TN= 265 lbs/yr TP= 135 lbs/yr TSS= 94 tons/yr
AG10 & AG12	106 acres (AG10) and 20 acres (AG12) of agricultural land is row crop production along Tributary F	Implement conservation tillage (no till) with filter strips	TN= 366 lbs/yr TP= 186 lbs/yr TSS= 131 tons/yr
AG11	94 acres of agricultural land is row crop production at headwaters of Tributary F	Implement conservation tillage (no till) with filter strips	TN= 407 lbs/yr TP= 207 lbs/yr TSS= 143 tons/yr
AG13	63 acres of agricultural land is row crop production at headwaters of Tributary M	Implement conservation tillage (no till) with filter strips	TN= 282 lbs/yr TP= 144 lbs/yr TSS= 100 tons/yr
AG14	157 acres of agricultural land is row crop production adjacent to Long Run Creek Reach 11 (LRC11), Tributary M, and Long Run Seep Nature Preserve	Implement conservation tillage (no till) with filter strips	TN= 640 lbs/yr TP= 327 lbs/yr TSS= 221 tons/yr
AG15	22 acre horse farm with approximately 24 horses; area is adjacent to and drains to Long Run Seep Nature Preserve	Implement manure management system to reduce nutrient runoff	TN= 371 lbs/yr TP= 46 lbs/yr TSS= na
Green Infrastructure Protection Areas			
GI 1, GI 2, GI 3	59 acres (GI1), 70 acres (GI2), 100 acres (GI3) on private agricultural parcels in Tampier Lake TMDL subwatershed; parcels are slated for future residential development	Incorporate Conservation Design standards into future development plans. Note: GI3 has set density minimums in Orland Park	Pollutant reduction cannot be assessed via modeling
GI 4, GI 5, GI 6	163 acres (GI4), 36 acres (GI5), 209 acres (GI6) on private agriculture parcels along and at headwaters of Long Run Creek Reach 1 (LRC1); parcels are slated for future residential and commercial development	Incorporate Conservation Design standards into future development plans. Note: GI4 & GI5 have set density minimums in Orland Park	Pollutant reduction cannot be assessed via modeling
GI 7 & GI 8	231 acres (GI7) and 238 acres (GI8) on private agricultural parcels at headwaters of Tributary D (TribD); most parcels are slated for future residential development	Incorporate Conservation Design standards into future development plans	Pollutant reduction cannot be assessed via modeling
GI 9	275 acres encompassing Old Oak Country Club and private agricultural parcels along Long Run Creek Reach 5 (LRC5); parcels are included in FPDWC 1996 Preservation Plan	FPDWC or other entity acquire and protect parcels should they become available for purchase in the future	Pollutant reduction cannot be assessed via modeling

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction
GI 10 & GI 11	143 acres (GI10) and 121 acres (GI12) on private agricultural parcels along Tributary F (TribF); parcels are slated to be Conservation Development by Lemont	Incorporate Conservation Design standards into future development plans	Pollutant reduction cannot be assessed via modeling
GI 12 &GI 13	71 acres (GI12) and 85 acres (GI13) on private agricultural parcels at headwaters of Tributary E (TribE) and Tributary M (TribM); parcels are slated for future residential and business development	Incorporate Conservation Design standards into future development plans	Pollutant reduction cannot be assessed via modeling
GI 14	143 acres on private residential and agricultural parcels along Long Run Creek Reach 10 (LRC10) and Tributary L (TribL); parcels are included in FPDWC 1996 Preservation Plan	FPDWC or other entity acquire and protect parcels should they become available for purchase in the future	Pollutant reduction cannot be assessed via modeling
GI 15	30 acres on private open space parcels at headwaters of Tributary K (TribK); parcels are adjacent to Bambrick Park	Village of Lemont acquire and protect parcels as extension of Bambrick Park	Pollutant reduction cannot be assessed via modeling
GI 6 & GI 18	484 acres (GI16) and 40 acres (GI18) encompassing Big Run Golf Course, private agricultural parcels, Lockport Golf & Recreation Club; parcels are included in FPDWC 1996 Preservation Plan and generally surround Long Run Seep Nature Preserve	FPDWC or other entity acquire and protect parcels should they become available for purchase in the future	Pollutant reduction cannot be assessed via modeling
G I17	149 acres (GI17) encompassing Parcels owned by Hanson Material Service and Chevron along Long Run Creek Reach 14 (LRC14) and Tributary M (TribM); parcels are included in FPDWC 1996 Preservation Plan and are adjacent to Long Run Seep Nature Preserve	Hanson Material Service and Chevron protect and restore or enhance habitat on parcels for Federally endangered Hine's Emerald Dragonfly	Pollutant reduction is not applicable
GI 19	39 acres on private residential, woodland, and agricultural parcel along headwaters of Tributary J1 (TribJ1); parcel is slated to become residential with 0-2 du/acre.	Incorporate Conservation Design standards into future development plans to preserve tributary and woodland corridor	Pollutant reduction cannot be assessed via modeling

*WWTP upgrades after February 2, 2006 shall meet 1.0 mg/l total phosphorus monthly averages (35 Ill. Adm. Code 304.123 (g); total nitrogen levels could be reduced to about 5.5 mg/l using BNR technology (CMAP 2008).


Long Run Creek Watershed
Fig. 51: Critical Areas
Critical Area Types
Wastewater Treatment Plants
Stream Reaches
Riparian Areas & Lake Buffers
Detention Basins
Wetland Restoration
Agricultural Land
Green Infrastructure Protection Areas
Legend
Roads
Streams & Tributaries
Stream Break
Significant Open Water
LRC Watershed Boundary
Adjacent Watershed
County Boundary
Tampier Lake TMDL Subwatershed
Data Sources: AES
Locator Map
DuPage County
Des Plaines Watershed
Des Plaines River
Cook County
Cal-Sag Channel
Chicago River Watershed
Will County
Applied Ecological Services, Inc.™
Figure 51
Saganashkee Slough-Calumet Sag Channel Watershed
McGinnis Slough Watershed
Hickory Creek Watershed
Spring Creek Watershed
Maple Lake-Chicago Sanitary and Ship Canal Watershed
Des Plaines River
Chicago Sanitary & Ship Canal
I & M Canal
CN Railway
Tampier Lake
Tampier Slough
McGinty Slough
Derby Meadows WWTP
Chickasaw Hills WWTP
Long Run Cr.
Wolf Rd.
Will Cook Rd.
Bell Rd.
Parker Rd.
Lemont Rd.
Smith Rd.
New Rd.
Archer Ave.
131st St.
143rd St.
151st St.
Cook County
Will County
FIG51_LRC_Template_Critical_Areas.mxd
0 3,000 6,000 12,000 Feet

5.3 WATERSHED IMPAIRMENT REDUCTION TARGETS

Establishing "Impairment Reduction Targets" is important because these targets provide a means to measure how implementation of Management Measures at Critical Areas is expected to reduce watershed impairments over time. Table 36 summarizes the basis for *known* impairments and reduction targets. Reduction targets listed in Table 36 are based on documented information, modeling results, professional judgment, and/or water quality standards and criteria set by the Illinois Pollution Control Board (IPCB, 2011), USEPA (2000), and USGS (2006). It is important to note that the assumption is made that percent decrease in sample concentration (mg/l) needed correlates to the percent reduction in annual load (lbs/yr or tons/yr) for phosphorus, nitrogen, and sediment reduction targets. In addition, Table 36 summarizing the load reduction of phosphorus, nitrogen, and total suspended solids (sediment) expected from addressing Critical Areas.

Watershed-Wide Reduction Targets for Phosphorus, Nitrogen, and Suspended Solids

Watershed-wide nitrogen and phosphorus reduction targets could be attained by addressing Critical Areas alone according to the pollutant reduction calculations. It is interesting to note that 53% of nitrogen and 47% of phosphorus reduction needs could come from upgrades to the two wastewater treatment plants alone. The total suspended solids (sediment) reduction target was not met. However, approximately 5,561 lbs/yr of sediment or 58% could be removed by addressing Critical Areas. This is only 360 lbs/yr or 4% short of the sediment reduction target. Weekly street sweeping alone could remove an additional 147 tons/yr.

Additional watershed-wide reduction targets were established for habitat degradation, hydrologic flow changes, groundwater infiltration, and structural flood problems. Habitat degradation and hydrologic flow change targets could be met by implementing riparian area restoration and by restoring wetlands. Groundwater infiltration targets could be met primarily by preserving open space and incorporating infiltration practices into new and redevelopment. Each of the four structural flood problem areas can be addressed on a case by case basis to meet targets.

Tampier Lake Phosphorus TMDL Reduction Target

In summary, 48% or 0.5 lbs/day (182 lbs/yr) of phosphorus reduction from external subwatershed sources is needed to achieve the TMDL according to Illinois EPA's 2010 TMDL report for Tampier Lake. The TMDL report also states that an additional 53% or 0.8 lbs/day (292 lbs/yr) phosphorus reduction is needed from internal lake sources. Several Critical Areas in Tampier Lake's subwatershed were identified during Applied Ecological Services's (AES) field investigation in fall 2012. Management Measure opportunities identified to reduce phosphorus are included below. Pollutant reduction modeling for these potential Management Measures indicates that greater than 182 lbs/yr of phosphorus can be reduced from external sources thereby meeting the TMDL target.

- 9,650 linear foot buffer opportunity around the north portion of Tampier Lake
- Over 100 potential wetland restoration acres in agricultural land east of Tampier Lake
- Measures for 2-acre livestock area just east of Tampier Lake
- 2,960 linear foot buffer improvement opportunity along Tributary N to Tampier Slough
- Three potential detention basin retrofits

IEPA's 2010 TMDL report lists potential opportunities for internal phosphorus reduction in Tampier Lake such as aerator installation, aluminum treatments, and dredging. All of these options are costly and not generally feasible. Therefore, they are not recommended in this watershed plan.

Table 36. Basis for known impairments, reduction targets, & impairment reduction from Critical Areas.

Impairment: Cause of Impairment	Basis for Impairment	Reduction Target	Reduction from Critical Area	Target Attainable?
Watershed-Wide Reduction Targets				
Water Quality/Aquatic Life: Phosphorus in Long Run Creek	34,868 lbs/yr of phosphorus loading based on STEPL model & wastewater treatment plant loading; 0.2036 mg/l total phosphorus in LRC water quality samples	>**64.4% or 22,455 lbs/yr reduction in phosphorus** loading to achieve 0.0725 mg/l total phosphorus USEPA numeric criteria for streams in Ecoregion VI	16,763 lbs/yr or 48% reduction from wastewater treatment plant upgrades	
			2,778 lbs/yr or 8% reduction from critical stream reaches	
			98 lbs/yr or 1% reduction from critical riparian & lake buffers	
			310 lbs/yr or 1% reduction from critical wetland restorations	
			750 lbs/yr or 2% reduction from critical detention basin retrofits & creation	
			3,028 lbs/yr or 9% reduction from critical agricultural land	
TOTAL			**23,727 lbs/yr or 68% total phosphorus reduction from all Critical Areas**	**Yes**
Water Quality/Aquatic Life: Nitrogen in Long Run Creek	206,408 lbs/yr of total nitrogen loading based on STEPL model & wastewater treatment plant loading; 5.872 mg/l total nitrogen in LRC water quality samples	>**58.1% or 119,923 lbs/yr reduction in nitrogen** loading to achieve 2.461 mg/l total nitrogen USEPA numeric criteria for streams in Ecoregion VI	108,737 lbs/yr or 53% reduction from wastewater treatment plant upgrades	
			5,581 lbs/yr or 3% reduction from critical stream reaches	
			593 lbs/yr or 1% reduction from critical riparian & lake buffers	
			1,292 lbs/yr or 1% reduction from critical wetland restorations	
			6,411 lbs/yr or 3% reduction from critical detention basin retrofits & creation	
			6,227 lbs/yr or 3% reduction from critical agricultural land	
TOTAL			**128,841 lbs/yr or 62% total nitrogen reduction from all Critical Areas**	**Yes**
Water Quality/Aquatic Life: Total suspended solids (sediment) in Long Run Creek	9,550 tons/yr of sediment loading based on STEPL model & wastewater treatment plant loading; 50 mg/l total suspended solids in LRC water quality samples	>**62% or 5,921 tons/yr reduction in sediment** loading to achieve 19 mg/l total suspended solids based on USGS numeric criteria in Great Lakes Region	2,778 tons/yr or 29% reduction from critical stream reaches	
			28.5 tons/yr or 1% reduction from critical riparian areas	
			153 tons/yr or 2% sediment from critical wetland restorations	
			571 tons/yr or 6% reduction from critical detention basin retrofits & creation	
			2,030 tons/yr or 22% reduction from critical agricultural land	
TOTAL			**5,561 tons/yr or 58% sediment reduction from all Critical Areas**	**No****

Impairment: Cause of Impairment	Basis for Impairment	Reduction Target	Reduction from Critical Area	Target Attainable?
Habitat Degradation: Invasive/non-native plant species in riparian areas	63,718 linear feet along riparian areas are currently in poor condition	**12,750 linear feet or 20%** of riparian areas ecologically restored14,968	14,968 linear feet or 23% of riparian areas restored at critical riparian areas	Yes
Habitat Degradation: Hydrologic and flow changes in Long Run Creek	Increase in flow regime over time as documented via the flow-gaging station at Lemont Road; 2,121 acres (36%) of wetlands lost since pre-settlement	**13 critical wetlands restored** accounting for 355 acres	355 critical wetland acres restored	Yes
Aquifer Drawdown: Reduced infiltration & human use	Illinois State Water Survey Data showing 500 foot drawdown by 2005 and 800 foot drawdown by 2050 in shallow aquifers	>**50% preservation of open space and infiltration measures recommended** in all new and redevelopment	>50% preservation of open space and infiltration measures used if developed using Conservation or Low Impact Design	Yes**
Structural Flood Damage: Structures in 100-year floodplain	4 structural flood problem areas	**4 or 100%** structural flood problem areas addressed	Not Applicable*	Yes**
Tampier Lake Reduction Targets; Note: a TMDL for phosphorus has been established for Tampier Lake (IEPA 2010)				
Aesthetic Quality-Tampier Lake: Phosphorus	2.7 lbs/day (985 lbs/yr) of phosphorus loading to Tampier Lake from the surrounding watershed and internal cycling based on TMDL study conducted by Illinois EPA in 2010; 0.085 mg/l total phosphorus in water samples from 1992, 2001, and 2006	**48% or 0.5 lbs/day (182 lbs/yr) reduction from external watershed sources** to achieve 0.05 mg/l total phosphorus Illinois EPA numeric standard. Note: an additional 52% or 0.8 lbs/day (292 lbs/yr) reduction is needed from internal sources; there are no viable internal reduction options recommended.	3 lbs/yr or 1% from critical lake buffers	
			30 lbs/yr or 3% reduction from critical riparian areas	
			24 lbs/yr or 2% reduction from critical wetland restorations	
			20 lbs/day or 2% reduction from critical detention basin retrofits	
			289 lbs/yr or 29% reduction from critical agricultural land	
TOTAL			**366 lbs/yr or >100% phosphorus reduction from all Critical Areas**	**Yes**

* Addressed in Action Plan section of report

**Target will be met if additional Action Plan recommendations are implemented

SECTION 5.0

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