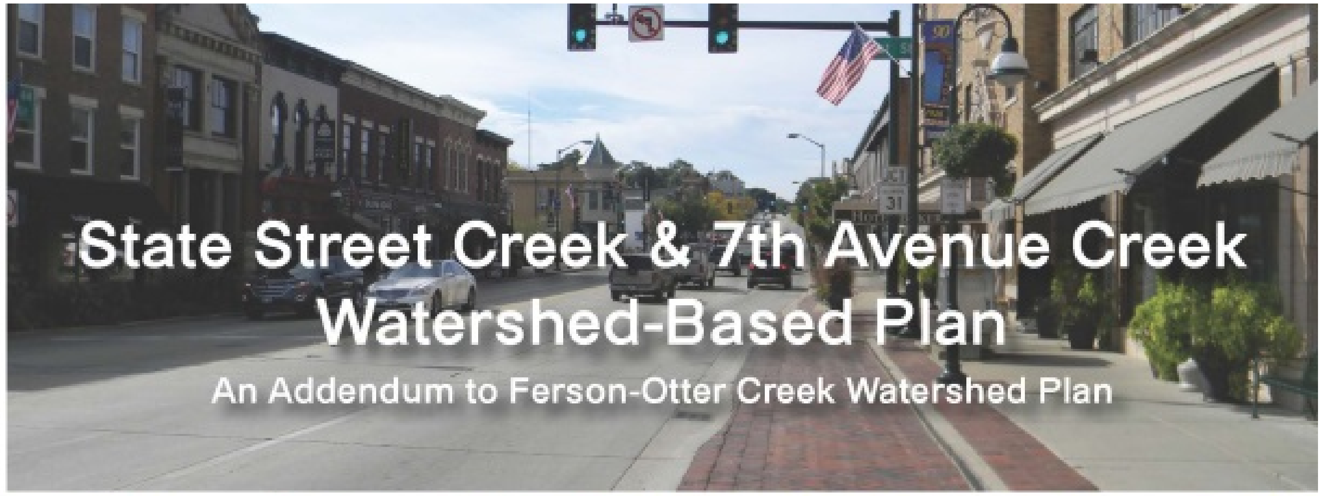

State Street Creek & 7th Avenue Creek Watershed-Based Plan

An Addendum to Ferson-Otter Creek Watershed Plan

DRAFT REPORT
Prepared for
City of St. Charles
By Applied Ecological Services, Inc.
April 2017

ST. CHARLES
SINCE 1834

Applied Ecological Services, Inc.

HRGreen

ACKNOWLEDGEMENTS

Funding for the State Street Creek and 7th Avenue Creek Watershed-Based Plan was provided by the City of St. Charles. This plan was created as a stand-alone addendum to the Ferson-Otter Creek Watershed Plan completed by the Chicago Metropolitan Agency for Planning (CMAP) in December of 2011.

Karen Young, Assistant Director of Public Works for the City of St. Charles, acted as coordinator on the watershed plan and worked closely with Applied Ecological Services, Inc. (AES) and HRGreen to produce the watershed planning document.

The watershed planning group consisted of representatives from the City of St. Charles, Kane County, St. Charles Park District, CMAP, Illinois Environmental Protection Agency, the Conservation Foundation, Friends of the Fox, Fox River Study Group, Fox River Ecosystem Partnership, River Corridor Foundation, Sierra Club, Illinois Department of Natural Resources, and local residents. These partners played an important role in providing feedback and input on watershed issues, developing goals and objectives, various planning approaches, and input on potential watershed projects.

AES, with assistance from HRGreen, conducted analysis, presented at stakeholder and public outreach meetings, summarized results, and authored the State Street Creek and 7th Avenue Creek Watershed-Based Plan.

In addition to residents, people from the following entities attended and provided input at watershed meetings:

Applied Ecological Services, Inc.: Cecily Cunz, Steve Zimmerman
Chicago Metropolitan Agency for Planning: Kelsey Pudlock
City of St. Charles: Chris Adesso, Chris Bong, Brian Hermann, Ken Jay, Isabel Soderlind, Peter Suhr, Karen Young
Conservation Foundation: Trish Beckjord
Engineering Resource Associates: Monica Hawk
Fox River Study Group: Cindy Skrukrud
Friends of the Fox River: Gary Mechanic
HRGreen: Logan Gilbertson, Ajay Jain, Sylwia Kokszka, Scott Marquardt
Illinois Department of Natural Resources, Office of Water Resources: Brain Eber
Kane County: Phil Lewis
River Corridor Foundation: Philip Held, John Rabchuk
Sierra Club: Cindy Skrukrud
St. Charles Park District: John Wessel
WBR Engineering: Greg Chismark

All photos and graphics by Applied Ecological Services unless otherwise noted.

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Prepared for
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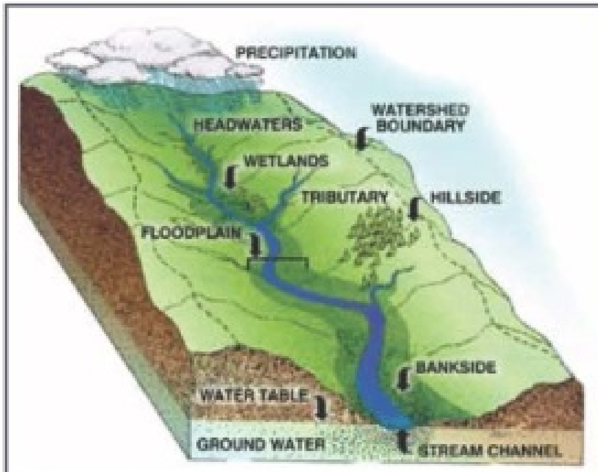
10. HOW CAN YOU HELP STATE STREET & 7TH AVENUE CREEKS?

INTRODUCTION

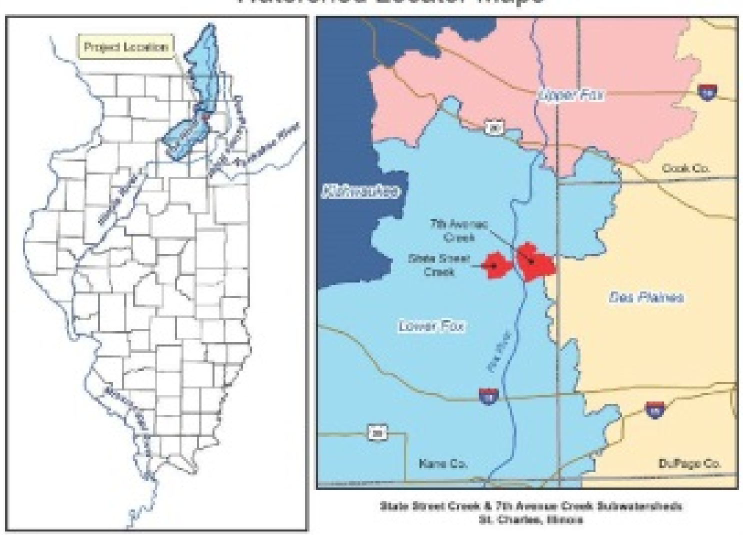
Each of us lives, works, and plays in a watershed. A watershed is best described as an area of land where surface water drains to a common location such as a stream, river, or lake. The source of groundwater recharge to aquifers, streams, and lakes is also considered part of a watershed. Watersheds are complex systems because of the ongoing interaction between climate, surface water, groundwater, vegetation, wildlife, and humans. Human influences generally produce polluted stormwater runoff, increase impervious surfaces, alter stormwater flows, and degrade or fragment natural areas.



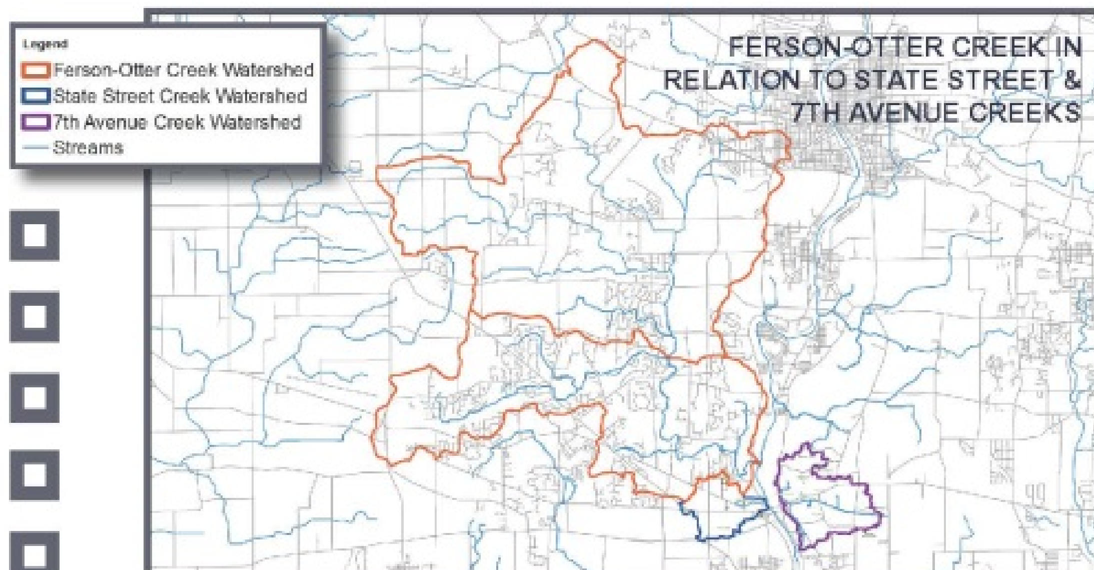
Source: City of Berkley - Public Works.

The City of St. Charles voluntarily decided to pursue development of a watershed plan for State Street and 7th Avenue Creeks that follows federal and state guidance under Section 319 of the Clean Water Act. The State Street Creek and 7th Avenue Creek Watershed Plan is intended as an Addendum to the Ferson-Otter Creek Watershed Plan completed by Chicago Metropolitan Agency for Planning (CMAP) in December of 2011. This Addendum is to provide detailed supplemental information for two adjacent watersheds to the Ferson-Otter Creek Watersheds, all of which are located within the Lower Fox River Basin (Hydrologic Unit Code [HUC] 07120007). State Street Creek is part of the Norton Creek-Fox River subwatershed (HUC 071200070104) and 7th Avenue Creek is part of the Town of Geneva-Fox River subwatershed (HUC 071200070106).

Watershed Locator Maps



State Street Creek & 7th Avenue Creek Subwatersheds
St. Charles, Illinois



PURPOSE

The primary purpose of this plan is to spark interest and give stakeholders a better understanding of State Street Creek and 7th Avenue Creek watersheds so they can promote and implement plan recommendations that will accomplish the goals and objectives of this plan. This plan was produced using 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.

GOALS

Since this plan is an addendum to the Ferson-Otter Creek Watershed Plan, it was decided during the planning process to adopt a modified version of their goals. Those resulting goals are as follows:

GOAL 1: *Reduce nutrients, sediments, and other pollutant contributions to State Street and 7th Avenue Creeks.*

GOAL 2: *Raise stakeholder awareness about the importance and best management practices of proper watershed stewardship.*

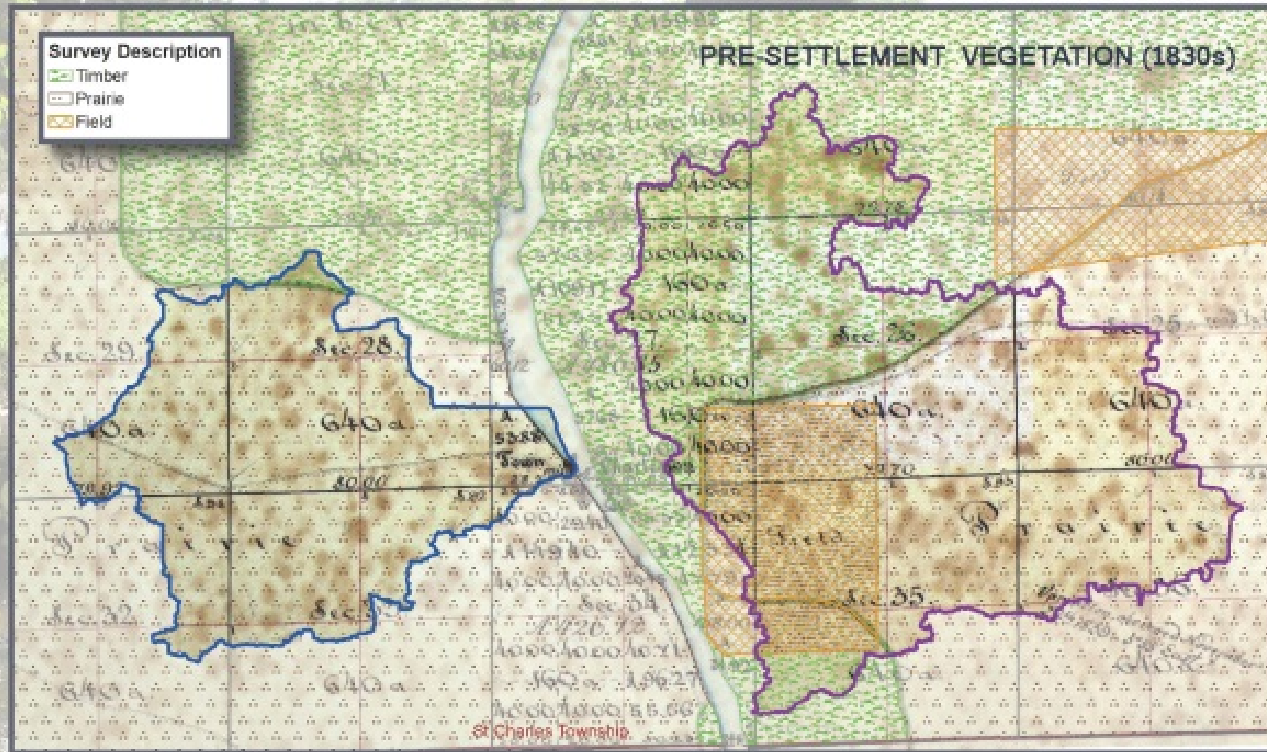
GOAL 3: *Promote land use and best management practices that minimize increase in the volume of stormwater runoff and reduce the risk of flood damage.*

GOAL 4: *Protect the quality and quantity of our water supplies.*

GOAL 5: *Improve the physical conditions of our waterways and natural areas.*

GOAL 6: *Protect and restore the green infrastructure network.*

GOAL 7: *Leverage existing watershed partnerships to foster continuing stewardship efforts in the watershed.*



HISTORY OF THE WATERSHED

Both the State Street Creek and 7th Avenue Creek watersheds fall within St. Charles, Illinois, in Kane County. Prior to European settlement, the Potawatomi maintained a pair of summer camps along the shallowest banks of the Fox River, and it was here that they crossed the river and fished. The area was known to have extensive woods and prairies as well as rock outcrops from which building stone was harvested.

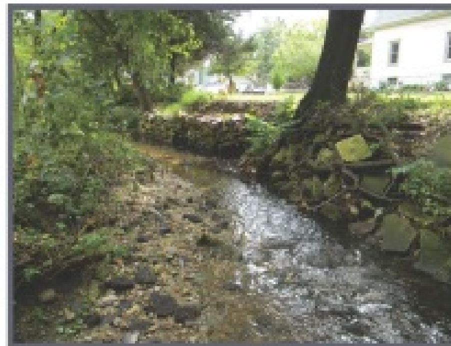
The surveyors in the 1830s described the State Street Creek watershed as "Prairie" with a small portion of the northern tip of the watershed as "Timber." Meanwhile, the northwestern half 7th Avenue Creek watershed was "Timber" and the southeastern half was "Prairie" with a substantial portion just east of downtown identified as "Field" or cropland. During pre-European settlement times most of the water that fell as precipitation was absorbed in upland prairie and savanna communities and within wetlands. Infiltration and absorption was so great that most of the defined stream channels seen today were non-existent or simply wetland complexes. Neither State Street nor 7th Avenue Creek were present at the time of the surveys. The prairie-savanna landscape was maintained and renewed by fires and grazing by bison and elk.

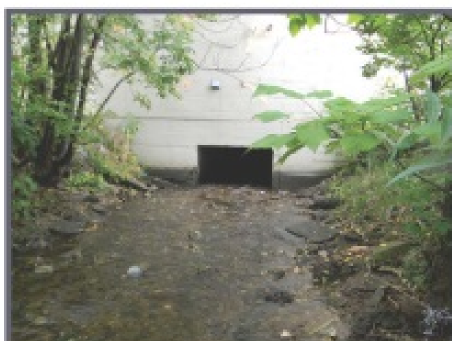
A settlement was first established as "Charleston" in March of 1834 on the east bank of the Fox where Baker Memorial Park now stands. A few years later, the name was changed to St Charles after it was discovered that a town named "Charleston" already existed downstate. Lumber mills, gristmills and wool carding mills were among the first industries in the town.

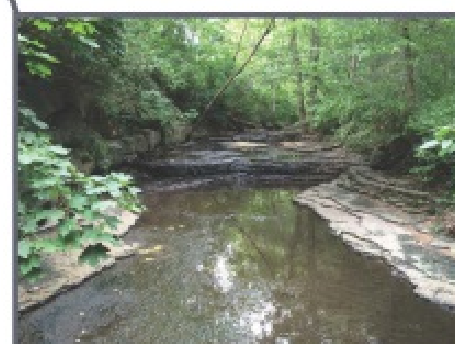
STREAMS

The State Street Creek watershed contains only one fragmented stream, including five reaches of State Street Creek and totaling 4, 331 linear feet. Much of the headwaters of State Street Creek were buried decades ago as development progressed. 7th Avenue Creek watershed contains the main branch of 7th Avenue Creek, 7th Avenue Creek North Branch, and a number of small, intermittent tributaries. The main stem is broken into 14 reaches, totaling 23,717 linear feet; 7th Avenue Creek North Branch is divided into four reaches and totals 4,453 linear feet; and has eight small tributaries ranging in size from 260 to 1,933 linear feet.

The condition of stream reaches in the watershed varies. According to the stream inventory, 11% of stream length is naturally meandering; 12% is moderately channelized (straightened by man); and 77% is highly channelized. Approximately 13% of stream lengths exhibit no or minimal bank erosion; moderate erosion is occurring along 68% of streambanks; 19% of streambanks are highly eroded. Approximately 23% of the riparian areas are "Moderate" quality. The remaining 77% of riparian areas are in "Poor" condition. There are no riparian areas that are in "Good" condition. Invasive species including common reed (*Phragmites australis*), common buckthorn (*Rhamnus cathartica*), and reed canary grass (*Phalaris arundinacea*) contribute most to degraded conditions.







Water quality sampling shows moderate overall impairment from elevated total phosphorus, total nitrogen, and total suspended solids (sediment) in both watersheds. Elevated phosphorus and nitrogen (nutrient) levels are a problem under the right conditions and can lead to a chain of undesirable events in streams 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.

Nitrogen levels in State Street Creek are particularly high, most likely a result of being a buried stream. According to research, nitrogen generally travels 18 times further in a buried stream than in an open stream due to the lack of plants and other organic matter that could feed on those nitrates, keeping streams healthy and oxygenated.

CHALLENGES & THREATS

WATER

- 77% of the stream and tributary length is highly channelized.
- 87% of stream and tributary banks are moderately to highly eroded.
- 72% of the 75 detention basins surveyed are poorly designed for water quality benefits.

LAND

- Both watersheds are already fully developed, with virtually no remaining undeveloped land to protect.
- 77% of stream & tributary riparian areas are in "poor" ecological condition.
- Invasive species such as common reed, reed canary grass, common buckthorn, and box elder are threats to most natural areas.
- Most of the upstream portions of State Street Creek have been buried by development over time.
- Many Green Infrastructure parcels within the floodplain are unprotected, heavily degraded, and at risk to flooding.


URBANIZED STREAMS

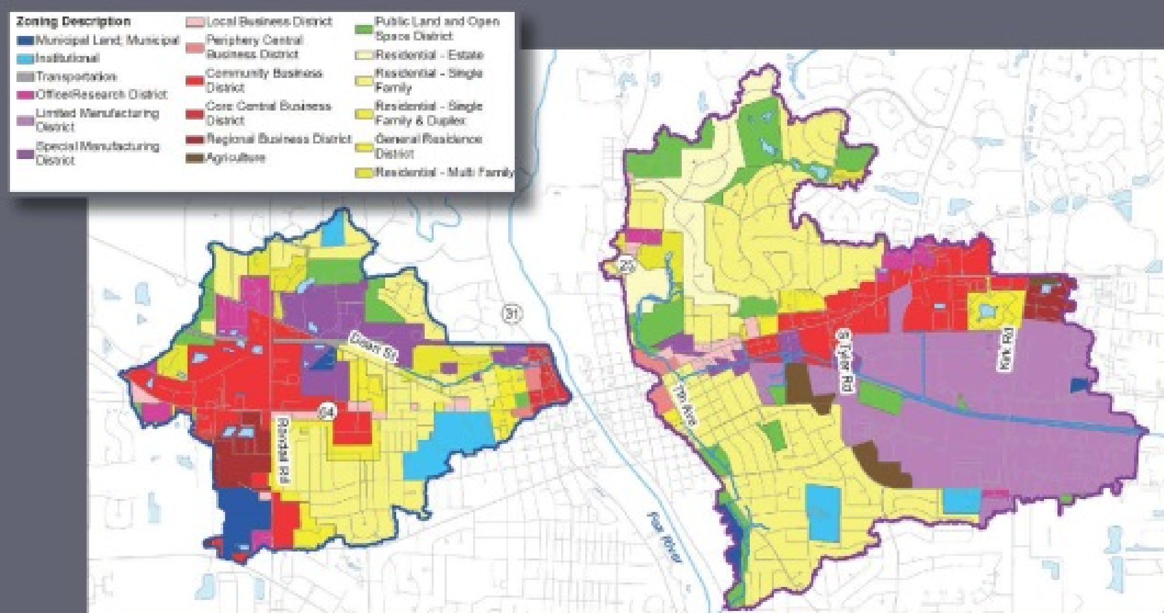

FULLY DEVELOPED


POOR DETENTION DESIGN

LAND USE

The predominant land use/ land cover in State Street Creek and 7th Avenue Creek watersheds is Residential, making up 43% of both watersheds. Business and Manufacturing take up the next two highest land use/ land cover categories in both watersheds at 28% and 11% (respectively) for State Street Creek and 12% and 29% (respectively) for 7th Avenue Creek. These top three categories cover more than 80% of both watersheds.

State Street and 7th Avenue Creek watersheds are predominantly built-out, with future land use changes focused mostly on adjustments to already developed land.

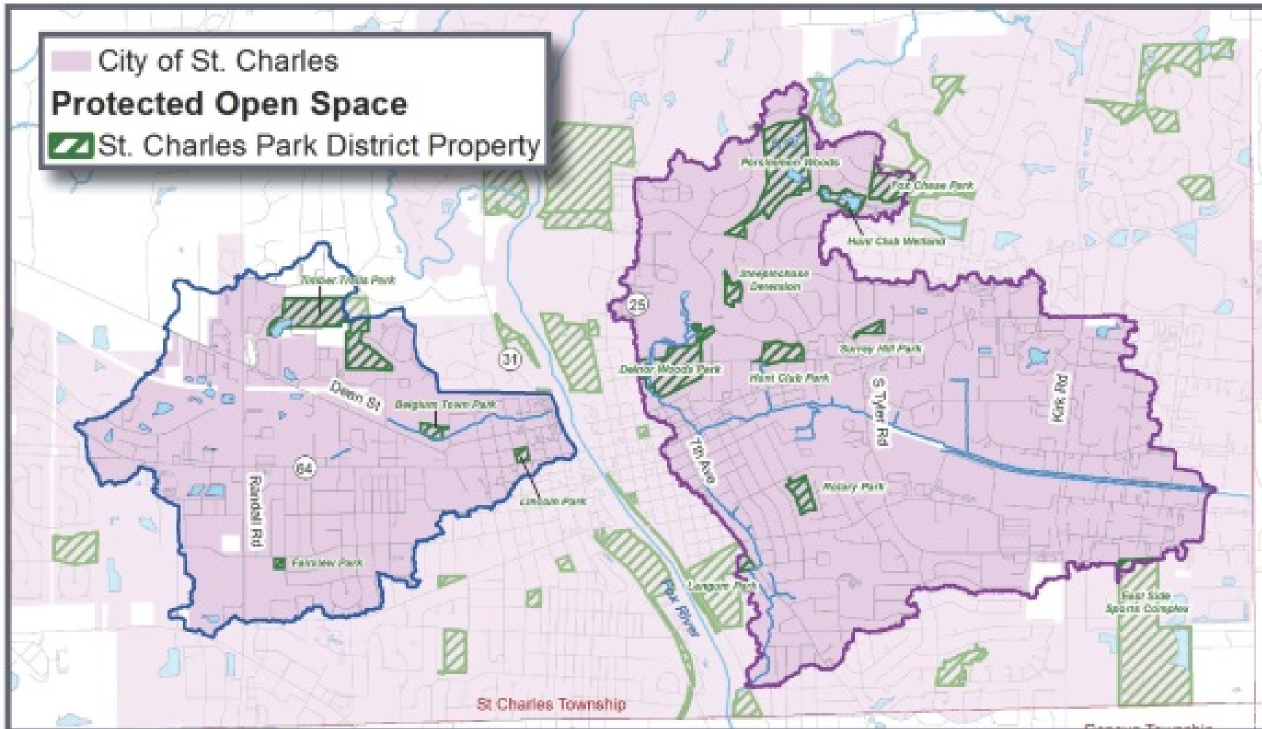


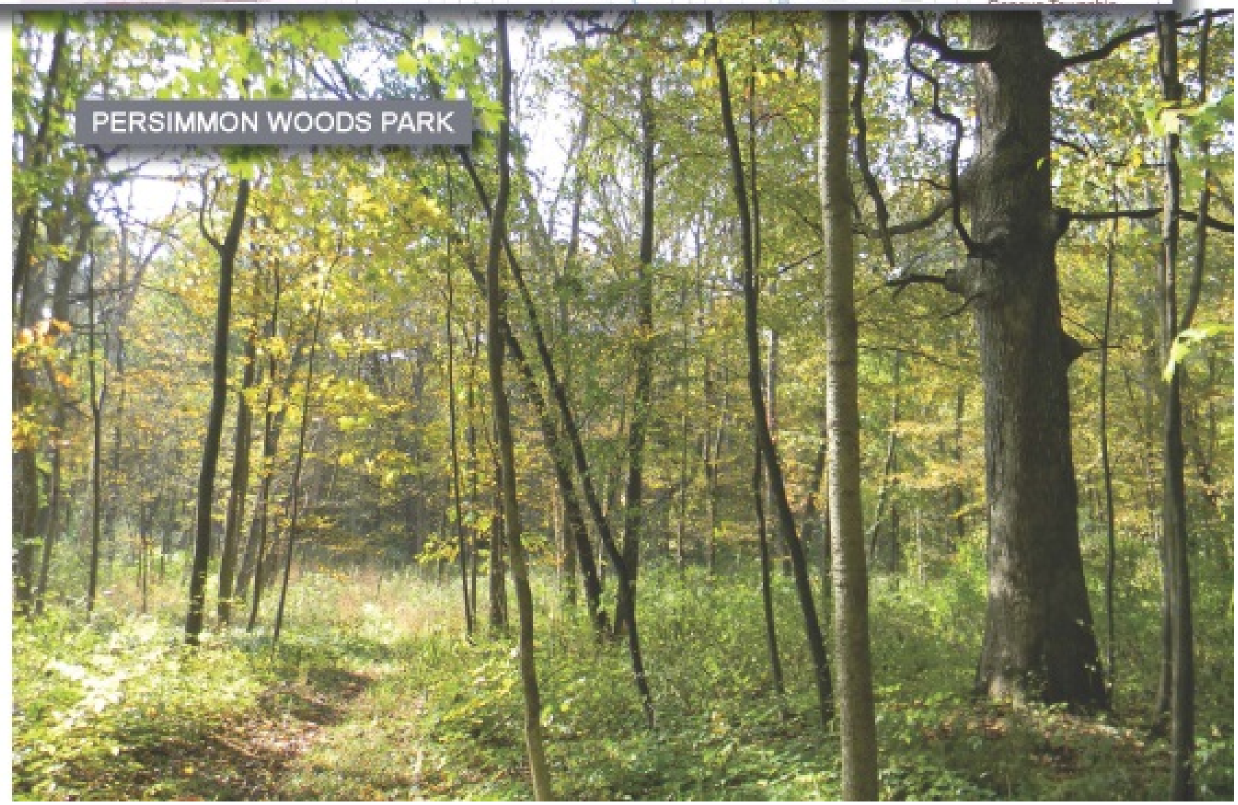

PROTECTED OPEN SPACE
DELNOR WOODS PARK
TIMBER TRAILS PARK

For this watershed plan, protected open space includes protected prairie, woodlands, and wetland within parks that are important to wildlife or the green infrastructure network (see map, right). Many of these areas often provide high quality habitat for and harbor uncommon or even threatened and endangered (T&E) species. Protected open space 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 protected open space areas are located in the two watersheds, all owned by St. Charles Park District, and totaling 136.7 acres. State Street Creek has four parks: Timber Trails Park, Belgium Town Park, Fairview Park and Lincoln Park. 7th Avenue Creek has ten parks, including Persimmon Woods, Delnor Woods, Fox Chase, Hunt Club, Rotary, Langum, and Surry Hill Parks as well as Hunt Club Wetland, Steeplechase Detention, and East Side Sports Complex.

Timber Trails Park, Delnor Woods Park, and Persimmon Woods Park are the largest and most important protected natural areas in the watersheds. All three could be considered hidden gems within St. Charles with ample recreational opportunities. Timber Trails Park includes savanna, prairie, and wetland areas. Delnor Woods Park is predominantly a woodland with wetland and grassland areas and was a partnership with the Illinois Department of Natural Resources. Persimmon Woods Park is a unique upland swamp with adjacent marshy wetlands and a white oak woodland and was developed in cooperation with the Illinois Department of Conservation.



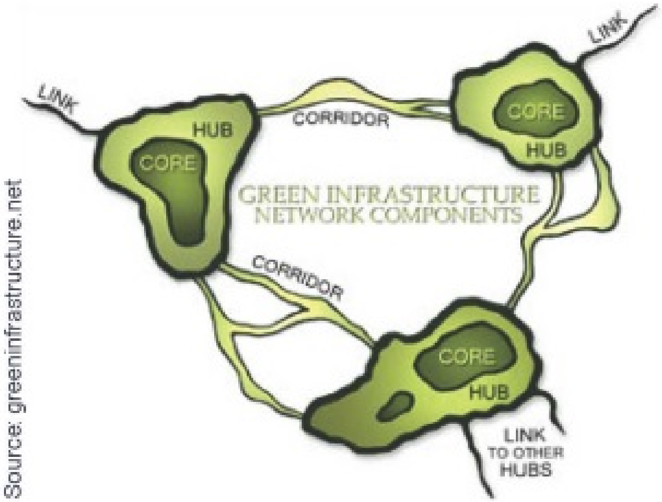


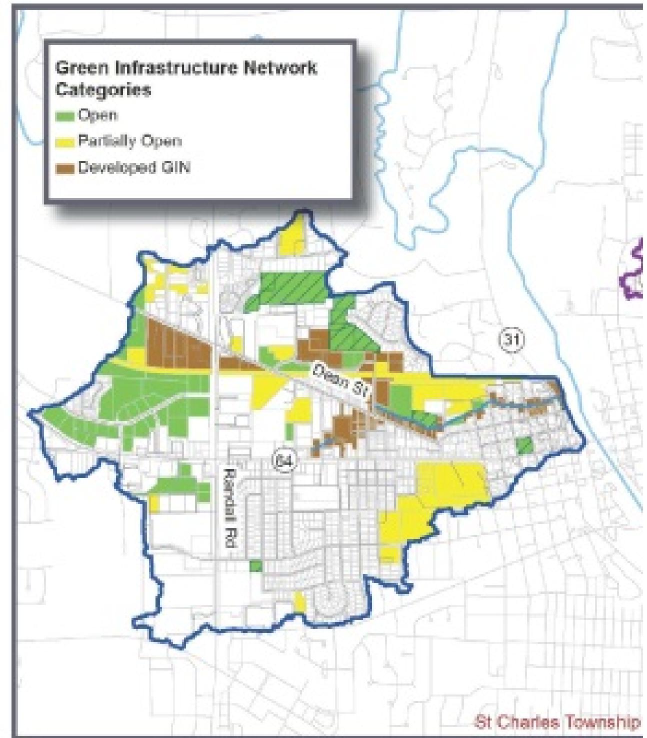
PERSIMMON WOODS PARK

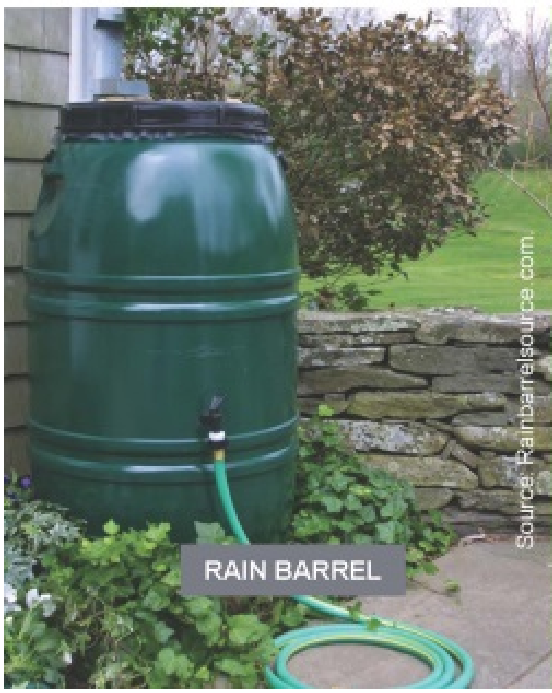
GREEN INFRASTRUCTURE & YOUR BACKYARD

A Green Infrastructure Network is a connected system 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 wildlife and people. The network (see map, right) is made up of hubs and linking corridors. Hubs generally consist of the largest and least fragmented areas such as Persimmon Woods Park, Timber Trails Park, and Delnor Woods Park. Corridors are generally formed by smaller private residential parcels along developed reaches of State Street & 7th Avenue Creeks 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 and landowners embrace the idea of managing stream corridors or creating backyard habitats.

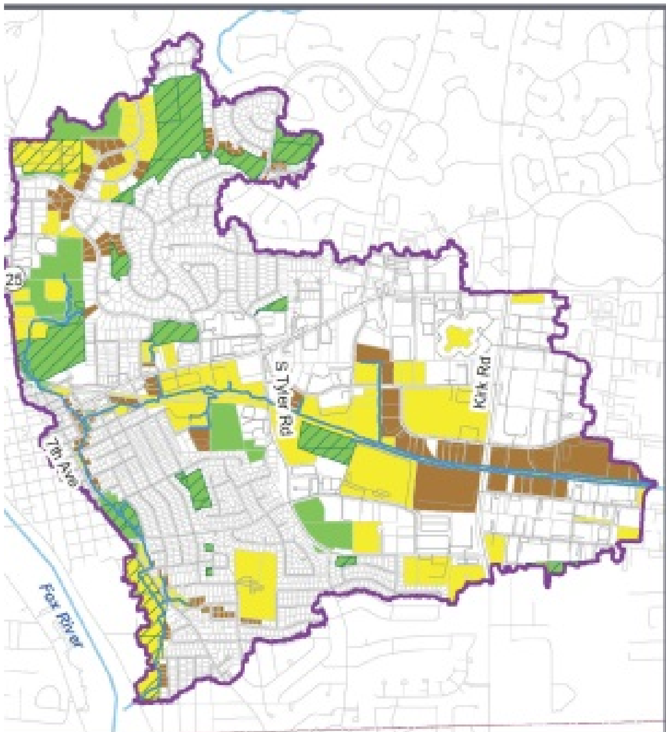
Source: greeninfrastructure.net

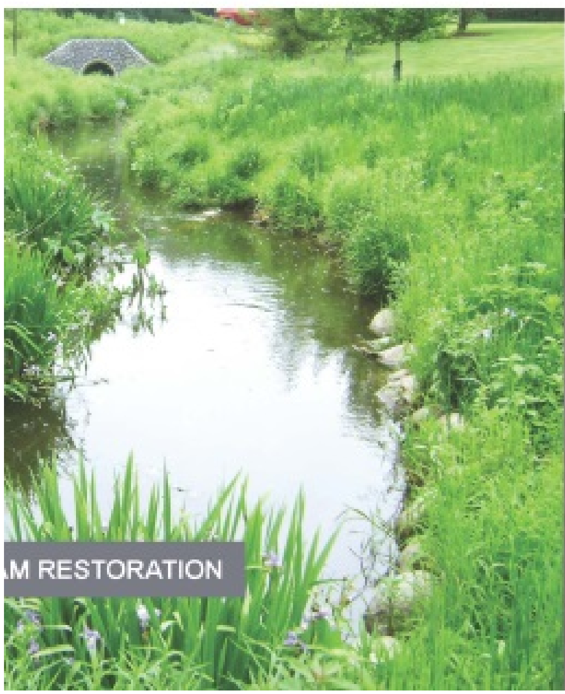






GREEN INFRASTRUCTURE NETWORK





If a portion of a stream runs through your backyard, here are some tips to help properly manage your piece of the green infrastructure network:

1. NO DUMPING
   Avoid dumping yard waste and clear heavy debris jams.
2. MANAGE FERTILIZER USE
   Avoid over fertilizing lawns adjacent to streams and only use phosphorus when soil testing shows that it is necessary.
3. REMOVE NON-NATIVE SPECIES
   Identify and remove plants that are out of place (see photo guide, right).
4. PLANT NATIVE VEGETATION
   Plants adapted to the Midwest climate can help control erosion by stabilizing banks.
5. A NATURAL, MEANDERING STREAM IS A HAPPY STREAM
   Work with experts to restore degraded streams.

For more detailed information, check out the Lake County Stormwater Management Commission's booklet, "Riparian Area Management: A Citizen's Guide," at www.lakecountyil.gov/stormwater.

Any property owner can improve green infrastructure. Create a safe place for wildlife by providing a few simple things such as food, water, cover, and a place for wildlife to raise their young. The National Wildlife Federation's Certified Wildlife Habitat® and the Conservation Foundation's Conservation @ Home programs can help you get started.


Source: Appalachian Traveller.

Creating a rain garden, or a small vegetated depression, to capture water is another way of promoting infiltration while beautifying your yard and providing additional habitat. Disconnecting your roof downspouts and capturing that runoff in rain barrels not only reduces the amount of runoff entering streams, but also serves as a great source of water for irrigating your yard.

REMOVE THESE NON-NATIVE AND INVASIVE SPECIES

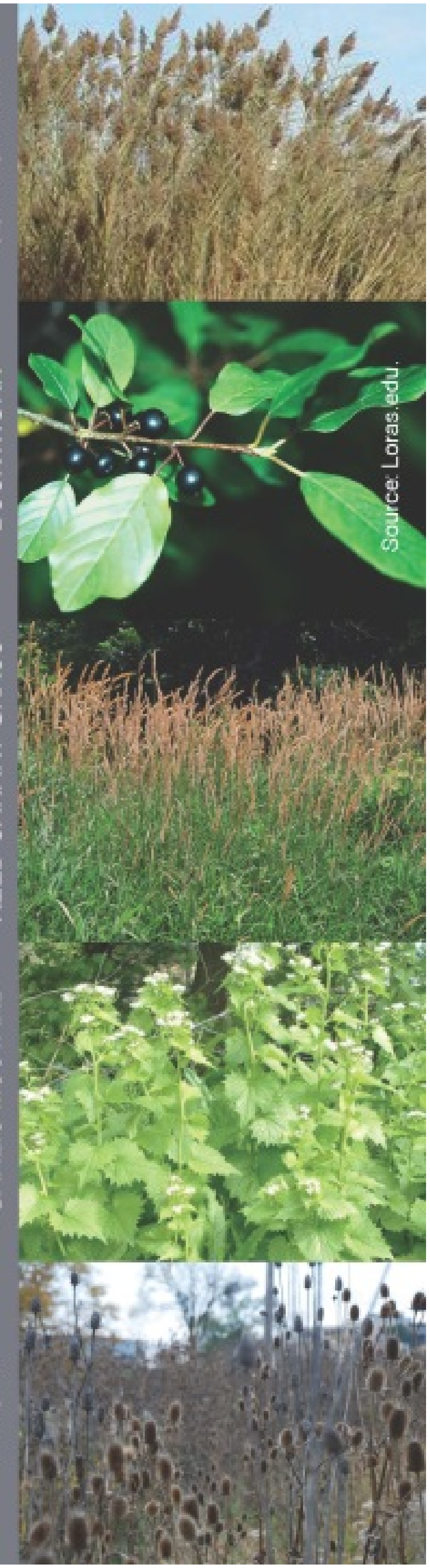
COMMON REED

BUCKTHORN

REED CANARY GRASS

GARLIC MUSTARD

TEASEL


Source: Loras.edu.

ACTION RECOMMENDATIONS

NATURALIZED DETENTION

The State Street & 7th Avenue Creek Watershed-Based Plan includes an "Action Plan" developed to provide stakeholders with recommendations to specifically address plan goals. The Action Plan includes two subsections: programmatic recommendations and site specific recommendations. Programmatic recommendations are general remedial, preventative, and regulatory watershed-wide actions. Site specific recommendations include identified locations where projects can be implemented to improve surface and groundwater quality, green infrastructure, and habitat. Programmatic recommendations and Site Specific High Priority-Critical Areas are discussed in this section.

POLICY TYPE PROGRAMMATIC GUIDANCE RECOMMENDATIONS*

*All recommendations are for guidance only and not required by any federal, state, or local agency.

Plan Adoption and/or Support & Implementation Policy Recommendations

- St. Charles adopts the State Street & 7th Avenue Creek Watershed-Based Plan as a "Guidance Document."

Green Infrastructure Network Policy Recommendations

- The City incorporates the Green Infrastructure Network (GIN) into comprehensive plans and development review maps.
- Encourage landowners within the GIN to manage thier stream corridors and/or create habitat on their property.
- Utilize tools such as protection overlays, setbacks, open space zoning, conservation easements, etc. on GIN parcels.
- Preserve and restore High Priority/Critical Area Green Infrastructure Protection Areas to the extent practicable as parcels become available for purchase.

Road Salt Policy Recommendations

- Consider supplementing existing programs with deicing best management practices.

Lawn Fertilizer Policy Recommendations

- Extend phosphorus regulation to all non-commercial applicators, consider soil testing pre-application, or ban out-right.

Stormwater Management Facility Policy Recommendations

- Allow new development and redevelopment to use stormwater management facilities that serve multiple functions including storage, water quality benefits, infiltration, and wildlife habitat.

Native Landscaping/Natural Area Restoration

- Allow native landscaping within local ordinances and ensure local "weed control" ordinances do not discourage or prohibit native landscaping.

Pavement Alternatives

- Consider encouraging pavement alternatives such as pervious concrete, permeable asphalt, and paver systems over asphalt requiring coal-tar sealants or banning the use or sale of coal-tar sealants.

OTHER PROGRAMMATIC RECOMMENDATIONS FOUND IN THE PLAN

- *Dry & Wet Bottom Detention Basin Design/ Retrofits, Establishment, & Maintenance*
- *Stream & Riparian Area Restoration & Maintenance*
- *Natural Area Restoration & Native Landscaping*
- *Conservation & Low Impact Development*
- *Rainwater Harvesting & Re-use*
- *Rain Gardens*
- *Street Sweeping*
- *Wetland Restoration*
- *Vegetated Filter Strips*
- *Green Infrastructure Planning*
- *Vegetated Swales (bioswales)*

HIGH PRIORITY-CRITICAL AREA SITE SPECIFIC PROJECT RECOMMENDATIONS (see map, below)

Streambank, Channel, & Riparian Area Restoration

Seventeen stream reaches have been identified as High Priority-Critical Areas because they exhibit highly eroded and channelized banks and/or degraded channel conditions that are a major source of total suspended solids (sediment). Streambank stabilization and channel restoration using bioengineering as well as restoration of riparian areas will reduce nutrient and sediment loading and improve habitat.

Detention Basin Retrofits & Maintenance

Many detention basins can be retrofitted by naturalizing with native vegetation. Naturalized basins improve water quality from developed areas, improve habitat, and require less maintenance. Twenty seven detention basins were identified as High Priority-Critical Areas in the watershed.

Urban and Other Management Measures

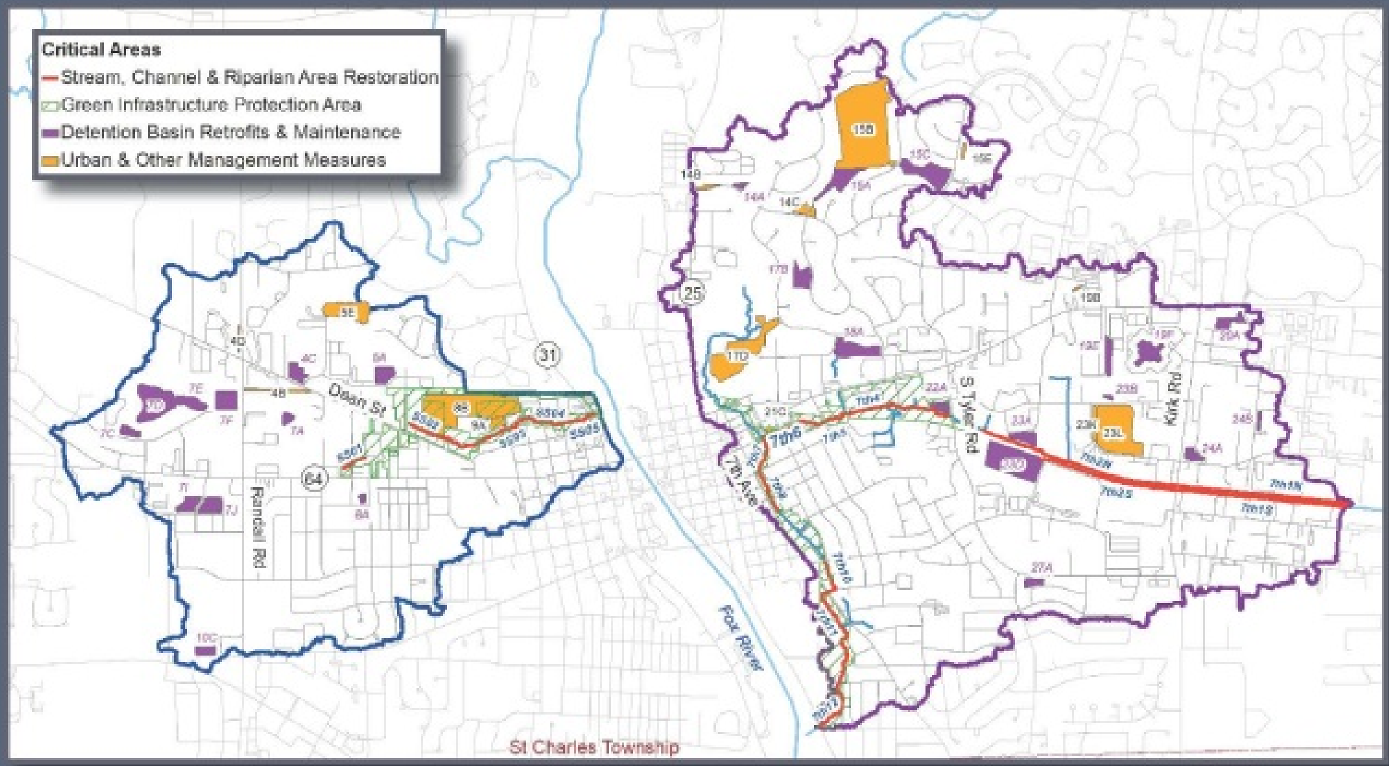
A number of critical urban and other management measures have been identified in State Street & 7th Avenue Creek watersheds. They include four swale retrofit opportunities, five turf/park retrofit opportunities, three woodland restoration or management plan opportunities, one parking lot retrofit opportunity, and one brownfield redevelopment opportunity.

Green Infrastructure Protection Areas

Both watersheds are considered built out, with little land left to be developed. Portions of both watersheds contain resources that need to be proactively protected so they can continue to provide water quality benefits in the future. Fifty-seven (57) acres of land in or adjacent to the floodplain, including a buried reach where floodplain once existed, along State Street Creek and 74 acres of land in or adjacent to the floodplain in 7th Avenue Creek have been identified as Critical Green Infrastructure Priority Protection Areas.

RESTORED STREAM & RIPARIAN AREA

HIGH PRIORITY-CRITICAL AREA PROJECT LOCATIONS



How can *you* help State Street & 7th Avenue Creeks?

Watershed planning and implementation is a voluntary effort. Active watershed stakeholders are needed to put this watershed plan into action. The City will support plan implementation and future planning efforts. Contact the City of St. Charles Public Works Department to learn how you can help. The State Street & 7th Avenue Creek Watershed-Based Plan can be downloaded at: www.stcharlesil.gov.

Residents & Businesses

- [ ] Manage your backyard as part of the green infrastructure network.
- [ ] Reduce fertilizer use on lawns and only use phosphorus based on soil testing results.
- [ ] Use less salt on driveways, parking lots, and sidewalks during winter months.
- [ ] Use native landscaping to decrease watering needs and maintenance.
- [ ] Install rain gardens and use rain barrels to reduce stormwater runoff.
- [ ] Attend meetings with decision makers to express concerns about the watershed.
- [ ] Build a sense of community in your neighborhood around the creeks and the watersheds.
- [ ] Attend watershed education and volunteer events.

St. Charles Park District

- [ ] Control non-native/invasive species and replace with native vegetation.

St. Charles City and Township, Kane County

- [ ] Adopt the State Street & 7th Avenue Creek Watershed-Based Plan and inform the public that a plan has been developed.
- [ ] Incorporate plan recommendations into comprehensive plans, codes, and ordinances.
- [ ] Build "demonstration projects," or large-scale water quality & public education projects, near public facilities.
- [ ] Look for opportunities to protect or acquire green infrastructure protection areas.
- [ ] Distribute materials to help residents manage streams in their backyards.

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For more information contact:
The City of St. Charles - Public Works
www.stcharlesil.gov

HRGreen

Executive Summary & Plan produced by:
Applied Ecological Services, Inc.
www.appliedeco.com
All photos by AES unless otherwise noted.

1 INTRODUCTION

1.1 WATERSHED PLANNING

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. 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).

The watershed planning process is a collaborative effort involving voluntary stakeholders with the primary goal to restore impaired waters and protect unimpaired waters by developing an ecologically-based management plan for State Street Creek and 7th Avenue Creek watersheds 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 State Street Creek and 7th Avenue Creek watersheds 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.

1.2 HISTORY OF THE WATERSHED

Both the State Street Creek and 7th Avenue Creek watersheds fall within St. Charles, Illinois, in Kane County. Prior to European settlement, the Potawatomi maintained a pair of summer camps along the shallowest banks of the Fox River, and it was here that they crossed the river and fished. The existing creeks feeding the Fox River, such as what are now known as State Street Creek and 7th Avenue Creek, were used to run mills and the area was known to have extensive woods and prairies as well as rock outcrops from which building stone was harvested (Buisseret, 2005).

A settlement was first established as "Charleston" in March of 1834, by Evan Shelby and William Franklin on the east bank of the Fox where Baker Memorial Park now stands. A few years later, the name was changed to St. Charles after it was discovered that a town named "Charleston" already existed downstate. Lumber mills, gristmills and wool carding mills were among the first industries in the town (St. Charles History Museum, 2009). "By 1836 a bridge and dam had been built, and a little town was growing up around them on both the east and west banks (Buisseret, 2005)."

1.3 OVERVIEW

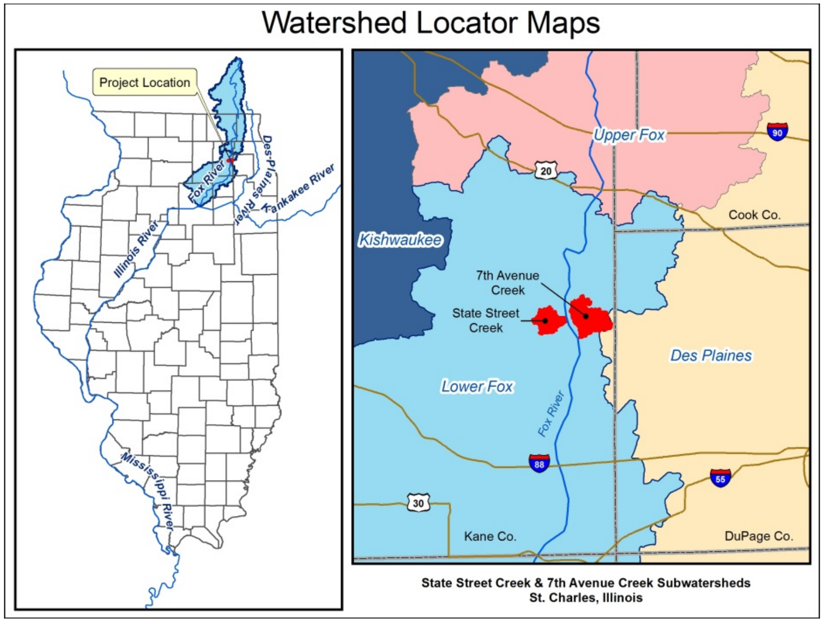
The City of St. Charles voluntarily decided to pursue development of a watershed plan for State Street and 7th Avenue Creeks that follows federal and state guidance under Section 319 of the Clean Water Act. The State Street Creek and 7th Avenue Creek Watershed-Based Plan is intended as an Addendum to the Ferson-Otter Creek Watershed Plan completed by Chicago Metropolitan Agency for Planning (CMAP) in December of 2011. This Addendum is to provide detailed supplemental information for two adjacent watersheds to the Ferson-Otter Creek Watersheds, all of which are located within the Lower Fox River Basin (Hydrologic Unit Code [HUC] 07120007) (Figure 2). State Street Creek is part of the Norton Creek-Fox River subwatershed (HUC 071200070104) and 7th Avenue Creek is part of the Town of Geneva-Fox River subwatershed (HUC 071200070106) (Figure 1).

The full Ferson-Otter Creek Watershed Plan can be found at http://epa.illinois.gov/Assets/iepa/water-quality/watershed-management/watershed-based-planning/2016/ferson-otter.pdf.

For our planning purposes, the State Street Creek and 7th Avenue Creek will be studied together as both are tributaries to the Lower Fox River. The State Street Creek and 7th Avenue Creek Watersheds are located on the urban fringe of the Chicago metropolitan area in Kane County, covering portions both banks of the Fox River within the City of St. Charles. The total population of St. Charles was 33,327, according to a July 2012 US Census Bureau estimate (USCB, 2012). The State Street Creek Watershed drains approximately 1,030 acres and has 0.8 miles of stream, while the 7th Avenue Creek Watershed drains approximately 1,885 acres and has 6.7 miles of streams and tributaries. Approximately 96% of the two watersheds fall within the City of St. Charles, with the remainder falling within unincorporated St. Charles Township (Figure 3).

Neither State Street Creek nor 7th Avenue Creek have been assessed for water quality impairments by the Illinois Environmental Protection Agency's (IEPA) in the most recent 2016 Integrated Water Quality Report and Section 303(d) List, due to the relatively small size of both tributaries. Furthermore, there is no USGS gauge station or historical water quality data for either stream. In order to gauge baseline water quality conditions in the streams, Applied Ecological Services (AES) conducted water quality sampling for both State Street and 7th Avenue Creek in order to establish baseline water quality conditions. The results of this sampling show moderate overall impairment from elevated total phosphorus, total nitrogen, total suspended solids (sediment), and biological oxygen demand (BOD) in both watersheds. Project recommendations will include a number of project types designed to improve overall water quality. The need for more comprehensive monitoring is addressed in Section 7.

Figure 1. Regional location map of State Street Creek and 7th Avenue Creek Watersheds.



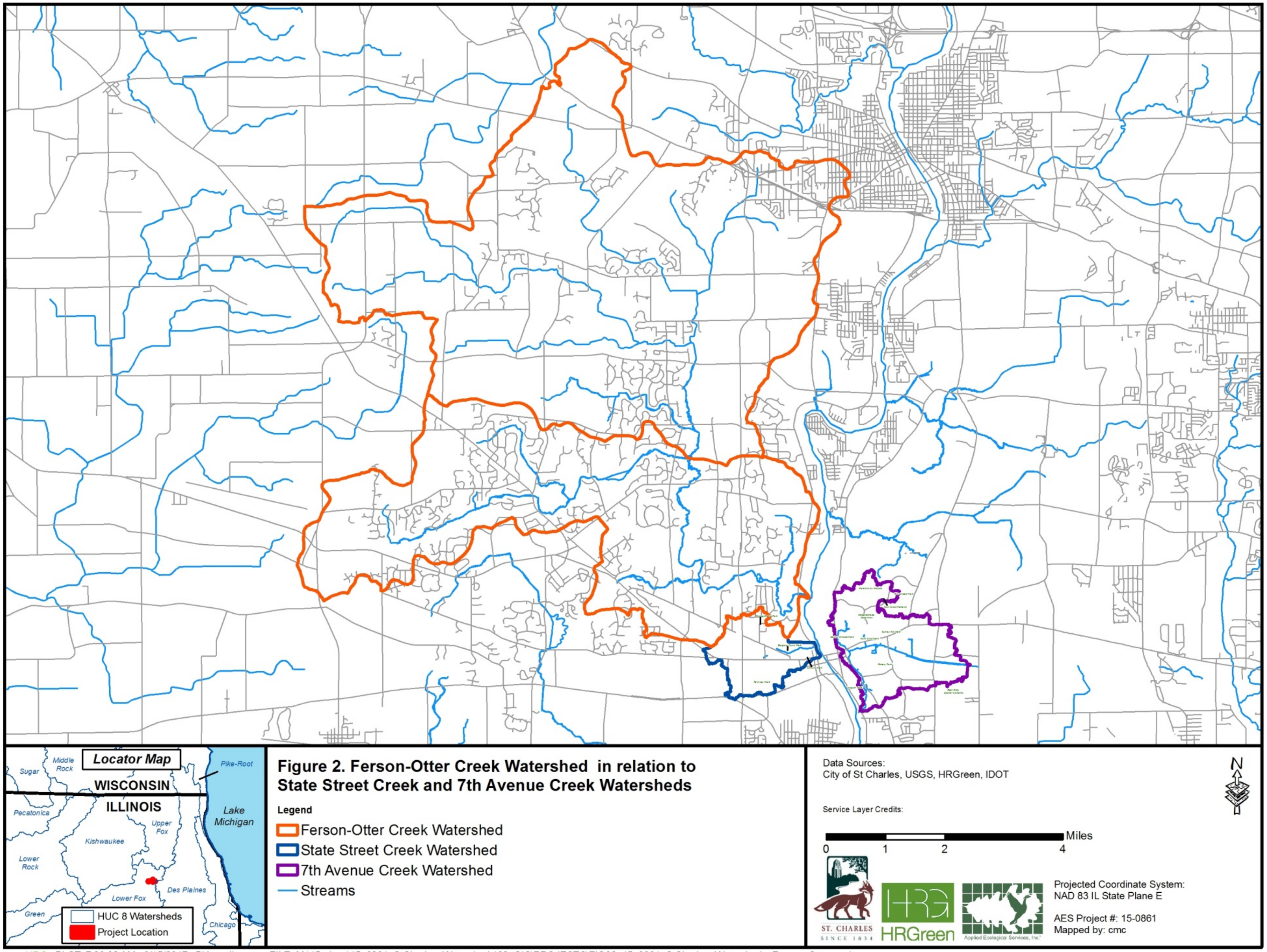


Figure 2. Ferson-Otter Creek Watershed in relation to State Street Creek and 7th Avenue Creek Watersheds

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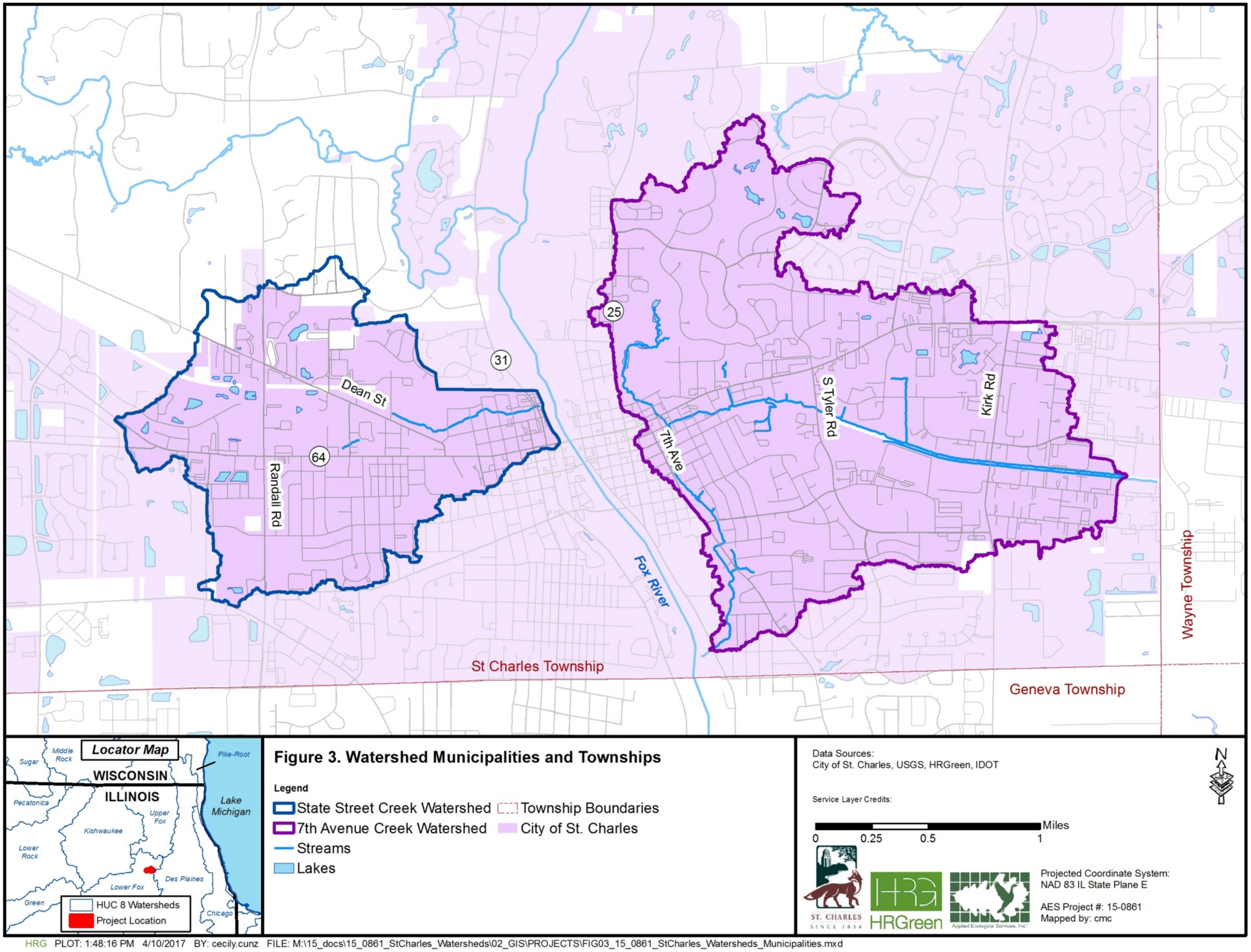
Dean St
Randall Rd
64
31
25
7th Ave
S Tyler Rd
Kirk Rd
Fox River
St Charles Township
Geneva Township
Wayne Township
Locator Map
WISCONSIN
ILLINOIS
Lake Michigan
Figure 3. Watershed Municipalities and Townships
Legend
State Street Creek Watershed
7th Avenue Creek Watershed
Streams
Lakes
Township Boundaries
City of St. Charles
Data Sources:
City of St. Charles, USGS, HRGreen, IDOT
Service Layer Credits:
Miles
0 0.25 0.5 1
Projected Coordinate System:
NAD 83 IL State Plane E
AES Project #: 15-0861
Mapped by: cmc
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1.4 PLAN GUIDANCE

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 State Street Creek and 7th Avenue 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. The Nine Elements are as follows:

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

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

Element C: Description of the 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.

Additionally, and as addressed in the Ferson-Otter Creek Plan, three additional regional criteria will be analyzed as well, including:

1. Set target pollutant-load reductions for impaired waters taking into current water quality data;
2. Consider groundwater protection from both water quality and water quantity perspectives; and
3. Compare municipal codes and ordinances against the Center for Watershed Protection's Code and Ordinance Worksheet.

Criterion one is addressed in the Water Quality chapter (Section 3), criterion two is addressed in its own section within the Physical and Cultural Characteristics chapter (Section 2.2.11) and again in the Water Quality chapter (Section 3.3) as the City of St. Charles is dependent on groundwater as a water source, and criterion three is covered in detail in the Water Resource Policy Recommendations chapter (Section 5).

1.5 GOALS AND OBJECTIVES

During the planning process, stakeholders decided that since this plan is an addendum to the Ferson-Otter Creek Watershed Plan, they wanted to adopt as their own all but one of the goals of that plan for State Street Creek and 7th Avenue Creek watersheds. Lacking any water quality data supporting fecal coliform as a pollutant of concern in the watershed, as well as the fact that there are almost no septic systems or agricultural lands within the watersheds, stakeholders decided to drop the fecal coliform goal from the State Street Creek and 7th Avenue Creek Watershed-Based Plan. Additionally, stakeholders wanted to add a goal supporting the green infrastructure network. The resulting goals for this plan are as follows:

1. Reduce nutrients, sediments, and other pollutant contributions to State Street and 7th Avenue Creeks.
2. Raise stakeholder (residents, public officials, etc.) awareness about the importance and best management practices of proper watershed stewardship.
3. Promote land use and best management practices that minimize increase in the volume of stormwater runoff and reduce the risk of flood damage.
4. Protect the quality and quantity of our water supplies.
5. Improve the physical conditions of our waterways and natural areas.
6. Protect and restore the green infrastructure network.
7. Leverage existing watershed partnerships (such as Fox River Study Group, Fox River Ecosystem Partnership, the Ferson-Otter Watershed Coalition) to foster continuing stewardship efforts in the watershed.

1.6 THE PLANNING PROCESS

The State Street Creek and 7th Avenue Creek watershed planning process was designed to be stakeholder-driven with assistance from AES, HRGreen, the City of St. Charles, and other partner agencies. AES facilitated meetings between September 2016 and June 2017, provided technical assistance for the watershed-based plan, and drafted the report. The kick-off meeting was held November 9th, 2016, at the St. Charles Public Works Facility in St. Charles, Illinois. In addition to the regular watershed meetings, two evening Open House Workshop meetings were held to better accommodate a wider variety of stakeholders. Feedback gathered at these meetings, best professional judgement, and the requirements outlined in USEPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* directed the development of the watershed-based plan.

The State Street Creek and 7th Avenue Creek watershed planning process include a wide range of stakeholders. In addition to residents and landowners within the watershed, a number of agencies were represented at meetings including the City of St. Charles, CMAP, St. Charles Park District, Active River Corridor Foundation, Illinois Department of Natural Resources, Kane County Board, Friends of the Fox, Fox River Study Group, and the Sierra Club.

2.0 RESOURCE INVENTORY & ASSESSMENT

This chapter constitutes a summary of publicly available data gathered during the watershed planning process. While this watershed plan provides as much detail and depth of information as possible, it does not claim to be exhaustive. Data has been collected from a variety of sources in order to provide stakeholders with a broad overview of existing conditions in the watershed in order to assist in goal development and recommendations for restoration of water quality.

2.1 FOX RIVER OVERVIEW

The State Street Creek and 7th Avenue Creek Watershed-Based Plan aims to address phosphorus, nitrogen, and sediment loading in those streams, and the plan will also address some of the Fox River concerns since it is a tributary to the Fox River. As outlined in the Ferson-Otter Creek Watershed Plan, these concerns include phosphorus, nitrogen, and sediment. The sources of these pollutants include both agricultural and urban runoff, both of which have had negative impacts on the hydrology, aquatic habitat, and water quality of the Fox River and its tributaries. Streambank erosion, non-native invasive species, and lack of quality habitat have compounded water quality issues.

Neither State Street Creek nor 7th Avenue Creek have been assessed for water quality impairments by IEPA in the most recent 2016 Integrated Water Quality Report and Section 303(d) List, due to the relatively small size of both tributaries. AES conducted baseline water quality sampling in the fall of 2016 and those sampling results point to phosphorus and nitrogen impairments in both watersheds, as well as a sediment impairment in 7th Avenue Creek watershed.

Figure 4 shows IEPA-compliant watersheds in northeastern Illinois and the location of State Street and 7th Avenue Creeks within the larger Fox River Basin and just below the Ferson-Otter Creek watershed. For more details on the conditions of the Fox River, please refer to Chapter 2.1 of the Ferson-Otter Creek Plan.

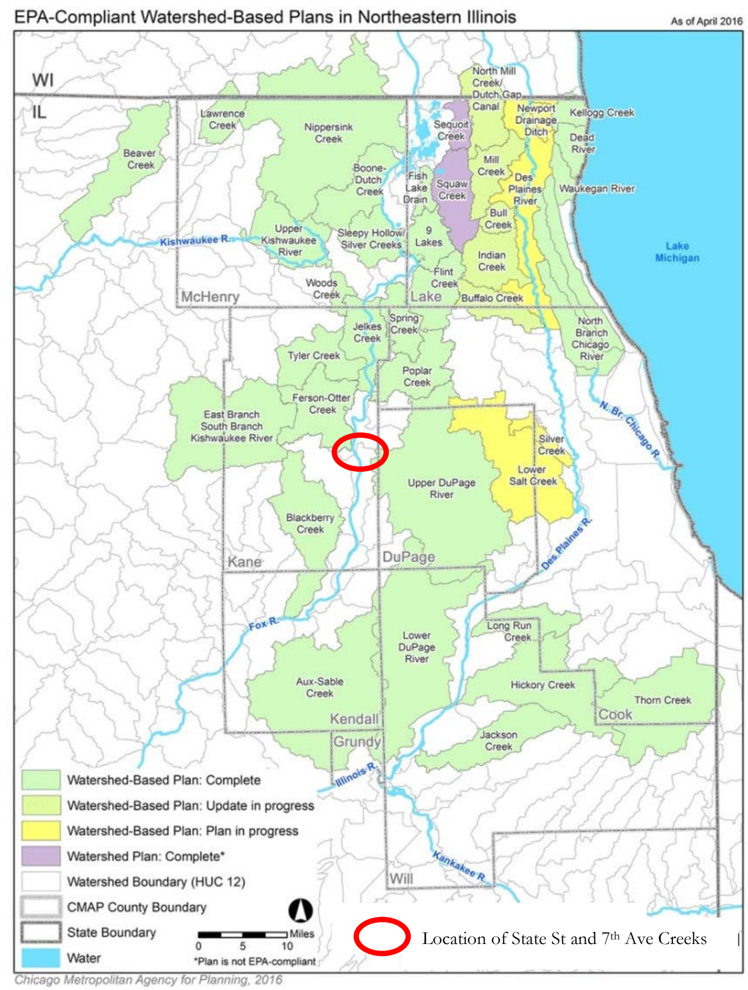

Figure 4. IEPA compliant watershed plans in northeastern Illinois (CMAP 2016).

2.2 PHYSICAL & CULTURAL CHARACTERISTICS

This section covers a wide variety of physical and cultural characteristics within the watersheds. Both the physical condition and cultural decisions (such as land use change) directly affect water quality conditions and serve as the basis for future restoration recommendations to improve the ecological health and sustainability of the watershed.

2.2.1 GEOLOGY, CLIMATE, & PRE-SETTLEMENT CONDITIONS

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 5). 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.

The nearby Fox River and surrounding area was formed at the end of the Wisconsin glaciation within deposits left by the Valparaiso Moraine System. State Street and 7th Avenue Creek watersheds are 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,

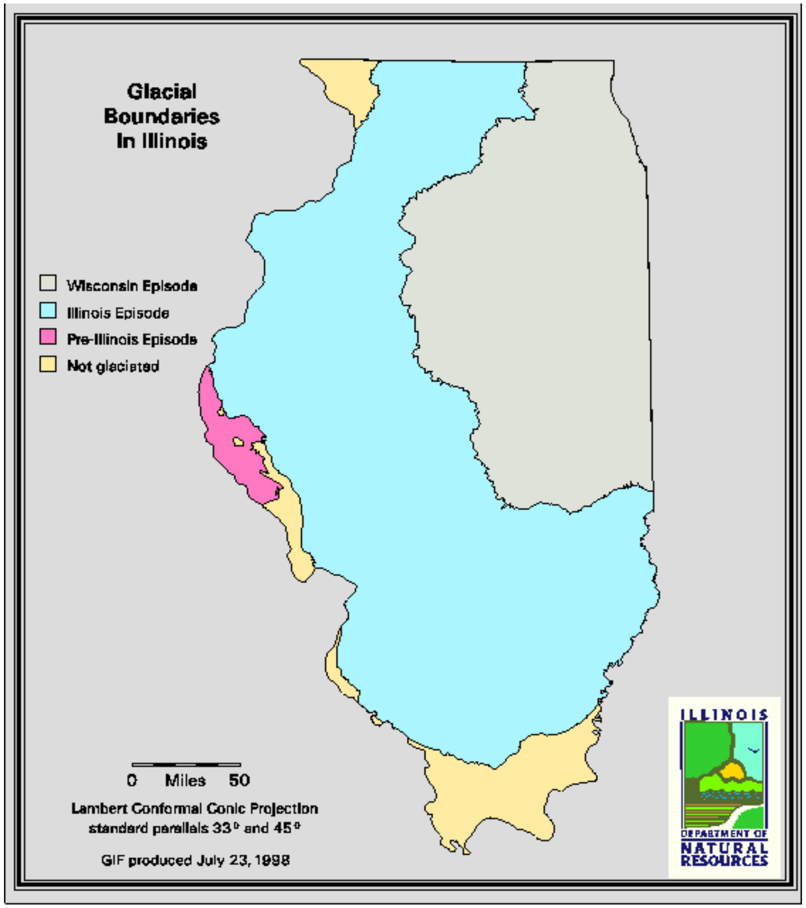

Figure 5. Glacial boundaries in Illinois.

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 provides an excellent summary of climate statistics including monthly averages and records for most locations in Illinois. Data for St. Charles represents the climate and weather patterns experienced in State Street and 7th Avenue Creek watersheds (Figure 6). The winter months are cold averaging highs around 30° F while winter lows are around 13° F. Summers are warm with average highs around 84° F and summer lows around 63° F. The highest recorded temperature was 102° F in July 2012 while the lowest temperature was -27° F in January 1985 (The Weather Channel 2016).

Fairly typical for the Midwest, the current climate of the watersheds consists of an average precipitation around 38 inches annually. According to data collected in St. Charles, the most precipitation on average occurs in August (4.8 inches) while February receives the least amount of precipitation with 1.6 inches on average (The Weather Channel 2016).

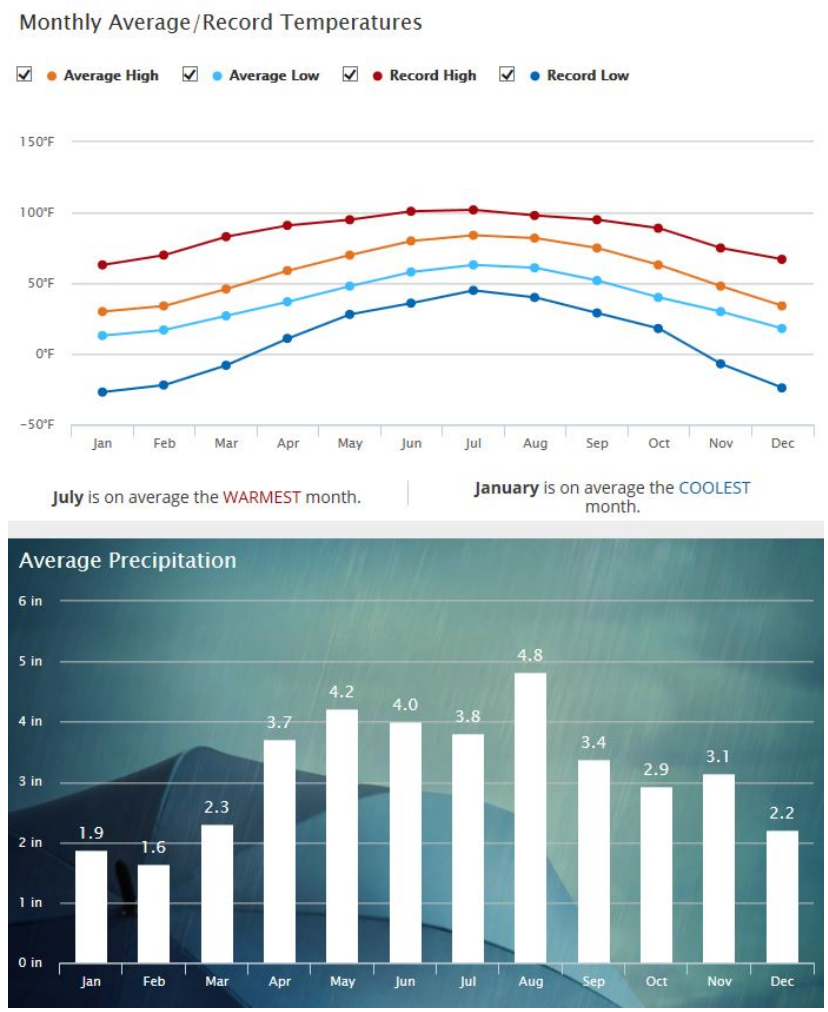

Figure 6. Monthly average temperatures and precipitation for St. Charles, IL. Source: (The Weather Channel 2016).

Pre-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. 2016). 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.

Pre-European settlement prairie-savanna landscape

The surveyors in the 1830s described the State Street Creek watershed as "Prairie" with a small portion of the northern tip of the watershed as "Timber." Meanwhile, the northwestern half 7th Avenue Creek watershed was described as "Timber" and the southeastern half as "Prairie" with a substantial portion just east of downtown "Charleston," as St. Charles was then known, as "Field" or cropland (Figure 7). The 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.

During pre-European settlement times most of the water that fell as precipitation was absorbed in upland prairie and savanna communities and within the wetlands that existed along stream corridors. Infiltration and absorption of water was so great that most of the defined stream channels seen today were non-existent or simply wetland complexes. Neither State Street Creek nor 7th Avenue Creek were present at the time of the survey, but the streets of the town that would eventually be known as downtown St. Charles are evident on either bank of the Fox River, as well as the Main Street Bridge.

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 8) depict State Street and 7th Avenue Creek watersheds when row crop farming was the primary land use but before residential and commercial development seen today. Already much of the woodland communities described in the northeastern portion of the 7th Avenue Creek watershed were cleared and farmland clearly replaced virtually all of the prairie communities. With the advent of farming came significant changes in stormwater runoff. By 1939 portions of both creeks had formed defined stream channels or were created.

Figure 9 shows a 2015 aerial photograph of State Street and 7th Avenue Creek watersheds. It is clear that residential and commercial development replaced virtually all of the farmland in both watersheds. A few wooded natural areas persist, particularly in the 7th Avenue Creek watershed, but are mostly fragmented by residential development. In the State Street Creek watershed, much of the upstream and headwater portions of the creek were buried under ground as development progressed.

With degraded ecological conditions comes the opportunity to implement ecological restoration to improve the condition of State Street and 7th Avenue Creek watersheds. Present day knowledge of how pre- 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.

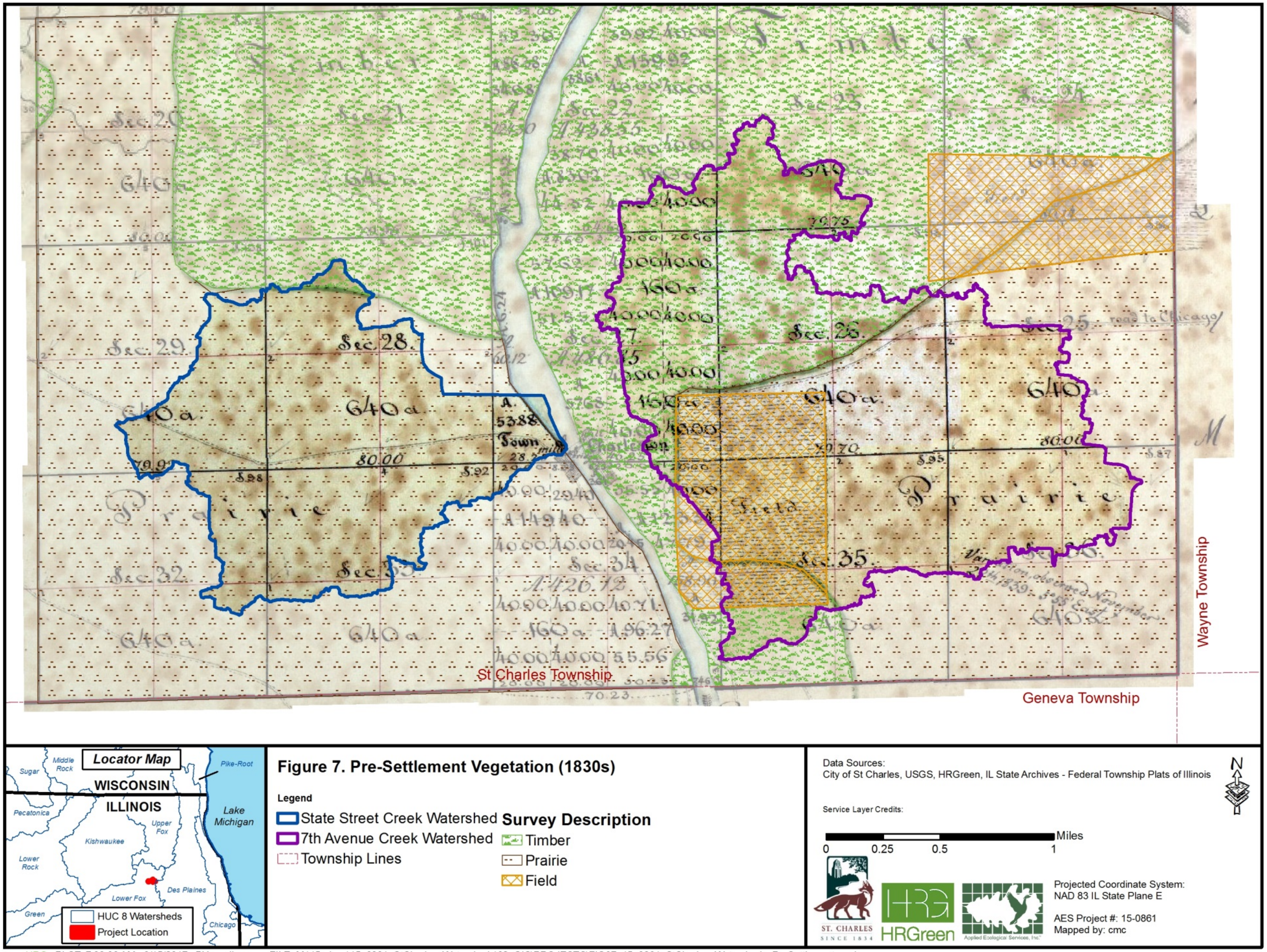

Figure 7. Pre-Settlement Vegetation (1830s)

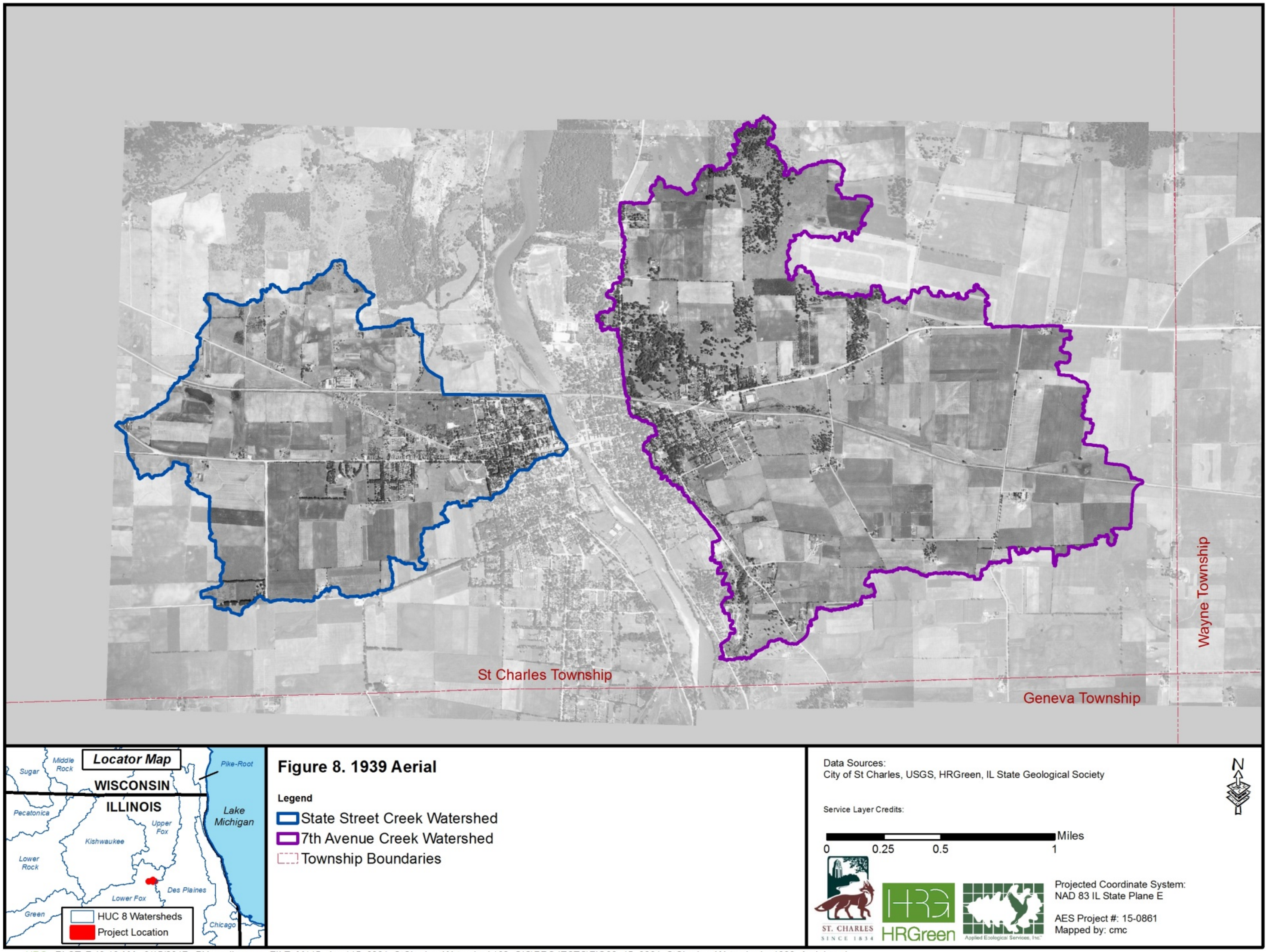

Figure 8. 1939 Aerial

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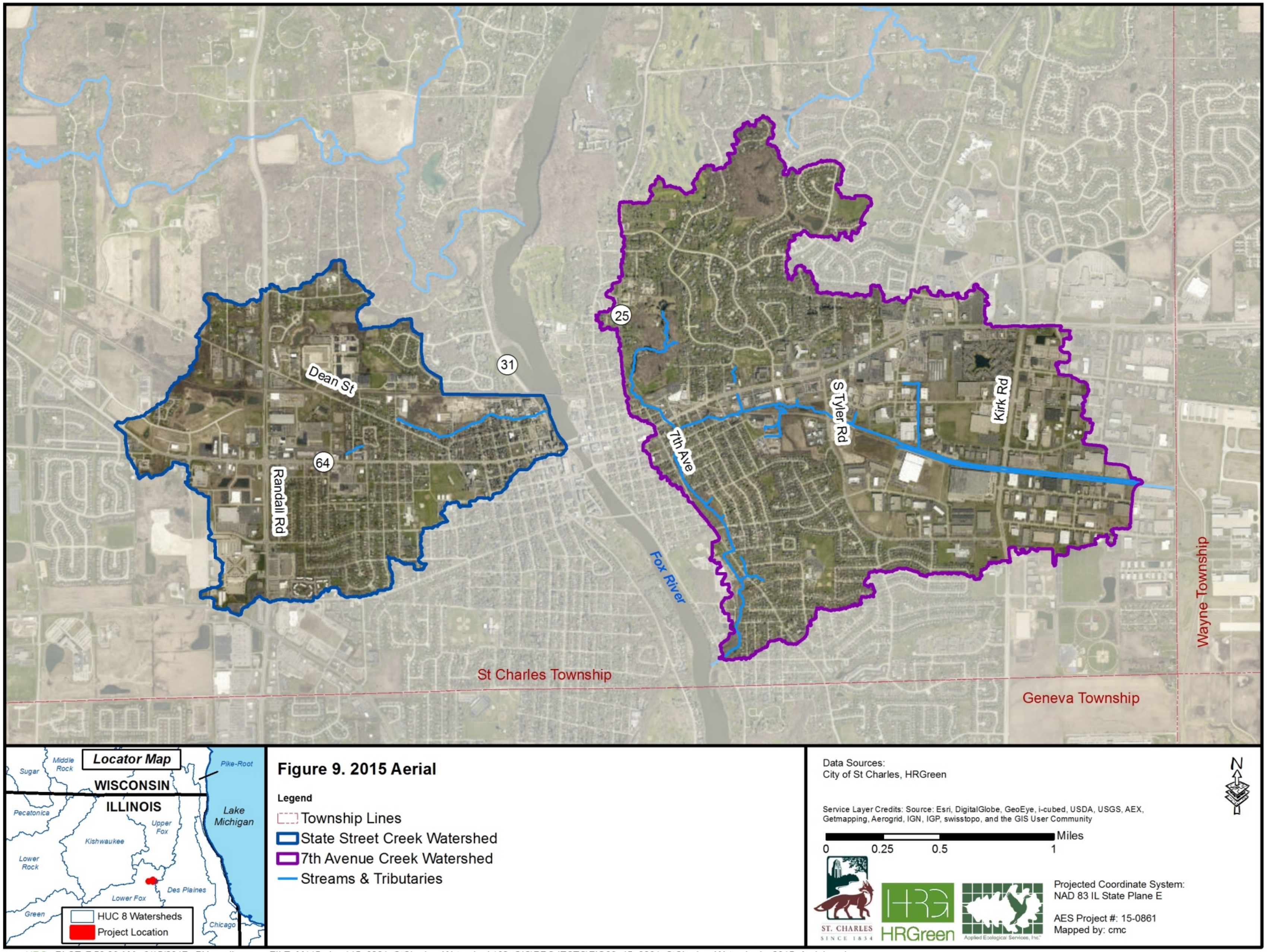

Figure 9. 2015 Aerial

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2.2.2 TOPOGRAPHY & SUBWATERSHED MANAGEMENT UNITS

Topography & Watershed Boundary

The Wisconsin glacier that retreated 14,000 years ago formed much of the topography and helped define the State Street Creek and 7th Avenue Creek watershed boundaries 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 cannot begin until a watershed boundary is clearly defined.

The State Street Creek and 7th Avenue Creek watershed boundaries were provided by HRGreen, the City Engineer for St. Charles, and are reflective of topography and the stormwater system. The refined watershed boundary was then input into a GIS model (Arc Hydro) that generated a Digital Elevation Model (DEM) of the watersheds (Figure X). State Street Creek and 7th Avenue Creek watersheds are 1,030 acres and 1,885 acres in size, respectively.

State St Creek watershed generally drains from west to east while 7th Avenue Creek watershed generally drains from east to west before entering the Fox River, with rolling topography at the higher elevations. Elevation within the watersheds range from a high of 840 feet above mean sea level (AMSL) to a low of 679 feet ASL, with both the highest and lowest points in the State Street Creek watershed, for a total relief of 161 feet (Figure 10). The highest point is found in the northwest portion of the State Street Creek watershed. High elevations also extend along the southwestern portion of the 7th Avenue Creek watershed. As expected, the lowest elevations occur where the two creeks meet the Fox River and generally surrounding both outlets.

Rolling topography at Timber Trails Park in State Street Creek watershed.

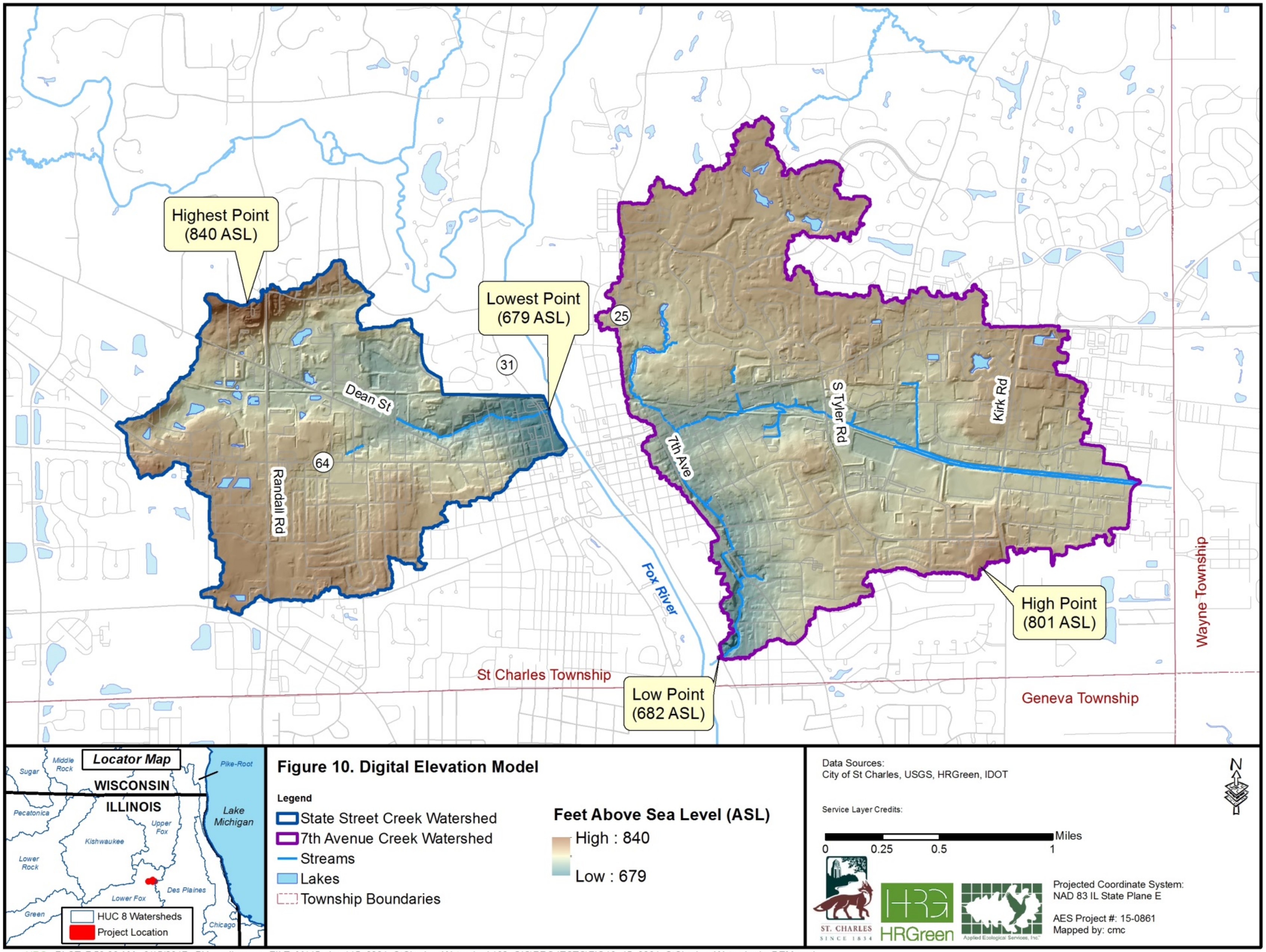

Figure 10. Digital Elevation Model

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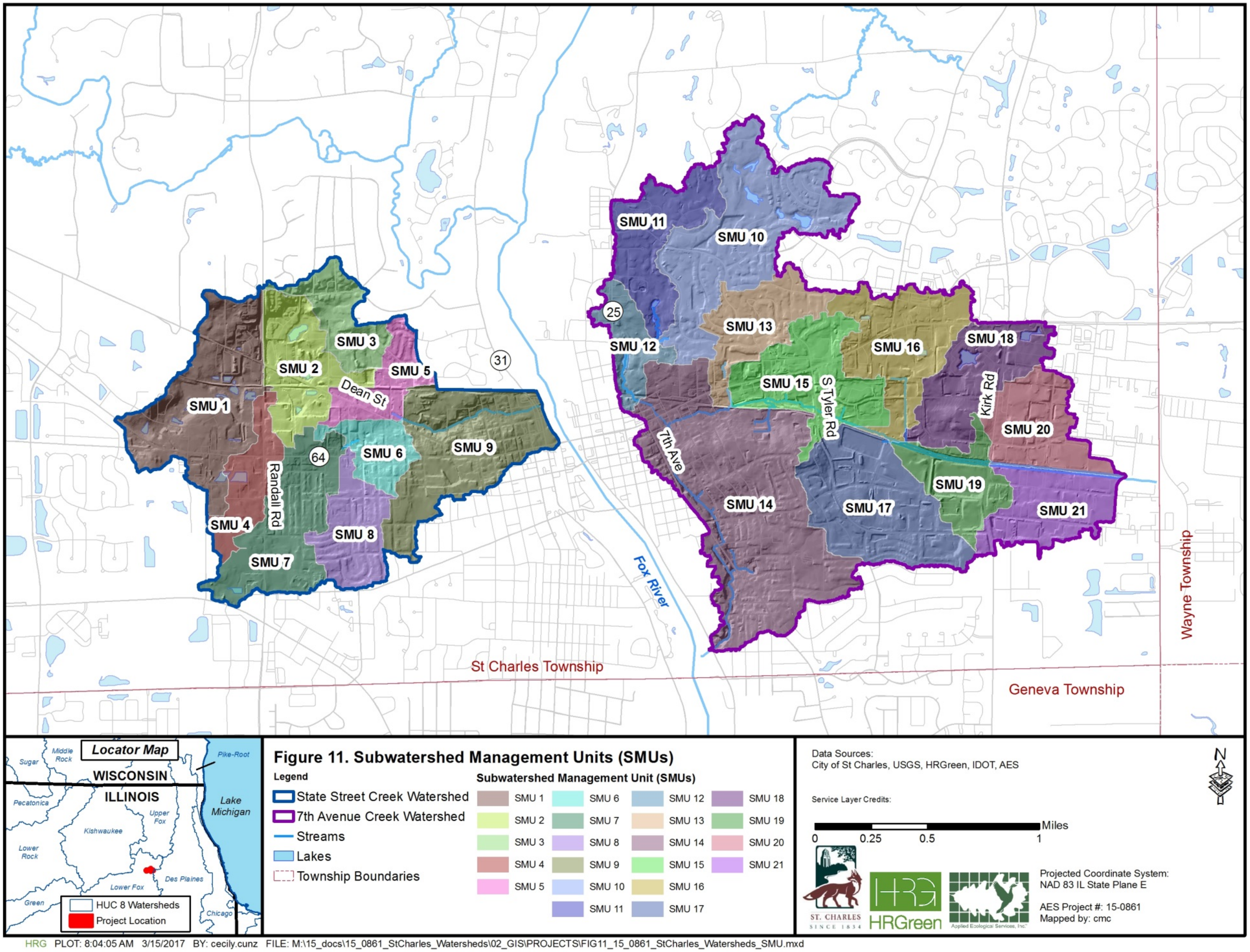
Subwatershed Management Units (SMUs)

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. State Street Creek and 7th Avenue Creek watersheds combined are about 4.5 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). State Street Creek and 7th Avenue Creek watersheds were delineated into 21 SMUs (9 in State Street Creek and 12 in 7th Avenue Creek) 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 1 presents each SMU and size within the watershed. Figure 11 depicts the location of each SMU boundary delineated within the larger watersheds.

Table 1. Subwatershed management units and acreage.

SMU #	Total Acres
State Street Creek Watershed	
SMU 1	213.8
SMU 2	115.4
SMU 3	72.5
SMU 4	71.8
SMU 5	64.7
SMU 6	53.8
SMU 7	153.1
SMU 8	87.1
SMU 9	197.7
7th Avenue Creek Watershed	
SMU 10	250.5
SMU 11	119.0
SMU 12	60.8
SMU 13	99.7
SMU 14	422.7
SMU 15	148.1
SMU 16	155.7
SMU 17	197.4
SMU18	125.5
SMU19	88.2
SMU 20	111.5
SMU 21	105.8
Totals	**2,915.0**



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
SMU 21
Dean St
Randall Rd
7th Ave
S Tyler Rd
Kirk Rd
Fox River
St Charles Township
Geneva Township
Wayne Township
Locator Map
WISCONSIN
ILLINOIS
Lake Michigan
HUC 8 Watersheds
Project Location
Figure 11. Subwatershed Management Units (SMUs)
Legend
State Street Creek Watershed
7th Avenue Creek Watershed
Streams
Lakes
Township Boundaries
Subwatershed Management Unit (SMUs)
Data Sources:
City of St Charles, USGS, HRGreen, IDOT, AES
Service Layer Credits:
Miles
0 0.25 0.5 1
Projected Coordinate System:
NAD 83 IL State Plane E
AES Project #: 15-0861
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2.2.3 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 woodland, prairie, and wetland 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 State Street and 7th Avenue Creek watersheds (Tables 2 and 3; Figures 12-14).

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 State Street and 7th Avenue Creek watersheds 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 254.5 acres of wetlands in the State Street Creek watershed and roughly 413.8 acres of wetlands in the 7th Avenue Creek watershed. Approximately 771.9 acres and 1,466.6 acres, respectively, are not hydric and the remaining 3.6 and 4.6 acres, respectively, have unknown classification because they have been heavily disturbed by human land practices. According to existing Kane County wetland inventories, 65.8 acres or 26% of the pre-European settlement wetlands remain in the State Street Creek watershed and 94.1 acres or 23% remain in 7th Avenue Creek watershed. The location of hydric soils in the watershed is depicted on Figure 12. Existing wetlands are discussed in detail in Section 2.2.8.

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.

A highly erodible land map was created based on NRCS SSURGO dataset (Figure 13). It is important to know the location of highly erodible lands because these areas have the highest potential to degrade water quality during farm tillage and development. Based on mapping, 130.7 acres or 13% of the soils in the State Street Creek watershed and 220.6 acres or 12% of the soils in the 7th Avenue Creek watershed are categorized as highly erodible lands. Fortunately, many of these soils are located in upland areas that are currently stabilized by existing land uses/cover. But others are located near existing streams and tributaries where further erosion measures may need to be taken. For more information on highly erodible lands, please refer to the Agriculture section of CMAP's Ferson-Otter Creek Watershed Plan.

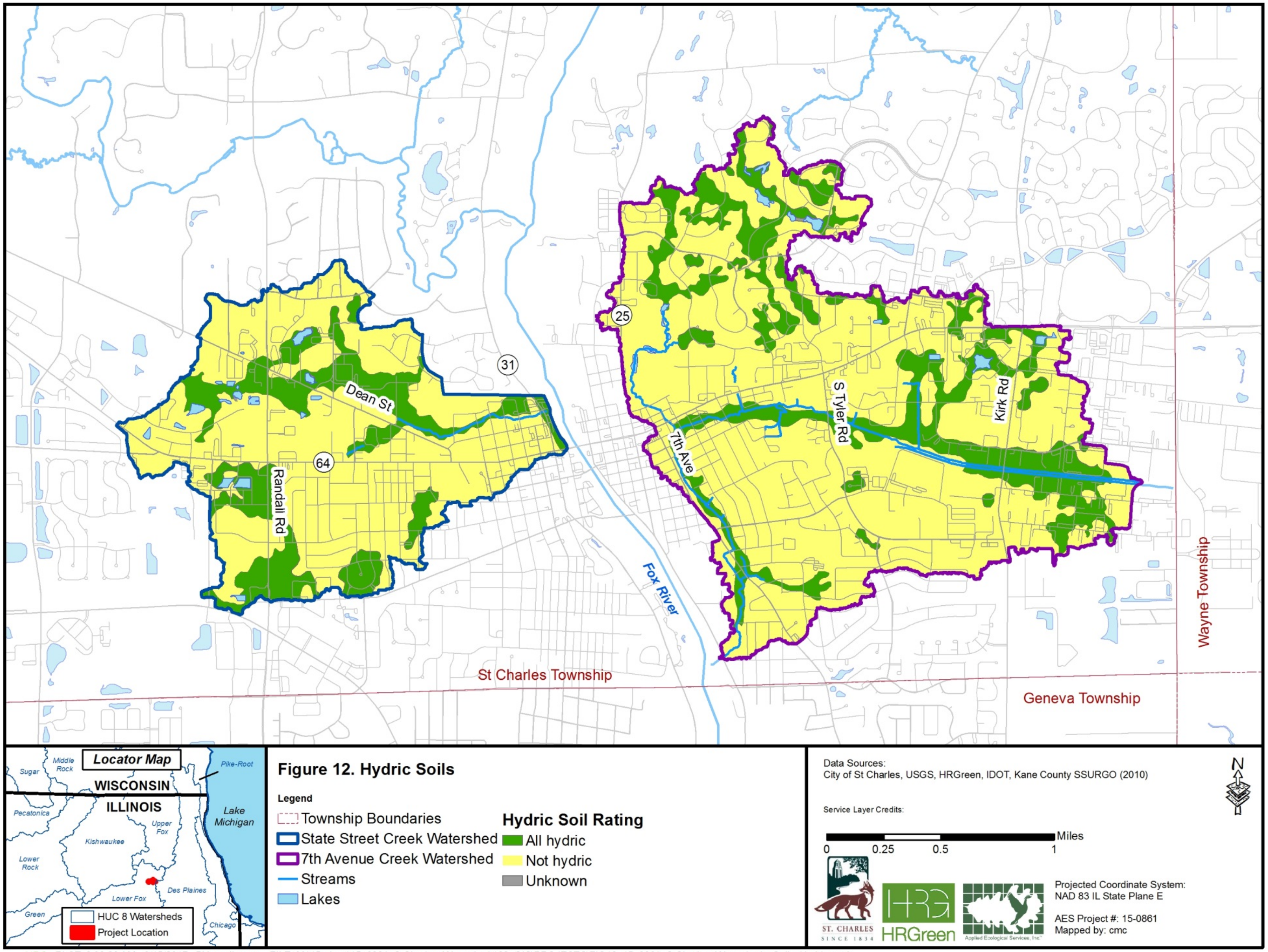

Figure 12. Hydric Soils

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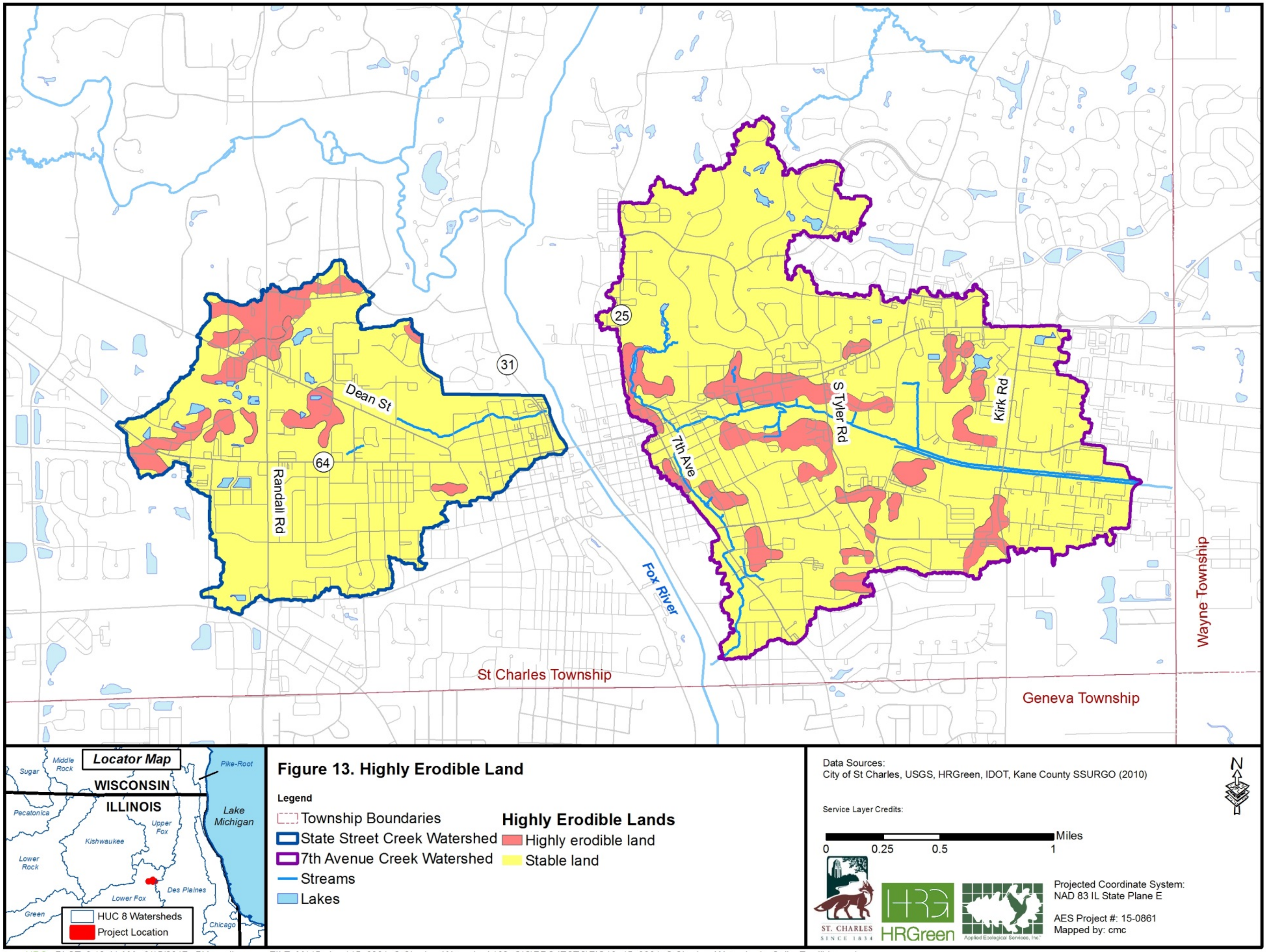

Figure 13. Highly Erodible Land

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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 2.2.11.

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 14 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 2 while Table 3 summarizes the acreage and percent of each HSG. Neither watershed has any A soils. Group C soils are dominant throughout both watersheds at 76% and 77% coverage for State Street and 7th Avenue Creeks, respectively. Group C/D soils make up most of the remaining portions of the watersheds at 24% and 17%, respectively.

Table 2. 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 3. Hydrologic Soil Groups including acreage and percent of watershed.

Hydrologic Soil Group	State St Area (acres)	State St % of Watershed	7th Ave Area (acres)	7th Ave % of Watershed
B	11.7	1%	34.6	2%
B/D	6.1	>1%	90.2	5%
C	760.1	74%	1,432.0	76%
C/D	248.5	24%	323.6	17%
Unclassified	3.6	>1%	4.5	>1%
Totals	**1,030.0**	**100%**	**1,884.9**	**100%**

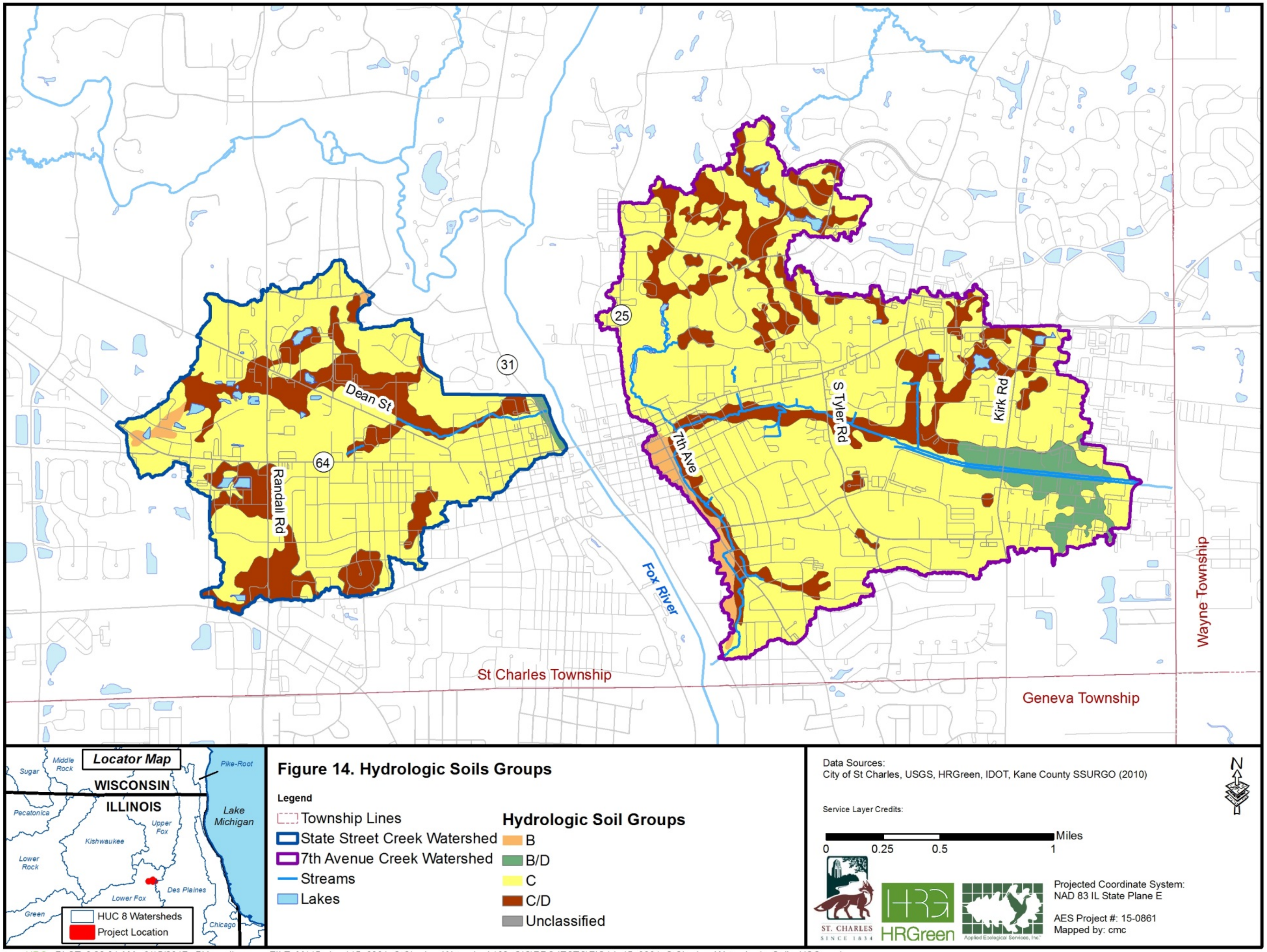

Figure 14. Hydrologic Soils Groups

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2.2.4 JURISDICITIONS, DEMOGRAPHICS, & PROTECTED OPEN SPACE

Jurisdictions

Both State Street Creek and 7th Avenue Creek watersheds are located entirely within Kane County and St. Charles Towhnship, and almost entirely within the City of St. Charles (Table 4, Figures 3 and 15). The City of St. Charles makes up 945.8 acres (92%) of the State Street watershed and 1,862.2 acres (99%) of the 7th Avenue Creek watershed. The remaining acreage of both watersheds fall within unincorporated St. Charles Township. In addition several area parks and natural areas, including Timber Trails Park in the State Street Creek watershed and Persimmon Woods Park and Delnor Woods Park in the 7th Avenue Creek watershed are owned and managed by the St. Charles Park District (SCPD).

Table 4. County, township, unincorporated, and municipal jurisdictions and protected areas.

Jurisdiction	State St Area (acres)	State St % of Watershed	7th Ave Area (acres)	7th Ave % of Watershed
County				
Kane	1,030.0	100%	1,884.9	100%
Township				
St. Charles Township	1,030.0	100%	1,884.9	100%
Unincorporated Areas				
Unincorporated St. Charles Twp.	84.2	8%	22.7	1%
Municipalities				
St. Charles	945.8	92%	1,862.2	99%
Protected Areas				
St. Charles Park District	37.1	4%	99.6	5%

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 were used to project how these attributes will impact State Street Creek and 7th Avenue Creek watersheds (Table 5). 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. CMAP updated this data in October 2014 and Applied Ecological Services, Inc. (AES) used GIS to overlay the watershed boundaries onto CMAP's municipal subzone aggregation (or quarter section). If any part of a subzone fell inside the watershed boundary, the statistics for the entire subzone were included unless it covered less than 5% of the subzone. It is important to note that this methodology makes best use of the data limitations but likely inflates forecasts.

The combined population of the watershed is expected to increase from 20,276 in 2010 to 24,249 by 2040, a 19.6% increase. Household change follows this trend and is predicted to increase from 8,139 to 9,731 (19.5% increase). Employment within the watershed is expected to increase by 47.8% from 16,994 in 2010 to 25,049 in 2040. The highest population and household increases are fairly modest and expected in areas that are already set aside for development near Randall Rd and Main St in State Street Creek and along Route 25/5th Avenue in 7th Avenue Creek watershed. Most employment change is predicted in the business and industrial park areas along Randall Rd in State Street Creek and along Kirk Rd in 7th Avenue Creek (CMAP 2014).

Table 5. CMAP 2010 data and 2040 forecast data.

Data Category	2010	2040	Change (2010-2040)	Percent Change
Population	20,276	24,249	+3,973	+19.6
Household	8,139	9,731	+1,592	+19.5
Employment	16,944	25,049	8,105	+47.8

Source: Chicago Metropolitan Agency for Planning 2040 Forecasts

Socioeconomic Status

Known as "the Pride of the Fox," St. Charles can best be described as growing and affluent. As a suburb of the Chicago region, it offers excellent amenities such as parks, shopping, conservation areas, quality schools and libraries, safe neighborhoods, and is in close proximity to commuter rail and interstate access. 2015 U.S. Census Bureau Quick Facts information for St. Charles was used as a basis for profiling the socioeconomic status of the watersheds. To summarize, the area is comprised of a mostly white population (89%) with a median household income over $83,000. In addition, approximately 72% of housing units are owner occupied, median value of owner-occupied housing is $277,800, about 49% of residents hold a college bachelor's degree or higher, and 69% of the population age 16 years or over is in the civilian labor force (USCB 2015).

Protected Open Space

For this watershed plan, protected open space includes protected prairie, woodlands, and wetland within parks that are important to wildlife or the green infrastructure network (Table 6; Figure 15). Many of these areas often provide high quality habitat for and harbor uncommon or even threatened and endangered (T&E) species. Protected Open Space 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 protected open space areas are located in the two watersheds, all owned by St. Charles Park District, and totaling 136.7 acres. State Street Creek has four parks: Timber Trails Park, Belgium Town Park, Fairview Park and Lincoln Park. 7th Avenue Creek has ten, including Persimmon Woods, Delnor Woods, Fox Chase, Hunt Club, Rotary, Langum, and Surry Hill Parks as well as Hunt Club Wetland, Steeplechase Detention, and East Side Sports Complex. Protected open space of ten acres or more are briefly summarized in the table below.

Table 6. Larger protected open space areas by watershed.

Protected Open Space	Size * (acres)	Description
St. Charles Park District		
State Street Creek Watershed		
Timber Trails Park	31.9	31.9 acres of Timber Trails Park fall within the State Street Creek watershed. The park includes many recreational opportunities as well as degraded prairie, savanna, and wetland areas.
7th Avenue Creek Watershed		
Persimmon Woods Park	36.1	36.1 acres of dry woodland dominated by mature white and red oak and sugar maple in canopy; subcanopy dominated by sugar maple and basswood. Trails meander throughout the park.
Delnor Woods Park	23.8	23.8 acres of recreational areas and woodlands, including streams and ponds. Woodland areas are dry mesic and degraded.
Fox Chase Park	10.7	10.7 acres of recreational opportunities.

* Note: Acreages include only the portions that fall within the watershed boundaries.

Timber Trails Park, Delnor Woods Park, and Persimmon Woods Park are the largest and most important protected natural areas in the watersheds. All three could be considered hidden gems within St. Charles with ample recreational opportunities. Timber Trails Park includes savanna, prairie, and wetland areas. Delnor Woods Park is predominantly a woodland with wetland and grassland areas and was a partnership with the Illinois Department of Natural Resources. Persimmon Woods Park is a unique upland swamp with adjacent marshy wetlands and a white oak woodland and was developed in cooperation with the Illinois Department of Conservation.

Left: Prairie at Timber Trails Park; Right: Streams through woodland in Delnor Woods Park; Below: Woodland at Persimmon Woods Park.

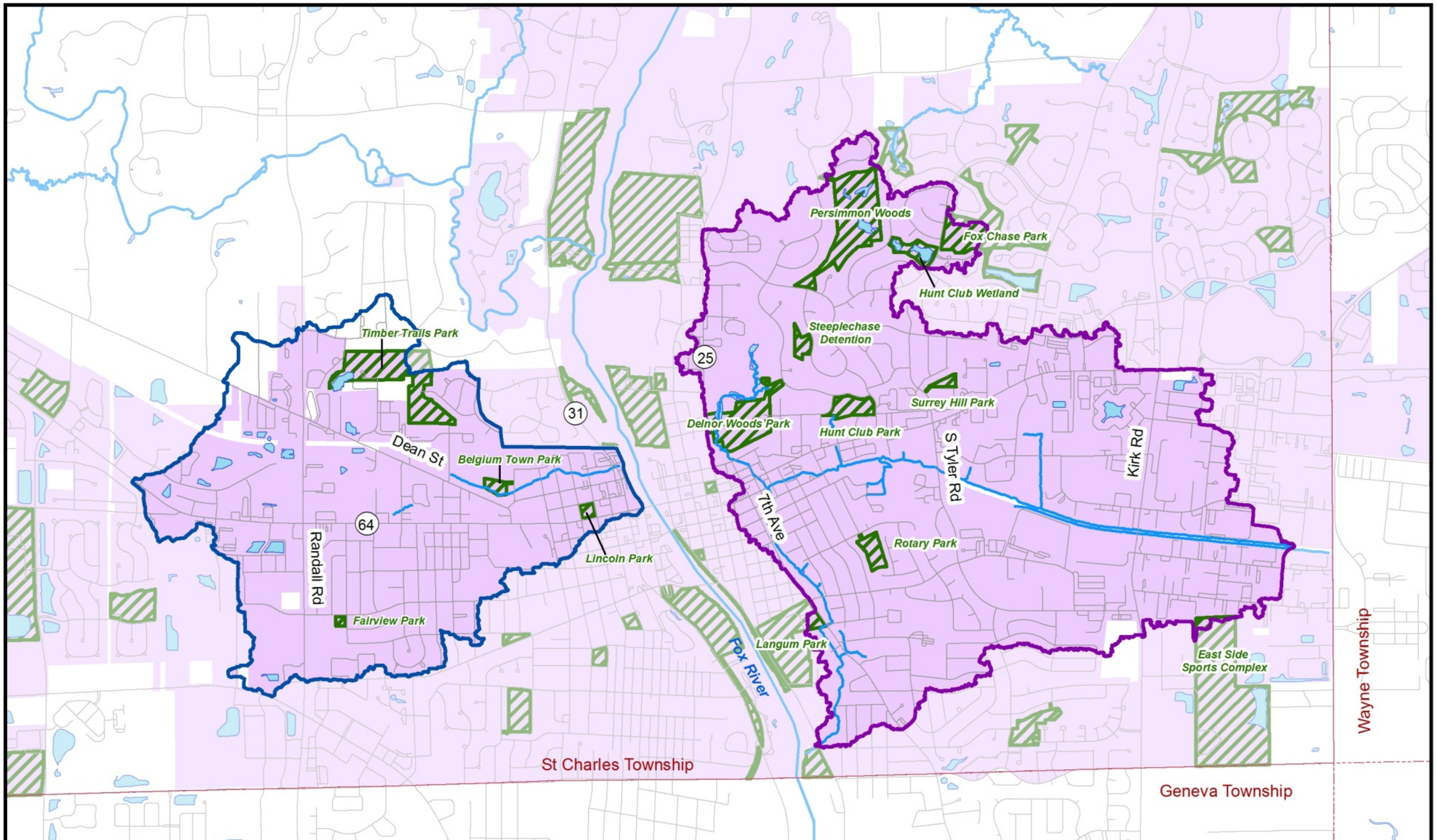

Figure 15. Watershed Jurisdictions & Protected Open Space

Legend

- State Street Creek Watershed
- 7th Avenue Creek Watershed
- Streams
- Lakes
- Township Boundaries
- City of St. Charles

Protected Open Space

- St. Charles Park District Property

Data Sources:
City of St. Charles, USGS, HRGreen, IDOT

Service Layer Credits:

0 0.25 0.5 1 Miles

Projected Coordinate System:
NAD 83 IL State Plane E

AES Project #: 15-0861
Mapped by: cmc

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2.2.5 LAND USE/LAND COVER & IMPERVIOUS COVER

2016 Land Use/Land Cover

Highly accurate land use/land cover data was produced for State Street Creek and 7th Avenue Creek watersheds using several sources of data. First, St. Charles 2016 land use data was used as a base layer. 2016 aerial photography of the watershed was also overlaid on existing land use data in GIS so that 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 2016 watershed resource inventory. The resulting 2016 land use/land cover data and map for State Street Creek and 7th Avenue Creek watersheds is included in Table 7 and depicted on Figure 16.

The predominant land use/land cover in State Street Creek and 7th Avenue Creek watersheds is Residential, making up 43% of both watersheds. Business and Manufacturing take up the next two highest land use/land cover categories in both watersheds at 28% and 11% (respectively) for State Street Creek and 12% and 29% (respectively) for 7th Avenue Creek. These top three categories cover more than 80% of both watersheds.

The remaining land use/land cover categories in State Street Creek are Institutional (5%), Open Space and Public Land (5%), Office/Research Park (4%), Municipal (4%), and Transportation (1%). The remaining categories in 7th Avenue Creek are Open Space and Public Land (9%), Agriculture (2%), Institutional (2%), Office/Research Park (2%), Transportation (1%), and Municipal (1%).

Table 7. 2016 land use/land cover classification and acreage.

Land Use/Land Cover	**Acres**	% of Watershed
State Street Creek Watershed		
Residential	445.3	43.2%
Business	283.8	27.6%
Manufacturing	109.5	10.6%
Institutional	54.0	5.2%
Open Space and Public Land	48.4	4.7%
Office/Research Park	41.8	4.1%
Municipal	37.2	3.6%
Transportation	9.9	1.0%
Totals	**1030.0**	**100.0%**
7th Avenue Creek Watershed		
Residential	819.9	43.5%
Manufacturing	552.6	29.3%
Business	219.3	11.6%
Open Space and Public Land	169.0	9.0%
Agriculture	37.8	2.0%
Institutional	33.5	1.8%
Office/Research Park	27.6	1.5%
Transportation	13.3	0.7%
Municipal	12.0	0.6%
Totals	**1884.9**	**100.0%**

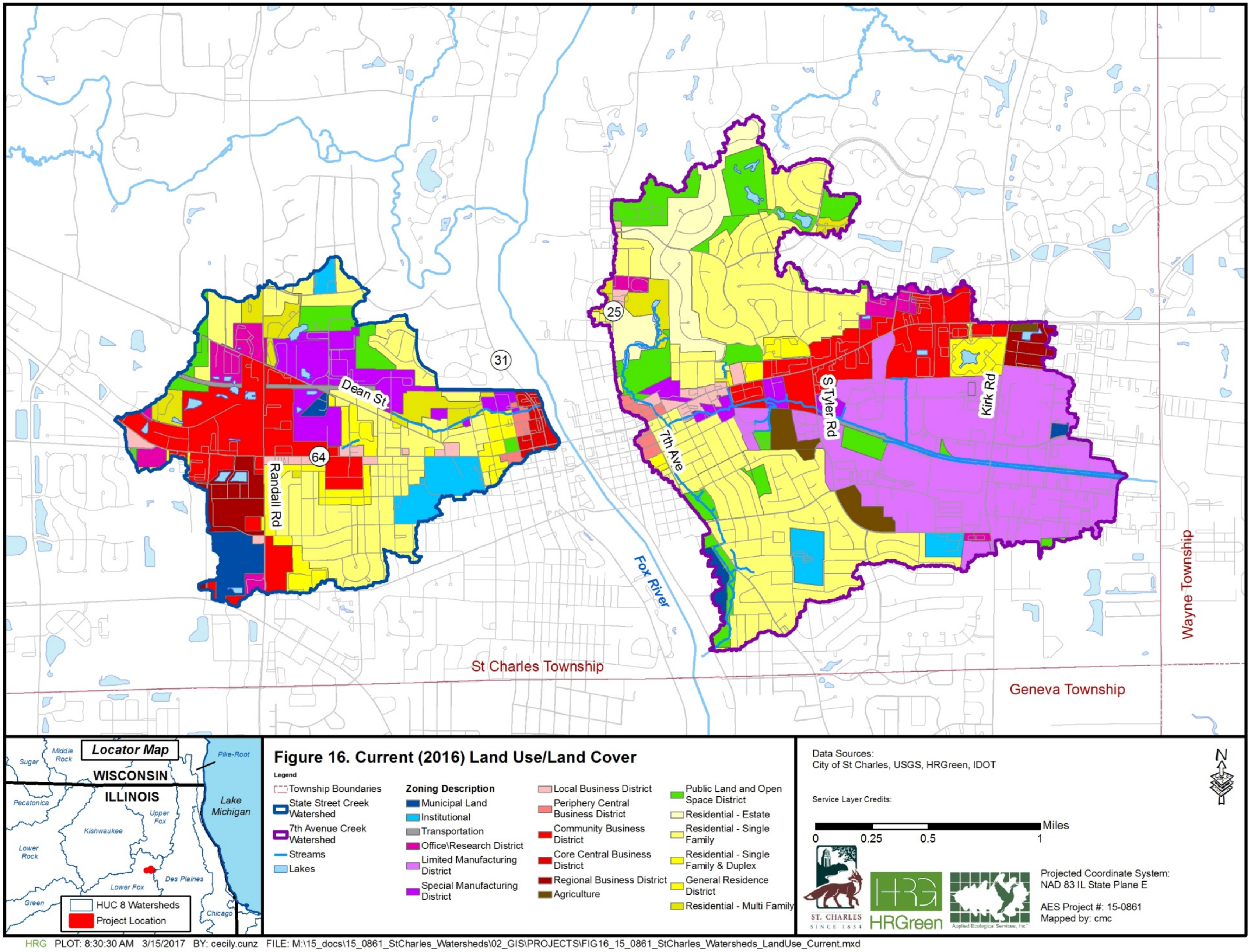

Figure 16. Current (2016) Land Use/Land Cover

Future Land Use/Land Cover Predictions

Information on predicted future land use/land cover for the watershed was obtained from the City of St. Charles. Available data was analyzed and GIS used to map predicted land use/land cover changes. The results are summarized in Table 8 and Figure 17.

Since both watersheds are predominantly built out, most land use changes predicted across both watersheds are fairly minor, with only a few exceptions. State Street Creek is expected to see a 40-acre decrease in manufacturing areas and 22-acre decrease in residential areas, while gaining roughly 52 acres of business areas and 11 acres of open space. In 7th Avenue Creek, a 34-acre decrease in agricultural land uses and a 17-acre reduction in residential areas are predicted to follow a 30-acre increase in business land uses, 18 acre increase in open space, and a 13 acre increase in municipal or public land use areas. This is generally the result of a focus on supporting business land uses in the area.

Both watersheds see additional preservation of open space areas in the future.

Table 8. Comparison between 2016 and predicted 2040 land use/land cover statistics.

Land Use/Land Cover	2016 Area (Acres)	2016 % of Cover	2040 Area (Acres)	2040 % of Cover	Change (Acres)	Percent Change
State Street Creek Watershed						
Residential	445.3	43.2%	423.7	41.1%	-21.6	-4.8%
Business	283.8	27.6%	336.2	32.6%	52.4	18.5%
Manufacturing	109.5	10.6%	69.1	6.7%	-40.4	-36.7%
Institutional	54	5.2%	54	5.2%	0	0.8%
Open Space	48.4	4.7%	59.1	5.7%	10.7	22.1%
Office	41.8	4.1%	39.1	3.8%	-2.7	-7.4%
Municipal	37.2	3.6%	38.8	3.8%	1.6	4.6%
Transportation	9.9	1.0%	9.9	1.0%	0	-3.9%
7th Avenue Creek Watershed						
Residential	819.9	43.5%	802.6	42.6%	-17.3	-2.1%
Manufacturing	552.6	29.3%	544.6	28.9%	-8	-1.4%
Business	219.3	11.6%	248.9	13.2%	29.6	13.8%
Open Space	169	9.0%	186.6	9.9%	17.6	10.0%
Agriculture	37.8	2.0%	3.4	0.2%	-34.4	-91.0%
Institutional	33.5	1.8%	33.5	1.8%	0	-1.3%
Office	27.6	1.5%	27.6	1.5%	0	-2.4%
Transportation	13.3	0.7%	13.3	0.7%	0	0.8%
Municipal	12	0.6%	24.5	1.3%	12.5	116.6%

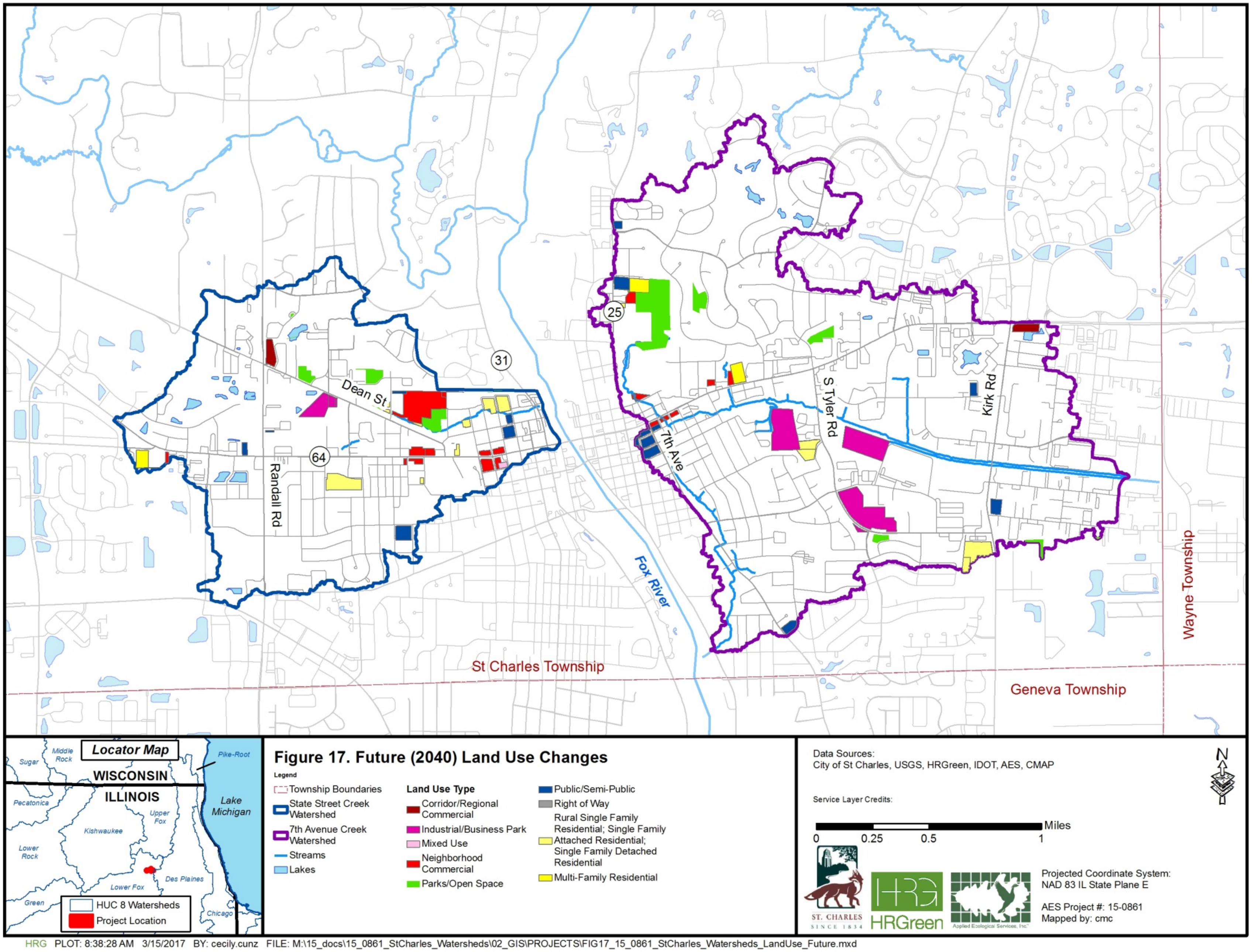

Figure 17. Future (2040) Land Use Changes

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.

Table 9. Impervious category & corresponding stream condition via the Impervious Cover Model.

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.

Source: (Zielinski, 2002)

Imperviousness affects water quality in streams 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. 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.

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 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.

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.

Impervious Cover Estimate

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 land use in the watershed using 2016 land use/land cover data are displayed in Table 10 and Figure 18.

Since these two watersheds include some of the earliest settlements in the area and are both highly urbanized, it should come as no surprise that 54% of State Street Creek is classified as non-supporting, 41 % is considered impacted, and only 5% is sensitive, and similarly 7th Avenue Creek is classified as 47% non-supporting, 35% impacted, and 18% sensitive for impervious cover.

Table 10. Impervious cover classification by watershed.

Impervious Cover Class	Acres	Percent
State Street Creek Watershed		
Sensitive (<10%)	48.4	4.7%
Impacted (10-25%)	425.8	41.3%
Non-Supporting (> 25%)	555.7	54.0%
Total	1029.9	100.0%
7th Avenue Creek Watershed		
Sensitive (<10%)	342.6	18.2%
Impacted (10-25%)	663	35.2%
Non-Supporting (> 25%)	878.9	46.6%
Total	1884.5	100.0%

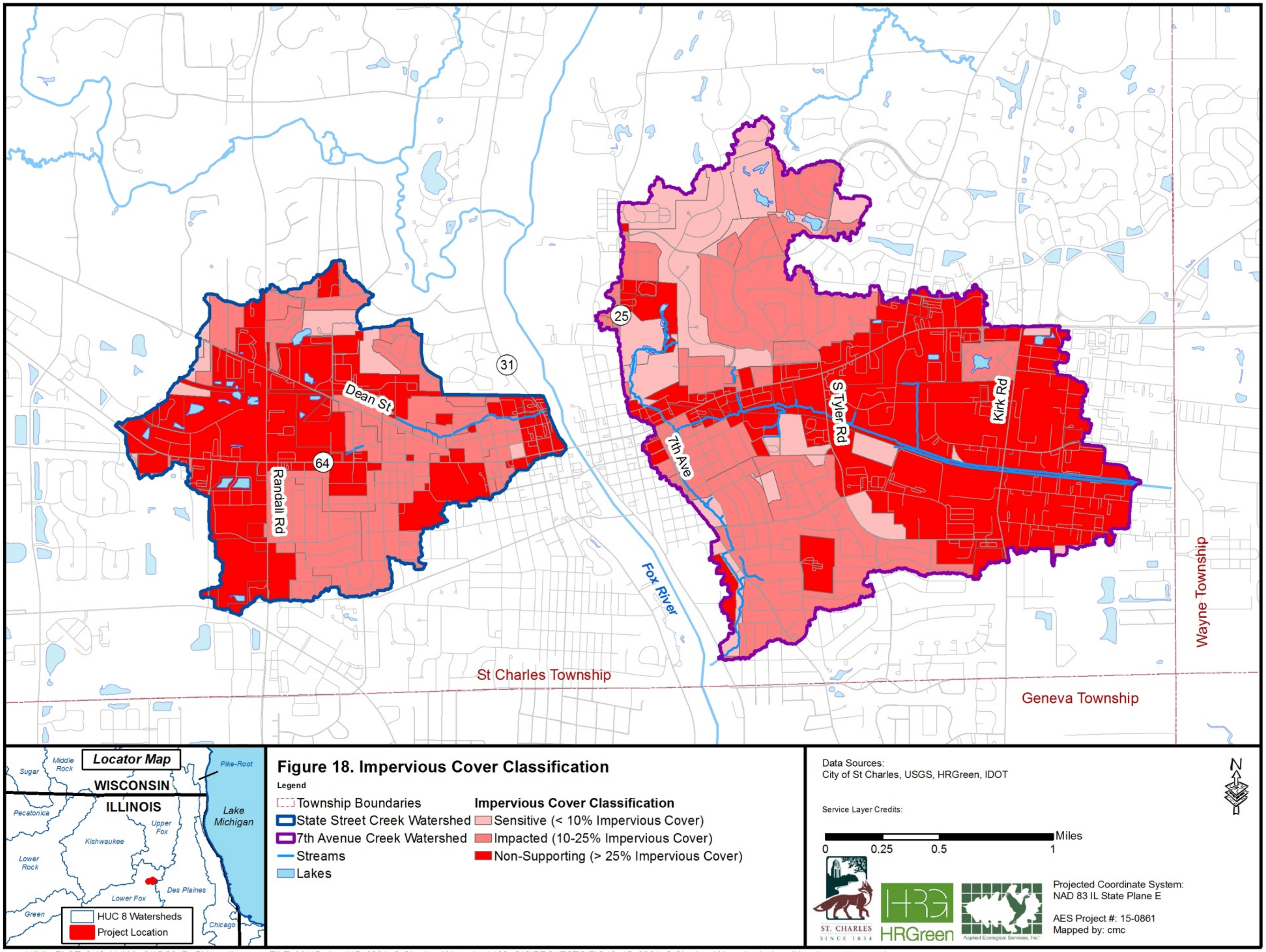

Figure 18. Impervious Cover Classification

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SMU Vulnerability Analysis

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).

Applied Ecological Services, Inc. (AES) used a modified Vulnerability Analysis to compare each SMU's vulnerability to predicted land use changes across State Street Creek and 7th Avenue Creek watersheds. 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 2016 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 based on the existing 2016 land use/land cover classification of each SMU. Each SMU then received an initial classification (Sensitive, Impacted, or Non-Supporting) based on percent of existing impervious cover (Table 11; Figure 19).

Table 11. Existing and predicted impervious cover classifications.

SMU	Step 1: Existing Impervious %	Existing (2016) Impervious Classification	Step 2: Predicted Impervious %	Predicted Impervious Classification
1	61.0%	Non-Supporting	60.0%	Non-Supporting
2	59.1%	Non-Supporting	59.2%	Non-Supporting
3	29.7%	Non-Supporting	33.8%	Non-Supporting
4	67.9%	Non-Supporting	73.1%	Non-Supporting
5	40.6%	Non-Supporting	44.1%	Non-Supporting
6	33.9%	Non-Supporting	48.5%	Non-Supporting
7	45.2%	Non-Supporting	57.2%	Non-Supporting
8	29.7%	Non-Supporting	38.9%	Non-Supporting
9	39.9%	Non-Supporting	46.0%	Non-Supporting
10	16.6%	Impacted	28.3%	Non-Supporting
11	18.5%	Impacted	27.1%	Non-Supporting
12	21.0%	Impacted	28.2%	Non-Supporting
13	25.8%	Non-Supporting	36.9%	Non-Supporting
14	30.5%	Non-Supporting	42.1%	Non-Supporting
15	62.6%	Non-Supporting	63.2%	Non-Supporting
16	70.9%	Non-Supporting	71.3%	Non-Supporting
17	44.2%	Non-Supporting	59.7%	Non-Supporting
18	62.6%	Non-Supporting	67.6%	Non-Supporting
19	74.3%	Non-Supporting	73.5%	Non-Supporting
20	74.3%	Non-Supporting	74.1%	Non-Supporting
21	73.8%	Non-Supporting	71.7%	Non-Supporting

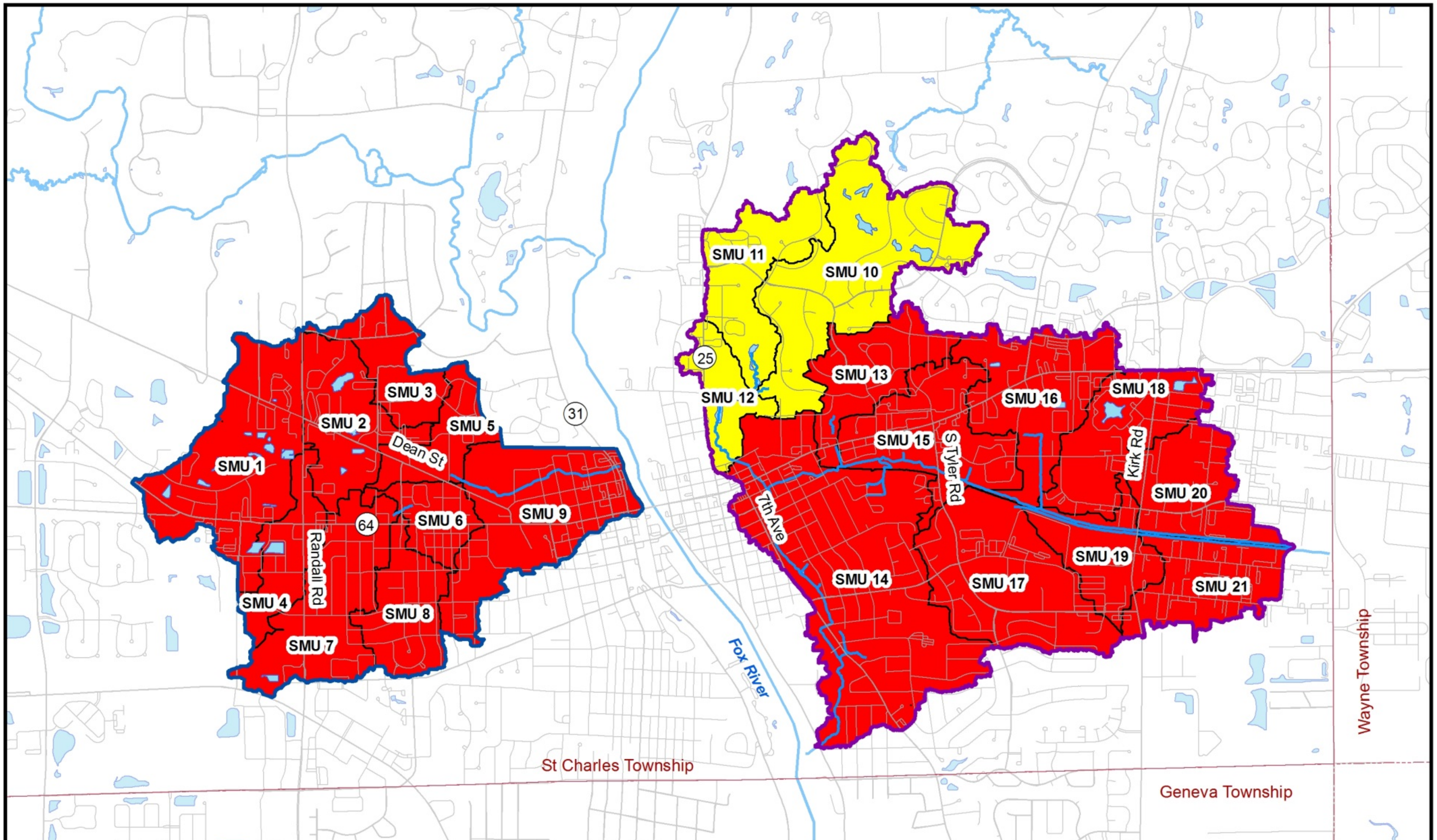

Figure 19. Existing Impervious Cover Classification by SMU

Legend

- State Street Creek Watershed
- 7th Avenue Creek Watershed
- Streams
- Lakes
- Township Boundaries

2016 Impervious Cover by SMU

- Impacted
- Non-supporting

Data Sources:
City of St Charles, USGS, HRGreen, IDOT, AES

Service Layer Credits:

Miles: 0, 0.25, 0.5, 1

Projected Coordinate System:
NAD 83 IL State Plane E

AES Project #: 15-0861
Mapped by: cmc

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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 12 and Figure 20 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 10, 11, and 12 all changed from Impacted to Non-Supporting. These changes are attributed to predicted municipal and business and increases in the northwest portion of the 7th Avenue Creek watershed as well as the general intensification of development resulting in increases 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 5%)?
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 (Figure 21):

Low = no change in classification; <5% change in impervious cover

Medium = 5-10% change in impervious cover

High = classification change and/or >10% change in impervious cover

Table 12. SMU vulnerability analysis.

SMU #	Percent Change	Step 3: Vulnerability
1	-1%	Low
2	0.1%	Low
3	4.0%	Low
4	5.1%	Medium
5	3.5%	Low
6	14.7%	High
7	12.0%	High
8	9.2%	Medium
9	6.1%	Medium
10	11.7%	High
11	8.5%	High
12	7.2%	High
13	11.1%	High
14	11.6%	High
15	0.5%	Low
16	0.3%	Low
17	15.4%	High
18	5.0%	Medium
19	-0.8%	Low
20	-0.1%	Low
21	-2.1%	Low

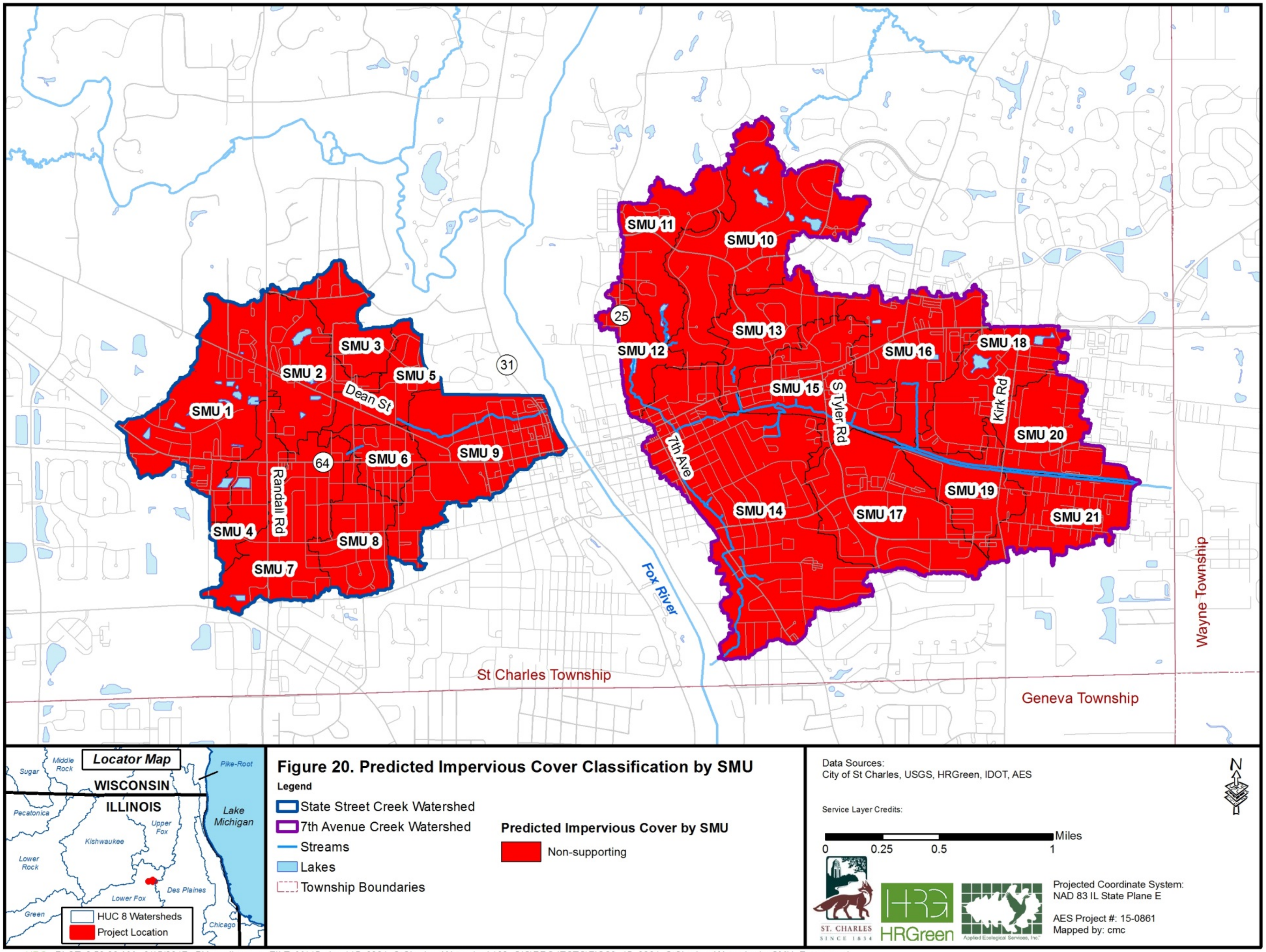

Figure 20. Predicted Impervious Cover Classification by SMU

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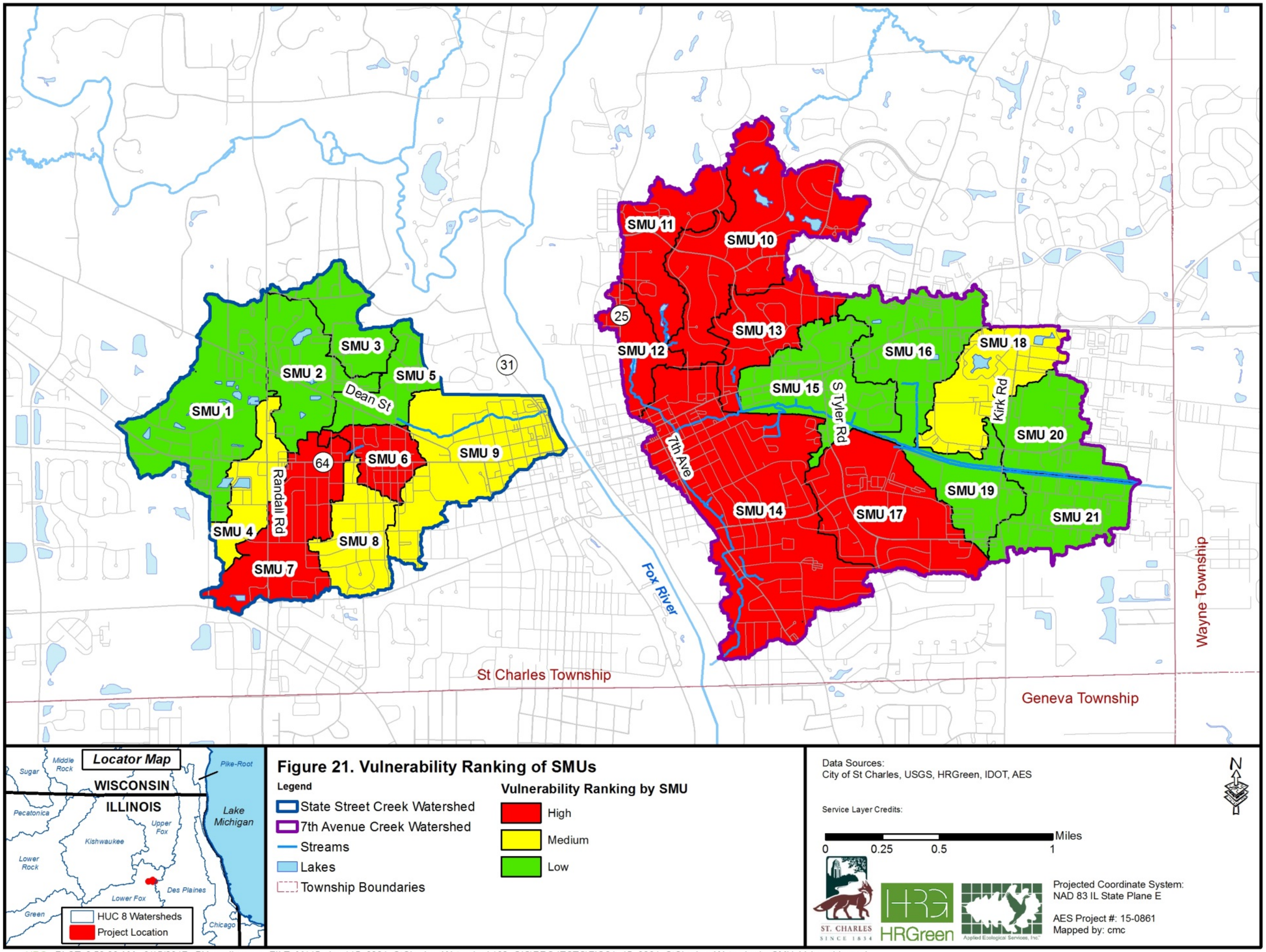

Figure 21. Vulnerability Ranking of SMUs

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2.2.6 STREAMS

The State Street Creek watershed contains only one fragmented stream, including five reaches of State Street Creek and totaling 4, 331 linear feet. Much of the headwaters of State Street Creek were buried decades ago as development progressed. The most upstream reach (SS01) begins from a stormwater pipe nearly in the center of the watershed near the northwest corner of Main Street and N 15th St in St. Charles and ends where it enters a culvert at the Firethorne Luxury Apartments on Brook St. From there the stream is piped underground to the east side of N 12th St just north of Dean St to the main channel of State Street Creek. From there it flows generally east through heavily channelized residential and manufacturing areas, with retaining walls or rock lining various portions of either bank, until it flows under a building and N. 2nd Street where it briefly daylights again to meet the Fox River.

7th Avenue Creek watershed contains the main branch of 7th Avenue Creek, 7th Avenue Creek North Branch, and a number of small, intermittent tributaries. The main stem is broken into 14 reaches, totaling 23,717 linear feet; 7th Avenue Creek North Branch is divided into 4 reaches and totals 4,453 linear feet; and has 8 small tributaries ranging in size from 260 to 1,933 linear feet.

The main branch of 7th Avenue Creek begins in the far eastern portion of the watershed west of Kautz Rd. From the upstream most portions to south of Industrial Drive, the stream flows west and is divided into a north and south portion and ditched along either side of the old railroad bed. The southern portion ends in a large mostly dry detention basin east of S Tyler Rd. The remaining stream north of the railroad bed continues west behind commercial and industrial areas and then through residential areas in the heart of St. Charles until it joins 7th Avenue Creek North Branch from the north and continues due south just west of 9th Avenue. The stream is heavily channelized with retaining or rock walls lining various portions of either bank all through the residential areas, with a more naturalized section of stream occurring south of Washington Ave to Madison Avenue. From there the stream is piped under 7th Avenue to just south of Langum Park along the east side of the Public Works facility. From there it travels south with residential land along most of its eastern bank and public land along its western bank until it turns southwest a little north of Moore Avenue and continues generally westward to join the Fox River just west of the intersection of Riverside and Moore Avenues.

Seventh Avenue North Branch begins on private residential land immediately north of Delnor Woods Park in a series of ponds with small dams at the bottom of each. It flows south, then west, then south again through wooded residential lands and into woodlands within Delnor Woods Park and through Delnor Pond. From there it meanders generally south until it crosses State Avenue at which point it is heavily channelized as it flows southeast to join the main stem of the 7th Avenue Creek just west of 9th Avenue and south of Walnut Avenue.

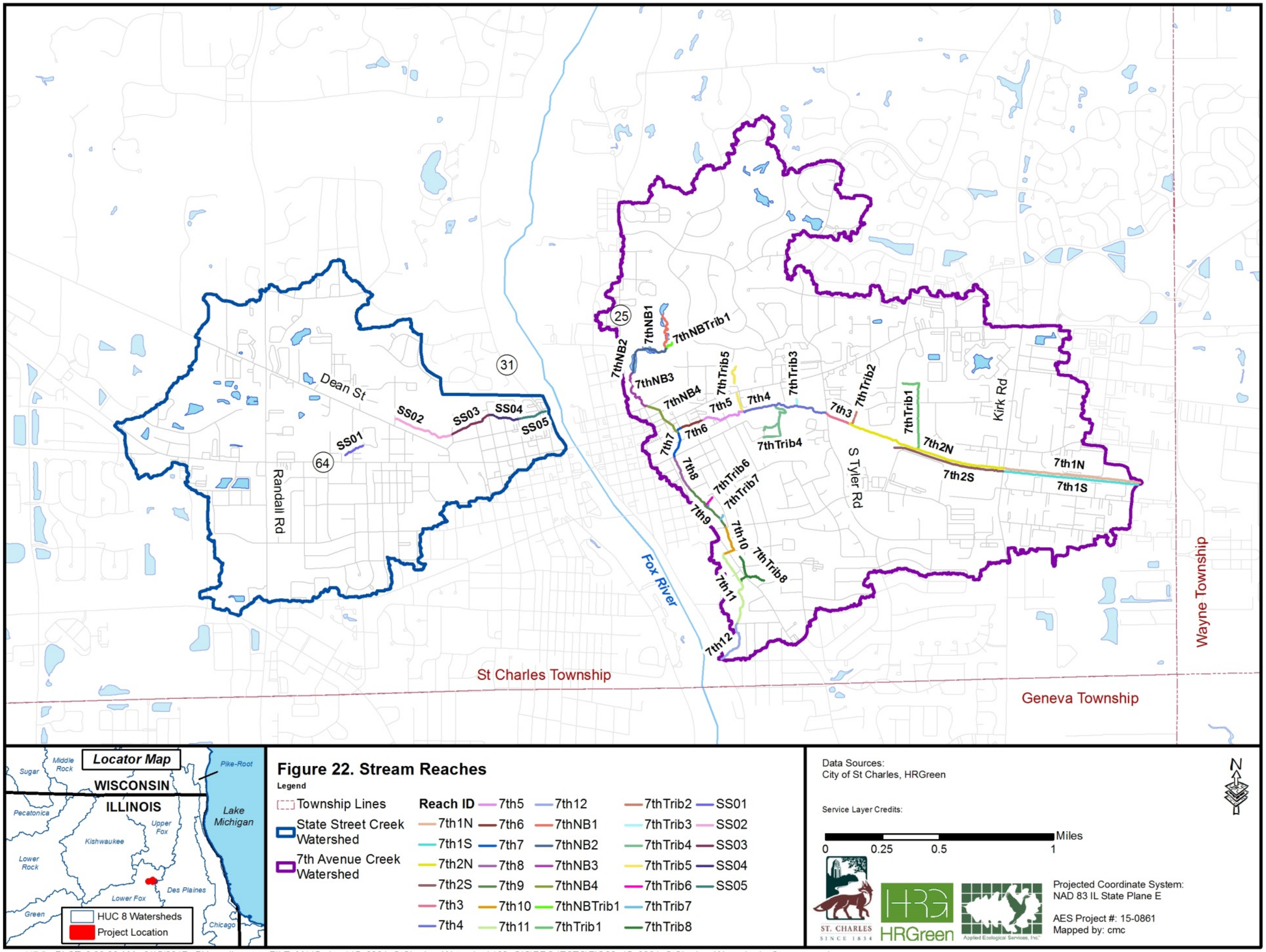
Both State Street Creek, 7th Avenue Creek, and all of the tributaries to 7th Avenue Creek are flashy, intermittent streams. This means that they tend to hold high volumes of fast moving water during and shortly after rain events, but dry up during drier periods. Table 13 summarizes the stream and tributary reaches and lengths and they are depicted in Figure 22.

***Photos** - top right: State Street Creek between 4th and 5th Avenue (Reach SS04), bottom right: 7th Avenue Creek where it is joined by 7th Avenue Creek North Branch (7th7).*

Table 13. Summary of stream and tributary reaches and length.

Stream or Tributary Name	Reach Abbreviation	Number of Reaches	Stream Length (ft)
State Street Creek Watershed			
State Street Creek	SS	5	4,331
7th Avenue Creek Watershed			
7th Avenue Creek	7th	14	23,717
7th Avenue Creek North Branch	7thNB	4	4,453
7th Avenue Creek North Branch Tributary 1	7thNBTrib1	1	381
Tributary 1	7thTrib1	1	1,933
Tributary 2	7thTrib2	1	340
Tributary 3	7thTrib3	1	169
Tributary 4	7thTrib4	1	1,889
Tributary 5	7thTrib5	1	926
Tributary 6	7thTrib6	1	260
Tributary 7	7thTrib7	1	118
Tributary 8	7thTrib8	1	1,178
Totals		**32**	**39,694**

In fall 2016, Applied Ecological Services, Inc. (AES) completed a field inventory of State Street Creek and 7th Avenue Creek. All streams and tributaries were assessed based on divisions into "Stream Reaches" (Table 13; Figure 22). 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

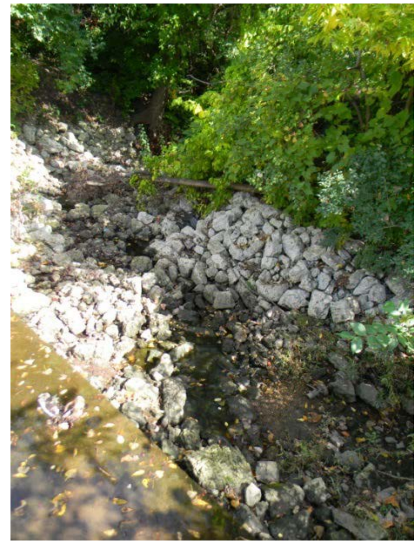


HRG PLOT: 9:00:39 AM 3/15/2017 BY: cecily.cunz FILE: M:\15_docs\15_0861_StCharles_Watersheds\02_GIS\PROJECTS\FIG22_15_0861_StCharles_Watersheds_Streams.mxd stream and tributary reaches, collecting measurements, taking photos, and noting channel, streambank, and riparian corridor conditions on Stream Inventory/BMP Data Forms. 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 A.

State Street Creek

State Street Creek was divided into 5 distinct "Stream Reaches" beginning at the furthest upstream reach nearly in the center of the watershed near the northwest corner of Main Street and N 15th St and ending at where the stream joins the Fox River.

All 5 reaches of State Street Creek are similar in that they are all part of man-made and heavily urbanized stream. The stream is completely buried in stormwater pipes between Reaches SS01 and SS02 and again in the downstream portion of reach SS05. All 5 reaches are heavily manipulated and channelized, with random stream bank armoring, retaining walls, and rock lining either bank. Riparian areas are either poor quality and dominated with invasive species such as buckthorn or non-existent with turf right up to the stream edge. Reaches SS01, SS02, and SS05 show moderate levels of erosion while Reaches SS03 and SS04 exhibit high levels of erosion with structures adjacent to streams being threatened or compromised. Sediment accumulation is generally low in all of the reaches, with few debris jams and moderate instream pool-riffle development.



Photos Left to right, top to bottom: Reaches SS01, SS02, SS02, SS03, SS04, and SS05.

7th Avenue Creek

7th Avenue Creek is divided into 14 distinct stream reaches, beginning in the far eastern portion of the watershed west of Kautz Rd and ending at the Fox River just west of the intersection of Riverside and Moore Avenue.

Reaches 7th1N, 7th1S, 7th2N, and 7th2S are ditched along the northern and southern banks of the old railroad bed, beginning at the eastern edge of the watershed and flowing generally west. Reach 7th2N ends where it is joined by 7thTrib 2 a little east of S Tyler Rd and Reach 7th2S ends at a large detention basin south of the railroad bed and east of S Tyler Rd. These 4 reaches are all very similar, exhibiting highly channelized streams as they are ditched along the railroad bed and poor riparian areas, thick with invasive species. Reach 7th2N is heavily eroded, while reaches 7th1N, 7th1S, and 7th2S exhibit moderate levels of erosion. All four reaches have high sediment accumulation and poor instream pool-riffle development, with sporadic debris jams.

Reach 7th3 is a short section of the main channel immediately east of S Tyler Rd that is completely lined with large rock both instream and up its banks. It is heavily channelized, has no riparian area, but exhibits low erosion due to the rock. It has no debris jams, no pool and riffles, and no sediment accumulation.

Reach 7th4 extends from S Tyler Rd to roughly 14th Avenue through commercial and industrial land uses. It exhibits moderate channelization, relatively low levels of erosion, and has a degraded riparian area, dominated with invasive species. This reach also has a moderate amount of debris jams as well as a lot of debris and commercial refuse dumped in the channel. Pool-riffle development is moderate as is sediment accumulation.

Left to right, top to bottom: 7th1N, 7th1S, 7th2N, 7th2S, 7th3, and 7th4.

Reaches 7th5 through 7th8 are similar in nature as they flow through a residential area from 14th Avenue to Washington Avenue. The majority of these reaches abut residential land on both sides, with turf right up to the stream edge and retaining walls and heavily armored banks common. Some retaining walls are failing and additional spot armoring will be necessary. These reaches are all highly channelized and all exhibit moderate levels of erosion. Reaches 7th5 through 7th7 exhibit poor riparian conditions, while reach 7th8 has an average riparian condition. All four reaches have high to moderate pool and riffle development, and low amounts of sediment accumulation and few debris jams.

Reaches 7th9 and 7th10 extend from Washington Ave south to a culvert under 7th Avenue. Along both reaches the western bank is at the bottom of a steep, wooded embankment while the eastern bank is a residential neighborhood. Both are highly channelized, exhibit moderate levels of erosion, and have riparian areas in average condition. Both reaches have moderate pool and riffle development and low amounts of sediment accumulation with a moderate amount of debris jams and some debris in the channel.

Reaches 7th11 and 7th12 extend from the culvert west of 7th Avenue and south of the baseball fields at Langum Park to Riverside Avenue and are divided at Beatrice Avenue. Both reaches are less channelized than elsewhere in the watershed with moderate to high levels of pool/riffle development, but exhibit heavily degraded riparian areas. Both exhibit moderately high erosion levels, particularly along the outside bends where stormwater structures and other infrastructure are often found exposed. Also, both of these reaches have sections of exposed bedrock in the stream channel as well as random stretches of bank armoring in varying condition and have low levels of debris jams and sediment accumulation.

Photos left to right, top to bottom: Reaches 7th5, 7th6, 7th7, 7th8, 7th9, 7th10, 7th11, and 7th12.

7th Avenue Creek North Branch

7th Avenue Creek North Branch is divided into 4 distinct stream reaches, beginning on private property north of Delnor Woods Park and ending where it joins the main stem of 7th Avenue Creek near Walnut and S 9th Avenues.

Reach 7thNB1, 7thNB2, and 7thNB3 are all relatively similar as they drain a series of man-made ponds through a woodland heavily overgrown with buckthorn and undergoing mesification. Mesification is a gradual change in woodland as it changes from an oak woodland to one dominated by maples and basswood, predominantly caused by a reduction in fire frequency and ground disturbance. Reach 7thNB1 extends from a pond on private property south to where it is joined by 7th NBTrib1. Reach 7thNB2 continues from there through two more ponds before ending at Delnor Pond, while Reach 7thNB3 continues from Delnor Pond to State Avenue just east of N 7th Avenue. These reaches exhibit low to moderate levels of erosion, with low levels of channelization and are moderately to highly sinuous. Sediment accumulation and debris jams are also low to moderate throughout these reaches.

Reach 7thNB4 begins at State Avenue and flows generally southeast through a heavily manipulated system of channels and stormwater pipes until it reaches the main stem of 7th Avenue Creek near Walnut and S 9th Avenues. This reach is moderately eroded, heavily channelized with low sinuosity and moderate pool/riffle development. Debris jams are low and sediment accumulation is moderate, but debris apparent in the channel. The riparian condition is poor throughout this section with little to no riparian buffer present. Some retaining walls are failing and spot armoring will be necessary.

7th Avenue Creek Tributaries

7th Avenue Creek has eight tributaries, ranging in size from 119 to 1,993 linear feet (Figure 22). Due to the small size, lack of access to many of these tributaries, and that most of these stretches would make for poor water quality improvement projects, they were not assessed.

Photos left to right, top to bottom: Reaches 7thNB1, 7thNB2, an impoundment on 7thNB2, and Reach 7thNB3.

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.

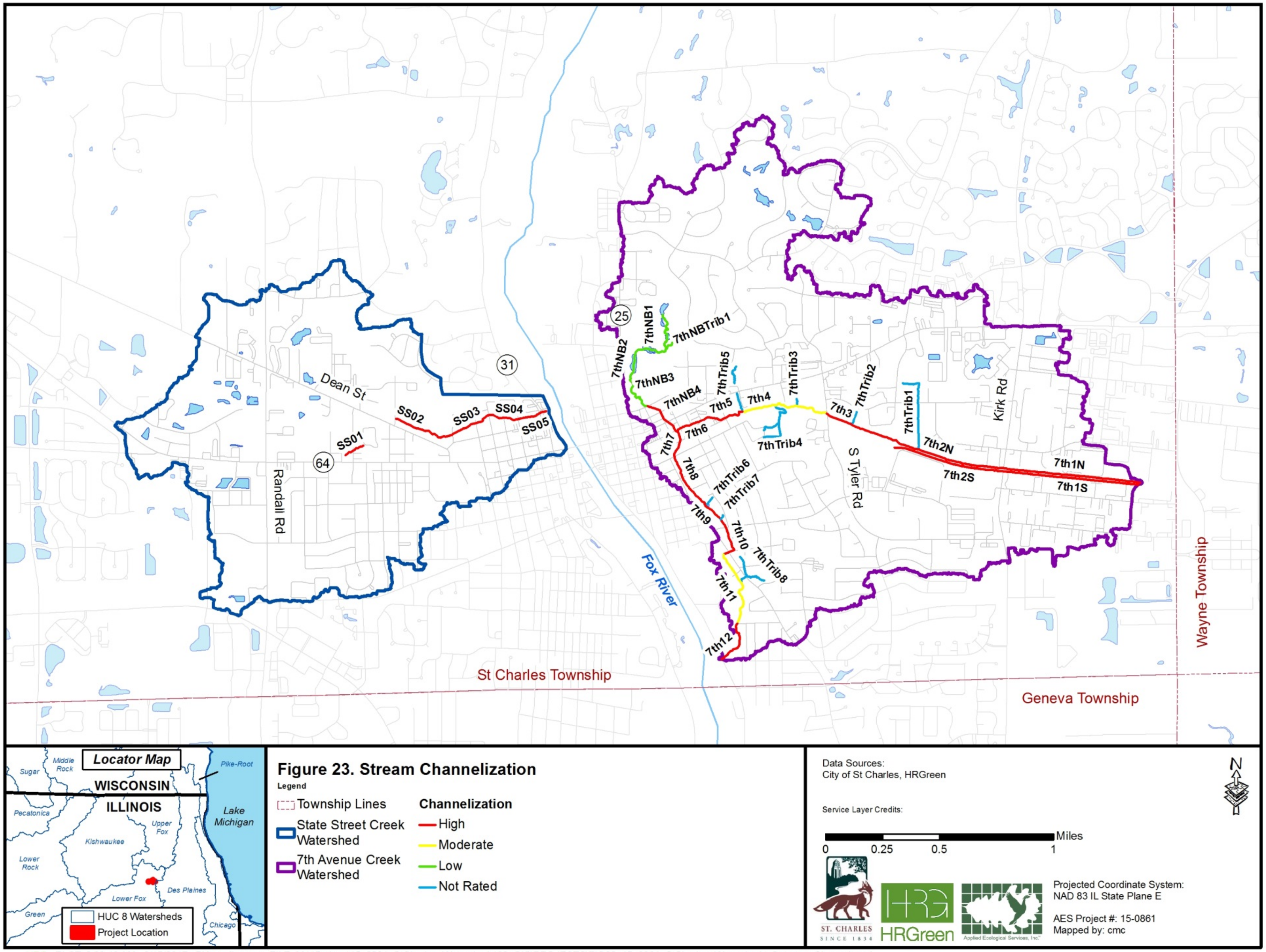
Each stream reach in the watersheds were characterized as either having none or low channelization (highly sinuous, no human disturbance), moderate channelization (some sinuosity but altered), or highly channelized (straightened by humans) (Table 14; Figure 23). According to the stream inventory, 11% (3,486.8 lf) of stream and tributary length is naturally meandering; approximately 12% (3,979.2 lf) is moderately channelized; 77% (25,035.0 lf) is highly channelized. The most severe channelization is found all through State Street Creek and where 7th Avenue Creek follows the old railroad bed where 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 channelization.

Stream or Tributary Name	No or Low Channelization (feet)	(%)	Moderate Channelization (feet)	(%)	High Channelization (feet)	(%)
State Street Creek Watershed						
State Street Creek	0	0%	0	0%	4,331.1	100%
7th Avenue Creek	0	0%	3,979.2	11%	19,737.8	83%
7th Avenue Creek North Branch	3,486.8	78%	0	0%	966.1	22%
Totals	**3,486.8**	**11%**	**3,979.2**	**12%**	**25,035.0**	**77%**

Example of high channelization in 7th Avenue Creek Reach 2N along old railroad bed



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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 watersheds and is a reflection of increased impervious cover and stormwater runoff.

The location and severity of streambank erosion in the watershed is summarized in Table 15 and depicted on Figure 24. Approximately 13% (4,258.3 lf) of the total stream and tributary length exhibits no or low bank erosion while moderate erosion is occurring along 68% (22,116.6 lf) of streambanks. Highly eroded streambanks occur in both watersheds accounting for 19% (6,126.1 lf) of the total stream length. Many highly eroded reaches are considered "Critical Areas" because they are actively contributing significant sediment loads downstream as well as pose a threat to structures and property.

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 streambank erosion.

Stream or Tributary Name	No or Low Erosion		Moderate Erosion		High Erosion	
	(feet)	(%)	(feet)	(%)	(feet)	(%)
State Street Creek Watershed						
State Street Creek	0	0%	2,627.8	61%	1,703.2	39%
7th Avenue Creek Watershed						
7th Avenue Creek	2,075.7	9%	17,218.4	73%	4,422.9	19%
7th Avenue Creek North Branch	2,182.6	49%	2,270.4	51%	0	0%
Totals	**4,258.3**	**13%**	**22,116.6**	**68%**	**6,126.1**	**19%**

Example of highly eroded streambanks along State Street Creek Reach 3

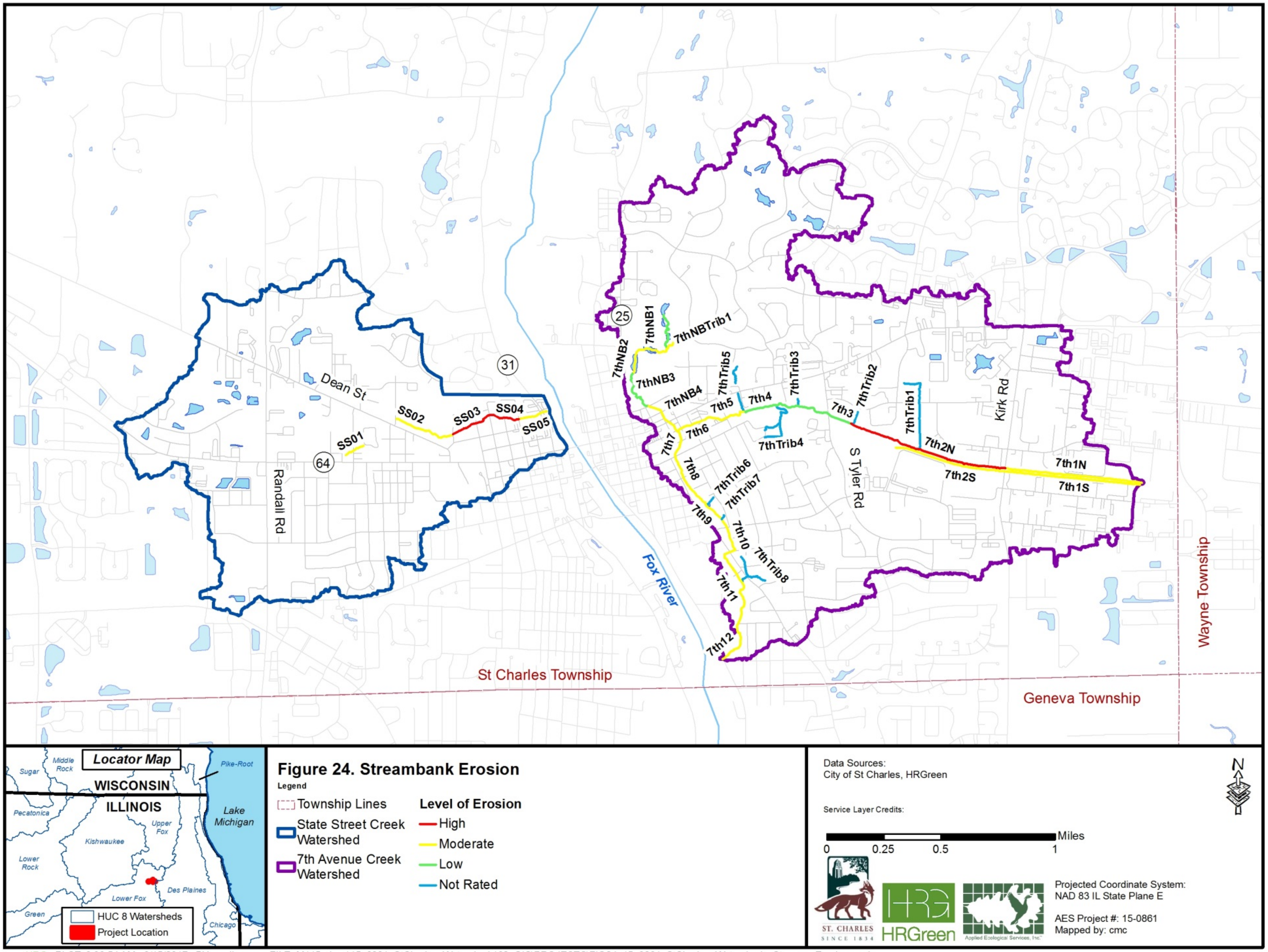

Figure 24. Streambank Erosion

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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 altered in the past causing degraded plant communities to establish.

The location and condition of riparian areas in the watershed are summarized in Table 16 and Figure 25. Approximately 23% (7,531.6 lf) of the riparian areas are at least "Moderate" quality and are found predominantly along the western portions of 7th Avenue Creek watershed. The remaining 77% (24,987.4 lf) of riparian areas are in "Poor" condition; 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*), and common buckthorn (*Rhamnus cathartica*) 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.

Table 16. Summary of stream area riparian condition.

Stream or Tributary Name	Good Condition (feet)	(%)	Average Condition (feet)	(%)	Poor Condition (feet)	(%)
State Street Creek Watershed						
State Street Creek	0	0%	0	0%	4,331.1	100%
7th Avenue Creek	0	0%	4,026.8	17%	19,690.2	83%
7th Avenue Creek North Branch	0	0%	3,486.8	78%	966.1	22%
Totals	**0**	**0%**	**7,531.6**	**23%**	**24,987.4**	**77%**

Example of heavily degraded riparian area along 7th Avenue Creek Reach 11

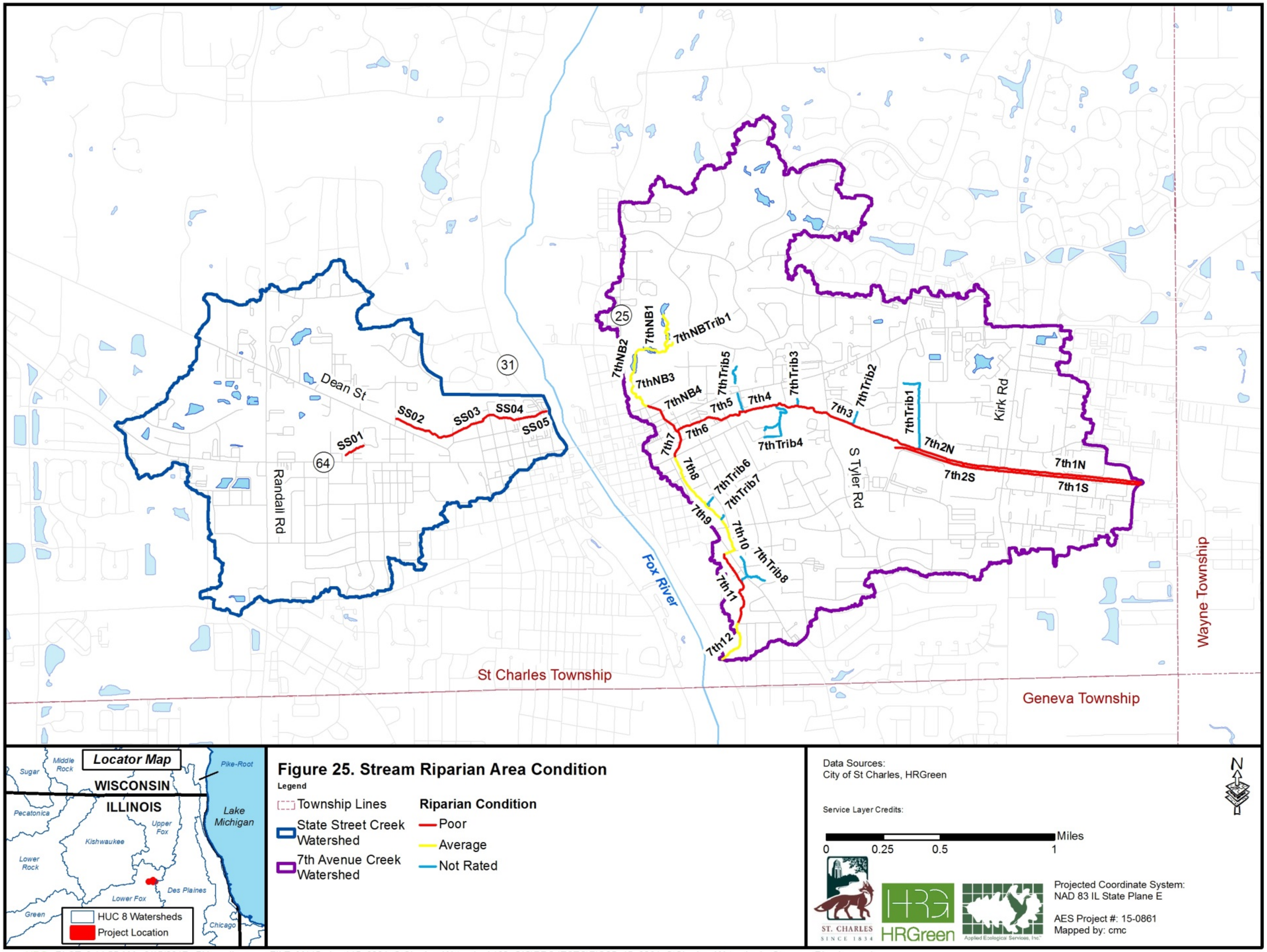

Figure 25. Stream Riparian Area Condition

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2.2.7 DETENTION BASINS

Over the past 100+ years, the drainage system in State Street Creek and 7th Avenue Creek watersheds have changed from farmland driven drain tiles, channels, and ditches to ones driven by runoff from developed areas. Planners and engineers eventually 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 generally meant to prevent flooding. 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 both streams.

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 - Hunt Club Wetland is a great example of such a basin. 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.

Applied Ecological Services, Inc. completed a basic assessment of 75 detention basin in fall 2016 (Figure 26). 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 A. The inventory resulted in 35 dry bottom with turf slopes, 32 wet bottom with turf slopes, and 8 naturalized wetland bottom basins (Figure 26).

Of the 75 basins, only 2 (3%) likely provide “Good” ecological and water quality benefits while 19 basins (25%) likely provide “Average” benefits. The remaining 54 basins (72%) likely provide “Poor” ecological and water quality benefits because most were designed simply to meet stormwater storage volume requirements (Figure 27). Designs that also improve water quality and wildlife habitat were not necessarily considered because they are not required under local and federal regulations.

Typical dry bottom turf basin behind Sportsplex in State Street Creek watershed

All of the 35 dry bottom basins in the watersheds are planted with turf grass and provide 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. In addition, some of the dry bottom basins are constructed with either outlet drains flush with the bottom of the basin or have concrete low flow channels that run directly from the inlet to the outlet. 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 watersheds. 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. Two (2) of the 40 wet and wetland bottom detention basins in the watershed are naturalized with native vegetation, one in each watershed. 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.

Top: typical wet bottom basin at Foundry Business Park Sportsplex; Bottom: typical wetland bottom detention at Foundry Business Park

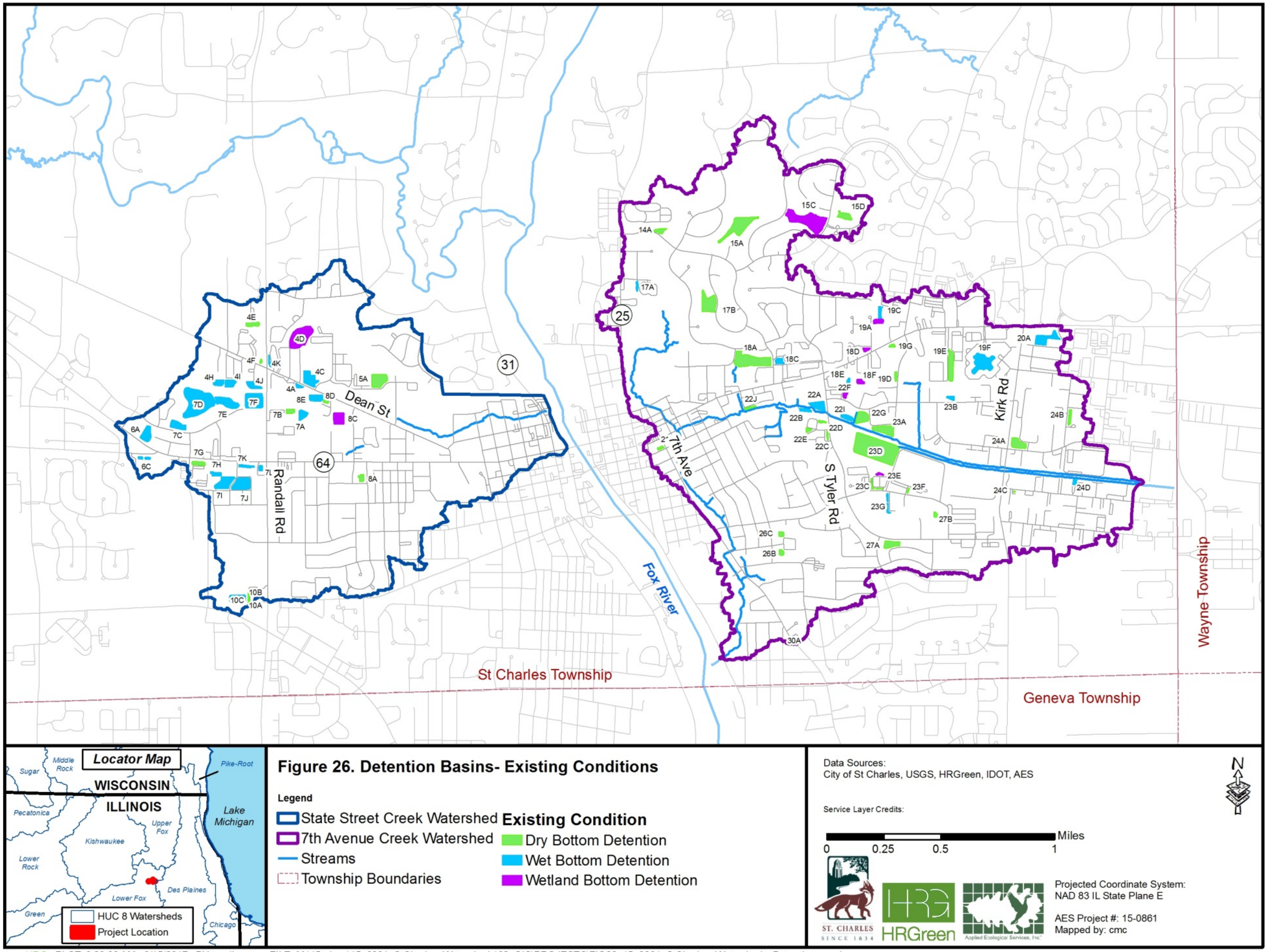

Figure 26. Detention Basins- Existing Conditions

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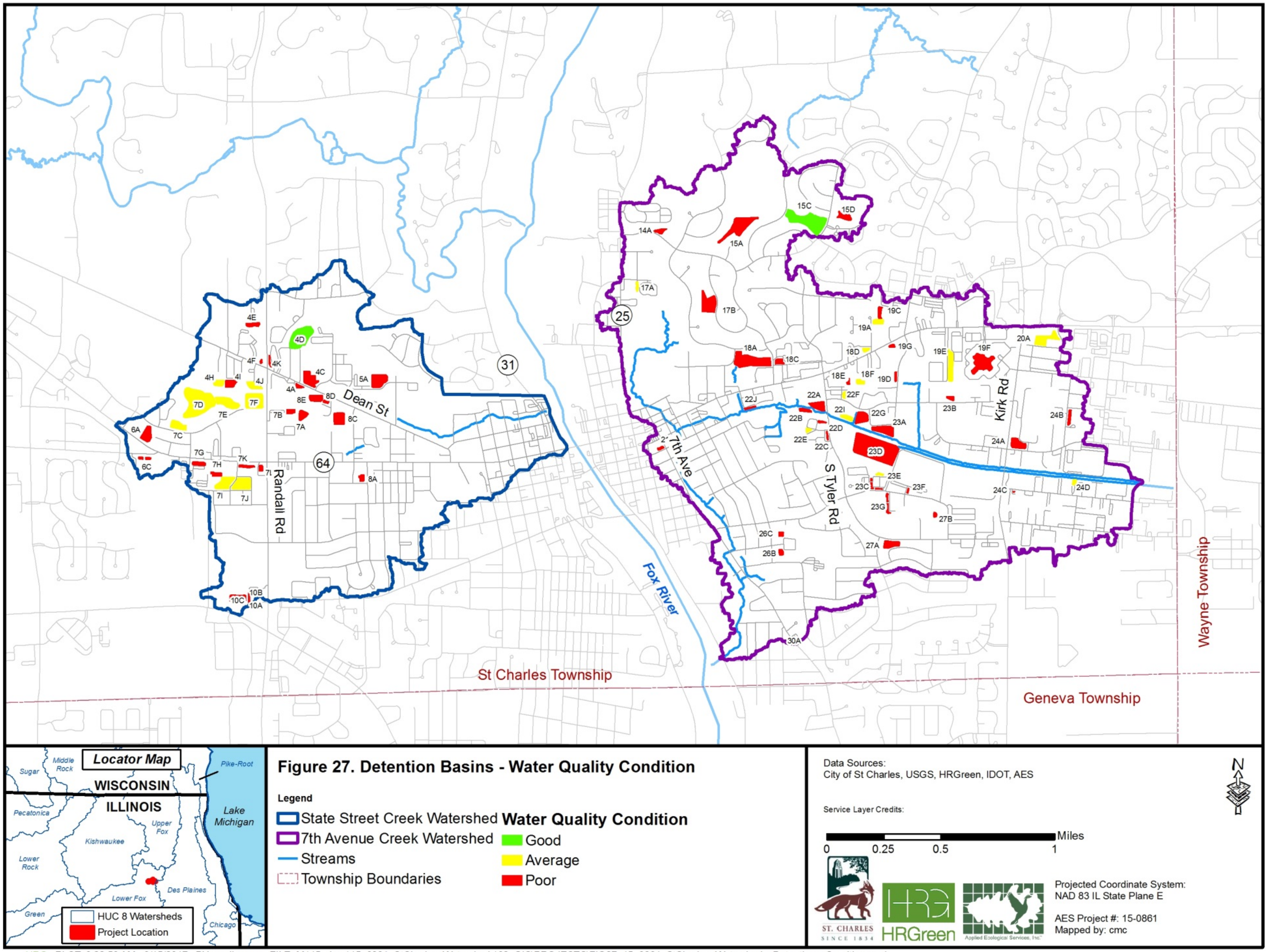

Figure 27. Detention Basins - Water Quality Condition

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2.2.8 WETLANDS

While no wetlands were apparent on the earliest survey maps, a network of wetlands most likely existed in State Street Creek and 7th Avenue Creek watersheds where hydric soils remain today. In the late 1830s, European settlers began to alter significant portions of the watershed's natural hydrology and wetland processes. Where it was feasible, sedge meadow and wet prairie communities were drained, ditches were created, and existing vegetation cleared to farm the rich soils or create space for development. There were approximately 254.5 acres of wetlands in the State Street Creek watershed and roughly 413.8 acres of wetlands in the 7th Avenue Creek 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 Kane County ADID (Advanced Identification, 2000) wetland inventories, 65.8 acres or 26% of the pre-European settlement wetlands remain in the State Street Creek watershed and 94.1 acres or 23% remain in 7th Avenue Creek watershed (Figure 28). Kane County further categories there wetlands by type - there are 79.4 acres of high functional value wetlands and 80.5 acres of other wetlands across State Street Creek and 7th Avenue Creek watersheds.

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 State Street Creek and 7th Avenue Creek watersheds via the United States Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI).

The vast majority of pre-settlement wetlands were drained or degraded by farming practices or as part of urbanization at some point in the last 150 years to the extent that hydrology has changed and invasive species such as common and glossy buckthorn (*Rhamnus sp.),* reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites australis*) now dominate.

State Street Creek and 7th Avenue Creek watersheds both have existing wetlands remaining in varying conditions that will need to be managed in the future. In State Street Creek, these include a high functional value wetland complex in a commercial/residential area just northwest of Route 64 and Randall Rd, surrounding the pond at Timber Trails Park, and an area adjacent to the St. Charles Park District office. In 7th Avenue Creek, existing wetlands include Hunt Club Wetland (used as detention, but still a wetland), a large complex of high functional value wetlands within Persimmon Woods Park, portions of Delnor Woods, and a number of stream corridors along the main stem of 7th Avenue Creek.

Wetland and pond at Timber Trails Park in State Street Creek watershed

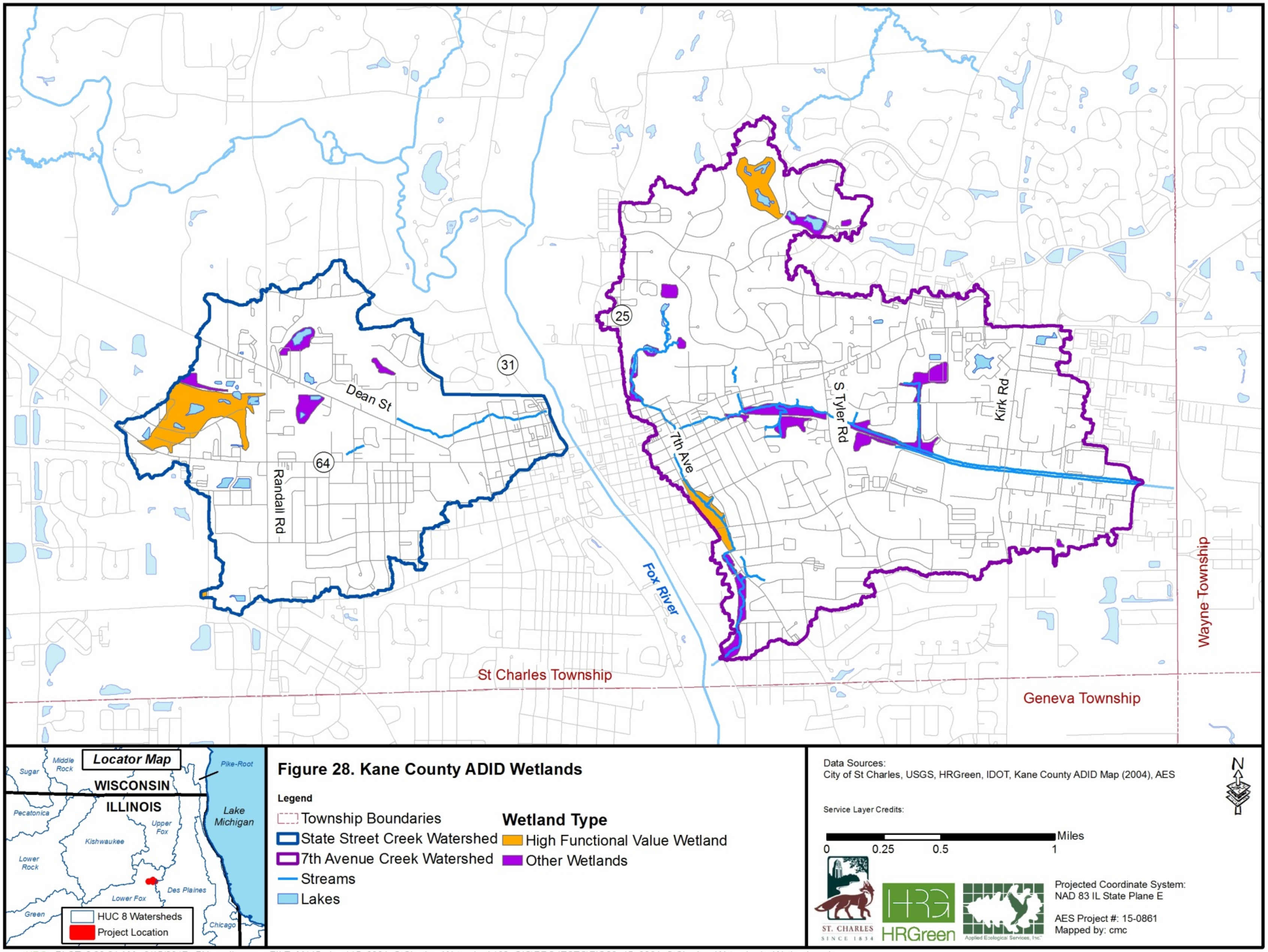

Figure 28. Kane County ADID Wetlands

HRG PLOT: 9:28:21 AM 3/15/2017 BY: cecily.cunz FILE: M:\15_docs\15_0861_StCharles_Watersheds\02_GIS\PROJECTS\FIG28_15_0861_StCharles_Watersheds_Wetland.mxd

2.2.9 FLOODPLAINS, FLOODWAY, & 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), while the 500-year floodplain is the area that has a 0.2% percent chance of being inundated in any given year. 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 59 depicts the 100-year floodplain and floodway in relation to a hypothetical stream channel.

As expected, the mapped floodplain in the watershed closely follows the streams and tributaries within the downstream portions of the watersheds. Figure 30 depicts the 100-year floodplain, 500-year floodplain, and the floodway within the watersheds. The most extensive floodplain areas are associated with the stream corridors along the main stems of both State Street Creek and 7th Avenue Creek. Development has encroached on the floodplain in many of these areas.

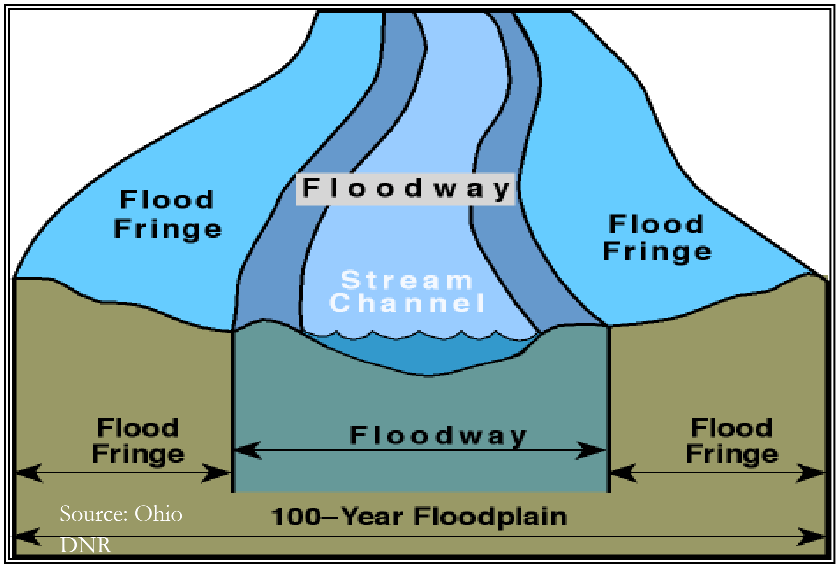

Figure 29. 100-year floodplain and floodway depiction.

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. The location and condition of six documented FPAs was obtained from information provided by watershed stakeholders during one of the public meetings and are mapped on Figure 30.

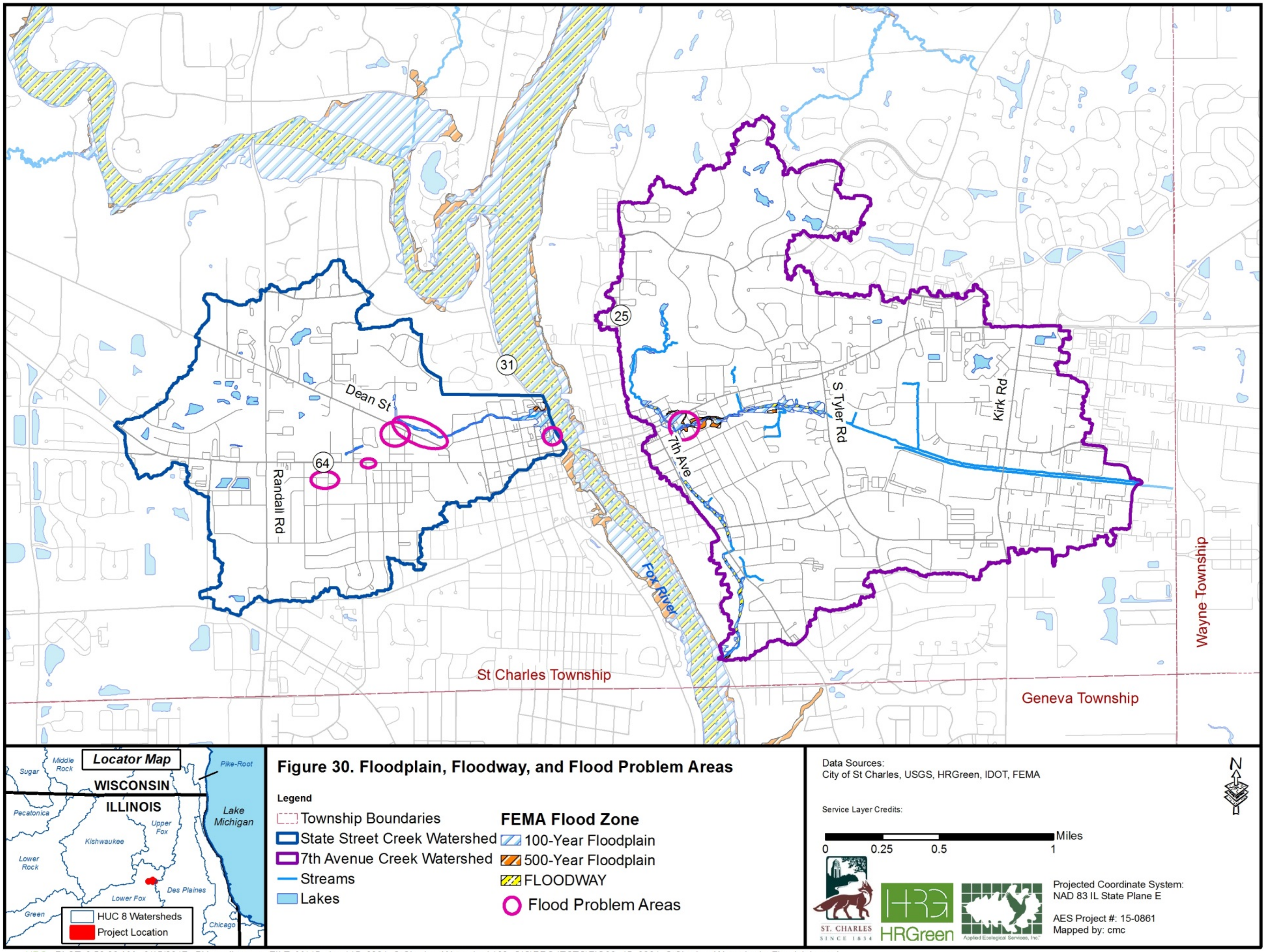

Figure 30. Floodplain, Floodway, and Flood Problem Areas

2.2.10 WASTEWATER & NPDES PERMITS

Water quality can be adversely affected by both point and nonpoint source pollutants. Point sources are identified as any discharge that comes from a pipe or permitted outfall, such as municipal and industrial discharges. Section 402 of the federal Clean Water Act established the National Pollutant Discharge Elimination System. This program regulates point source discharges of pollutants into United States waters and sets specific limits on discharges from point sources, establishes monitoring and reporting requirements, and establishes exceptions. The permitting program is designed to prevent storm water runoff from washing harmful pollutants into local surface waters such as streams, rivers, lakes or coastal waters. It also allows for the USEPA to authorize states to assume many of the permitting, administrative and enforcement responsibilities of the program (EPA, 2012).

Municipal and industrial discharges to State Street and 7th Avenue Creek and tributaries are regulated by Illinois Environmental Protection Agency Bureau of Water. There are a total of two permitted NPDES sites within State Street Creek watershed and eight in the 7th Avenue Creek watershed (Table 17, Figure 31). Of these, there is one municipal permit that falls within 7th Avenue Creek watershed – the St. Charles Wastewater Treatment Facility, however it discharges directly to the Fox River, not 7th Avenue Creek. Water quality data collected at this facility over the last ten years was reviewed, but not included in this report since the discharge is outside of the watershed boundaries.

Table 17. Active NPDES permit facilities.

Permit ID	Facility Name	Permit Class
State Street Creek Watershed		
ILG870429/ ILR400131	ST. CHARLES TOWNSHIP HWY DEPT	Minor
ILR105363	FOUNDRY BUSINESS PARK	Minor
7th Avenue Creek Watershed		
IL0022705	ST. CHARLES WASTEWATER TREATMENT FACILITY	Major
ILR10J702	LEGACY CENTER OF SAINT CHARLES BLDG 1,11,13	Minor
ILR000472	CHICAGO MOLD ENGINEERING CO INC	Minor
ILR005532	SMURFIT STONE CORP-ST. CHARLES	Minor
ILR006566	CONAGRA FOODS	Minor
ILR006774	SYSTEM SENSOR/HONEYWELL	Minor
WYG480026	CLARK ENVIRONMENTAL MOSQUITO MANAGEMENT, INC.	Minor
ILR003494	BLUEGRASS LABELS-FORMERLY	Minor

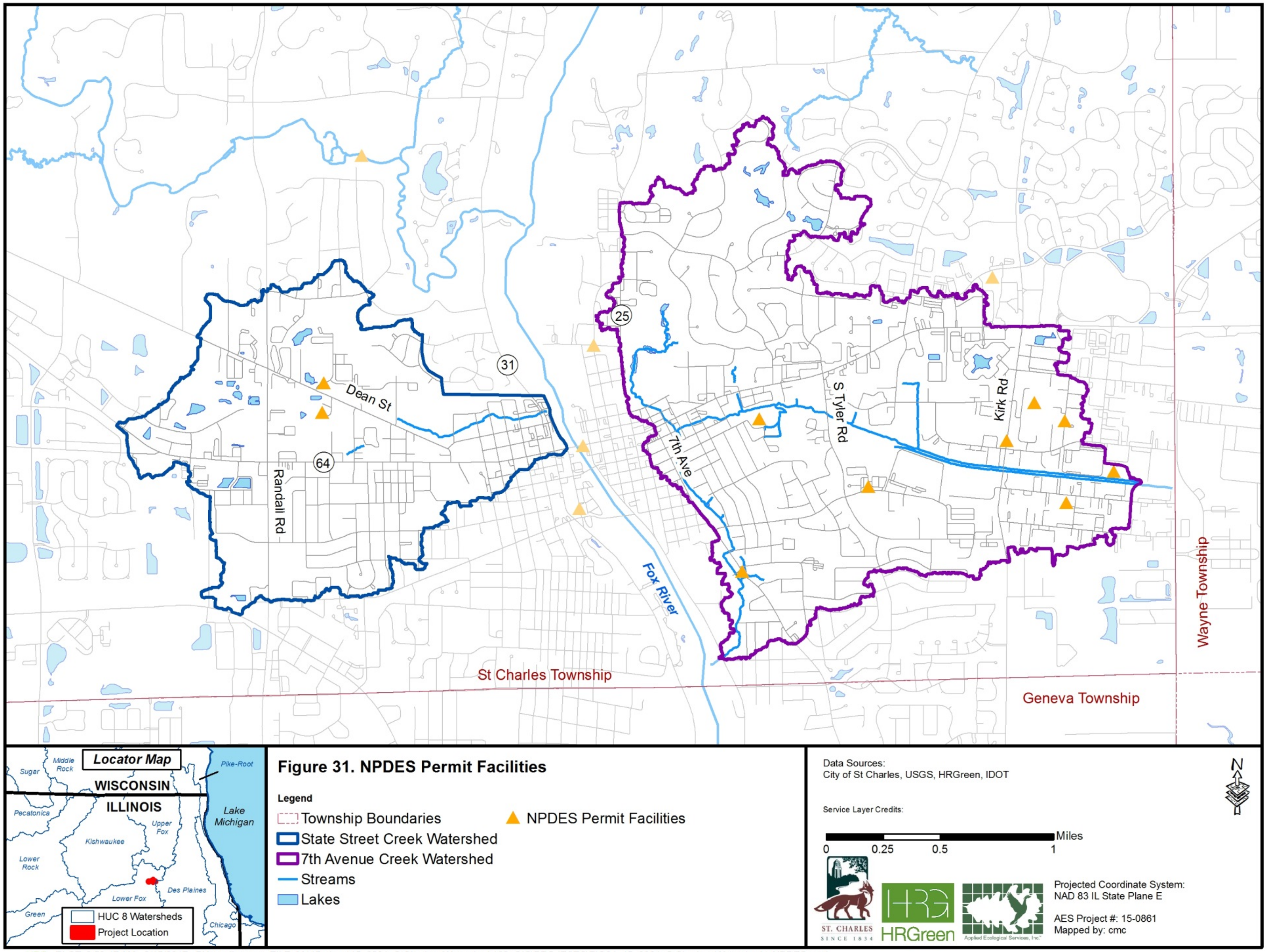

Figure 31. NPDES Permit Facilities

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2.2.11 GROUNDWATER

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 63). 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.

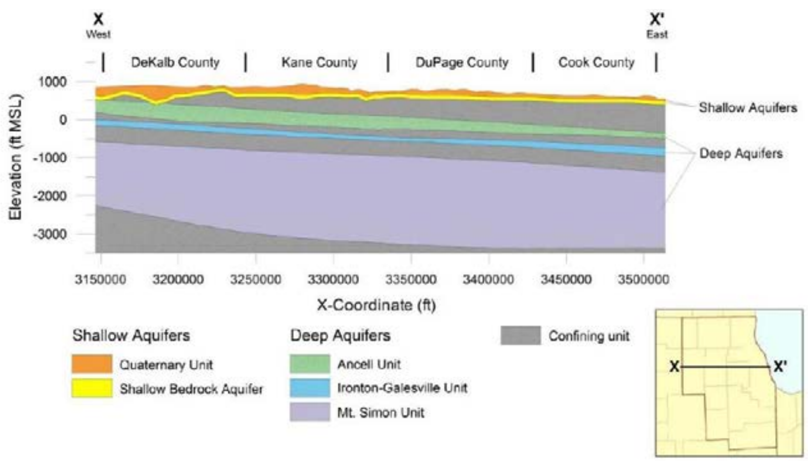

Figure 32. Northeastern Illinois deep and shallow aquifer units (ISWS 2012).

Groundwater modeling studies conducted for Northeastern Illinois Regional Water Supply Planning area by the Illinois State Water Survey (ISWS, 2012) suggest that by 2050 groundwater drawdown levels could be as much as 550 feet in the Ancell Unit and over 1,100 feet in the Ironton-Galesville Unit by 2050. These deep aquifer Units are the principal deep aquifers in the region. Ultimately, groundwater models suggest that additional drawdown, reduction in stream base flow to the Fox River, and changes in the quality of groundwater from deep wells are all possible in the future (ISWS, 2012).

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 2007 IDNR and Illinois State Geological Survey developed a map of potential aquifer sensitivity to contamination for Kane County, Illinois (Dey et al 2007). Figure 33 and Table 18 depict the results of that mapping for State Street Creek and 7th Avenue Creek watersheds, where aquifer contamination potential is generally moderate to moderately low. For additional information on groundwater please see Section 2.2.6 of the Ferson-Otter Creek Plan.

Table 18. Potential for aquifer contamination (Dey et al 2007).

Aquifer Sensitivity Classification	Acres	Percent
High Potential	109.6	3.8%
Moderately High Potential	104.7	3.6%
Moderate Potential	1,308.9	44.9%
Moderately Low Potential	1,273.0	43.7%
Low Potential	118.8	4.1%
Totals	**2,915.0**	**100.0%**

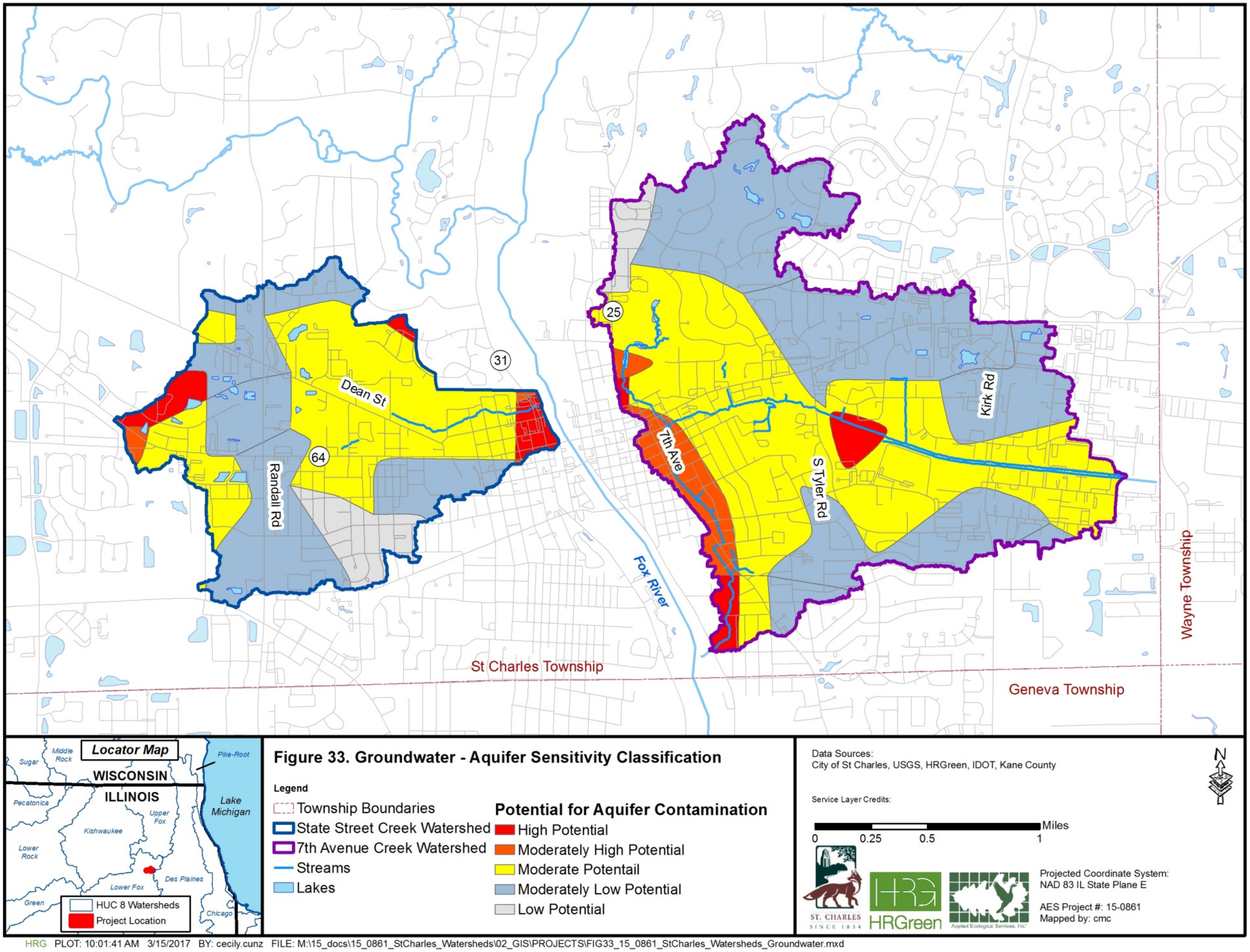

Figure 33. Groundwater - Aquifer Sensitivity Classification

Community Water Supply

Groundwater is an essential resource to much of Kane County as underlying aquifers provide the drinking water supply for many people. Two (2) active public wells are located within State Street and 7th Avenue Creek watershed boundaries while the City holds another 5 outside of the watershed boundaries (Table 19). These are a mix of deep and artesian wells, ranging in depth from 52 to 821 feet. 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.

Table 19. Public, active wells in St. Charles (St. Charles, 2017).

Well Number	Well Depth	Pump Depth
Well 3	1191	804
Well 4	1645	821
Well 7	172	110
Well 8	1366	811
Well 9	86	679
Well 11	129	52
Well 13	0	120

3.0 WATER QUALITY & MODELING RESULTS

The primary goal of this watershed plan is to guide efforts to protect and restore surface water quality in State Street Creek and 7th Avenue Creek watersheds. Section 305(b) of the Federal Clean Water Act requires 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.* Unfortunately due to the small size of both State Street and 7th Avenue Creek, neither stream was assessed in Illinois EPA's most recent 2016 *Integrated Water Quality Report and Section 303(d) List* nor was there any water quality sampling data available for either stream via EPA's STORET database or Fox River Study Group's water quality database. A search for any additional chemical or biological water quality data found neither.

3.1 WATER QUALITY ASSESSMENT

Lacking any chemical or biological water quality data, Applied Ecological Services (AES) conducted water quality sampling for both State Street and 7th Avenue Creek in order to establish baseline water quality conditions. The results of this sampling show moderate overall impairment from elevated total phosphorus, total nitrogen, total suspended solids (sediment), and biological oxygen demand (BOD) in both watersheds.

Elevated phosphorus and nitrogen (nutrient) levels are a problem under the right conditions and can lead to a chain of undesirable events in streams such as accelerated plant growth, algae blooms, low dissolved oxygen, and death of some aquatic organisms. BOD is the amount of oxygen required by aerobic microorganisms to decompose organic matter in a sample of water. Elevated nutrient levels can contribute to high BOD levels. It is assumed in this plan that nutrient reductions will improve BOD levels. 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.

Applied Ecological Services, Inc. (AES) collected water chemistry samples at the most downstream portion of each creek before it reached the Fox River in an attempt to capture a snapshot of water quality near the point where water leaves the watershed. The sample location for State Street Creek was immediately east of where the creek crosses 4th Avenue and the sample location for 7th Avenue Creek was just east of where the creek crosses Riverside Avenue (Figure 34). Samples were taken at both locations on October 7th, 2016 after a 0.5 inch rain event and on October 26th, 2016 after a 1+ inch rain event.

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, chloride and biological oxygen demand. Water chemistry results are summarized in Table 20. Both streams exceed water quality criteria for total phosphorus, total nitrogen, total suspended solids, and biological oxygen demand.

State Street Creek (left) and 7th Avenue Creek (right) conditions during sampling on October 26th, 2016

Nitrogen levels in State Street Creek are particularly high, most likely a result of being a buried stream. According to research, nitrogen generally travels 18 times further in a buried stream than in an open stream due to the lack of plants and other organic matter that could feed on those nitrates, keeping streams healthy and oxygenated (Bliss 2015). One solution is to daylight or unbury streams.

While fecal coliform was noted as a water quality issue within the Ferson-Otter Creek Watershed Plan, there is no data to suggest that fecal coliform is a problem within State Street Creek and 7th Avenue Creek and pathogen testing is prohibitively expensive and outside the parameters of this watershed plan. However, the vast majority of water quality improvement projects recommended within the watershed plan also reduce pathogens in streams.

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 State Street Creek and 7th Avenue Creek watersheds.

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 streams, to develop pollution reduction targets and measure future success, 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 the watersheds.

Table 20. Water chemistry data summary.

Parameter	Statistical, Numerical, or General Use Guidelines	Location & Date			
		State St Oct 7th, 2016	State St Oct 26th, 2016	7th Ave Oct 7th, 2016	7th Ave Oct 26th, 2016
pH	>6.5 or <9.0*	7.61	7.5	8.11	7.54
Chloride	<500 mg/l*	294 mg/L	39.6 mg/L	51 mg/L	26.7 mg/L
Total Phosphorus	<0.0725 mg/l**	0.12 mg/L	0.27 mg/L	0.12 mg/L	0.14 mg/L
Total Nitrogen	<2.461 mg/l**	5.965 mg/L	5.817	2.475 mg/L	5.33
Ammonia-Nitrogen	<15 mg/l*	0.1 mg/L	0.18 mg/L	<0.1 mg/L	0.25 mg/L
Total Suspended Solids	<19 mg/l***	6 mg/L	28 mg/L	122 mg/L	18 mg/L
Bio. Oxygen Demand	<5.0 mg/l*	<7 mg/L	9 mg/L	<6 mg/L	6 mg/L
Conductivity	<1,667 µmhos/cm	1,343 µmhos/cm	225 µmhos/cm	554 µmhos/cm	155.4 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 & 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)

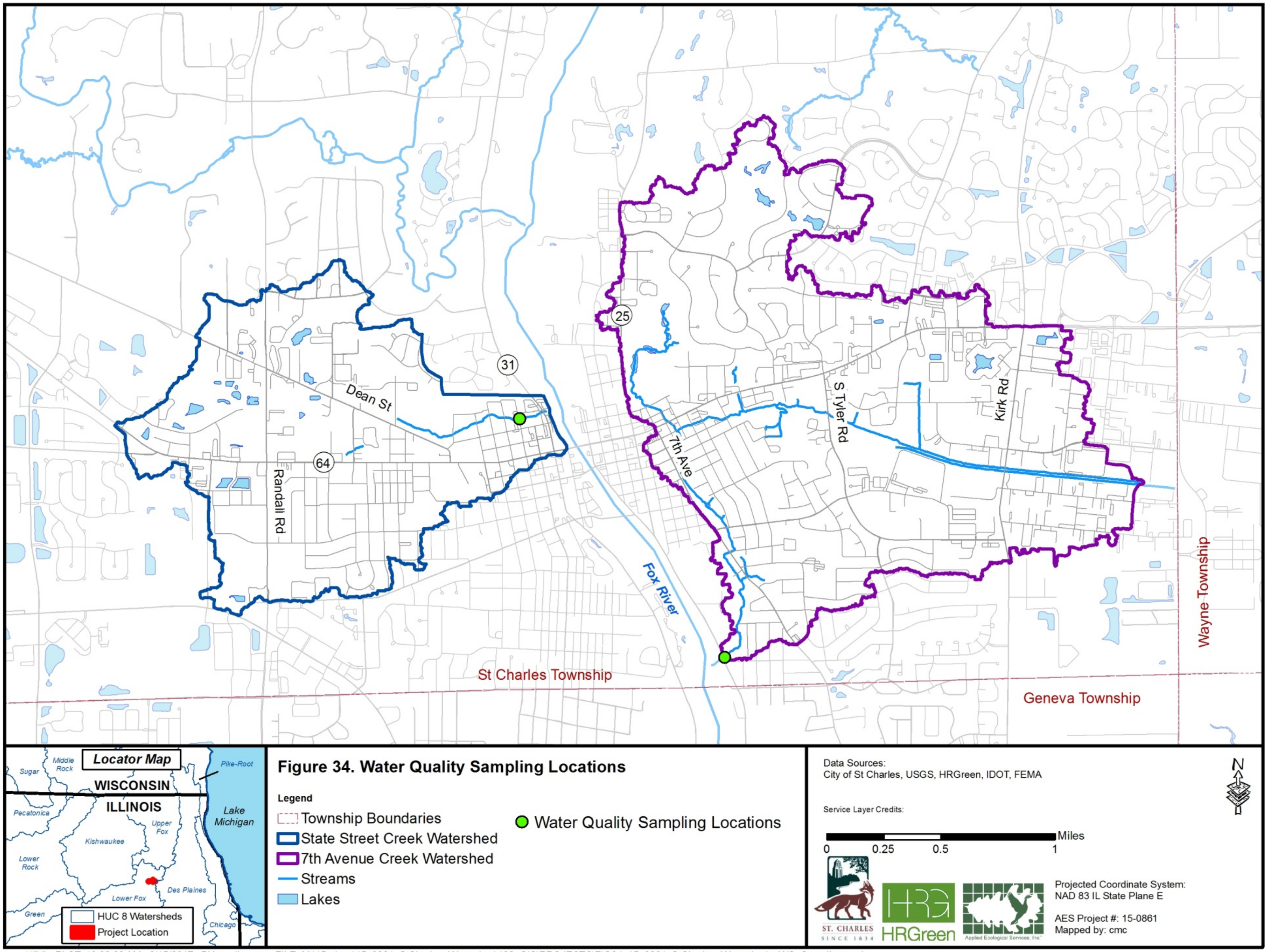

Figure 34. Water Quality Sampling Locations

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3.2 POLLUTANT LOADING MODEL RESULTS

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 State Street Creek and 7th Avenue Creek watersheds as a whole and by individual Subwatershed Management Unit (SMU). The model uses land use/land cover category types, precipitation, soils information, existing best management practices, and other data to model outputs of average annual pollutant load for each of the land use/cover types. The results of this analysis were 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 indicate that State Street Creek and 7th Avenue Creek watersheds produce 17,018.9 lbs/yr of nitrogen, 2,581.0 lbs/yr of phosphorus, and 460.1 tons/yr of sediment (Table 21; Figure 35). Urban land uses contribute over 93% of the nitrogen, phosphorus, and sediment loading within the watersheds, with all remaining land uses contributing less than 5% each of any one pollutant. These results are in expected since the watersheds are highly urbanized and heavily built out.

Table 21. Estimated existing (2015) annual pollutant load by source.

STEPL Source	N Load (lbs/yr)	% of Total Load	P Load (lbs/yr)	% of Total Load	Sediment (tons/yr)	% of Total Load
Urban	15,892.7	93.4%	2,399.7	93.0%	348.8	93.0%
Cropland	232.5	1.4%	53.4	2.1%	23.0	2.1%
Pastureland	752.3	4.4%	69.3	2.7%	13.0	2.7%
Forest & Grassland	38.5	0.2%	18.8	0.7%	1.2	0.7%
Water/ Wetland	2.1	0.0%	1.0	0.0%	0	0.0%
Streambank Erosion	100.8	0.6%	38.8	1.5%	74.1	1.5%
Total	**17,018.9**		**2,581.0**		**460.1**	

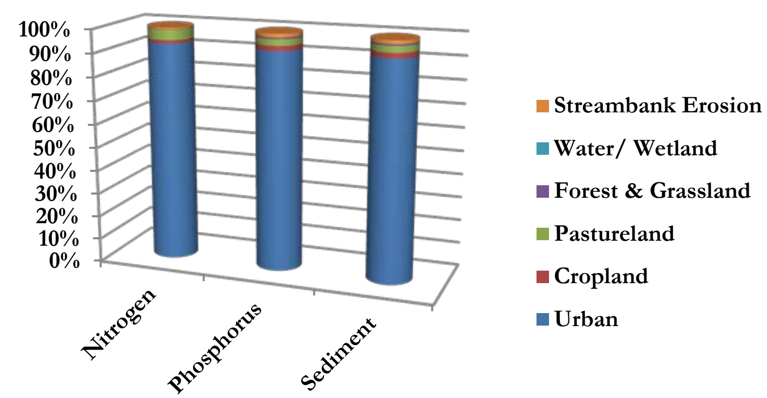

Figure 35. Estimated percent contributions to existing (2015) pollutant load by source.

The results of the STEPL model were also analyzed for nonpoint source pollutant loads at the Subwatershed Management Unit (SMU) scale. This 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 all pollutants. 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 lower concentration of pollutants relative to other SMUs. Table 22 and Figure 36 depict and summarize the results of the SMU scale pollutant loading analysis.

Six of the 21 SMUs comprising State Street Creek and 7th Avenue Creek watersheds are considered "High Concentration" pollutant load Hot Spots for nitrogen, phosphorus, and sediment based on STEPL modeling – SMUs 9, 14, 16, 19, 20, and 21. Five SMUs are considered "Moderate Concentration" pollutant load Hot Spots for the same pollutants – SMUs 2, 4, 15, 17 and 18. The remaining SMUs contribute either "Moderately Low" or "Low" concentrations based on modeling.

Table 22. Pollutant load "Hot Spot" SMUs.

Hot Spot SMU	Size (Acres)	N Load (lbs/yr) /acre	P Load (lbs/yr) /acre	Sediment Load (lbs/yr) /acre
High Concentration Hot Spot SMUs				
W19	88.2	12.4	3.0	3.4
W09	197.7	7.8	1.7	1.6
W21	105.8	8.7	1.6	0.7
W20	111.5	8.6	1.5	0.6
W14	422.7	6.9	1.7	1.9
W16	155.7	7.7	0.9	0.2
Moderate Concentration Hot Spot SMUs				
W02	115.4	7.2	1.1	0.2
W15	148.1	7.1	1.0	0.3
W04	71.9	7.3	0.8	0.1
W18	125.4	6.9	1.0	0.2
W17	197.5	6.3	1.0	0.2

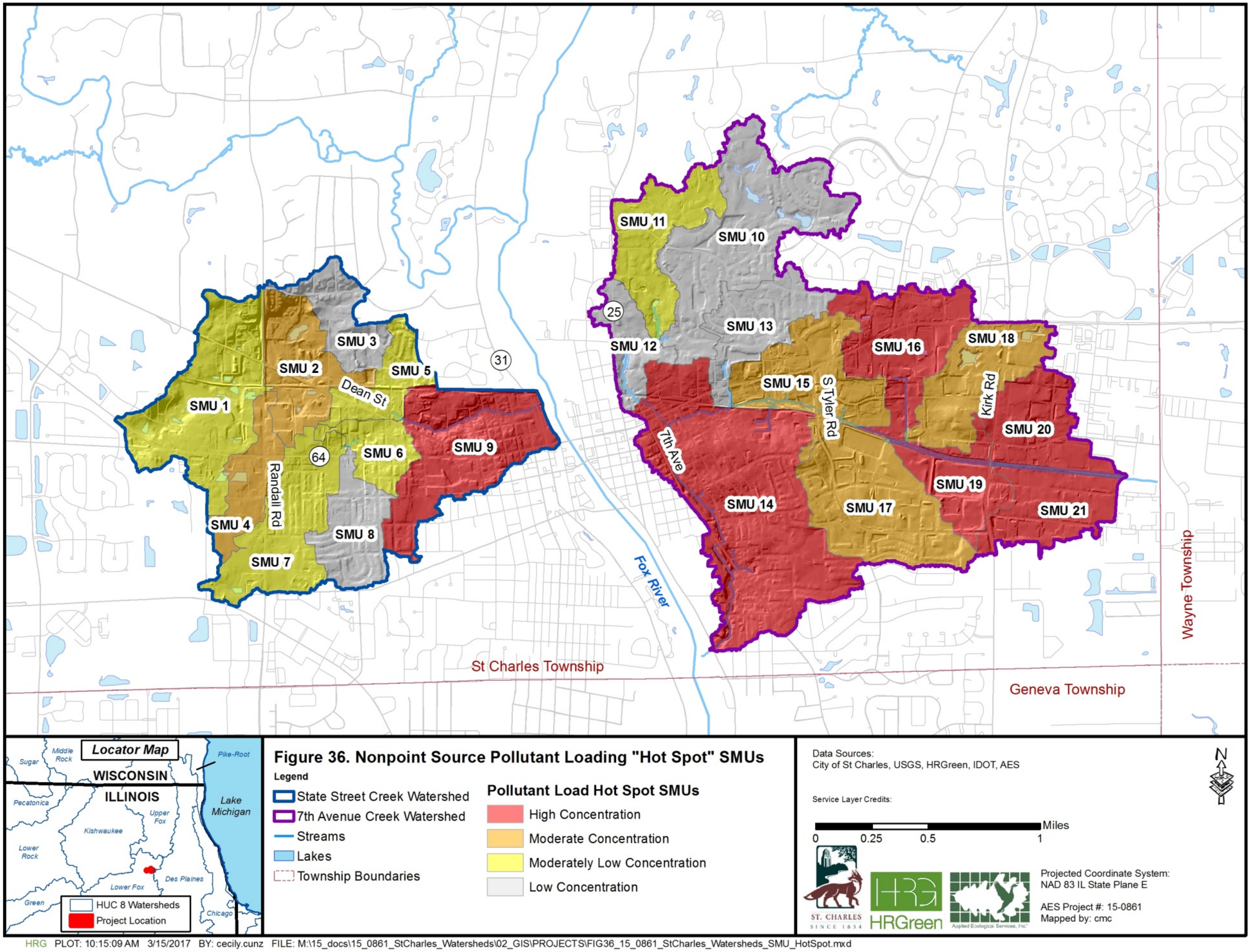

Figure 36. Nonpoint Source Pollutant Loading "Hot Spot" SMUs

3.3 GROUNDWATER QUALITY DATA

Groundwater quality data was gathered and analyzed at the county and regional level within the Ferson-Otter Creek Watershed Plan. As this information is also relevant and would include the State Street Creek and 7th Avenue Creek watershed planning area, please refer to Section 3.4 of the Ferson-Otter Creek Watershed Plan for full details on groundwater quality.

3.4 CAUSES & SOURCES OF IMPAIRMENT

Neither stream was assessed in Illinois EPA's most recent 2016 Integrated Water Quality Report and Section 303(d) List. Water quality sampling data suggests moderate impairment caused primarily from streambank erosion, nutrient loading, and channel modification.

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 23 summarizes all *known* or *potential* causes and sources of watershed impairment as identified via Applied Ecological Service's watershed resource inventory, water quality sampling, and input from watershed stakeholders who met during the planning process to discuss impairments.

Table 23. Known and potential causes and sources of watershed impairment.

Impairment	Cause of Impairment	Known or Potential Source of Impairment
Water Quality: Aquatic Life	Nutrients- *known impairment*: (Phosphorus & Nitrogen)	Streambank erosion; Buried streams; Residential, Ag, and commercial lawn fertilizer; Inadequate policy; Lack of landowner education; Agricultural row crop runoff; Old brownfield site
Water Quality: Aquatic Life	Sediment- *known impairment* (Total Suspended Solids/turbidity)	Streambank erosion; Construction sites; Existing & future urban runoff;
Water Quality: Aquatic Life	Low dissolved oxygen- *known impairment*	Heated stormwater runoff from urban areas; Lack of natural riffles in stream reaches; Runoff from impervious surfaces
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; Lack of maintenance
Habitat Degradation	Loss and fragmentation of open space/natural habitat due to development *known impairment*	Traditional development design; Streambank, channel, and riparian area modification; Inadequate protection policy; Lack of appropriate land management; Lack of restoration and maintenance funds; Wetland loss; Development policy changes

Impairment	Cause of Impairment	Known or Potential Source of Impairment
Hydromodification & Habitat Degradation	Alteration of natural drainage channels; buried streams; impervious surfaces- *known impairment*	Alteration of natural drainage patterns; Buried or piped streams; 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; Policies on impervious surfaces

3.5 CRITICAL AREA ANALYSIS

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. Four Critical Area types were identified in State Street and 7th Avenue Creek watersheds and include:

1. highly degraded stream reaches and riparian areas;
2. poorly designed/functional detention basins or detention needs;
3. urban and other management measures; and
4. green infrastructure protection areas.

Short descriptions of each Critical Area type are included below. Table 24 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 37 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 sediment and nutrient load reductions from the implementation of streambank stabilization measures. Estimate of sediment and nutrient load reduction from implementation of urban measures are based on efficiency calculations developed by Illinois EPA. STEPL pollutant load reduction worksheets for each Critical Area Management Measure are located in Appendix B. It is assumed in this plan that nutrient reductions will improve BOD levels.

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, installation of artificial riffles, and restoration of the riparian buffers in Critical Area stream reaches will greatly reduce sediment and nutrient transport downstream while improving habitat and increasing oxygen levels. Seventeen stream reaches (SS01-SS05, 7th1N, 7th1S, 7th2N, 7th2S, 7th4-8, and 7th10-12) totaling 26,181 linear feet were identified as Critical Areas. Section 2.2.6 includes a complete summary of streams and tributaries in the watershed.

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. Twenty seven (27) 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 near the headwaters of State Street and 7th Avenue Creeks where opportunities exist to enhance existing detention to filter additional pollutants before they move downstream. 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 2.2.7.

Critical Urban and Other Management Measures

A number of critical urban and other management measures have been identified in State Street & 7th Avenue Creek watersheds. They include four swale retrofit opportunities, five turf/park retrofit opportunities, three woodland restoration or management plan opportunities, one parking lot retrofit opportunity, and one brownfield redevelopment opportunity. Detailed descriptions of all urban and other management measures can be found in the Action Plan section of the report.

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). While both watersheds are considered built out, with little land left to be developed, portions of both watersheds contain resources that need to be proactively protected so they can continue to provide water quality benefits in the future. Fifty-seven (57) acres of land in or adjacent to the floodplain, including a buried reach where floodplain once existed, along State Street Creek and 74 acres of land in or adjacent to the floodplain in 7th Avenue Creek have been identified as Critical Green Infrastructure Priority Protection Areas. A full description of green infrastructure and green infrastructure protection areas can be found in Section 5.1.

Table 24. 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 per Year		
			TSS (tons)	TP (lbs)	TN (lbs)
Stream, Channel and Riparian Area Reaches					
State Street Creek Reach SS01	492 lf of man-made and heavily urbanized stream with moderately eroded streambanks	Design, permit and implement project to remove excess rock, key some of existing rocks into banks, naturalize 30 ft buffer and streambanks with natives, and maintain for three years to establish	20.5	25.4	154.7
State Street Creek Reach SS02	1,453 lf of man-made and heavily urbanized stream with moderately eroded streambanks	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water qualtiy, and maintain for three years to establish	253.2	223.0	511.2
State Street Creek Reach SS03	984 lf of man-made and heavily urbanized stream with heavily eroded streambanks	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water qualtiy, and maintain for three years to establish	161.4	143.5	318.0
State Street Creek Reach SS04	719 lf of man-made and heavily urbanized stream with heavily eroded streambanks	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water qualtiy, and maintain for three years to establish	138.9	121.9	322.7
State Street Creek Reach SS05	683 lf of man-made and heavily urbanized stream with moderately eroded streambanks, partially routed under a building and roadway	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	56.4	52.1	207.3
7th Avenue Creek Reach 7th1N	3,186 lf of man-made and heavily channelized stream with moderately eroded streambanks, running along railroad bed	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	205.2	203.0	819.2
7th Avenue Creek Reach 7th1S	3,142 lf of man-made and heavily channelized stream with moderately eroded streambanks, running along railroad bed	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	238.8	233.2	913.4
7th Avenue Creek Reach 7th2N	3,791 lf of man-made and heavily channelized stream with heavily eroded streambanks, running along railroad bed	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	503.8	473.4	1667.8

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction per Year		
			TSS (tons)	TP (lbs)	TN (lbs)
7th Avenue Creek Reach 7th2S	2,611 lf of man-made and heavily channelized stream with moderately eroded streambanks, running along railroad bed	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary including culverts under railroad bed, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	220.6	237.8	1086.6
7th Avenue Creek Reach 7th4	2,076 lf of stream with moderate channelization, low erosion, and has a degraded riparian area, thick with invasive species	Design, permit, and implement project to remeander stream where possible and reconnect it to the floodplain, remove existing abandoned railroad spur berms, install pools and riffles within stream channel, remove invasives along full stream corridor and floodplain, replant with natives, install educational signage at either end regarding water qualtiy, and maintain for three years to establish	111.2	109.1	494.1
7th Avenue Creek Reach 7th5	1,089 lf of highly channelized and moderately eroded stream with turf right up to the stream edge and retaining walls and heavily armored banks common	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water qualtiy, and maintain for three years to establish	118.2	111.7	358.7
7th Avenue Creek Reach 7th6	526 lf of highly channelized and moderately eroded stream with turf right up to the stream edge and retaining walls and heavily armored banks common	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water qualtiy, and maintain for three years to establish	57.3	51.3	168.5
7th Avenue Creek Reach 7th7	733 lf of highly channelized and moderately eroded stream with turf right up to the stream edge and retaining walls and heavily armored banks common	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water qualtiy, and maintain for three years to establish	77.2	69.1	189.2
7th Avenue Creek Reach 7th8	875 lf of highly channelized and moderately eroded stream with turf right up to the stream edge and retaining walls and heavily armored banks common	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water qualtiy, and maintain for three years to establish	162.5	144.6	327.1
7th Avenue Creek Reach 7th10	828 lf of highly channelized and moderately eroded stream; western bank is at the bottom of a steep, wooded embankment while eastern bank is residential	Design, permit and implement project to selectively stabilize eroded areas using hard-armoring where necessary, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	154.9	135.3	305.5
7th Avenue Creek Reach 7th11	1,904 lf of stream with moderately channelized and eroded streambanks with some sections of exposed bedrock	Design, permit and implement project to selectively stabilize eroded areas particularly outside bends using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	367.5	319.7	710.6

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction per Year		
			TSS (tons)	TP (lbs)	TN (lbs)
7th Avenue Creek Reach 7th12	1,088 lf of stream with highly channelized and moderately eroded streambanks with some sections of exposed bedrock	Design, permit and implement project to selectively stabilize eroded areas particularly outside bends using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor and adjacent natural area, naturalize corridor and streambanks with natives, and maintain for three years to establish	125.2	111.0	262.0
Detention Basins					
4C	Wet Bottom Detention - large basin with rock retaining wall along outside of buffer, turf side slopes and lots of geese	Design and implement project to remove turf, install a native prairie buffer, plant emegents along shoreline, and maintain for three years to establish	7	9	63
5A	Dry Bottom Detention - turf lined basin and slopes with multiple inlets	Design and implement a project to remove turf, plant basin and slopes to natives, and maintain for three years to establish	9	13	53
5D	Wetland Bottom Detention - large wetland used as detention adjacent expansive turf areas with manhole that short circuits to outlet on south side, low flow drains into manhole at inlet	Design and implement a project to regrade low area for water quality benefits; remove or plug lowflow manhole; restore existing wetland and plant extended prairie buffer, and install educational signage	3	10	32
7A	Wet Bottom Detention - full of cattails with mowed turf side slopes	Design and implement a project to remove turf and invasives, naturalize buffer, and maintain for three years to establish	7	9	46
7C	Wet Bottom Detention - unmaintained naturalized basin overrun with invasives	Design and implement a project to remove invasives, naturalize buffers, and maintain for three years to establish once development resumes	2	3	11
7D	Wet Bottom Detention - unmaintained naturalized basin overrun with invasives	Design and implement a project to remove invasives, naturalize buffers, and maintain for three years to establish once development resumes	4	6	18
7E	Wet Bottom Detention - unmaintained naturalized basin overrun with invasives	Design and implement a project to remove invasives, naturalize buffers, and maintain for three years to establish once development resumes	1	1	1
7F	Wet Bottom Detention - unmaintained naturalized basin overrun with invasives	Design and implement a project to remove invasives, naturalize buffers, and maintain for three years to establish once development resumes	4	5	31
7I	Wet Bottom Detention - large baisn surrounded by woody invasives	Design and implement a project to remove invasives, restore with natives, and maintain for three years to establish	8	9	69
7J	Wet Bottom Detention - large baisn surrounded by woody invasives	Design and implement a project to remove invasives, restore with natives, and maintain for three years to establish	10	13	93
8A	Dry Bottom Detention - large basin with north half filled with phragmites and cattails, remaining mowed turf	Design and implement a project to remove turf, naturalize buffer and basin with natves, and maintain for three years to establish	5	7	50
10C	Wet Bottom Detention with mowed buffer and slopes with some invasives	Design and implement a project to remove turf and invasives, naturalize buffer, install educational signage, and maintain for three years to establish	16	19	68

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction per Year		
			TSS (tons)	TP (lbs)	TN (lbs)
14A	Dry Bottom Detention lined with mowed turf, with manhole at the bottom and adjacent unused area of mowed turf	Design and implement a project to remove turf, naturalize buffer and basin with natves, and maintain for three years to establish	10	15	52
15A	Dry Bottom Detention - large turf basin with manholes at bottom, no or little residential access	Design and implement a project to remove turf, naturalize buffer and basin with natves, and maintain for three years to establish	5	15	51
15C	Wetland Bottom Detention – naturalized with shallow cattail emergent area and prairie buffer	Design and implement a project to remove invasives throughout wetland buffer	6	19	63
17B	Dry Bottom Detention - massive mowed turf basin with three manholes at bottom and four large inlet structures; fish in mouth of inlet	Design and implement a project to remove turf, naturalize basin, install educational signage, and maintain for three years to establish	7	21	71
18A	Dry Bottom Detention - large, turf basin with manholes at bottom, flume running to tributary and several inlets	Design and implement a project to remove turf, plant basin and slopes to native vegetation, install educational signage, and maintain for three years to establish	3	10	34
19E	Dry Bottom Detention - long linear basin behind Toyota, half mowed turf and half wetland	Design and implement a project to remove turf, naturalize buffer and basin with natves, and maintain for three years to establish	6	8	33
19F	Wet Bottom Detention - large basin with rock toe and mowed turf side slopes; lots of geese	Design and implement a project to remove turf in roughly 10 foot buffer surrounding pond, regrade if necessary, naturalize buffer and basin with natves, and maintain for three years to establish	22	25	107
20A	Wet Bottom Detention - large basin for commercial complex, has roughly 6 foot buffer of weeds at toe with turf side slopes, lots of weedy/woody invasives	Design and implement a project to remove turf and invasives, regrade slopes if necessary, naturalize basin and buffer, and maintain for three years to establish	9	12	85
22A	Wet Bottom Detention - north and east sides are rock retaining walls, woody invasives all along southwestern side; rock wall failing along Tyler Rd	Design & implement a project to remove invasives, plant prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	5	6	43
23A	Dry Bottom Detention - large turf basin behind commercial business	Design and implement a project to remove turf, naturalize buffer and basin with natves, and maintain for three years to establish	5	7	31
23B	Dry Bottom Detention with old field, sometimes mowed	Design and implement a project to remove remaining turf and invasives, naturalize basin and buffer, and maintain for three years to establish	5	7	31
23D	Dry Bottom Detention - massive dry basin behind industrial/commercial businesses; old field/weedy mowed turf with pocket of phragmites in NW corner, several large inlets	Design and implement a project to remove turf and old field, raise outlets if possible, naturalize buffer and basin with natves, install educational signage, and maintain for three years to establish	14	20	82

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction per Year		
			TSS (tons)	TP (lbs)	TN (lbs)
24A	Dry Bottom Detention - large turf basin with two outlets and fake swan	Design and implement a project to remove turf, raise outlets, regrade slopes, naturalize buffer and basin with natves, and maintain for three years to establish	11	15	65
24B	Dry Bottom Detention - long linear basin	Design and implement a project to remove turf, naturalize buffer and basin with natves, and maintain for three years to establish	9	12	52
27A	Dry Bottom Detention - large and lined with turf	Design and implement a project to remove turf, raise outlets, naturalize buffer and basin with natves, and maintain for three years to establish	5	9	30
Urban and Other Management Measures					
Swale 4B	Roadside swale - mowed turf and phragmites througout	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	5	5	36
Swale 4G	Linear roadside swale lined with rock, some phragmites and invasives	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	5	5	32
Swale 19B	Unused old field lot with swale running diagonally across center	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	4	6	82
Swale 23K	Turf swale with manhole at bottom	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	5	7	56
Turf/Park 9A	Mowed turf lot with irregular topography and failed tiles (sinkholes)	Design and implement a project to create connected flood storage area adjacent to stream, remove turf, naturalize and maintain for three years to establish	2	3	40
Turf/Park 14B	Unused mowed turf area	Design and implement a project to remove turf and convert area to native prairie and maintain for three years to establish	9	15	104
Turf/Park 14C	Large depressional turf area adjacent SCPD posted "no mow" naturalized area	Design and implement a project to remove turf and convert area to native prairie to extend "no mow" area and maintain for three years to establish	3	9	56
Turf/Park 21C	turf at 10th Ave and 7th Ave Creek	Design and implement a project to create connected flood storage area adjacent to stream, remove turf, naturalize and maintain for three years to establish	1	1	13
Turf/Park 23L	turf at Dukane	Design and implement a project to remove turf and convert area to native prairie and maintain for three years to establish	20	31	253
Woodland 5E	Timber Trails thicket, scrub shrub - full of woody invasives, mostly buckthorn	Design and implement a project to remove invasive shrubs and then reseed with natives and maintain for three years to establish	8	13	103
Woodland 15B	Dry mesic woodland dominated by mature white and red oak and sugar maple in canopy; subcanopy dominated by sugar maple and basswood (mesification)	Develop a natural area management plan to include heavy thinning of sugar maple and basswood subcanopy in order to produce oak regeneration	4	47	87

Critical Area	Existing Condition/Description	Recommended Critical Area Management Measure	Nutrient & Sediment Load Reduction per Year		
			TSS (tons)	TP (lbs)	TN (lbs)
Woodland 17D	Dry mesic woodland, degraded - evidence of mesification	Develop and implement a natural area management plan to include buckthorn and honey suckle removal, thinning of sugar maple, basswood, black cherry	3	11	56
Parking Lot 15E	Fox Chase Park parking lot	Design and implement a project to remove black top and replace with permeable pavers or similar and install educational signage	4	7	63
Brownfield 8B	Brownfield at end of 9th St	Require conservation design or low impact development for future redevelopment of site	Pollutant reduction cannot be assessed via modeling		
Green Infrastructure Protection Areas					
GI – State Street Creek	57 acres on mostly private parcels in State Street Creek watershed where floodplain is or should be located	Manage as part of the green infrastructure network by maintaining stream corridors and expanding buffers where possible. Permanently protect via easement and/or acquire and naturalize parcels or portions of parcels if and when the opportunity arises.	Pollutant reduction cannot be assessed via modeling		
GI – 7th Avenue Creek	74 acres on mostly private parcels in 7th Avenue Creek watershed where floodplain is located	Manage as part of the green infrastructure network by maintaining stream corridors and expanding buffers where possible. Permanently protect via easement and/or acquire and naturalize parcels or portions of parcels if and when the opportunity arises.	Pollutant reduction cannot be assessed via modeling		

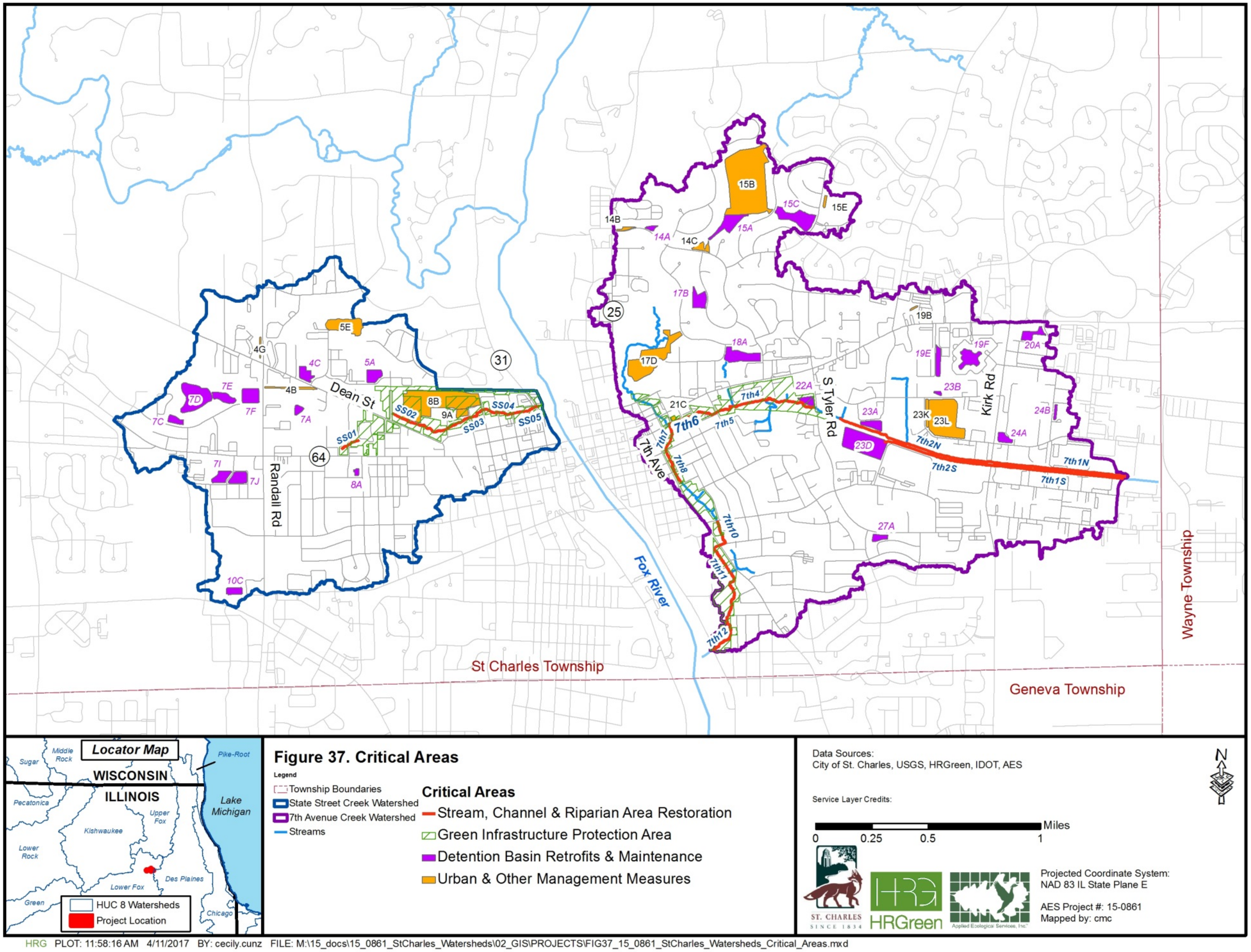

Figure 37. Critical Areas

3.6 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 25 summarizes the basis for *known* impairments and reduction targets. Reduction targets listed in Table 25 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 total suspended solids reduction targets. In addition, Table 25 summarizes the load reduction of phosphorus, nitrogen, and total suspended solids 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 88% of the total nitrogen and more than 100% of total phosphorus and sediment reduction needs for the watersheds could be achieved from critical stream, channel, and riparian area restoration projects alone.

Additional watershed-wide reduction targets were established for habitat degradation, hydrologic flow changes, groundwater infiltration, and structural flood problems. Habitat degradation and hyrdromodification targets could be met by implementing stream and riparian area restoration and by protecting critical green infrastructure protection areas. Groundwater infiltration targets could be met primarily by protecting existing green infrastructure and incorporating urban infiltration practices and retrofits. Each of the six structural flood problem areas can be addressed on a case by case basis to meet targets.

Table 25. Basis for known impairments, reduction targets, & impairment 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: Nitrogen in State Street Creek and 7th Avenue Creek	17,019 lbs/yr of total nitrogen loading based on STEPL model; 5.965 mg/l total nitrogen in stream water quality samples	**>59% or 10,041 lbs/yr reduction in nitrogen** loading to achieve 2.461 mg/l total nitrogen USEPA numeric criteria for streams in Ecoregion VI	8,817 lbs/yr or 52% reduction from critical stream and riparian reaches	
			1,365 lbs/yr or 8% reduction from critical detention basin retrofits	
			981 lbs/yr or 6% reduction from urban and other retrofits	
TOTAL			**11,163 lbs/yr or 66% total nitrogen reduction from all Critical Areas**	**Yes**
Water Quality/Aquatic Life: Phosphorus in State Street Creek and 7th Avenue Creek	2,581 lbs/yr of phosphorus loading based on STEPL model; 0.27 mg/l total phosphorus in stream water quality samples	**>73% or 1,884 lbs/yr reduction in phosphorus** loading to achieve 0.0725 mg/l total phosphorus USEPA numeric criteria for streams in Ecoregion VI	2,765 lbs/yr or 107% reduction from critical stream and riparian reaches	
			305 lbs/yr or 12% reduction from critical detention basin retrofits	
			160 lbs/yr or 6% reduction from urban and other retrofits	
TOTAL			**3,230 lbs/yr or 125% total phosphorus reduction from all Critical Areas**	**Yes**
Water Quality/Aquatic Life: Total suspended solids in State Street Creek and 7th Avenue Creek	460 tons/yr of sediment loading based on STEPL model; 122 mg/l total suspended solids in stream water quality samples	**>85% or 391 tons/yr reduction in sediment** loading to achieve 19 mg/l total suspended solids based on USGS numeric criteria in Great Lakes Region	2,973 tons/yr or 646% reduction from critical stream and riparian reaches	
			198 tons/yr or 43% reduction from critical detention basin retrofits	
			73 tons/yr or 16% reduction from urban and other retrofits	
TOTAL			**3,244 tons/yr or 705% sediment reduction from all Critical Areas**	**Yes**
Habitat Degradation: Invasive/non-native plant species in riparian areas	24,987 linear feet along riparian areas are currently in poor condition	**12,494 linear feet or 50%** of riparian areas ecologically restored	26,181 linear feet or 105% of riparian areas restored along critical stream reaches	Yes
Habitat Degradation: Loss and fragmentation of open space/natural habitat	Virtually no undeveloped land available to expand the green infrastructure network	**>32 acres (25%) of preservation of existing critical green infrastructure**	127 acres (100%) preservation of existing critical green infrastructure network	Yes

Impairment: Cause of Impairment	Basis for Impairment	Reduction Target	Reduction from Critical Area	Target Attainable?
Habitat Degradation: Hydromodification & Habitat Modification	25,035 linear feet of stream are highly channelized	**6,259 linear feet or 25% of** streams restored to natural channel geometries	9,821 linear feet or 39% of streams restored to natural channel geometries along critical stream reaches	Yes
Aquifer Drawdown: Reduced infiltration & human use	Illinois State Water Survey Data showing 550 foot drawdown and 1,100 foot drawdown by 2050 in deep aquifers	**>32 acres (25%) of preservation of existing critical green infrastructure and implementation of 5 swale, 5 turf/park, and 1 parking lot retrofits**	131 acres (100%) preservation of existing critical green infrastructure network and 9 bioswale, 11 turf/park, and 1 parking lot retrofits	Yes
Structural Flood Damage: Structures in 100-year floodplain	6 structural flood problem areas	**6 or 100%** structural flood problem areas addressed	Not Applicable	Yes

4.0 NONPOINT-SOURCE PROJECT RECOMMENDATIONS

Site Specific Management Measure (Best Management Practice [BMP]) recommendations made in this section of the report are backed by findings from the watershed field inventory, overall watershed resource inventory, and input from stakeholders. In general, the recommendations address sites where watershed problems and opportunities can best be addressed to achieve watershed goals and objectives. The Site Specific Management Measures Action Plan is organized by project type making it easy for users to identify the location of project sites and corresponding project details. It is important to note that project implementation is voluntary and there is no penalty or reduction in future grant opportunities for not following recommendations. Additionally, cost estimates were calculated as rough approximations of costs for the purpose of pursuing funding and not based on feasibility studies or detailed cost estimates. Management Measure categories include: Streambank, Channel, & Riparian Area Restorations; Detention Basin Retrofits and Maintenance, and Urban and Other Management Measures. Green Infrastructure Protection Areas and included in Section 5.1.

Descriptions and location maps for each Management Measure category follow. Table 28 includes useful project details such as site ID#, Location, Units (size/length), Existing Condition, Management Measure Recommendation, Pollutant Load Reduction Efficiency, Priority, Owner/Responsible Entity, Sources of Technical Assistance, Cost Estimate, and Implementation Schedule.

Project importance, technical and financial needs, estimated cost, feasibility, and ownership type were taken into consideration when prioritizing and scheduling Management Measures for implementation. High, Medium, or Low Priority was assigned to each recommendation. "Critical Areas" as discussed in Section 3.5 are all High Priority and highlighted in red on project category maps and the Action Plan table. 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 or where the most water quality benefit can be achieved through restoration. Implementation schedule varies greatly with each project but is generally based on the short term (1-10 years) for High Priority/Critical Area projects and 10-20+ years for medium and low priority projects. Maintenance projects are ongoing.

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

Method 1: The user should identify the Management Measure category of interest (ie. Detention Basin Retrofit). A Site ID# can be found in the first column under each recommendation that corresponds to the Site ID# on a map (Figures 38-40) associated with each category.

Method 2: The user should go to the page(s) summarizing the Management Measure category of interest then locate the corresponding map and Site ID# of the site specific recommendations for that category. Next, the user should go to Table 28 and locate the project category and Site ID# for details about the project.

Pollutant Load Reduction Estimates

Where applicable, pollutant load reductions and/or estimates for total suspended solids (TSS), phosphorus (TP), and nitrogen (TN) were evaluated for each recommended Management Measure based on efficiency calculations developed for the USEPA's Region 5 Model. This model uses "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual"

(MDEQ, 1999) to provide estimates of sediment and nutrient load reductions from the implementation of streambank stabilization measures. Estimate of sediment and nutrient load reduction from implementation of *urban* measures are based on efficiency calculations developed by Illinois EPA.

Estimates of pollutant load reduction using the Region 5 Model are measured in weight/year (tons/yr for total suspended solids and lbs/yr for nitrogen and phosphorus). The model was generally used to calculate weight of pollutant reductions for all recommended projects where calculation of such data is applicable. In summary, pollutant reductions were calculated for 23 streambank, channel, and riparian area restoration projects, 68 detention basin retrofit & maintenance projects, and 27 urban and other management measure projects. Spreadsheets used to determine pollutant load reductions can be found in Appendix B.

Estimated *percent* removal of total suspended solids, nitrogen, and phosphorus based on various Management Measures included in the Region 5 Model are shown in Table 26.

Table 26. Region 5 Model percent pollutant removal efficiencies for various Management Measures.

Management Measures	TSS	TN	TP
Vegetated Filter Strips	73%	40%	45%
Wet Pond/Detention	60%	35%	45%
Wetland Detention	77.5%	20%	44%
Dry Detention	57.5%	30%	26%
Infiltration Basin	75%	60%	65%
Streambank Stabilization	90%	90%	90%
Weekly Street Sweeping	16%	0%	6%
Porous Pavement	90%	85%	65%

Watershed-Wide Summary of Action Recommendations

All Site Specific Management Measures, Education Plan (Section X), and Monitoring Plan (Section X) recommendation information is condensed by Category in Table 27. This information provides a watershed-wide summary of the "Total Units" (size/length), "Total Cost," and "Total Estimate of Pollutant Load Reduction" if all the recommendations in the Site Specific Management Measures Action Plan, Education Plan, and Monitoring Plan are implemented. Key points include:

- 175 acres of ecological restoration and maintenance with a total cost of $3,425,050.
- 32,501 linear feet of streambank, channel, and riparian area restoration and maintenance costing $18,131,000.
- 126 acres of green infrastructure protection areas identified.
- 3,875 tons/year of total suspended solids (TSS) would potentially be reduced each year exceeding the 460 tons/year Reduction Target identified in Section 3.6.
- 3,873 pounds/year of phosphorus (TP) would potentially be reduced each year, exceeding the 2,581 pounds/year Reduction Target indentified in Section 3.6.
- 13,529 pounds/year of nitrogen (TN) would potentially be reduced each year exceeding 10,041 pounds/year Reduction Target identified in Section 3.6.
- The monitoring plan will cost $2,000 every year to implement (see Section 7).

Table 27. Watershed-wide summary of Management Measures recommended for implementation.

Management Measure Category	Total Units (size/length)	Total Cost	Estimated Load Reduction* TSS (t/yr)	TP (lbs/yr)	TN (lbs/yr)
Streambank, Channel & Riparian Area Restoration & Maintenance					
Streambank & Channel Restoration	32,501 lf	$18,131,000	3,463	3,224	10,194
Riparian Areas & Maintenance (burning, invasive control, brushing, etc.)	32,501 lf (45 ac)				
Detention Basin Retrofits & Maintenance	94.6 acres	$2,390,450	317	449	2,066
Green Infrastructure Protection Areas*	131 acres	na	na	na	na
Urban and Other Management Measures					
9 Bioswale Retrofits	4 acres	$134,100	33	41	361
11 Turf/Park Retrofits	24 acres	$426,500	42	77	578
3 Woodland Restorations or Management Plans	48 acres	$114,000	15	71	246
1 Prairie Restoration	4 acres	$60,000	1	4	21
1 Parking Lot Retrofit	0.4 acres	$300,000	4	7	63
*Brownfield**	20 acres	N/A	N/A	N/A	N/A
Information & Education Plan	Entire Plan	N/A	N/A	N/A	N/A
Water Quality Monitoring Plan	Entire Plan	$2,000/yr	N/A	N/A	N/A
TOTALS	**175 acres restoration**	**$3,425,050**	**3,875 tons/yr**	**3,873 lbs/yr**	**13,529 lbs/yr**
	32,501 lf restoration	**$18,131,000**			
	126 acres protection	**N/A**			
	Education	**N/A**			
	Monitoring	**$2,000/yr**			

* Pollutant load reductions were not or could not be calculated using STEPL or other modeling.

4.1 STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATIONS

Applied Ecological Services, Inc. (AES) completed a general inventory of State Street and 7th Avenue Creeks in fall of 2016. All streams were assessed based on divisions into "Stream Reaches." Twenty three (23) stream reaches and their adjacent riparian areas were assessed accounting for 32,501 linear feet. Detailed notes were recorded for each stream reach related to potential Management Measure recommendations such as improving streambank and channel conditions, restoration of riparian areas, and maintaining these reaches long term. The results of the stream inventory are summarized in Section 2.2.6; detailed field investigation datasheets can be found in Appendix A.

The condition of stream reaches in the watershed varies. According to the stream inventory, 11% of stream length is naturally meandering; 12% is moderately channelized; and 77% is highly channelized. Approximately 13% of stream lengths exhibit no or minimal bank erosion; moderate erosion is occurring along 68% of streambanks; 19% of streambanks are highly eroded. Approximately 23% of the riparian areas are "Moderate" quality. The remaining 77% of riparian areas are in "Poor" condition. There are no riparian areas that are in "Good" condition. Invasive species including common reed (*Phragmites australis*), common buckthorn (*Rhamnus cathartica*), and reed canary grass (*Phalaris arundinacea*) contribute most to degraded conditions.

Most streambank and channel projects include at least one of the following three water quality and habitat improvement components; 1) removal of existing invasive vegetation including trees and shrubs from the streambanks followed by; 2) stabilized streambanks using bioengineering, regrading of banks, and installation of native vegetation; and 3) restored riffles/grade controls in the stream channel to simulate conditions found in naturally meandering streams.

Example AES stream restoration in Barrington Illinois.

Riparian area restoration and/or maintenance projects generally focus on converting degraded ecological communities into higher quality communities that function to store and filter stormwater while also providing excellent wildlife habitat. The restoration process usually includes removal of invasive trees, shrubs, and herbaceous vegetation such as turf grass followed by planting with native vegetation. Short and long term maintenance then follows and is critically important in the development process and to maintain restored conditions.

Figure 38 shows the location of all potential streambank/channel restoration projects by reach ID# and priority while Table 28 lists project details about each recommendation. Reaches exhibiting more severe problems, particularly where structures are threatened due to ongoing erosion of banks, are generally assigned as higher priority for implementation.

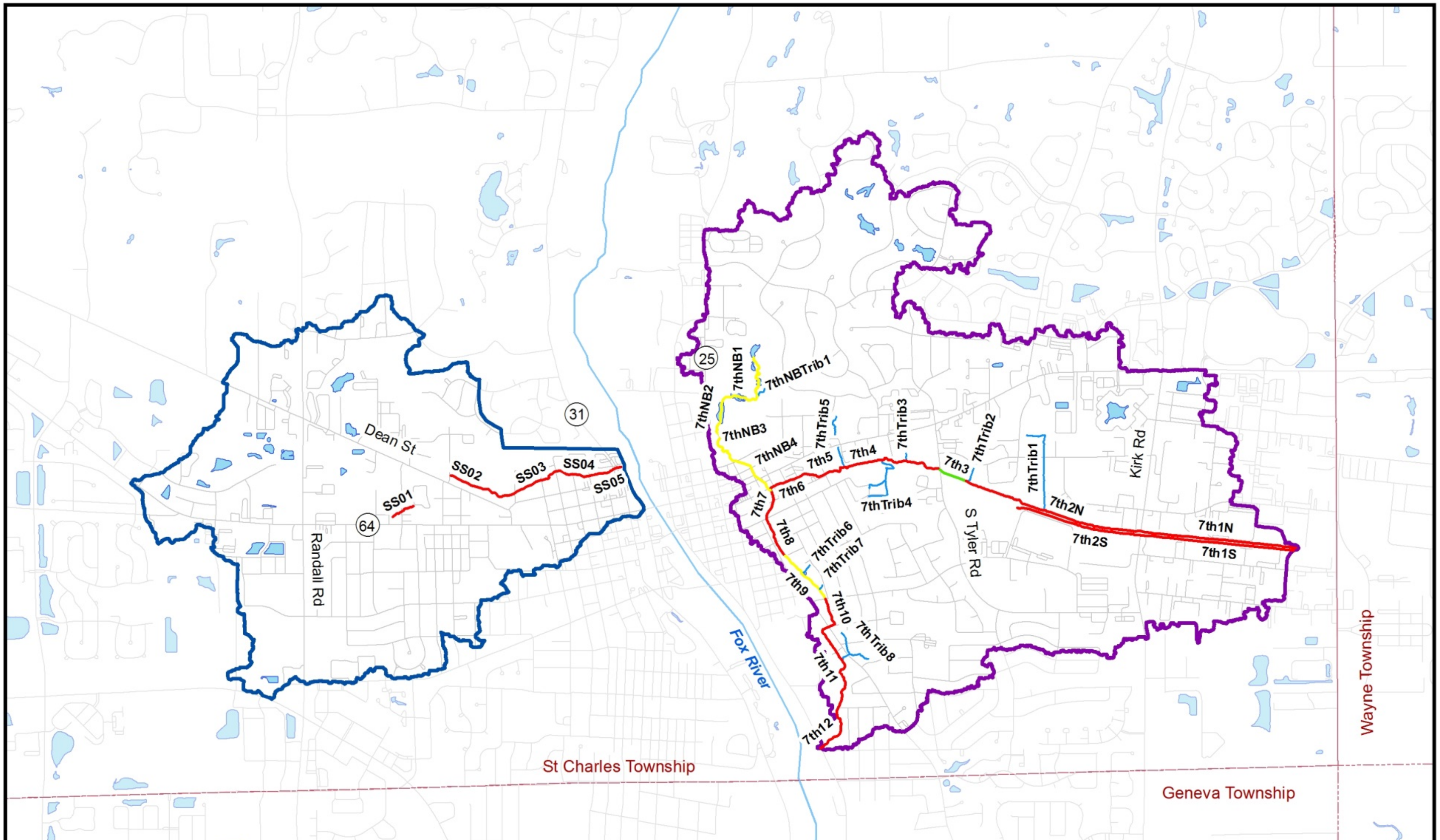

Figure 38. Streambank, Channel, & Riparian Area Restoration Recommendations

Legend

- Township Lines
- State Street Creek Watershed
- 7th Avenue Creek Watershed

Priority

- High Priority/Critical Area
- Medium
- Low
- Not Rated

Data Sources:
City of St. Charles, HRGreen

Service Layer Credits:

0 0.25 0.5 1 Miles

Projected Coordinate System:
NAD 83 IL State Plane E

AES Project #: 15-0861
Mapped by: cmc

HRG PLOT: 11:53:55 AM 4/11/2017 BY: cecily.cunz FILE: M:\15_docs\15_0861_StCharles_Watersheds\02_GIS\PROJECTS\FIG38_15_0861_StCharles_Watersheds_Recommendations_Streams.mxd

4.2 DETENTION BASIN RETROFITS & MAINTENANCE RECOMMENDATIONS

A vast number of detention basin retrofit projects were identified in State Street and 7th Avenue Creek watersheds because the watersheds are generally already developed and detention basins are currently in place. However, most detention basins provide little in the way of water quality improvement, infiltration capability, and wildlife habitat. In the future it is recommended that new standards for detention basins be implemented in local and county development ordinances (see Section 5.2). Applied Ecological Services, Inc. (AES) conducted an inventory of 76 detention basins in fall of 2016. The results of the detention basin inventory are summarized in Section 2.2.7. Detailed field investigation datasheets and maps can be found in Appendix A.

The condition of detention basins in the watershed varies. Thirty-four (34) dry bottom turf grass, 33 wet bottom with turf slopes, and 8 naturalized wetland bottom basins were assessed. Of the 75 basins, only 2 (3%) likely provide “Good” ecological and water quality benefits while 19 basins (25%) likely provide “Average” benefits. The remaining 54 basins (72%) likely provide “Poor” ecological and water quality benefits.

Many of the dry, wet, and wetland bottom basins in the watershed present excellent retrofit opportunities. Most would be relatively easy to naturalize with native plantings and concrete structures and drains in dry basins can be manipulated to store and infiltrate water as desired.

All recommended detention basin retrofits and/or maintenance recommendations are shown on Figure 39 by priority and Site ID# which correspond with the ID# used in the field investigation. Details about each recommendation can be found in the Action Plan Table (Table 28). All of the High priority recommendations are considered “Critical Areas.” Many of these are publicly owned basins and other private basins with significant problems or good opportunities; funding and implementation are usually easier on public land or where major problems/opportunities exist. Low or Medium priority is generally assigned to smaller private basins and those with fewer problems or maintenance needs. In addition, there are several detention basins with no retrofit or maintenance recommendations. In some cases, basins are assigned higher priority based on location and/or ability to treat polluted stormwater runoff in pollutant hotspot.

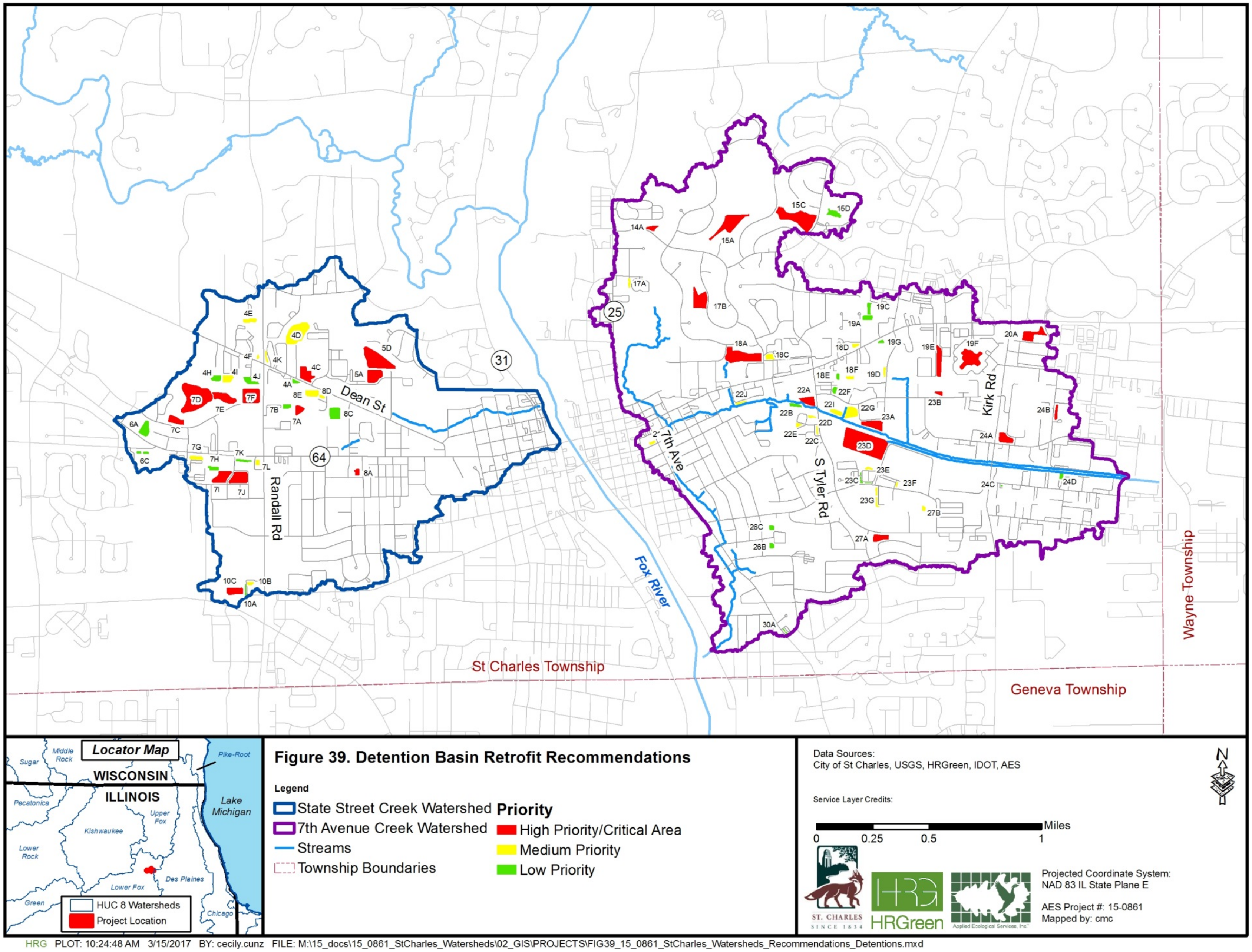
Figure 39. Detention Basin Retrofit Recommendations
Legend
State Street Creek Watershed
7th Avenue Creek Watershed
Streams
Township Boundaries
Priority
High Priority/Critical Area
Medium Priority
Low Priority
Locator Map
WISCONSIN
ILLINOIS
Lake Michigan
HUC 8 Watersheds
Project Location
Data Sources:
City of St Charles, USGS, HRGreen, IDOT, AES
Service Layer Credits:
Miles
0 0.25 0.5 1
Projected Coordinate System:
NAD 83 IL State Plane E
AES Project #: 15-0861
Mapped by: cmc
Dean St
Randall Rd
7th Ave
S Tyler Rd
Kirk Rd
Fox River
St Charles Township
Geneva Township
Wayne Township
HRG PLOT: 10:24:48 AM 3/15/2017 BY: cecily.cunz FILE: M:\15_docs\15_0861_StCharles_Watersheds\02_GIS\PROJECTS\FIG39_15_0861_StCharles_Watersheds_Recommendations_Detentions.mxd

4.3 OTHER URBAN BEST MANAGEMENT PRACTICE RECOMMENDATIONS

While completing the general inventory of State Street and 7th Avenue Creek watersheds, Applied Ecological Services, Inc. (AES) noted potential Management Measure projects that fit under other urban best management categories. Detailed field investigation datasheets for these projects can be found in Appendix A. Figure 40 the location of all "Other Management Measure" recommendations by ID# while Table 28 lists details about each recommendation. shows

Potential projects include:

1) Nine bioswale retrofit opportunities.
2) Eleven turf/park restoration or naturalization opportunities.
3) Three woodland restoration opportunities
4) One prairie restoration opportunity.
5) One parking lot retrofit opportunity.
6) One brownfield redevelopment opportunity.

Left: Turf/park retrofit opportunity 21B along S 9th Ave, South of Adams. Right: Woodland restoration opportunity 5E in Timber Trails Park.

Bioswale retrofit opportunities 23J along Production Dr (left) and 23M at Tyler southwest of Dukane Dr (right).

Left: Parking lot retrofit opportunity 15E at Fox Chase Park. Right: Turf/park retrofit opportunity 9A at north end of 7th St.

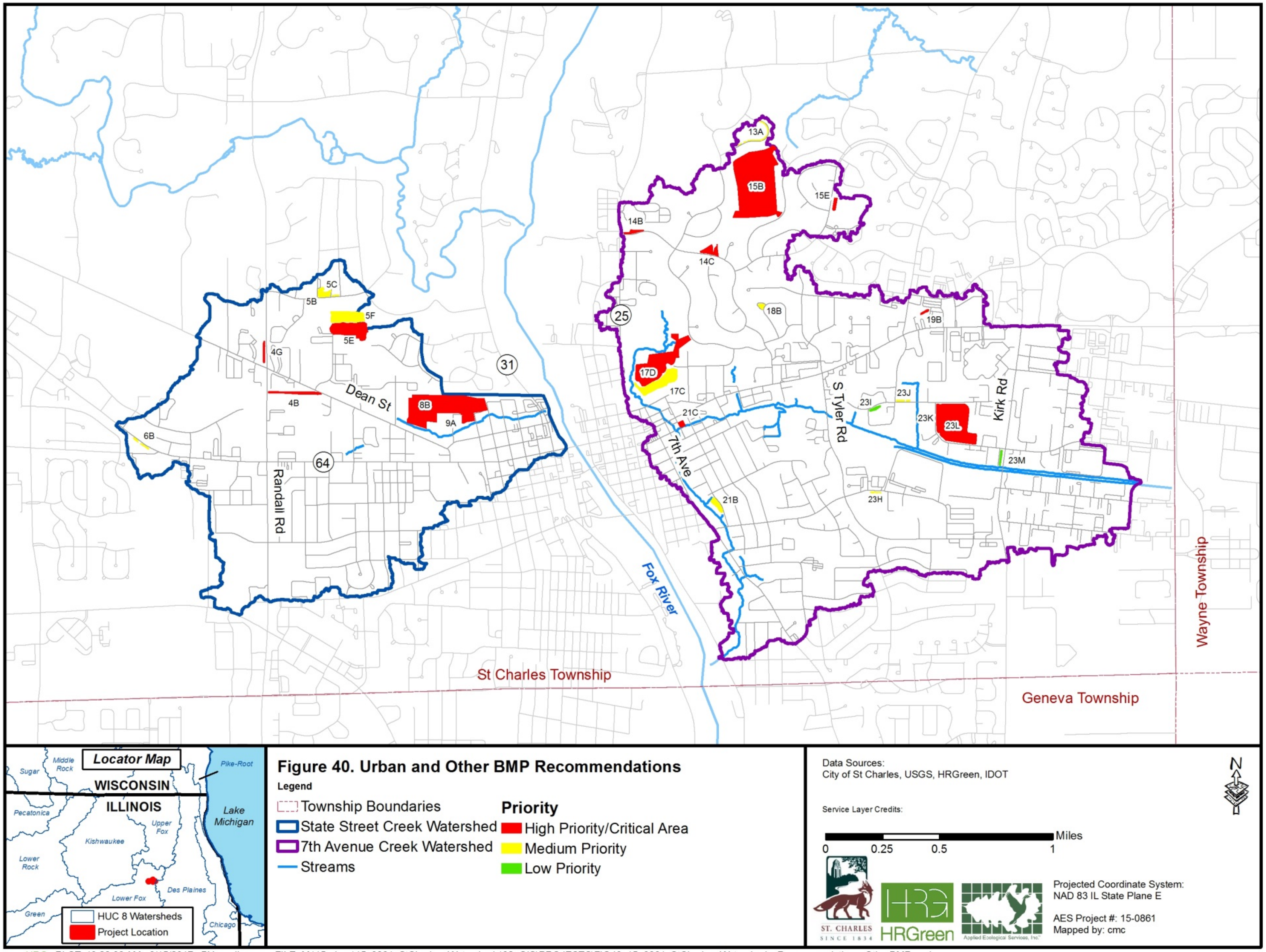

Figure 40. Urban and Other BMP Recommendations

HRG PLOT: 10:28:08 AM 3/15/2017 BY: cecily.cunz FILE: M:\15_docs\15_0861_StCharles_Watersheds\02_GIS\PROJECTS\FIG40_15_0861_StCharles_Watersheds_Recommendations_OtherBMP.mxd

4.4 SITE SPECIFIC MANAGEMENT MEASURES ACTION PLAN

Table 28. Site specific management measures action plan.

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATION (SEE FIGURE 38)												
Technical and Financial Assistance Needs: Stream restorations are complex and require high technical and financial assistance needs to protect land, design, construct, monitor, and maintain the restoration and become more complex where multiple landowners are involved. Technical and financial assistance associated with stream maintenance is generally low for minor tasks such as removing debris.												
SS01	See Figure 38 for project location	492	492 lf of man-made and heavily urbanized stream with moderately eroded streambanks	Design, permit and implement project to remove excess rock, key some of existing rocks into banks, naturalize 30 ft buffer and streambanks with natives, and maintain for three years to establish	20.5	25.4	154.7	High/ Critical Area	Private property owners	USACE, Engineer, Environmental Consultant	$50,000 to remove excess rock, key some of existing rocks into banks, naturalize 30 ft buffer and streambanks with natives, and maintain for three years to establish	1-10 years
SS02	See Figure 38 for project location	1,453	1,453 lf of man-made and heavily urbanized stream with moderately eroded streambanks	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	253.2	223.0	511.2	High/ Critical Area	St. Charles, SCPD, private property owners	USACE, Engineer, Environmental Consultant	$1.2 million to design, permit, and implement a project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	1-10 years
SS03	See Figure 38 for project location	984	984 lf of man-made and heavily urbanized stream with heavily eroded streambanks	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	161.4	143.5	318.0	High/ Critical Area	Private property owners	USACE, Engineer, Environmental Consultant	$1.3 million to design, permit, and install a project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATION (SEE FIGURE 38)												
SS04	See Figure 38 for project location	719	719 lf of man-made and heavily urbanized stream with heavily eroded streambanks	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	138.9	121.9	322.7	High/ Critical Area	Private property owners	USACE, Engineer, Environmental Consultant	$1.1 million to design, permit, and install a project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	1-10 years
SS05	See Figure 38 for project location	683	683 lf of man-made and heavily urbanized stream with moderately eroded streambanks, partially routed under a building and roadway	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	56.4	52.1	207.3	High/ Critical Area	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$1 million to design, permit, and install a project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	10-20 years
7th1N	See Figure 38 for project location	3,186	3,186 lf of man-made and heavily channelized stream with moderately eroded streambanks, running along railroad bed	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	205.2	203.0	819.2	High/ Critical Area	UPRR	USACE, Engineer, Environmental Consultant	$795K to design, permit, and install a project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATION (SEE FIGURE 38)												
7th1S	See Figure 38 for project location	3,142	3,142 lf of man-made and heavily channelized stream with moderately eroded streambanks, running along railroad bed	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	238.8	233.2	913.4	High/ Critical Area	UPRR	USACE, Engineer, Environmental Consultant	$785K to design, permit, and install a project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	1-10 years
7th2N	See Figure 38 for project location	3,791	3,791 lf of man-made and heavily channelized stream with heavily eroded streambanks, running along railroad bed	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	503.8	473.4	1667.8	High/ Critical Area	UPRR	USACE, Engineer, Environmental Consultant	$945K to design, permit, and install a project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	1-10 years
7th2S	See Figure 38 for project location	2,611	2,611 lf of man-made and heavily channelized stream with moderately eroded streambanks, running along railroad bed	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary including culverts under railroad bed, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	220.6	237.8	1086.6	High/ Critical Area	UPRR	USACE, Engineer, Environmental Consultant	$700K to design, permit, and install a project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, spot debris clearing where necessary including culverts under railroad bed, and restore 30 ft buffer on either bank by removing invasive species and planting native vegetation	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATION (SEE FIGURE 38)												
7th3	See Figure 38 for project location	631	631 lf of man-made and heavily channelized stream with no erosion, but full of rock	Design, permit and implement project to remove excess rock, key some of existing rocks into banks, naturalize 30 ft buffer and streambanks with natives, and maintain for three years to establish	14	20	167	Low	St. Charles	USACE, Engineer, Environmental Consultant	$50,000 to remove excess rock, key some of existing rocks into banks, naturalize 30 ft buffer and streambanks with natives, and maintain for three years to establish	10-20 years
7th4	See Figure 38 for project location	2,076	2,076 lf of stream with moderate channelization, low erosion, and has a degraded riparian area, thick with invasive species	Design, permit, and implement project to remeander stream where possible and reconnect it to the floodplain, remove existing abandoned railroad spur berms, install pools and riffles within stream channel, remove invasives along full stream corridor and floodplain, replant with natives, install educational signage at either end regarding water quality, and maintain for three years to establish	111.2	109.1	494.1	High/ Critical Area	UPRR, private property owners	USACE, Engineer, Environmental Consultant	$2.7 million to design, permit, and install a project to remeander stream where possible and reconnect it to the floodplain, remove existing abandoned railroad spur berms, install pools and riffles within stream channel, remove invasives along full stream corridor and floodplain, replant with natives, install educational signage at either end regarding water quality, and maintain for three years to establish	1-10 years
7th5	See Figure 38 for project location	1,089	1,089 lf of highly channelized and moderately eroded stream with turf right up to the stream edge and retaining walls and heavily armored banks common	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	118.2	111.7	358.7	High/ Critical Area	UPRR, private property owners	USACE, Engineer, Environmental Consultant	$1.3 million to design, permit, and install a project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATION (SEE FIGURE 38)												
7th6	See Figure 38 for project location	526	526 lf of highly channelized and moderately eroded stream with turf right up to the stream edge and retaining walls and heavily armored banks common	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	57.3	51.3	168.5	High/ Critical Area	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$910K to design, permit, and install a project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	1-10 years
7th7	See Figure 38 for project location	733	733 lf of highly channelized and moderately eroded stream with turf right up to the stream edge and retaining walls and heavily armored banks common	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	77.2	69.1	189.2	High/ Critical Area	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$1.7 million to design, permit, and install a project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove turf and invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	1-10 years
7th8	See Figure 38 for project location	875	875 lf of highly channelized and moderately eroded stream with turf right up to the stream edge and retaining walls and heavily armored banks common	Design, permit, and implement project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	162.5	144.6	327.1	High/ Critical Area	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$1.1 million to design, permit, and install a project to restore natural channel geometries where possible and reconnect it to the floodplain, install pools and riffles/grade controls in channel, remove invasives along full stream corridor and floodplain, replant with natives, install educational signage regarding water quality, and maintain for three years to establish	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATION (SEE FIGURE 38)												
7th9	See Figure 38 for project location	1,235	1,235 lf of highly channelized and moderately eroded stream; western bank is at the bottom of a steep, wooded embankment while eastern bank is residential	Design, permit and implement project to selectively stabilize eroded areas using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	231.1	202.3	459.6	Medium	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$171K to design, permit, and install a project to selectively stabilize eroded areas using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	10-20 years
7th10	See Figure 38 for project location	828	828 lf of highly channelized and moderately eroded stream; western bank is at the bottom of a steep, wooded embankment while eastern bank is residential	Design, permit and implement project to selectively stabilize eroded areas using hard-armoring where necessary, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	154.9	135.3	305.5	High/ Critical Area	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$510K to design, permit, and install a project to selectively stabilize eroded areas using hard-armoring where necessary, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	10-20 years
7th11	See Figure 38 for project location	1,904	1,904 lf of stream with moderately channelized and eroded streambanks with some sections of exposed bedrock	Design, permit and implement project to selectively stabilize eroded areas particularly outside bends using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	367.5	319.7	710.6	High/ Critical Area	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$710K to design, permit, and install a project to selectively stabilize eroded areas particularly outside bends using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATION (SEE FIGURE 38)												
7th12	See Figure 38 for project location	1,088	1,088 lf of stream with highly channelized and moderately eroded streambanks with some sections of exposed bedrock	Design, permit and implement project to selectively stabilize eroded areas particularly outside bends using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor and adjacent natural area, naturalize corridor and streambanks with natives, and maintain for three years to establish	125.2	111.0	262.0	High/ Critical Area	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$324K to design, permit, and install a project to selectively stabilize eroded areas particularly outside bends using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor and adjacent natural area, naturalize corridor and streambanks with natives, and maintain for three years to establish	1-10 years
7thN B1	See Figure 38 for project location	1,037	1,037 lf of stream with low levels of erosion and channelization; drains a series of man-made ponds through degraded woodland	Design, permit and implement project to selectively stabilize eroded areas using bioengineering techniques, remove invasives throughout stream corridor, naturalize corridor and streambanks with natives, and maintain for three years to establish	36.2	45.4	265.8	Medium	SCPD, private property owners	USACE, Engineer, Environmental Consultant	$146K to design, permit, and install a project to selectively stabilize eroded areas using bioengineering techniques, remove invasives throughout stream corridor, naturalize corridor and streambanks with natives, and maintain for three years to establish	10-20 years
7thN B2	See Figure 38 for project location	1,304	1,304 lf of stream with low levels of channelization and moderate erosion; drains a series of man-made ponds through degraded woodland	Design, permit and implement project to selectively stabilize eroded areas particularly outside bends using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor, naturalize corridor and streambanks with natives, and maintain for three years to establish	76.0	71.8	171.6	Medium	SCPD, private property owners	USACE, Engineer, Environmental Consultant	$235K to design, permit, and install a project to selectively stabilize eroded areas particularly outside bends using bioengineering techniques, or hard-armoring where necessary, remove invasives throughout stream corridor, naturalize corridor and streambanks with natives, and maintain for three years to establish	10-20 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
STREAMBANK, CHANNEL, & RIPARIAN AREA RESTORATION (SEE FIGURE 38)												
7thN B3	See Figure 38 for project location	1,145	1,145 lf of stream with low levels of erosion and channelization; drains a series of man-made ponds through degraded woodland	Design, permit and implement project to selectively stabilize eroded areas using bioengineering techniques, remove invasives throughout stream corridor, naturalize corridor and streambanks with natives, and maintain for three years to establish	31.8	31.6	98.2	Medium	SCPD, UPRR, private property owners	USACE, Engineer, Environmental Consultant	$160K to design, permit, and install a project to selectively stabilize eroded areas using bioengineering techniques, remove invasives throughout stream corridor, naturalize corridor and streambanks with natives, and maintain for three years to establish	10-20 years
7thN B4	See Figure 38 for project location	966	966 lf of moderately eroded, heavily channelized stream; heavily manipulated system of channels and stormwater pipes	Design, permit, and implement project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	100.8	88.2	215.2	Medium	St. Charles, private property owners	USACE, Engineer, Environmental Consultant	$240K to design, permit, and install a project to selectively stabilize eroded areas using bioengineering techniques, increase stream length with meanders or step weirs where possible, remove invasives throughout stream corridor, naturalize buffer and streambanks with natives, and maintain for three years to establish	10-20 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
Technical and Financial Assistance Needs: Technical assistance needed to implement detention basin retrofits is relatively low while financial assistance needs are moderate. Private landowners will need the greatest assistance.												
4A	Early Learning Center on Dean St west of 17th Street	0.3	Wet Bottom Detention - rock wall along portions of sides with remaining turf side slopes	Design and implement a project to remove turf and invasives, replant side slopes, and maintain for three years to establish	2	3	20	Low	Private property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
4C	Foundry Business Park at northwest corner of Dean St and 17th Street	1.9	Wet Bottom Detention - large basin with rock retaining wall along outside of buffer, turf side slopes and lots of geese	Design and implement project to remove turf, install a native prairie buffer, plant emergents along shoreline, and maintain for three years to establish	7	9	63	High/ Critical Area	Foundry Business Park property owner	Ecological Consultant/ Contractor	$45,750 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years
4D	Timber Trails - west end of park behind Thornwood Dr	4.3	Wetland Bottom Detention - large wetland used as detention with pier on water and woodland buffer	Design an implement a project to remove invasives throughout wetland buffer	8	11	37	Medium	SCPD	Ecological Consultant/ Contractor	$64,500 to implement invasive managemenet throughout wetland buffer	10-20 years
4E	Oak Crest Townhomes at south end of Oak Crest Ln	0.6	Dry Bottom Detention - turf lined basin and slopes with rock retaining wall along north end of basin	Design and implement a project to remove turf, plant basin and slopes to prairie, and maintain for three years to establish	3	3	12	Medium	Oak Crest Townhomes property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years

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					TSS (tons)	TP (lbs)	TN (lbs)					
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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
4F	Randallwood at northwest corner of Randall Rd and Dean St	0.1	Dry Bottom Detention - small turf lined basin and slopes	Design and implement a project to remove turf, plant basin and slopes to prairie, and maintain for three years to establish	4	4	16	Medium	Randallwood property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
4H	Behind 2435 Dean St at LeRoy Oaks Business Park	0.7	Wet Bottom Detention - natural detention basin filled with weedy and woody invasives and trees with turf buffer	Design and implement a project to remove turf and invasives, naturalize buffer, and maintain for three years to establish	3	3	26	Low	LeRoy Oaks Business Park property owner	Ecological Consultant/ Contractor	$20,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
4I	Behind Wind Hill Office Center	0.9	Wet Bottom Detention - large basin with turf side slopes and eroded toe	Design and implement project to remove turf, regrade toe, install a native prairie buffer, plant emergents along shoreline, and maintain for three years to establish	3	4	30	Medium	Wind Hill Office Center property owner	Ecological Consultant/ Contractor	$25,500 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
4K	Northeast corner of Dean St and Randall Rd	0.2	Dry Bottom Detention - turf lined basin with pocket of phragmites; exposed corrugated pipe running linear length of basin	Design and implement a project remove turf and pipe, create swale feature on linear length and replant basin and slopes to natives	2	2	15	Medium	Private property owner	Ecological Consultant/ Contractor	$15,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
5A	Behind Sportsplex on Foundry St	2.2	Dry Bottom Detention - turf lined basin and slopes with multiple inlets	Design and implement a project to remove turf, plant basin and slopes to natives, and maintain for three years to establish	9	13	53	High/ Critical Area	Foundry Business Park , Porter Business Park	Ecological Consultant/ Contractor	$36,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
5D	Timber Trails - southeast end of park near Manley Rd	5.0	Wetland Bottom Detention - large wetland used as detention adjacent expansive turf areas with manhole that short circuits to outlet on south side, low flow drains into manhole at inlet	Design and implement a project to regrade low area for water quality benefits; remove or plug lowflow manhole; restore existing wetland and plant extended prairie buffer, and install educational signage	3	10	32	High/ Critical Area	SCPD	Ecological Consultant/ Contractor; Engineer	$220,000 to design, permit & regrade, install prairie buffer & emergent plants, including maintenance for 3 year establishment period, and install educational signage	1-10 years
6A	Between Main St and Woodward Dr	1.4	Wet Bottom Detention - large basin with partially mowed and weedy side slopes	Design and implement a project to remove turf and invasives, naturalize buffer, and maintain for three years to establish	1	2	4	Low	Private property owner	Ecological Consultant/ Contractor	$34,500 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
7A	Behind school bus lot southeast of Randall and Dean Sts	0.8	Wet Bottom Detention - full of cattails with mowed turf side slopes	Design and implement a project to remove turf and invasives, naturalize buffer, and maintain for three years to establish	7	9	46	High/ Critical Area	St. Charles Twnshp	Ecological Consultant/ Contractor	$25,500 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
7B	Behind Simply Storage east of Randall Rd	0.4	Dry Bottom Detention - surrounded by 8-10 foot rock retaining wall and overgrown with woody invasives and cottonwoods	Design and implement a project to removes invasives, plant natives, and maintain for three years to establish	5	6	44	Low	Simply Storage property owner	Ecological Consultant/ Contractor	$15,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
7C	Built out, but unowned subdivision along Woodward Dr	1.2	Wet Bottom Detention - unmaintained naturalized basin overrun with invasives	Design and implement a project to remove invasives, naturalize buffers, and maintain for three years to establish once development resumes	2	3	11	High/ Critical Area	Pending property owner	Ecological Consultant/ Contractor	$27,700 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years
7D	Built out, but unowned subdivision along Woodward Dr	7.8	Wet Bottom Detention - unmaintained naturalized basin overrun with invasives	Design and implement a project to remove invasives, naturalize buffers, and maintain for three years to establish once development resumes	4	6	18	High/ Critical Area	Pending property owner	Ecological Consultant/ Contractor	$185,500 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years
7E	Built out, but unowned subdivision along Woodward Dr	2.2	Wet Bottom Detention - unmaintained naturalized basin overrun with invasives	Design and implement a project to remove invasives, naturalize buffers, and maintain for three years to establish once development resumes	1	1	1	High/ Critical Area	Pending property owner	Ecological Consultant/ Contractor	$53,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
7F	Built out, but unowned subdivision along Woodward Dr	3.1	Wet Bottom Detention - unmaintained naturalized basin overrun with invasives	Design and implement a project to remove invasives, naturalize buffers, and maintain for three years to establish once development resumes	4	5	31	High/ Critical Area	Pending property owner	Ecological Consultant/ Contractor	$73,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years
7G	Southeast of Main and Oak St in front of USPS	0.6	Dry Bottom Detention - mowed turf basin with pocket of woody invasives	Design and implement a project to remove turf and invasives, naturalize buffer, and maintain for three years to establish	5	5	18	Medium	USPS	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
7H	Behind Buona Beef south of Main St	0.4	Wet Bottom Detention - wet bottom basin filled with cattails and rock-lined walls	Design and implement a project to remove invasives, naturalize buffer, and maintain for three years to establish	3	3	23	Low	Buona Beef property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
7I	North of Harley Davidson along Oak St	2.0	Wet Bottom Detention - large baisn surrounded by woody invasives	Design and implement a project to remove invasives, restore with natives, and maintain for three years to establish	8	9	69	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$48,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
7J	North of Harley Davidson along Oak St	2.3	Wet Bottom Detention - large basin surrounded by woody invasives	Design and implement a project to remove invasives, restore with natives, and maintain for three years to establish	10	13	93	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$55,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years
7K	Firestone southwest of Main St and Randall Rd	0.4	Wet Bottom Detention full of cattails and woody invasives with rock wall on three sides	Design and implement a project to remove invasives, restore with natives, and maintain for three years to establish	2	3	15	Low	Firestone property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
7L	7 Eleven southwest of Main St and Randall Rd	0.3	Wet Bottom Detention - turf with pocket of cattails	Design and implement a project to remove turf and invasives, naturalize basin and buffer, and maintain for three years to establish	4	4	23	Medium	7 Eleven property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
8A	Behind O'Reilly southwest of Main St and S 14th St	0.4	Dry Bottom Detention - large basin with north half filled with Phragmites and cattails, remaining mowed turf	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	5	7	50	High/ Critical Area	O'Reilly property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
8C	Olcott Plastics at north end of N 17th St	1.5	Wetland Bottom Detention - full of cattails and little Phragmites with rock retaining wall on all four sides	Design and implement a project to remove invasives, restore with natives, and maintain for three years to establish	4	5	23	Low	Olcott Plastics property owner	Ecological Consultant/ Contractor	$36,750 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
8D	St. Charles Twnshp Office on Dean St	0.2	Dry Bottom Detention - turf basin with concrete channel, two inlets, and an outlet	Design and implement a project to break concrete channel, remove turf, naturalize basin and slopes with natives, and maintain for three years to establish	2	3	10	Medium	St. Charles Twnshp	Ecological Consultant/ Contractor	$20,000 to design & install prairie buffer, break channels, and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
8E	St. Charles Twnshp Office on Dean St	1.0	Wet Bottom Detention with mowed turf side slopes and full of cattails	Design and implement a project to remove turf and invasives, naturalize buffer, and maintain for three years to establish	3	3	12	Medium	Private property owner	Ecological Consultant/ Contractor	$25,500 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
10A	Behind Chase at Randall Rd and Prairie St	0.2	Dry Bottom Detention - linear turf basin with concrete channels along bottom	Design and implement a project to break concrete channel, remove turf, naturalize basin and slopes with natives, and maintain for three years to establish	1	1	5	Low	Chase property owner	Ecological Consultant/ Contractor	$20,000 to design & install prairie buffer, break channels, and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
10B	Behind Chase at Randall Rd and Prairie St	0.3	Dry Bottom Detention lined with turf and rock walls	Design and implement a project to remove turf, naturalize basin and maintain for three years to establish	2	2	14	Medium	Chase property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
10C	Kane Co. Fairgrounds at Randall Rd and Lincoln Hwy	1.4	Wet Bottom Detention with mowed buffer and slopes with some invasives	Design and implement a project to remove turf and invasives, naturalize buffer, install educational signage, and maintain for three years to establish	16	19	68	High/ Critical Area	Kane County	Ecological Consultant/ Contractor	$34,500 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years
14A	North of Stonehedge and west of Persimmon	0.5	Dry Bottom Detention lined with mowed turf, with manhole at the bottom and adjacent unused area of mowed turf	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	10	15	52	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer,and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
15A	Just south of Persimmon Woods behind Kleim Tl	3.8	Dry Bottom Detention - large turf basin with manholes at bottom, no or little residential access	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	5	15	51	High/ Critical Area	SCPD	Ecological Consultant/ Contractor	$60,000 to design & install prairie buffer, and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
15C	Hunt Club Wetland between Keim Tl and Fox Chase Blvd	6.3	Wetland Bottom Detention – naturalized with shallow cattail emergent area and prairie buffer	Design and implement a project to remove invasives throughout wetland buffer	6	19	63	High/ Critical Area	SCPD	Ecological Consultant/ Contractor	$94,500 to implement invasive managemenet throughout wetland buffer	1-10 years
15D	Southwest corner of Fox Chase Park off of Fox Chase Blvd.	0.9	Dry Bottom Detention lined with turf at southwest end of park	Design and implement a project to remove turf, naturalize buffer, install educational signage, and maintain for three years to establish	4	6	17	Low	SCPD	Ecological Consultant/ Contractor	$23,000 to design & install prairie buffer, naturalize basin including maintenance for 3 year establishment period, and install educational signage; assumes simple design-build with no permit requirements	10-20 years
17A	Behind Church south of Allen Ln	0.2	Wet Bottom Detention - naturalized but weedy basin behind church with mowed turf/manicured edges, adjacent to labyrinth	Design and implement a project to remove invasives, restore with natives, and maintain for three years to establish	5	5	19	Medium	Private property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
17B	Between Persimmon Dr and Steeplechase Ln	2.8	Dry Bottom Detention - massive mowed turf basin with three manholes at bottom and four large inlet structures; fish in mouth of inlet	Design and implement a project to remove turf, naturalize basin, install educational signage, and maintain for three years to establish	7	21	71	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$50,000 to design & install prairie buffer, naturalize basin including maintenance for 3 year establishment period, and install educational signage; assumes simple design-build with no permit requirements	1-10 years
18A	Hunt Club Park at Persimmon Dr and Hunt Club Dr	4.5	Dry Bottom Detention - large, turf basin with manholes at bottom, flume running to tributary and several inlets	Design and implement a project to remove turf, plant basin and slopes to native vegetation, install educational signage, and maintain for three years to establish	3	10	34	High/ Critical Area	SCPD	Ecological Consultant/ Contractor	$75,500 to design & install prairie buffer, naturalize basin including maintenance for 3 year establishment period, and install educational signage; assumes simple design-build with no permit requirements	1-10 years
18C	Hunt Club Village off of Hunt Club Dr	0.5	Wet Bottom Detention - 3/4 turf and 1/4 Phragmites with a manhole at the bottom and one inlet	Design and implement a project to remove turf, plant basin and slopes to native vegetation, and maintain for three years to establish	5	6	22	Medium	Hunt Club Village property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
18D	Heinz Brothers Greenhouse at Surrey Woods Dr and Main St	0.3	Wetland Bottom Detention - weedy bottom	Design and implement a project to control invasives, plant natives, and maintain for three years to establish	3	3	12	Medium	Heinz Brothers Greenhouse property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
19A	On Surrey Woods Dr	0.6	Wetland Bottom Detention with partial turf slopes (all but east end)	Design and implement a project to remove turf and invasives, naturalize basin and buffer, and maintain for three years to establish	2	2	15	Low	Private property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
19C	Behind Dunham Rd shops	0.5	Wet Bottom Detention - linear basin with walls on three sides and turf on east slope	Design and install project to remove turf on east slope, naturalize with natives and maintain for three years to establish	2	2	16	Low	Dunham Rd shops property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
19D	Along east side of Coca Cola at E Main St and Industrial Dr	0.2	Dry Bottom Detention lined with turf	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	2	3	11	Medium	Coca Cola	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
19E	At St. Charles Toyota off of E Main St	1.8	Dry Bottom Detention - long linear basin behind Toyota, half mowed turf and half wetland	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	6	8	33	High/ Critical Area	St. Charles Toyota	Ecological Consultant/ Contractor	$30,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
19F	AMLI at St. Charles off of Lakeside Dr	3.4	Wet Bottom Detention - large basin with rock toe and mowed turf side slopes; lots of geese	Design and implement a project to remove turf in roughly 10 foot buffer surrounding pond, regrade if necessary, naturalize buffer and basin with natives, and maintain for three years to establish	22	25	107	High/ Critical Area	AMLI	Ecological Consultant/ Contractor	$85,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years
19G	In front of Coca Cola at E Main St and Industrial Dr	0.2	Dry Bottom Detention - triangular turf basin	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	3	3	14	Low	Coca Cola	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
20A	Next to Spotted Fox Ale House southeast of E Main St and Kirk Rd	2.0	Wet Bottom Detention - large basin for commercial complex, has roughly 6 foot buffer of weeds at toe with turf side slopes, lots of weedy/woody invasives	Design and implement a project to remove turf and invasives, regrade slopes if necessary, naturalize basin and buffer, and maintain for three years to establish	9	12	85	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$48,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years

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DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
21A	Illinois and 7th	0.2	Dry Bottom Detention - deep turf basin	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	2	2	12	Medium	St. Charles Public Library	Ecological Consultant/ Contractor	$15,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
22A	S Tyler Rd and Production Dr	1.3	Wet Bottom Detention - north and east sides are rock retaining walls, woody invasives all along southwestern side; rock wall failing along Tyler Rd	Design & implement a project to remove invasives, plant prairie buffer & emergent plants, including maintenance for 3 year establishment period	5	6	43	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$60,000 to repair retaining wall, design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period	1-10 years
22B	South of 7th and west of S Tyler Rd	0.4	Wet Bottom Detention abandoned pit now used as detention; woody invasives throughout	Design & implement a project to remove invasives, plant prairie buffer & emergent plants, including maintenance for 3 year establishment period	0	0	1	Low	Private property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
22C	Tyler Ridge Business Park on S Tyler Rd	0.2	Dry Bottom Detention - deep, linear basin with two outlets at bottom	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	1	2	10	Medium	Tyler Ridge Business Park property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years

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					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
22D	Tyler Car Wash west of S Tyler Rd	0.2	Dry Bottom Detention - turf with pocket of Phragmites	Design and implement a project to remove turf and invasives, naturalize buffer and basin with natives, and maintain for three years to establish	2	2	10	Medium	Tyler Car Wash property owner	General Contractor, Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
22E	St. Charles Body Shop west of S Tyler Rd	0.2	Dry Bottom Detention with turf and wetland areas overrun with Phragmites and willow	Design and implement a project to remove turf and invasives, naturalize buffer and basin with natives, and maintain for three years to establish	1	2	12	Medium	St. Charles Body Shop property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
22F	Behind Geneva Inn, north of Production Dr	0.3	Wetland Bottom Detention overrun with Phragmites and woody invasives	Design and implement a project to remove invasives, regrade slopes, naturalize buffer and basin with natives, and maintain for three years to establish	3	4	24	Low	Geneva Inn property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
22G	Sun Chemical on Production Dr	1.5	Dry Bottom Detention - large turf basin west of Sun Chemical	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	5	6	27	Medium	Sun Chemical	Ecological Consultant/ Contractor	$25,500 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
22I	Behind car lot just north of 7th Ave Creek east of Tylyer Rd	0.6	Wet Bottom Detention surrounded by weeds	Design and implement a project to remove invasives from buffer, naturalize buffer and basin with natives, and maintain for three years to establish	4	5	22	Medium	Private property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
22J	Behind McGrath Honda of St. Charles	0.2	Dry bottom detention - oldfield	Design and implement a project to remove old-field, naturalize buffer and basin with natives, and maintain for three years to establish	4	5	22	Medium	McGrath Honda of St. Charles	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
23A	Behind Sun Chemical on Production Dr	1.9	Dry Bottom Detention - large turf basin behind commercial business	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	5	7	31	High/ Critical Area	Sun Chemical	Ecological Consultant/ Contractor	$31,500 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
23B	Production Dr and Toyota	0.1	Dry Bottom Detention with old field, sometimes mowed	Design and implement a project to remove remaining turf and invasives, naturalize basin and buffer, and maintain for three years to establish	5	7	31	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
23C	CHA Industrie along Sidwell Ct east side of road	0.3	Dry Bottom Detention - three part basin, all dry turf with outlet at bottom	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	1	2	8	Low	CHA Industrie	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
23D	North end of Sidwell Ct behind old tracks	10.9	Dry Bottom Detention - massive dry basin behind industrial/commercial businesses; old field/weedy mowed turf with pocket of phragmites in NW corner, several large inlets	Design and implement a project to remove turf and old field, raise outlets if possible, naturalize buffer and basin with natives, install educational signage, and maintain for three years to establish	14	20	82	High/ Critical Area	St. Charles	Ecological Consultant/ Contractor, Engineer	$200,000 to design, permit, & install prairie buffer, naturalize basin including maintenance for 3 year establishment period, and install educational signage	1-10 years
23E	RHA - east of north end of Sidwell Ct	0.2	Wetland Bottom Detention - overrun with phragmites	Design and implement a project to remove remaining turf and invasives, naturalize basin and buffer, and maintain for three years to establish	1	1	10	Medium	RHA property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
23F	Detention at RR Donnelley	0.1	Dry Bottom Detention - linear turf basin with manhole at bottom	Design and implement a project to remove turf, raise outlets, naturalize buffer and basin with natives, and maintain for three years to establish	5	7	28	Medium	RR Donnelley	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
23G	Blue Wave - 1735 Wallace Ave	0.4	Wet Bottom Detention - north end is wet basin with large outlet structure at Wallace, wall on west side and turf slope on east, south end is dry detention with manhole at bottom	Design and implement a project to remove turf, naturalize basin and buffer, and maintain for three years to establish	4	5	23	Medium	Blue Wave property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer & emergent plants, including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	10-20 years
24A	NE corner of Ohio and Kirk	1.4	Dry Bottom Detention - large turf basin with two outlets and fake swan	Design and implement a project to remove turf, raise outlets, regrade slopes, naturalize buffer and basin with natives, and maintain for three years to establish	11	15	65	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$24,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
24B	East of 37th Ave	0.5	Dry Bottom Detention - long linear basin	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	9	12	52	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period; assumes simple design-build with no permit requirements	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate*	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
DETENTION BASIN RETROFITS & MAINTENANCE (SEE FIGURE 39)												
27A	Between Williams and S Tyler Rd	1.1	Dry Bottom Detention - large and lined with turf	Design and implement a project to remove turf, raise outlets, naturalize buffer and basin with natives, and maintain for three years to establish	5	9	30	High/ Critical Area	St. Charles	Ecological Consultant/ Contractor	$19,500 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
27B	Behind Wallace Ave at 1815 Wallace Ave	0.2	Dry Bottom Detention - turf	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	2	3	11	Medium	Private property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
30A	Salvation Army - corner of 7th and 13th Pl	0.1	Dry Bottom Detention - turf between parking lot and road	Design and implement a project to remove turf, naturalize buffer and basin with natives, and maintain for three years to establish	1	1	8	Low	Salvation Army property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie buffer and naturalize basin including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
URBAN & OTHER MANAGEMENT MEASURES (SEE FIGURE 40)												
Technical and Financial Assistance Needs: Technical and financial assistance needed to implement these projects varies depending on complexity.												
4B	Along Dean St extending to Randall Rd	1.2	Roadside swale - mowed turf and phragmites throughout	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	5	5	36	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$23,100 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
4G	West of Randall Rd	0.4	Linear roadside swale lined with rock, some phragmites and invasives	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	5	5	32	High/ Critical Area	St. Charles	Ecological Consultant/ Contractor, Engineer, IDOT	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
5B	Wild Rose Elementary along Thornapple and Red Haw Rd	0.3	Rock-lined roadside swale and two grass swales long Red Haw in front of school	Design and implement a project to convert all three to bioswale with native plants and maintain for three years to establish	5	5	34	Medium	Wild Rose Elementary school	Ecological Consultant/ Contractor, Engineer	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
5C	Wild Rose Elementary along Red Haw between Thorny and Thornyapple Rd	0.8	Turf/park of oaks with turf understory in front of school	Design and implement a project to remove turf and convert area to native prairie/savanna and maintain for three years to establish	2	3	17	Medium	Wild Rose Elementary school	Ecological Consultant/ Contractor, Engineer	$18,000 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
5E	Northwest portion of Timber Trails Park	5.6	Timber Trails thicket, scrub shrub - full of woody invasives, mostly buckthorn	Design and implement a project to remove invasive shrubs and then reseed with natives and maintain for three years to establish	8	13	103	High/ Critical Area	SCPD	Ecological Consultant/ Contractor	$84,000 to design & install woodland restoration including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
URBAN & OTHER MANAGEMENT MEASURES (SEE FIGURE 40)												
5F	Northwest portion of Timber Trails Park	4.0	Timber Trails old field - with few prairie plants left	Design and implement a project to remove invasives and then reseed as prairie with natives and maintain for three years to establish	1	4	21	Medium	SCPD	Ecological Consultant/ Contractor	$60,000 to design & install prairie retrofit including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
6B	Along Main St and Campton Hills Rd	0.2	Linear turf swale along roadside	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	2	2	32	Medium	Private property owner	Ecological Consultant/ Contractor, Engineer, IDOT	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
8B	brownfield at end of 9th St	19.9	brownfield at end of 9th St	Require conservation design or low impact development for future redevelopment of site	N/A	N/A	N/A	High/ Critical Area	St. Charles	Ecological Consultant/ Contractor	N/A	1-10 years
9A	Turf at end of 7th St	1.1	Mowed turf lot with irregular topography and failed tiles (sinkholes)	Design and implement a project to create connected flood storage area adjacent to stream, remove turf, naturalize and maintain for three years to establish	2	3	40	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$19,500 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
13A	Along north side of Hampton Course	0.2	Turf areas between sidewalk and curb	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	2	5	35	Medium	St. Charles	Ecological Consultant/ Contractor, Engineer	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
14B	North along Stonehedge just east of 5th Ave	0.5	Unused mowed turf area	Design and implement a project to remove turf and convert area to native prairie and maintain for three years to establish	9	15	104	High/ Critical Area	St. Charles	Ecological Consultant/ Contractor	$13,000 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
URBAN & OTHER MANAGEMENT MEASURES (SEE FIGURE 40)												
14C	North of Stonehedge at Steeplechase	1.2	Large depressional turf area adjacent SCPD posted "no mow" naturalized area	Design and implement a project to remove turf and convert area to native prairie to extend "no mow" area and maintain for three years to establish	3	9	56	High/ Critical Area	SCPD	Ecological Consultant/ Contractor	$21,000 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
15B	Persimmon Woods Park off of Keim Trl	31.2	Dry mesic woodland dominated by mature white and red oak and sugar maple in canopy; subcanopy dominated by sugar maple and basswood (mesification)	Develop a natural area management plan to include heavy thinning of sugar maple and basswood subcanopy in order to produce oak regeneration	4	47	87	High/ Critical Area	SCPD	Ecological Consultant/ Contractor	$15,000 to create a natural area management plan to include heavy thinning of sugar maple and basswood subcanopy in order to produce oak regeneration	1-10 years
15E	Fox Chase Park parking lot	0.4	Fox Chase Park parking lot	Design and implement a project to remove black top and replace with permeable pavers or similar and install educational signage	4	7	63	High/ Critical Area	SCPD	Ecological Consultant/ Contractor, Engineer	$300K to replace existing asphalt with permeable paver and install educational signage	1-10 years
17C	Turf area to southeast at Delnor Woods	4.7	Mowed turf, few scattered large oaks does not appear to be used	Design and implement a project to remove turf and convert area to native prairie and maintain for three years to establish	0	2	7	Medium	SCPD	Ecological Consultant/ Contractor	$75,000 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
17D	North end of Delnor Woods	11.6	Dry mesic woodland, degraded - evidence of mesification	Develop and implement a natural area management plan to include buckthorn and honey suckle removal, thinning of sugar maple, basswood, black cherry	3	11	56	High/ Critical Area	SCPD	Ecological Consultant/ Contractor	$15,000 to create a natural area management plan to include heavy thinning of sugar maple and basswood subcanopy in order to produce oak regeneration	1-10 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
URBAN & OTHER MANAGEMENT MEASURES (SEE FIGURE 40)												
18B	island on Long Meadow Cr	0.3	island on Long Meadow Cr	Design and implement a project to remove turf and convert area to native prairie and maintain for three years to establish	1	4	24	Medium	St. Charles	Ecological Consultant/ Contractor	$13,000 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
19B	Unused lot behind bank off Main St	0.2	Unused old field lot with swale running diagonally across center	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	4	6	82	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor, Engineer	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
21B	turf at 9th, south of Adams	0.8	turf at 9th, south of Adams	Design and implement a project to remove turf and convert area to native prairie and maintain for three years to establish	1	4	26	Medium	Private property owner	Ecological Consultant/ Contractor	$18,000 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
21C	turf at 10th st and 7th Ave Creek	0.3	turf at 10th st and 7th Ave Creek	Design and implement a project to create connected flood storage area adjacent to stream, remove turf, naturalize and maintain for three years to establish	1	1	13	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor	$13,000 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
23H	depression in front of Blue Wave	0.2	depression in front of Blue Wave	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	2	3	22	Medium	Blue Wave property owner	Ecological Consultant/ Contractor	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
*** NOTE: All cost estimates are rough estimates based on average costs for similar work for the purposes of chasing additional funding and may change as projects are developed in detail.**												
URBAN & OTHER MANAGEMENT MEASURES (SEE FIGURE 40)												
23I	depression at Sun Chemical	0.3	depression at Sun Chemical	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	1	2	16	Low	Sun Chemical	Ecological Consultant/ Contractor	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
23J	2500 Production Dr	0.2	Linear turf swale with culverts under driveways	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	3	4	35	Medium	Private property owner	Ecological Consultant/ Contractor, Engineer	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years
23K	Along Dukane Dr south of Production Dr	1	Turf swale with manhole at bottom	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	5	7	56	High/ Critical Area	Private property owner	Ecological Consultant/ Contractor, Engineer	$20,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
23L	turf at Dukane	14	turf at Dukane	Design and implement a project to remove turf and convert area to native prairie and maintain for three years to establish	20	31	253	High/ Critical Area	Dukane property owner	Ecological Consultant/ Contractor	$210,000 to design & install prairie conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	1-10 years
23M	Kristel Displays at Tyler southwest of Dukane Dr	0.3	Linear turf swale between road and parking lot with manhole at bottom	Design and implement a project to convert to bioswale with native plants and maintain for three years to establish	2	2	19	Low	Kristel Displays property owner	Ecological Consultant/ Contractor, Engineer	$13,000 to design & install naturalized bioswale conversion including maintenance for 3 year establishment period, assumes simple design-build with no permit requirements	10-20 years

ID#	Location	Units (AC or LF)	Existing Condition	Management Measure Recommendation	Pollutant Reduction Efficiency per Year			Priority	Owner & Responsible Entity	Sources of Technical Assistance	Cost Estimate	Implementation Schedule (Years)
					TSS (tons)	TP (lbs)	TN (lbs)					
GREEN INFRASTRUCTURE PROTECTION AREAS (SEE FIGURE 43)												
Technical and Financial Assistance Needs: Technical and financial assistance needed to protect open space or implement conservation/low impact development is high because of land, design/permitting, and construction costs.												
GI – State Street Creek	Along State Street Creek where floodplain intersects parcels	57	57 acres on mostly private parcels in State Street Creek watershed where floodplain is or should be located	Manage as part of the green infrastructure network by maintaining stream corridors and expanding buffers where possible. Permanently protect via easement and/or acquire and naturalize parcels or portions of parcels if and when the opportunity arises.	Pollutant reduction cannot be assessed via modeling			High/ Critical Area	Private owners/St. Charles	SCPD, IDNR, IEPA	The cost for permanently protecting or acquiring parcels cannot be determined	If/when parcels become available for redevelopment or purchase
GI – 7th Avenue Creek	Along 7th Avenue Creek where floodplain intersects parcels	74.0	74 acres on mostly private parcels in 7th Avenue Creek watershed where floodplain is located	Manage as part of the green infrastructure network by maintaining stream corridors and expanding buffers where possible. Permanently protect via easement and/or acquire and naturalize parcels or portions of parcels if and when the opportunity arises.	Pollutant reduction cannot be assessed via modeling			High/ Critical Area	Private owners/St. Charles	SCPD, IDNR, IEPA	The cost for permanently protecting or acquiring parcels cannot be determined	If/when parcels become available for redevelopment or purchase

5.0 WATER RESOURCE POLICY & PROGRAMMATIC RECOMMENDATIONS

In addition to the site-specific recommendations outlined in section 4, this section includes policy or programmatic measures that can be applied across the watershed by various stakeholders. Together, the programmatic and site specific measures provide a solid foundation for protecting and improving watershed conditions but should be updated as projects are completed or other opportunities arise.

5.1 GREEN INFRASTRUCTURE

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 any school grounds, golf courses, detention basins, parks, ball fields, large residential parcels, and developed lots that include a stream corridor are also considered components of a Green Infrastructure Network (GIN). It is important to note that since State Street Creek and 7th Avenue Creek are highly developed watersheds, existing green infrastructure is highly fragmented.

The GIN was developed at the parcel level since this is the scale at which land changes ownership. A three step process was used to create a parcel-based GIN for the watersheds:

Step 1: All parcels of land in the watershed were categorized as open space, partially open space, or developed.

Step 2: Protected open and partially open parcels were identified.

Step 3: Open and partially open parcels, as well as some developed parcels within the floodplain, 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." Step 1 included classifying all parcels according to these categories.

Step 2 in creating a Green Infrastructure Network for State Street Creek and 7th Avenue Creek watersheds was completed by determining which open and partially open parcels were protected. This includes parcels owned and managed by St. Charles Park District as well as some City-owned parcels.

The final step (Step 3) in creating a Green Infrastructure Network for the watersheds involved laying out the network by incorporating all open and partially open parcels and then using the routes of hydric soils, i.e. historic drainage, where necessary to connect highly fragmented components of the green infrastructure network. These parcels were labeled as "Developed GIN" parcels. It is important that these parcels be managed as part of the green infrastructure network to the extent practicable in the future.

The resulting Green Infrastructure Network for State Street Creek and 7th Avenue Creek watersheds is illustrated in Figure 41. The Green Infrastructure Network totals 427 acres in State Street Creek, of which 38 acres are protected; while in 7th Avenue Creek watershed the network is 665 acres, of which 159 acres are protected.

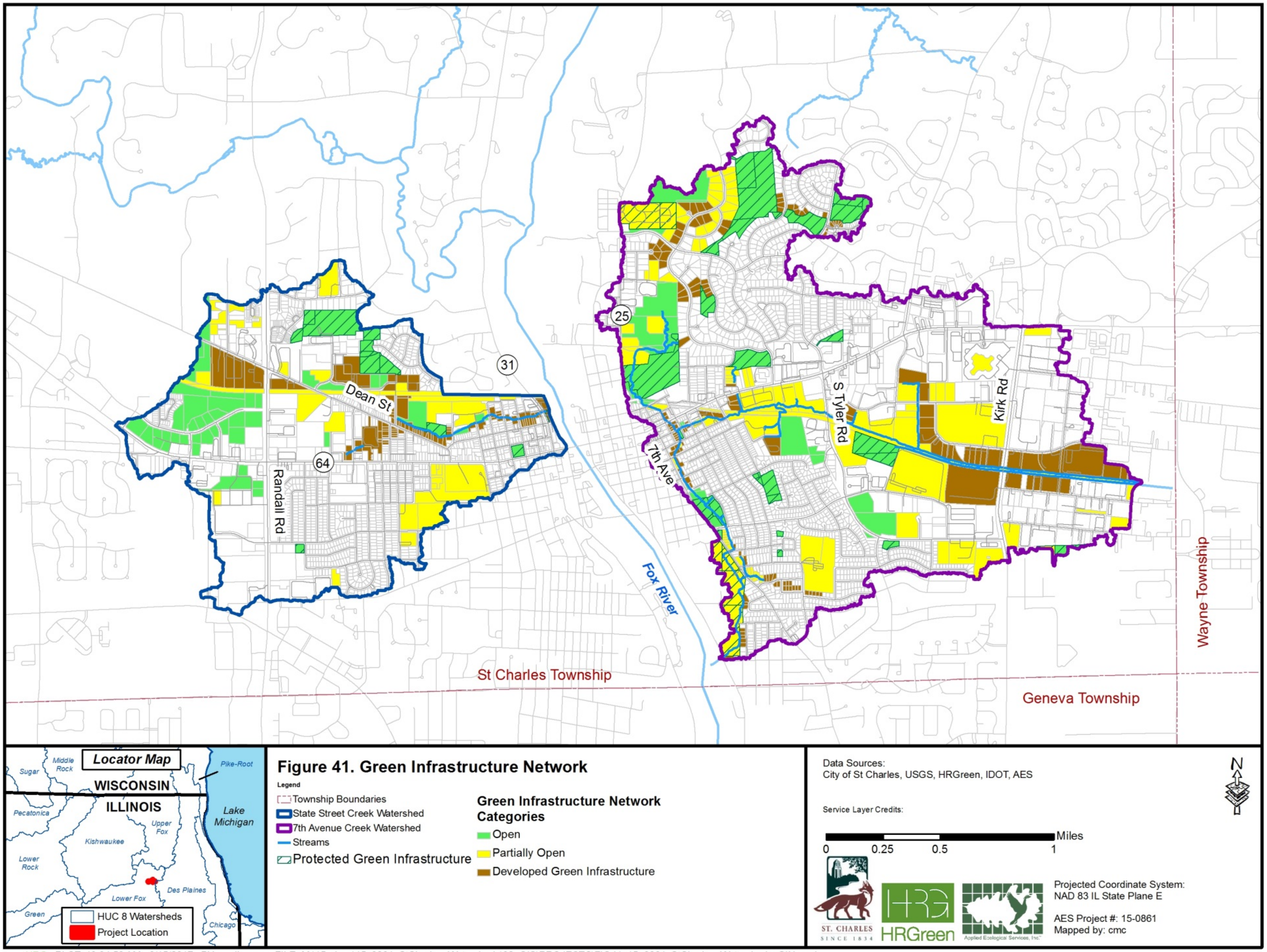

Figure 41. Green Infrastructure Network

HRG PLOT: 10:34:59 AM 3/15/2017 BY: cecily.cunz FILE: M:\15_docs\15_0861_StCharles_Watersheds\02_GIS\PROJECTS\FIG41_15_0861_StCharles_Watersheds_GIN.mxd

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 42). Hubs consist of the largest and least fragmented areas such as Timber Trails, Persimmon Woods, Delnor Woods Parks, and a number of large detention basins. Corridors are formed by smaller private/ unprotected parcels along developed reaches of streams and the old railroad beds. Corridors are important because they provide biological conduits between hubs. However, most parcels forming corridors are not ideal green infrastructure until residents, businesses, and other landowners embrace the idea of managing stream and drainage corridors.

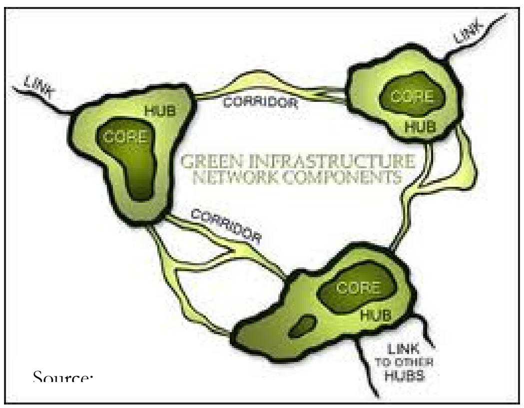

Figure 42. Green Infrastructure

Green Infrastructure Planning

A green infrastructure network provides communities with a tool to identify and prioritize land use or conservation opportunities and plan development that benefits both people and nature by providing a framework for future growth. It identifies areas not suitable for development, areas suitable for development but that should incorporate conservation or low impact design standards, and areas that do not affect green infrastructure. Park Districts, Forest Preserve Districts, and IDNR can use green infrastructure plans for trail routing, open space linkages, and natural area restoration decisions. Residents can use green infrastructure recommendations to reduce runoff from their properties and to see how their properties fit into the larger network.

Green Infrastructure Network *implementation* has several actions:

- Protect specific unprotected green infrastructure parcels through acquisition, regulation, and/or incentives.
- Incorporate conservation or low impact design standards on green infrastructure parcels where development is planned.
- Limit future fragmentation of green infrastructure parcels.
- Implement long term management of green infrastructure.

A Green Infrastructure Network can only be realized by coordinated planning efforts of local municipalities, park districts, developers, and private land owners. Stakeholders should follow the recommended process below to initiate and implement the Green Infrastructure Network for State Street Creek and 7th Avenue Creek watersheds.

1) Include all green infrastructure parcels in updated community comprehensive plans and development review maps.
2) Utilize tools such as protection overlays, setbacks, open space zoning, conservation easements, conservation and/or low impact development, etc. on all green infrastructure parcels.

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) Identify important unprotected green infrastructure parcels not suited for development then protect and implement long term management.
5) Work with private land owners along stream/tributary corridors to manage their land for green infrastructure benefits.
6) Use the Green Infrastructure Network to identify new trails and trail connections.

Green Infrastructure Protection Area Recommendations

Due to the built-out nature of the State Street Creek and 7th Avenue Creek watersheds and the fact that the St. Charles Park District owns and manages the bulk of the undeveloped green infrastructure parcels, it is important the existing stream corridors and adjacent buffers be managed as part of the Green Infrastructure Network to the extent practicable. That means that all landowners identified within the Green Infrastructure Network should be educated on how to manage their stream corridors and/or create habitat on their properties. Landowners within the Green Infrastructure Network can manage their fertilizer use, avoid dumping grass clippings and other garden debris in streams, remove non-native species from their land, plant native vegetation where possible, and work with experts to restore degraded stream reaches on their property.

For this watershed plan, High Priority/Critical Area Green Infrastructure Protection Areas are best described as parcels that intersect the FEMA Floodplains and Floodways, regardless of their level of development. These areas are situated along what remains of the existing Green Infrastructure Network, but are generally unprotected and heavily degraded and are at risk of flooding in the future. In addition to having private owners manage their land for the portion of the stream corridor and/or creating habitat on their property, permanently protecting (such as by utilizing conservation easements) and/or acquiring all or portions of these parcels and restoring them to the extent practicable as they become available for purchase would best improve overall watershed conditions in the future.

Green infrastructure protection can be accomplished over time through acquisition of some properties, but also relies heavily on encouraging landowners to protect all or portions of their land using conservation easements. A conservation easement permanently protects specific conservation values, such as natural habitat, outdoor recreation, hunting, and migration routes, and typically restricts future development. With a conservation easement, a landowner can preserve the qualities they treasure about their property for themselves and future generations to enjoy while maintaining ownership of that land (FPDWC, 2015). In turn landowners are afforded substantial tax benefits based on the reduced value of that portion of the land under easement and can create a legacy of conservation. In Illinois over 200,000 acres are protected under conservation easements. According to the president of Prairie State Conservation Coalition, Illinois residents "understand that more open space improves their quality of life, keeps property taxes low and ensures healthier, more sustainable communities for the future (PSCC, 2012)."

Information obtained from watershed conditions data and green infrastructure sections of this plan led to the identification of 57 acres of green infrastructure protection areas in State Street Creek and 74 acres of green infrastructure protection areas in 7th Avenue Creek (Figure 43).

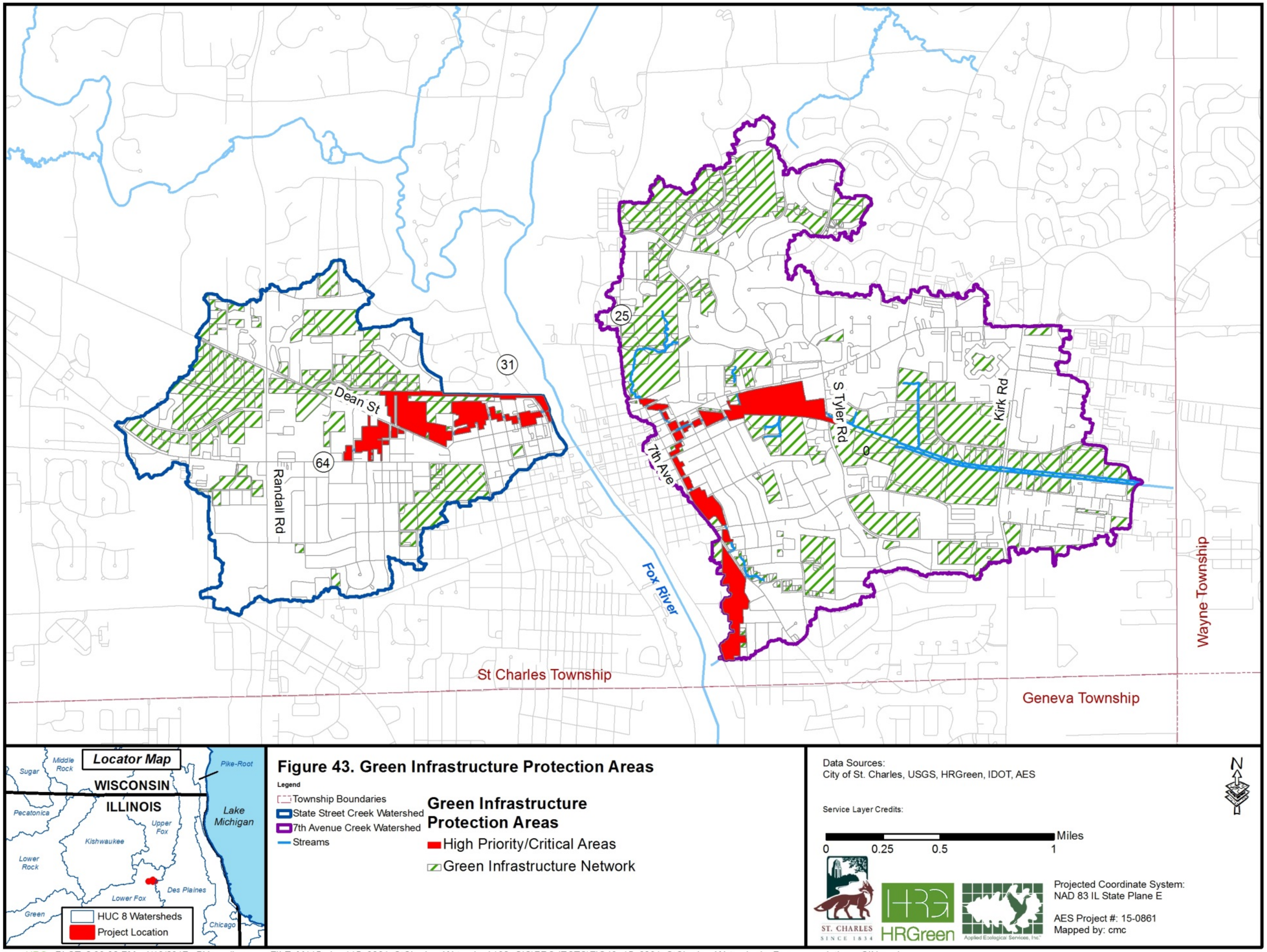

Figure 43. Green Infrastructure Protection Areas

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5.2 ADDITIONAL PROGRAMMATIC BEST MANAGEMENT PRACTICES

Dry & Wet Bottom Detention Basin Design/Retrofits, Establishment, & Maintenance

Detention basins are best described as human made depressions for the temporary storage of stormwater runoff with controlled release following a rain event. There are over 75 detention basins in State Street Creek and 7th Avenue Creek watersheds and most are associated with residential and commercial development. Many of the existing dry bottom basins are designed with outlets that sit flush with the basin bottom and are planted with turf grass. Most existing wet bottom basins are essentially ponds planted with turf grass along the slopes. These attributes do not promote good infiltration, water quality improvement, or wildlife habitat capabilities.

Studies conducted by several credible entities over the past two decades reveal the benefits of detention basins that serve multiple functions. According to USEPA, properly designed dry bottom infiltration basins reduce total suspended solids (sediment) by 75%, total phosphorus by 65%, and total nitrogen by 60%. Wet bottom basins designed to have wetland characteristics reduce total suspended solids (sediment) by 77.5%, total phosphorus by 44% and total nitrogen by 20%.

Future detention basin design within the watershed should consist of naturalized basins that serve multiple functions, including appropriate water storage, water quality improvement, natural aesthetics, and wildlife habitat. There are also a large number of opportunities to retrofit existing dry or wet bottom detention basins by incorporating minor engineering changes and naturalizing with native vegetation. Site specific retrofit opportunities are identified in the Site Specific Action Plan. Location, design, establishment, and long term maintenance recommendations for naturalized detention basins are included below.

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

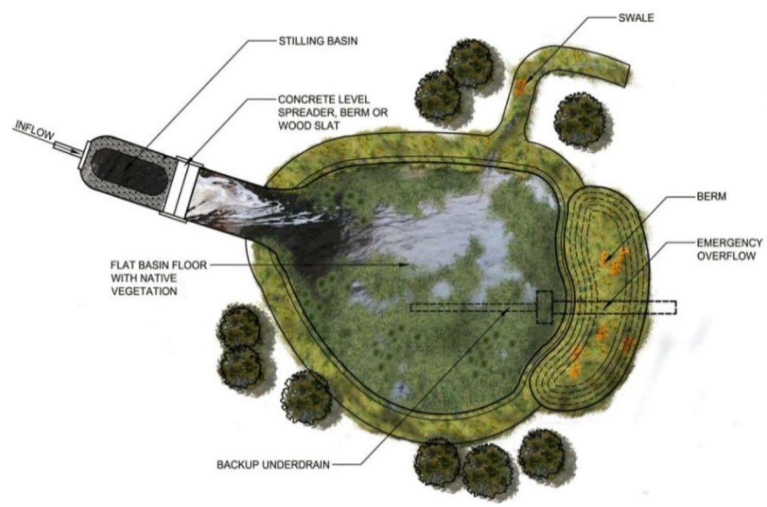


Figure 44. Naturalized dry bottom infiltration basin

One appropriately sized, large detention basin should be constructed across multiple development sites rather than constructing several smaller basins. Side slopes should be no steeper than 4H:1V, at least 25 feet wide, planted to native mesic prairie, and stabilized with erosion control blanket. Native oak trees (Quercus sp.) and other fire-tolerant species should be the only tree species planted on the side slopes. Dry bottom basins should be planted to mesic or wet-mesic prairie depending on site conditions.

A minimum 5-foot wide shelf planted to native wet prairie and stabilized with erosion control blanket should be constructed above the normal water level in wet and wetland bottom basins. This area should be designed to inundate after every 0.5 inch rain event or greater. A minimum 10-foot wide shelf planted with native emergent plugs should extend from the normal water level to 2 feet below normal water level in wet and wetland bottom basins. Permanent pools in wet and wetland bottom basins should be at least 4 feet deep. Irregular islands and peninsulas should be constructed in wet and wetland bottom basins to slow the movement of water through the basin. They should be planted to native mesic or wet prairie depending on elevation above normal water level. A 4-6 foot deep forebay should be built at inlet(s) of wet/wetland bottom basins to capture sediment; a 4-6 foot deep micropool should be constructed at the outlet to prevent clogging.

<u>Short Term (3 Years) Native Vegetation Establishment Recommendations</u>

In most cases, the developer or owner should be responsible for implementing short term management of detention basins and other natural areas to meet a set of performance standards. Generally speaking, three years of management is needed to establish native plant communities within detention basins. Measures needed include mowing during the first two growing seasons following seeding to reduce annual and biennial weeds. Spot herbiciding is also needed to eliminate problematic non-native/invasive species such as thistle, reed canary grass, common reed, and emerging cottonwood, buckthorn, and box elder saplings and inlet and outlet structures should be checked for erosion and clogging during every site visit. Table 29 includes a three year schedule appropriate to establish native plantings around naturalized detention basins.

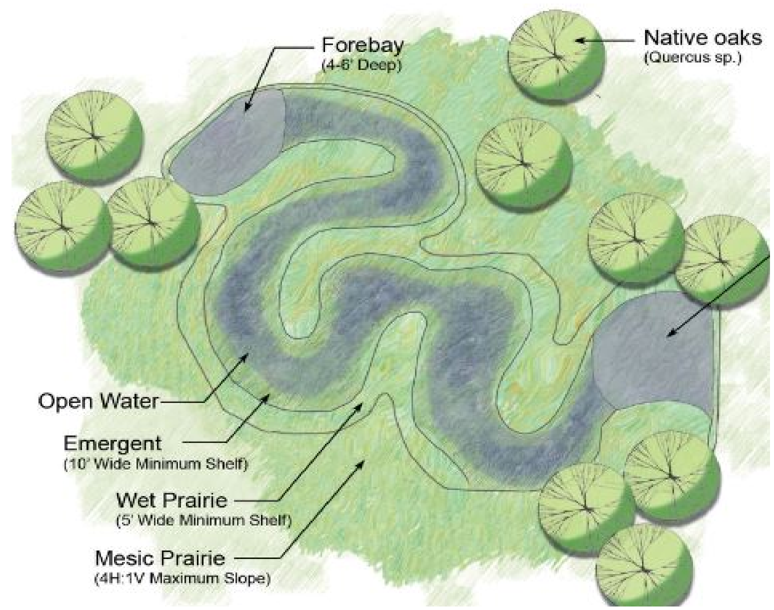


Figure 45. Naturalized wet bottom detention basin design.

Table 29. Three-year vegetation establishment schedule for naturalized detention basins.

Year 1 Establishment Recommendations
Mow prairie areas to a height of 6-12 inches in May, July, and September.
Spot herbicide non-native/invasive species throughout site in late May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
Check for clogging and erosion control at inlet and outlet structures during every site visit.
Year 2 Establishment Recommendations
Mow prairie areas to a height of 12 inches in June and August.
Spot herbicide non-native/invasive species throughout site in May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
Plant additional emergent plugs if needed and reseed any failed areas in fall.
Check for clogging and erosion control at inlet and outlet structures during every site visit.
Year 3 Establishment Recommendations
Spot herbicide non-native/invasive species throughout site in May and again in August/September. Target thistle, reed canary grass, common reed, purple loosestrife, and all emerging woody saplings.
Check for clogging and erosion control at inlet and outlet structures during every site visit.

Long Term Native Vegetation Maintenance Recommendations

Long term (3 Years +) management of most detention basins associated with development should be the responsibility of the homeowner or business or local municipality. Often, these groups lack the knowledge and funding to implement long term management of natural areas resulting in their decline over time. Future developers should be encouraged to donate naturalized detention basins and other natural areas to a local municipality or conservation organization for long term management who receive funding via a Special Service Area (SSA) tax. Table 30 includes a cyclical long term schedule appropriate to maintain native vegetation around detention basins.

Table 30. Three year cyclical long term maintenance schedule for naturalized detention basins.

Year 1 of 3 Year Maintenance Cycle
Conduct controlled burn in early spring. Mow to height of 12 inches in November if burning is restricted.
Spot herbicide problematic non-native/invasive species throughout site in mid August. Specifically target thistle, reed canary grass, common reed, & emerging woody saplings such as willow, cottonwood, buckthorn, & box elder.
Check for clogging and erosion control at inlet and outlet structures during every site visit.
Year 2 of 3 Year Maintenance Cycle
Spot herbicide problematic non-native/invasive species throughout site in August. Specifically target thistle, reed canary grass, common reed, & emerging woody saplings such as willow, cottonwood, buckthorn, & box elder.
Mow prairie areas to a height of 6-12 inches in November.
Check for clogging and erosion control at inlet and outlet structures during every site visit.
Year 3 of 3 Year Maintenance Cycle
Spot herbicide problematic non-native/invasive species in August. Specifically target thistle, reed canary grass, common reed, and emerging woody saplings. Cutting & herbiciding stumps of some woody saplings may also be needed.
Check for clogging and erosion control at inlet and outlet structures during every site visit.

Rain Gardens

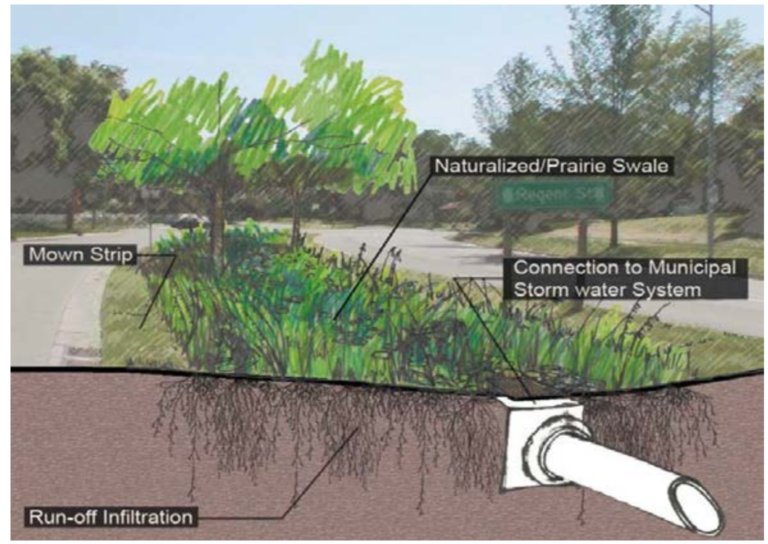
Rain garden adjacent to single family home

Rain gardens have become a popular new way of creating a perennial garden that cleans and infiltrates stormwater runoff from rooftops and sump pump discharges. A rain garden is a small shallow depression that is typically planted with deep rooted native wetland vegetation. These small gardens can be installed in a variety of locations but work best when located in existing depressional areas or near gutters and sump pump outlets. Not only do rain gardens clean and infiltrate water, they also provide food and shelter for many birds, butterflies, and insects.

Education programs in the watershed should focus on teaching residents and businesses the beneficial uses of rain gardens. Local governments in the watershed should also install demonstration rain gardens as a way for the general public to better understand their application. The City and Kane-DuPage Soil and Water Conservation District (SWCD) could hold rain garden training seminars and potentially provide partial funding to residents and businesses that install rain gardens.

Vegetated Swales (Bioswales)

Vegetated swales, also known as bioswales, are designed to convey water and can be modified slightly to capture and treat stormwater for the watershed. Vegetated swales are designed to remove suspended solids and other pollutants from stormwater running through the length of the swale. The type of vegetation can dramatically affect the functionality of the swale. Turf grass is not recommended because it removes less suspended solids than native plants and plants should be salt-tolerant. In addition, vegetated swales can add aesthetic features along a roadway or trail. They can be planted with wetland plants or a mixture of rocks and plant materials can be used to provide interest.



Dry vegetated swale rendering

Swales can be designed as either wet or dry swales. Dry swales include an underdrain system that allows filtered water to move quickly through the stormwater treatment train. Wet swales retain water in small wetland like basins along the swale. Wet swales act as shallow, narrow wetland treatment systems and are often used in areas with poor soil infiltration or high water tables.

Water quality is improved by filtration through engineered soils in dry swales and through sediment accumulation and biological systems in wet swales. According to USEPA, vegetated swales reduce total suspended solids (sediment) by 65%, total phosphorus by 25%, and total nitrogen by 10%.

Vegetated swales should be used to replace pipes or curbs in new and redevelopment where feasible. Swales can easily be integrated into various urban fabrics with curb cuts for water to access them from roadways, or they can be added between existing lots or in the grassy parkways between roads and sidewalks. Typically swales are used in lower density settings where infiltration might be maximized. Dry swales should be used for smaller development areas with small drainages. Wet swales should be used along larger roadways, small parking areas, and commercial developments.

Pavement Alternatives

Pervious concrete, permeable asphalt, and paver systems are potential alternatives to conventional asphalt or concrete parking lots and roadways. These alternatives allow for natural infiltration of the water by allowing water that falls on the surface to flow to a storage gallery through holes in the pavement. Areas that are paved with pervious pavement produce less stormwater runoff than conventionally paved areas.

Traditionally, the quantity and quality of water running off of paved and other impermeable surfaces are the primary reason for stormwater treatment. Pavement alternatives reduce runoff rates and volumes and can be used in almost every capacity in which traditional asphalt, concrete, or pavers are used.

Pavement alternatives capture first flush rainfall events and allow water to percolate into the ground. Pavement alternatives treat stormwater through soil biology and chemistry as the water slowly infiltrates. Groundwater and aquifers are recharged and water that might otherwise go directly to streams will slowly infiltrate, reducing flooding and peak flow rates entering drainage channels. Studies documented by USEPA show that properly designed and maintained pervious pavements reduce total suspended solids (sediment) by 90%, total phosphorus by 65%, and total nitrogen by 85%.

During the planning process, stakeholders brought up concerns regarding coal-tar sealants. Coal-tar sealant is a surface treatment typically applied to protect asphalt on driveways and parking lots which contains polycyclic aromatic hydrocarbons (PAHs). PAHs are a group of chemicals that have been linked to cancer in humans and have been shown to be toxic to aquatic life and damaging to the environment (Needleman, 2015). According to studies, "PAHs are significantly elevated in stormwater flowing from parking lots and other areas where coal-tar sealcoats were used as compared to stormwater flowing from areas not treated with the sealant (USEPA, 2016)." Pervious concrete, permeable asphalt, and paver systems are all potential alternatives to the need for coal-tar sealants. Additionally, several states and municipalities have banned the use and/or sale of coal-tar sealants to further protect their communities.

Future development and redevelopment in State Street and 7th Avenue Creek watersheds should consider the use of pavement alternatives. Pavement alternatives can be used in a variety of settings including parking lots, parking aprons, private roads, fire lanes, residential driveways, sidewalks, and bike paths. It is important to note that there are limitations to using pavement alternatives based on subsoil composition and they do require annual maintenance to remain effective over time.

Vegetated Filter Strips

Vegetated filter strips are shallowly sloped vegetated surfaces that remove suspended sediment, and nutrients from sheet flow stormwater that runs across the surface. This Management Measure is often referred to as a buffer strip. The type of vegetation can dramatically affect the functionality of the filter strip. Filter strips can either be planted or can be comprised of existing vegetation. Turf grass is not recommended as it removes less total suspended solids than filter strips planted with native vegetation.

The wider they are the more effective filter strips are because the amount of time water has for interception/ interaction with the plants and soil within the filter strip is increased. When installed and functioning properly, the USEPA has documented that filter strips can reduce total suspended solids (sediment) by 73%, total phosphorus by 45%, and total nitrogen by 40%.

Vegetated filter strips work in a variety of locations. Vegetated filter strips in rural and urban areas should be installed along streams, lakes, or ponds. Additionally, they can be used adjacent to buildings and parking lots that sheet drain. The water would then pass through the vegetated filter strip and into a waterway, such as a vegetated swale, stream, lake, pond, or other stormwater feature.

Filter strip along municipal building in Algonquin,

Natural Area Restoration & Native Landscaping

Natural area restoration and native landscaping are essentially one in the same but at different scales. Natural area restoration involves transforming a degraded natural area into one that exhibits better ecological health and is typically done on larger sites such as nature/forest preserves. Native landscaping is done at smaller scales around homes or businesses and is often formal in appearance. Both require the use of native plants to create environments that mimic historic landscapes such as prairie, woodland, and wetland. Native plants are defied as indigenous, terrestrial or aquatic plant species that evolved naturally in an ecosystem. The use of native plants in natural area or native landscaping is well documented. They adapt well to environmental conditions, reduce erosion, improve water quality, promote water infiltration, do not need fertilizer, provide wildlife food and habitat, and have minimal maintenance costs.

Several environmental agencies support the use of native plants including Illinois Nature Preserves Commission (INPC), Illinois

Native landscaping near residential home

Department of Natural Resources (IDNR), Forest Preserve District of Kane County (FPDKC), U.S. Department of Agriculture (USDA) Natural Resource Conservation Program (NRCS), National Wildlife Federation (NWF), and Conservation Foundation (CF).

Large residential lots with existing natural components such as oak woodlands and wetlands or large unused turf areas provide many of the best opportunities for natural area restoration and native landscaping at a larger scale. Homeowners interested in restoring natural areas or implementing native landscaping can find guidance through the agencies listed above or by contacting a local ecological consulting company. Backyard habitats can be certified through the National Wildlife Federation's Certified Wildlife Habitat program or Conservation Foundation's Conservation@Home program.

Wetland Restoration

Roughly 189 and 320 acres (or 74% and 77%) of the historic wetlands in State Street Creek and 7th Avenue Creek watersheds, respectively, have been lost to farming and other development practices since European settlement in the 1830s. Wetlands are essential for water quality improvement and flood reduction in any watershed and also provide habitat for a wide variety of plant and animal species. The wetland restoration process involves returning hydrology (water) and vegetation to soils that once supported wetlands. The USEPA estimates that wetland restoration projects can reduce suspended solids by 77.5%, total phosphorus by 44%, and total nitrogen by 20%.

St. Charles should consider requiring "Conservation Design" that incorporates wetland restoration on parcels slated for future development. Another option is to restore wetlands as part of a wetland mitigation bank where wetlands are restored on private land and become "fully certified." Then, developers are able to buy wetland mitigation credits from the bank for wetland impacts occurring elsewhere in the watershed.

Street Sweeping

Street sweeping is often overlooked as a Management Measure option to reduce pollutant loading in watersheds. With roads accounting for a sizeable percentage of land in an urbanized watershed, regular street sweeping could significantly reduce non-point source pollutants in the watersheds. Street sweeping works because pollutants such as sediment, trash, road salt, oils, nutrients, and metals that would otherwise wash into stormsewers and streams following rain events are gathered and disposed of properly. The USEPA and Center for Watershed Protection report similar pollutant removal efficiencies for street sweeping; weekly street sweeping can remove between 9% and 16% of sediment and between 3% and 6% of nitrogen and phosphorus. This is equivalent to removing about 170 tons/year sediment and 185 lbs/yr phosphorus and nitrogen from the roads in the watershed.

While St. Charles already has a street sweeping program, weekly street sweeping would provide the best results but annual (12 month) bi-weekly sweeping is cited as being sufficient in most cases. The frequency of street sweeping is a matter of time and budget and should be determined by the City.

Routine street sweeping is an effective Management Measure

Stream & Riparian Area Restoration & Maintenance

Streambank erosion and channelization is a problem in State Street Creek and 7th Avenue Creek watersheds. Stream surveys reveal that about 87% (28,243 linear feet) of stream length in the watershed is moderately to highly eroded and 77% (25,035 linear feet) is highly channelized. In addition, riparian areas adjacent to streams are suffering as 77% are in poor ecological condition.

Stream and riparian area restoration is one of the best Management Measures that can be implemented to improve degraded stream and riparian area conditions. This work involves improvements to a stream channel using artificial pool-riffle complexes, streambank stabilization using a combination of bioengineering with native vegetation and hard armoring with rock if needed, and adjacent riparian area improvements via removal of non-native vegetation and replacement with native species. These practices are typically done together as a way to improve water quality by reducing sediment transport, increasing oxygen, and improving habitat. The USEPA reports that as much as 90% of sediment, phosphorus, and nitrogen can be reduced following stream restoration. The downside to stream restoration is that it is technical and expensive. Stream restoration projects include detailed construction plans, often complicated permitting, and construction that must be done by a qualified contractor.

With so many individual landowners with parcels intersecting both streams, routine maintenance of stream systems is challenging. In many cases, landowners simply do not have the knowledge or are not physically capable of maintaining streams on their property. Stream maintenance includes an ongoing program to remove blockages caused by accumulated sediment, fallen trees, etc. and is a cost effective way to prevent flooding and streambank erosion.

There are many opportunities to implement stream and riparian area restoration in the watershed. These opportunities are identified in the Site Specific Action Plan. As far as stream maintenance goes, the Lake County Stormwater Management Commission (LCSMC) is a leader in the Chicago land area when it comes to managing stormwater and has developed an excellent guide for riparian owners called "Riparian Area Management: A Citizen's Guide." This short flyer can be found on Lake County's website and is intended to educate landowners about debris removal and riparian landscaping. It is also important to note that not all debris in streams is harmful. The American Fisheries Society has created a short document called "Stream Obstruction Removal Guidelines" which is meant to clarify the appropriate ways to maintain obstructions in streams to preserve fish habitat.

Stream restoration project in Barrington IL

Conservation & Low Impact Development

"Conservation or Low Impact Design" facilitates development density needs while preserving the most valuable natural features and ecological functions of a site. It does this by reducing lot size, especially lot width thereby reducing the amount of roads and infrastructure (Figure 46). The open space is typically preserved or restored natural areas that are integrated with newer natural stormwater features and recreational trails. The open space allows the residents to feel like they have larger lots because most of the lots adjoin the open space system. "Conservation/Low Impact Design" is also known as cluster or open space design.

Figure 46. Conservation/Low Impact development design

Such flexibility is intended to retain or increase the development rights of the property owner and the number of occupancy units permitted by the underlying zoning designation, while encouraging environmentally responsible development. "Conservation/Low Impact Design" is most appropriate in areas having natural and open space resources to be protected and preserved such as floodplains, groundwater recharge areas, wetlands, woodlands, streams, wildlife habitat, etc. It can also be used to preserve and integrate agricultural uses into the land pattern. The approach first takes into account the natural landscape and ecology of a development site rather than determining design features on the basis of pre-established density criteria.

There are several opportunities to implement "Conservation/Low Impact Design" into future development sites in the watershed. These opportunities are identified in the Site Specific Action Plan. The steps included below are generally followed when designing the layout of a development site using conservation or low impact design:

Step 1: Identify all natural resources, conservation areas, open space areas, physical features, and scenic areas and preserve and protect these areas from any negative impacts generated as a result of the development.

Step 2: Locate building sites to take advantage of open space and scenic views by requiring smaller lot sizes or cluster housing as well as to protect the development rights of the property owner and the number of occupancy units permitted by the underlying zoning of the property.

Step 3: Design the transportation system to provide access to building sites and to allow movement throughout the site and onto adjoining lands; roads should not traverse sensitive natural areas.

Step 4: Prepare engineering plans which indicate how each building site can be served by essential public utilities

5.3 GROUNDWATER PROTECTION

Groundwater data and groundwater protection recommendations were developed and analyzed at the county and regional level within the Ferson-Otter Creek Watershed Plan. As this information is also relevant and would include the State Street Creek and 7th Avenue Creek watershed planning area, please refer to Section 5.3 of the Ferson-Otter Creek Watershed Plan for full details on groundwater protections. This plan recommends development of a groundwater protection ordinance, wellhead protection programs, sensible salting programs, demand-initiated water softner recommendations, and street cleaning (as previously mentioned in Section 5.2 as well).

5.4 WATER EFFICIENCY/CONSERVATION

Water efficiency and conservation policies help reduce the amount of clean water that is used as well as reduce the amount of wastewater discharged. This plan recommends both programs recommended in the Ferson-Otter Creek Plan – that St. Charles becomes a WaterSense Promotional Partner and also adopts all or part of CMAP's Model Water Use Conservation Ordinance. Additionally, the State Street and 7th Avenue Creek Watershed-Based Plan recommends instituting a rain barrel or rainwater harvesting program.

Water harvesting and re-use via rain barrels and cisterns are important options to decrease the amount of stormwater runoff in a watershed. It is a simple, economical solution that can be done by any homeowner or business. On most homes and buildings, the water from roofs flows into downspouts and then onto streets, parking areas, or into storm sewers. Disconnecting downspouts and using either rain barrels or cisterns for re-use later can reduce the flood levels in local streams.

Water re-use differs based on the type of storage and water treatment. A rain barrel is typically attached to a downspout and collects water for irrigation purposes. In many areas, residential irrigation can account for almost 50 percent of residential water consumption. Re-using water is a great way of minimizing water use and lowering water bills.

A cistern also stores water from rooftop runoff to be used later. However a cistern is often larger, sealed and the water can be filtered for a wider variety of uses. With appropriate sanitation treatments, water from cisterns can even be reused for toilets, housecleaning, showers, hand washing, and dish washing. Cistern water, without any sanitation, can be used for lawn and garden watering, irrigation, car washing, and window cleaning.

The primary purpose of rain barrels and cisterns is water storage. Rain barrels typically store 55 gallons each. Cisterns can store greater amounts. Rain barrels and cisterns also reduce water demand in the summer months by reducing the potable water used for irrigation or other household uses.

Education programs in the watersheds should focus on teaching residents and businesses the beneficial uses of rain barrels and cisterns. St. Charles should aim to install demonstration rain barrels as a way to better engage the public in their use around residential homes. Local governments and conservation organizations such as Fox River Ecosystem Partnership (FREP) and Kane-DuPage Soil and Water Conservation District should sponsor programs where residents and businesses can purchase rain barrels.

Rain barrel adjacent to residential

5.5 ORDINANCE REVIEW & EXISTING POLICIES

Protection of natural resources and green infrastructure during future urban growth will be important for the future health of State Street Creek and 7th Avenue Creek watersheds. To assess how future growth might further impact the watershed, an assessment of local municipal ordinances was performed to determine how development currently occurs within the watershed. In this way, potential improvements to local ordinances can be identified. As part of the assessment, the City of St. Charles was 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)"

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.

According to the Ferson-Otter Creek Watershed-Based Plan, municipal scores ranged from 44 to 78, as assessed by each community's municipal representative. Although results were recorded anonymously in the plan, it's not possible to update this information without revealing St. Charles' results. St. Charles was Community B and has since been able to update their score to a 50, already showing improvement from when the survey was originally taken in 2012. It should be noted that this assessment is meant to be a tool for local communities to help guide development of future ordinances. The results of the review for the City can be found in Appendix C. Various policy recommendations meant to continue to improve the City's score are included in the previous section as well as in 5.6.1 of the Ferson-Otter Creek Plan, which lays out recommendations to improve performance by category in Residential Streets and Parking Lots, Lot Development, and Conservation of Natural Lands.

Various recommendations are made throughout this report related to how local governments can improve the condition of State Street Creek and 7th Avenue Creek watersheds through policy. Policy recommendations focus on improving watershed conditions by preserving green infrastructure, minimizing road salts, minimizing lawn fertilizer, sustainable management of stormwater, and allowances for native landscaping. To be successful, the State Street Creek and 7th Avenue Creek Watershed-Based Plan would need to be adopted and/or supported by the City of St. Charles and Kane County. The process of creating and implementing policy changes can be complex and time consuming. And, although there are numerous possible policy recommendations for the watershed, the following policy recommendations are considered the most important and highest priority for implementation.

Plan Adoption and/or Support & Implementation Policy Recommendations

- Watershed Partners adopt and/or support (via a resolution) the State Street Creek and 7th Avenue Creek Watershed-Based Plan and incorporate plan goals, objectives, and recommended actions into comprehensive plans and ordinances.

Green Infrastructure Network Policy Recommendations

- The City should consider incorporating the identified Green Infrastructure Network (GIN) into comprehensive plans and development review maps.
- Utilize tools such as protection overlays, setbacks, open space zoning, conservation easements, conservation and/or low impact

development, etc. in municipal comprehensive plans and zoning ordinances to protect environmentally sensitive areas on identified Green Infrastructure Network parcels.

- 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.
- Encourage developers to 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 such as Development Impact Fees, Stormwater Utility Taxes, Special Service Area (SSA) Taxes, etc. In general, it is not recommended that these features be turned over to HOA's to manage.
- Establish incentives for developers who propose sustainable or innovative approaches to preserving green infrastructure and using naturalized stormwater treatment trains.
- Consider limiting mitigation for all wetlands lost to development to occur within the watershed.

Road Salt Policy Recommendations
The City and township consider supplementing existing programs with deicing best management practices such as utilizing alternative deicing chemicals, anti-icing or pretreatment, controlling the amount and rate of spreading, controlling the timing of application, utilizing proper application equipment, and educating/training deicing employees.

Lawn Fertilizer Policy Recommendations
The City and township extend phosphorus regulation to all non-commercial applicators, consider soil testing pre-application, or ban out-right.

Stormwater Management Facility Policy Recommendations
Allow new development and redevelopment to use stormwater management facilities that serve multiple functions including storage, water quality benefits, infiltration, and wildlife habitat.

Native Landscaping/Natural Area Restoration
Allow native landscaping within local ordinances.
Ensure local "weed control" ordinances do not discourage or prohibit native landscaping.

Include short and long term management with performance standards for restored natural areas and stormwater features within new and redevelopment.

5.6 EXISTING BEST MANAGEMENT PRACTICES

As noted in the Ferson-Otter Creek plan, St. Charles already has implemented many of the best management practices outlined in this chapter, such as stream and riparian area restorations, rain gardens, bioswales, and native plantings. As recommended projects outlined in this plan are implemented, they will incorporate these, as well as additional, best management practices.

6.0 PUBLIC EDUCATION & OUTREACH

The health of the State Street and 7th Avenue Creek watersheds face challenges and threats from future land use changes, increasing nutrient loads, streambank erosion and channelization, invasive species, a depleting groundwater supply, poor land management practices and problematic flooding. At the root of these challenges and threats is that key audiences lack the necessary knowledge and tools to make informed decisions and adopt positive behaviors to mitigate such threats and challenges. Since a significant amount of State Street and 7th Avenue Creek watersheds is held as private property, any efforts to improve water quality must include education and outreach efforts to those landowners and key stakeholders.

This public education and outreach program is intended to spark interest in and provide stakeholders a better understanding of the watershed, and then promote and initiate the recommendations of the State Street Creek and 7th Avenue Creek Watershed-Based Plan. It will serve as an outline or agenda for outreach that will support accomplishment of the long-term goals and objectives of the Plan.

Thorough public information and stakeholder education efforts will ultimately inspire local residents and community members to adopt recommended behaviors. The cumulative actions of individuals and communities watershed-wide can accomplish the goals of the watershed plan. When people begin to understand the issues related to water quality and natural resource protection, they begin to change their behaviors and activities, thereby improve the overall health of the watershed.

6.1 EDUCATION & OUTREACH CAMPAIGNS

Public education and outreach campaign recommendations were developed within the Ferson-Otter Creek Watershed Plan. These outreach efforts are also relevant to the State Street Creek and 7th Avenue Creek watersheds and outline available resources in developing effective watershed education and outreach campaigns as well as outline the use of Cause-Based Marketing to improve society and the environment. Please refer to Sections 6.0 and 6.1 of the Ferson-Otter Creek Watershed Plan for full details.

6.2 WATERSHED PLANNING PROCESS ACTIVITIES

A variety of public education and outreach activities took place over the course of the watershed planning process. These activities have laid the groundwork for the success of future education and outreach efforts.

6.2.1 WEBSITE

Materials for this watershed planning effort can be found on the City of St. Charles' website at: https://www.stcharlesil.gov/projects/state-street-creek-study. This includes watershed plan presentations, plan documents, and upcoming events.

6.2.2 WATERSHED & OUTREACH MEETINGS

The City of St. Charles hosted three public watershed planning meetings over the course of the planning process to inform stakeholders of the results of the inventory, assessment, and recommendations in the plan and to gather stakeholder feedback and knowledge used to refine the watershed plan document. These meetings were held on November 9th, 2016, February 22nd, 2017, and XXX. In addition, two public education and outreach meetings were held on February 22nd, 2017 and XXX. These meetings were formatted as open house workshops with representatives from AES, HRGreen, and the City of St. Charles on hand to answer questions on a variety of topics including stream restoration and maintenance, green infrastructure protection and maintenance, rain gardens, and invasive vs. native species.

6.2.3 LITERATURE & OUTREACH MATERIALS

Two flyers, three posters, and an executive summary brochure were created for public education and outreach purposes during the planning process. The flyers covered green infrastructure protection and management for residents as well as a guide that helps identify invasive species and recommends native plants landowners can plant on their property. The posters were used during the public education and outreach meetings and covered stream restoration and maintenance for landowners, green infrastructure protection and management for residents, and one detailing the function and importance of rain gardens. The executive summary was also created as a 12-page brochure summarizing the watershed inventory, assessment, and recommendations.

All of these materials will be available for future public education and outreach efforts as well.

6.3 ACTIVITIES GOING FORWARD

The public education and outreach activities begun during the planning process should be continued in the future. This could include updating stakeholders on plan implementation, grant applications, and water quality issues important to stakeholders such as maintaining the green infrastructure and streams on their land, controlling invasive species, and implementing urban water quality projects where appropriate.

6.3.1 ORGANIZATION

Since the watersheds fall entirely within the boundaries of the City of St. Charles and they successfully managed the watershed planning process for their community, they should continue to lead watershed implementation and public education and outreach after the plan has been completed. Ideally, the City should meet with stakeholders bi-annually, but annual meetings could prove sufficient depending on the pace of change and implementation in the watershed.

During the planning process the City relied on AES and HRGreen to lead meetings with stakeholders and this approach should be continued in the future to the extent practicable. The City should also rely on the extensive public education and outreach materials developed during the planning process, such as the executive summary, flyers, posters, and presentations, to continue stakeholder education in the future and update these periodically as needed.

Additionally, the City should utilize the strengths of Ferson-Otter Watershed Coalition and Fox River Ecosystem Partnership meetings and events to leverage existing partnerships for the benefit of extending their public education and outreach investments.

6.3.2 PUBLIC AWARENESS CAMPAIGN

As outlined in the Ferson-Otter Creek Watershed Plan, the State Street & 7th Avenue Creek watersheds should manage their public education and outreach efforts and utilize the City's website, flyers and brochures, installation of educational signs, and public service announcements in order to increase public awareness and education on water quality issues in the watersheds. The City could use simple surveys that track changes in water quality knowledge of stakeholders and source tracking to determine the effectiveness of these programs over time. For more information, please refer to Section 6.3.2 of the Ferson-Otter Creek Watershed Plan.

6.3.3 PROGRAM ACTIVITIES FOR TARGETED AUDIENCES

The Ferson-Otter Creek Watershed Plan identified a variety of outreach and education activities targeted to specific audiences that can be leveraged to improve awareness of watershed issues, increase levels of public education, and encourage adoption of water quality initiatives and programs. They include targeted curricula and training for children and students such as the Watershed Quilt Project, Agriculture in the Classroom, World Water Monitoring Day, the Envirothon Competition, and the Mighty Acorns; Conservation @ Home, presentations to landowners, Partners for Conservation, targeted events and conferences, River Sweep, and storm drain stenciling to educate landowners; and policy review, regional planning, the WaterSense Program, technical workshops, natural resource inventory (NRI) reports, and leveraging soil erosion and sediment control expertise and Natural Resources Conservation Service (NRCS) programs to educate and inform decision makers. Detailed information on all of these programs can be found in Section 6.3.3 of the Ferson-Otter Creek Watershed Plan.

6.3.4 SOCIAL INDICATORS OF WATER QUALITY

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

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

GLRWP has developed a Social Indicators Data Management and Analysis Tool (SIDMA) to assist watershed stakeholders with consistent measures of social change by organizing, analyzing, and visualizing social indicators related to non-point source (NPS) management efforts. Detailed information about GLRWP's social indicator tool can be found at: http://35.8.121.111/si/Home.aspx.

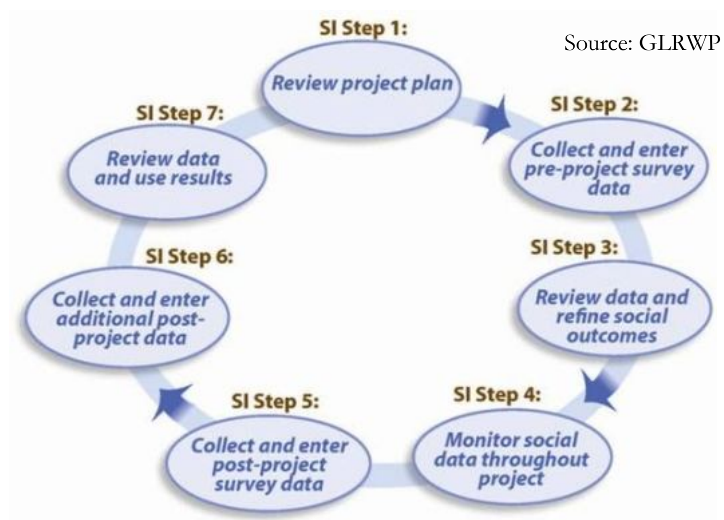


Figure 47. Steps to measure social indicators.

To summarize, the SIDMA tool uses a seven step process to measure social indicators as shown in Figure 47.

Several potential social indicators could be evaluated by the City using different strategies to assess changes in water quality. For example, surveys, public meetings, and establishment of interest groups can give an indication of the public feelings about the water quality in the watershed. It is important to involve the public in the water quality improvement process at an early stage through public meetings delineating the plans for improvement and how it is going to be monitored.

Potential social indicators that can be used by the watershed committee to evaluate the social changes related to water quality issues include media coverage, resident awareness, and watershed activities. Media coverage can be measured as the number of radio broadcasts, newspaper articles, press releases, or social media posts used to promote watershed protection. Resident awareness can be measured by increases in awareness of the watershed plan and its recommendations, participation at meetings and volunteer days related to water quality, and the amount of informational flyers and brochures distributed. Measurements of watershed activities can be tracked as the number of educational signs installed, the number of schools or classrooms participating in continuing water quality education, the number of landowners that implement plan recommendations, and the number of stream miles cleaned up each year.

Monitoring social indicators in the watershed will be the responsibility of the City. Online internet surveys are among the most popular method to gauge social behavior. A survey should be developed that identifies residents' perceptions of water quality problems and protection strategies. The results of the survey can be used to develop appropriate media, citizen awareness, and watershed management activities to improve social behavior.

7.0 PLAN IMPLEMENTATION & MONITORING

7.1 SCHEDULE & MILESTONES

Improvements in water quality in the State Street Creek and 7th Avenue Creek watersheds will occur as a direct result of implementing the plan's site-specific, programmatic, and education and outreach recommendations. Schedules and milestones for each type of recommendation are laid out below.

7.1.1 SITE SPECIFIC RECOMMENDATIONS

The site-specific action plan table (Table 28) lays out a number of on-the-ground restoration projects designed to improve water quality in the watersheds. Each project has been scheduled as either short-term (1-10 years) or long-term (10-20 years), as noted in the last column for each project. As scheduled, all short-term projects should be completed by 2027 and long-term projects completed by 2037. It is important to note, however, that successful implementation of these projects is dependent on a variety of factors such as landowner participation and cooperation, securing necessary funding, and support and cooperation from willing partners.

The milestone to track progress on the implementation of the site-specific action plan recommendations is the development of at least 10 grant applications for watershed projects within the 10-year/short-term planning timeframe.

7.1.2 PROGRAMMATIC & POLICY RECOMMENDATIONS

The programmatic and policy recommendations laid out in Section 5 of this plan are designed to improve water quality at the watershed scale. All of these recommendations are considered 10-year/short term recommendations and should be implemented by 2027 to the extent practicable.

The milestone for programmatic and policy recommendations is the adoption of at least three recommended measures within the 10-year/short term planning timeframe.

7.1.3 EDUCATION & OUTREACH RECOMMENDATIONS

Education and outreach recommendations, as outlined in Section 6 of this plan, are an on-going effort led by the City and should continue throughout the planning timeframe.

The milestone to track progress on public education and outreach is a 5% increase annually in the reach of public education and outreach campaigns as measured by tracking the social indicators of water quality over the planning timeframe.

7.2 FUNDING OPTIONS

Implementation of watershed plan recommendation is often based on the availability of funding. In addition to those programs outlined in the Ferson-Otter Creek Plan (Section 7.2), a full list of additional funding opportunities and programs is included in Appendix D.

7.3 MONITORING FOR SUCCESS

While no pre-existing water quality data was available for State Street Creek or 7th Ave Creek, Applied Ecological Services, Inc. (AES) was able to collect water quality samples for both watersheds in 2016 as part of this planning effort (summarized in Section 3.1). The results of this sampling show moderate overall impairment from elevated total phosphorus, total nitrogen, total suspended solids (sediment), and biological oxygen demand (BOD) in both watersheds.

The following monitoring plan recommendations should be implemented to measure changes in watershed impairments related primarily to water quality. Water quality monitoring is performed by first collecting physical, chemical, biological, and/or social indicator data. This data is then compared to criteria (indicators & targets) related to established water quality objectives.

The criteria used to determine whether loading reductions are being achieved over time are outlined in Table 20 in Section 3.1. For each sampling parameter, a statistical, numerical, or general use guideline is identified. For total suspended solids, the criteria is less than 19 mg/L; for total phosphorus the criteria is less than 0.0725 mg/L; and for total nitrogen the criteria is less than 2.461 mg/L.

The water quality monitoring plan is designed to capture snapshots of water quality within State Street and 7th Avenue Creeks over time and assess changes in water quality following implementation of Management Measures. **It is important that all future monitoring be completed using protocol and methods used by the Illinois EPA for QAQC purposes.** Illinois EPA Quality Assurance Project Plans (QAPPs) and Standard Operating Procedures (SOPs) can be found at http://www.epa.state.il.us/water/water-quality/methodology/index.html.

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

Chemical monitoring should at a minimum occur annually at the two locations identified in Figure 48. This sampling should occur after a large rain event, to capture the first flush of pollutants. Samples should be collected using Illinois EPA protocol and tested for total phosphorus, nitrate, nitrite, ammonia nitrogen, total Kjeldahl nitrogen, total suspended solids, pH, conductivity, chloride and biological oxygen demand. The results of this water quality testing should be stored in a database. The approximate cost of outlined monitoring should be roughly $2,000 annually, or less if the City utilizes its own lab.

It is crucial to collect representative water samples using careful handling procedures. Unrepresentative samples or samples contaminated during collection or handling are often useless. The collected samples should be submitted for analysis to a laboratory certified by the National Environmental Laboratory Accreditation Conference (NELAC). Alternatively, money can be saved by having the City analyze samples using its municipal water treatment plant lab if it has the proper certification. Generally, the laboratory will work closely with the monitoring entity to assure that the samples are collected in the proper containers with preservatives for the parameter of interest. The laboratory usually provides the containers, ice chests for transport, labels, and chain-of-custody forms to the client as part of their service.

7.4 NEXT STEPS

The planning process for this watershed plan will end in the second quarter of 2017, followed by plan approval. The full plan and executive summary will be printed, distributed, and available online by July 2017. The City will be encouraged to adopt a resolution in support of the completed plan and begin implementing the plan immediately thereafter.

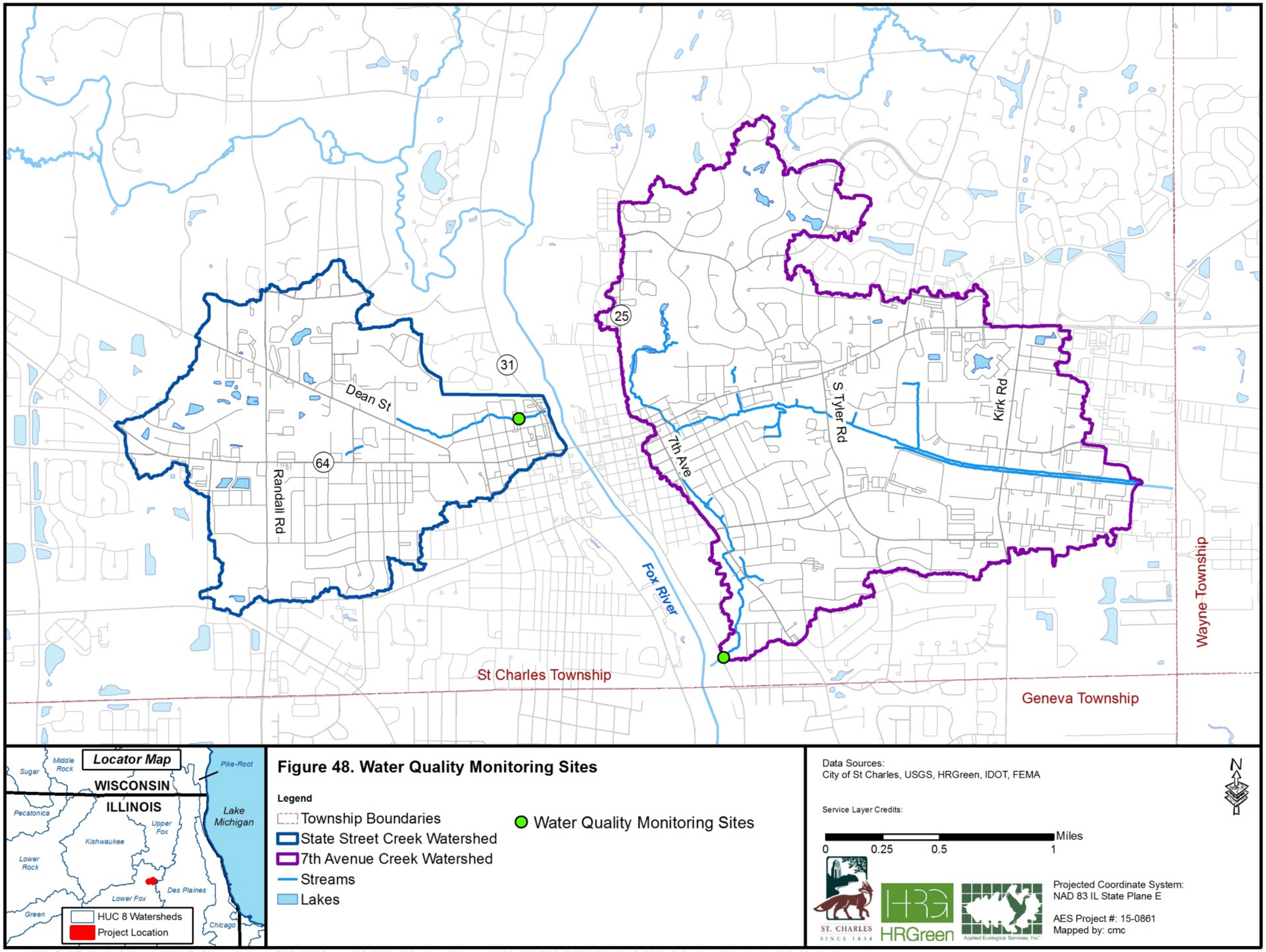


Figure 48. Water Quality Monitoring Sites

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