Metropolitan Planning Council

POPLAR CREEK WATERSHED- BASED PLAN

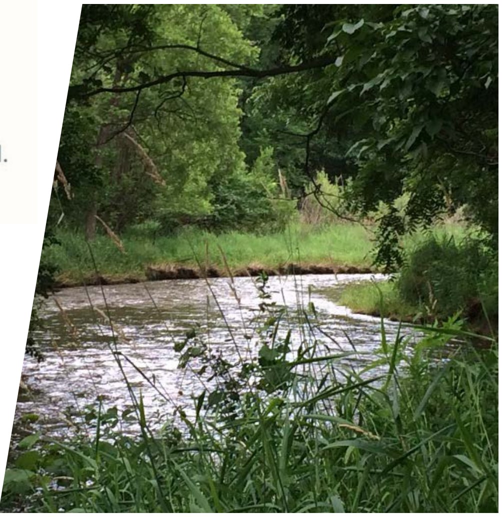
OCTOBER 2018

A WATER QUALITY FOCUSED SUPPLEMENT TO MWRD'S DETAILED WATERSHED PLAN

Christopher B. Burke Engineering, Ltd.

Illinois Environmental Protection Agency

Metropolitan Water Reclamation District of Greater Chicago



ACKNOWLEDGEMENTS

The Metropolitan Planning Council is grateful to the Illinois Environmental Protection Agency for providing funding to support watershed planning work for four watersheds in Cook County. MPC and Christopher B. Burke Engineering also appreciate the guidance and reviews provided by Illinois EPA staff.

MPC and CBBEL would also like to acknowledge contributions, ideas, and information drawn from watershed planning work led by the Chicago Metropolitan Agency for Planning (CMAP). CMAP has managed watershed planning projects for numerous areas in Northeastern Illinois, and is currently working on a plan for the Salt Creek watershed. CMAP maintains a webpage with information about watershed plans and watershed planning work in the region. The plans developed by CMAP and partner organizations and engineering firms were valuable resources from which ideas and content were drawn for this watershed planning document. Sections of the Resource Inventory in this plan mirror material from CMAP-led plans where the information is relevant across the region. This was an important efficiency for plan development and provides for some consistency in plans across the region. We would particularly like to thank Holly Hudson, Kelsey Pudlock, Nora Beck, and Jason Navota for being valuable collaborating partners in watershed planning and stormwater work.

Two important resources for this watershed plan were the "Guidance for Developing Watershed Action Plans in Illinois," developed by CMAP and Illinois EPA, and US EPA's "Handbook for Developing Watershed Plans to Restore and Protect Our Waters."

This watershed planning document is a supplement to the Poplar Creek Detailed Watershed Plan (DWP) prepared by the Metropolitan Water Reclamation District of Greater Chicago (MWRD) in 2010. The DWP addresses flooding issues in the watershed. This complementary document focuses on water quality. MWRD has provided numerous datasets, mapping tools and information to support the 2018 watershed planning work.

Finally, MPC and CBBEL would like to thank the members of the Peer Review Committee who lent experience and expertise to the WBP development process:

- Matt Bardol: Principal Water Resources Engineer, Geosyntec Consultants
- Noel Basquin: Chief Engineer, Cook County Department of Transportation and Highways
- Michael "Mick" Cosme: Senior Civil Engineer, MWRD
- Deanna Doohaluk: Watershed Project Manager, The Conservation Foundation
- K.C. Doyle: Energy & Sustainability Manager, Cook County, Department of Environmental Control
- Holly Hudson: Senior Aquatic Biologist, Chicago Metropolitan Agency for Planning
- Adam James: Drainage and Utilities Manager, Cook County Department of Transportation and Highways
- Eric Otto: Civil Engineer, Forest Preserves of Cook County
- John Quail: Director of Watershed Planning, Friends of the Chicago River
- Cindy Skrukrud: Clean Water Program Director, Illinois Chapter, Sierra Club
- Nancy Williamson: Ecosystem Administrator, Illinois Department of Natural Resources

This watershed-based plan serves as an update to the Watershed Action Plan for the Poplar Creek Watershed completed in 2007. This plan was prepared in part using United States Environmental Protection Agency funds under Section 319(h) of the Clean Water Act distributed through the Illinois Environmental Protection Agency. The findings and recommendations herein are not necessarily those of the funding agencies.

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LIST OF ACRONYMS

AISWCD	Association of Illinois Soil and Water Conservation Districts
AMSL	Above Mean Sea Level
AUID	Assessment Unit Identification
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
CAWS	Chicago Area Waterway System
CBBEL	Christopher B. Burke Engineering, Ltd.
CMAP	Chicago Metropolitan Agency for Planning
COD	Chemical Oxygen Demand
COMM	Commercial
CSO	Combined Sewer Overflow
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Fund
DNR	Department of Natural Resources
DO	Dissolved Oxygen
DWP	Detailed Watershed Plan
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Authority
FIRM	Flood Insurance Rate Maps
FPCC	Forest Preserves of Cook County
FPDCC	Forest Preserve District of Cook County
HSG	Hydrologic Soil Groups
HUC	Hydrologic Unit Codes
IDNR	Illinois Department of Natural Resources
LTA	Local Technical Assistance
MPC	Metropolitan Planning Council
MS4	Municipal Separate Storm Sewer System
MWRD	Metropolitan Water Reclamation District of Greater Chicago
NAWQA	National Water Quality Assessment Program
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
ROW	Right-of-Way
SRF	State Revolving Fund
SSMP	Small Streams Maintenance Program

SSURGO	Soil Survey Geographic Database
STEPL	Spreadsheet Tool for Estimating Pollutant Loads
T	Tolerable Soil Rate
TARP	Tunnel and Reservoir Project
TMDL	Total Maximum Daily Load
TRANS	Transportation
TSS	Total Suspended Solids
US EPA	United States Environmental Protection Agency
USACE	United States Army Corp of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
UTIL	Utility
WMO	Watershed Management Ordinance
WPC	Watershed Planning Council

CHAPTER 1 INTRODUCTION

1.1 WATERSHED-BASED PLAN SCOPE AND PURPOSE

This watershed-based plan for the Poplar Creek planning area is a comprehensive overview of the water quality conditions in the watershed and measures that need to be implemented to restore and protect water quality. This document assesses current conditions, predicts future conditions, and makes recommendations to improve future conditions by taking appropriate actions. The appropriate actions come in a wide variety of forms but include education and outreach to people and communities within the watershed, and strategies for applying Best Management Practices (BMPs) to control sources of water pollution. The negative consequences of actions or inactions over the years have caused degradation in areas, and the watershed cannot be restored overnight. However, with proper planning and funding, and determined efforts by civic leaders, businesses, and residents, appropriate steps can be taken to markedly improve water quality in the watershed. This plan identifies nonpoint source control measures to improve water quality.

The location of the Poplar Creek planning area in northeastern Illinois is shown in Figure 1.1-1.

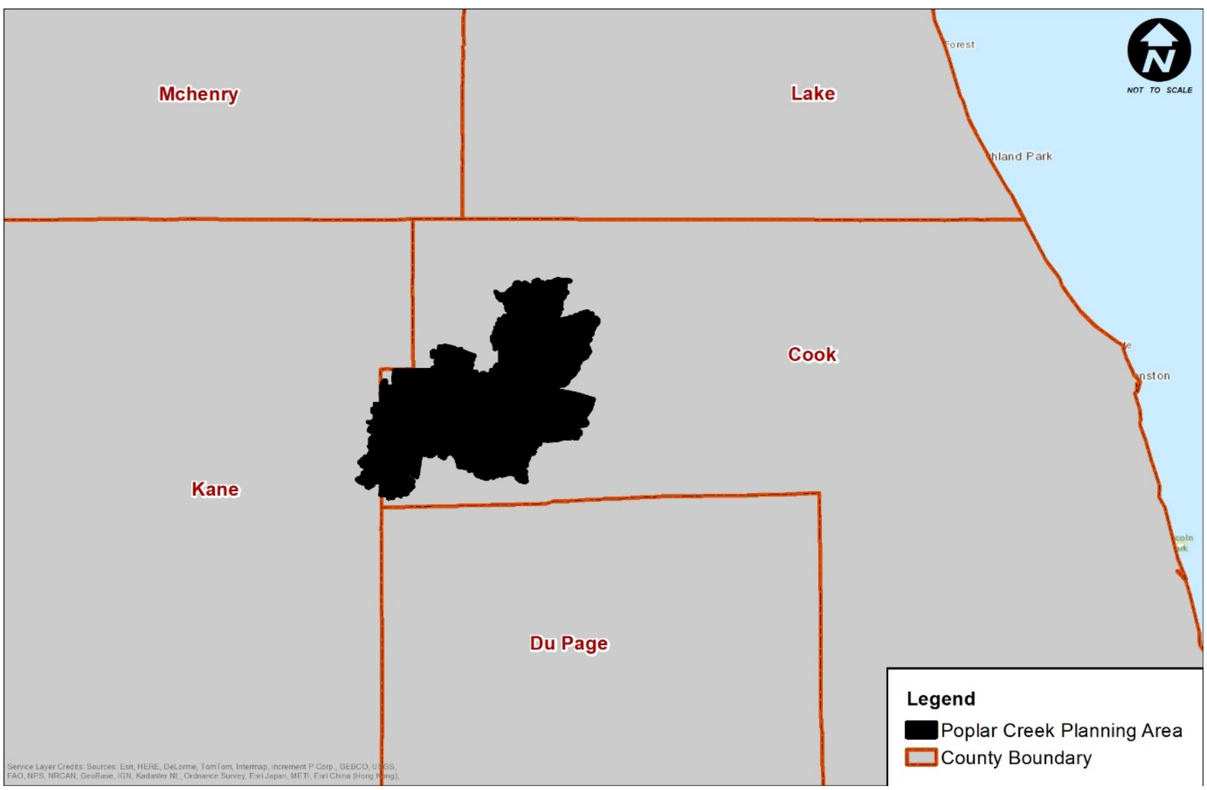


Figure 1.1-1 Poplar Creek Planning Area in Relation to NE IL

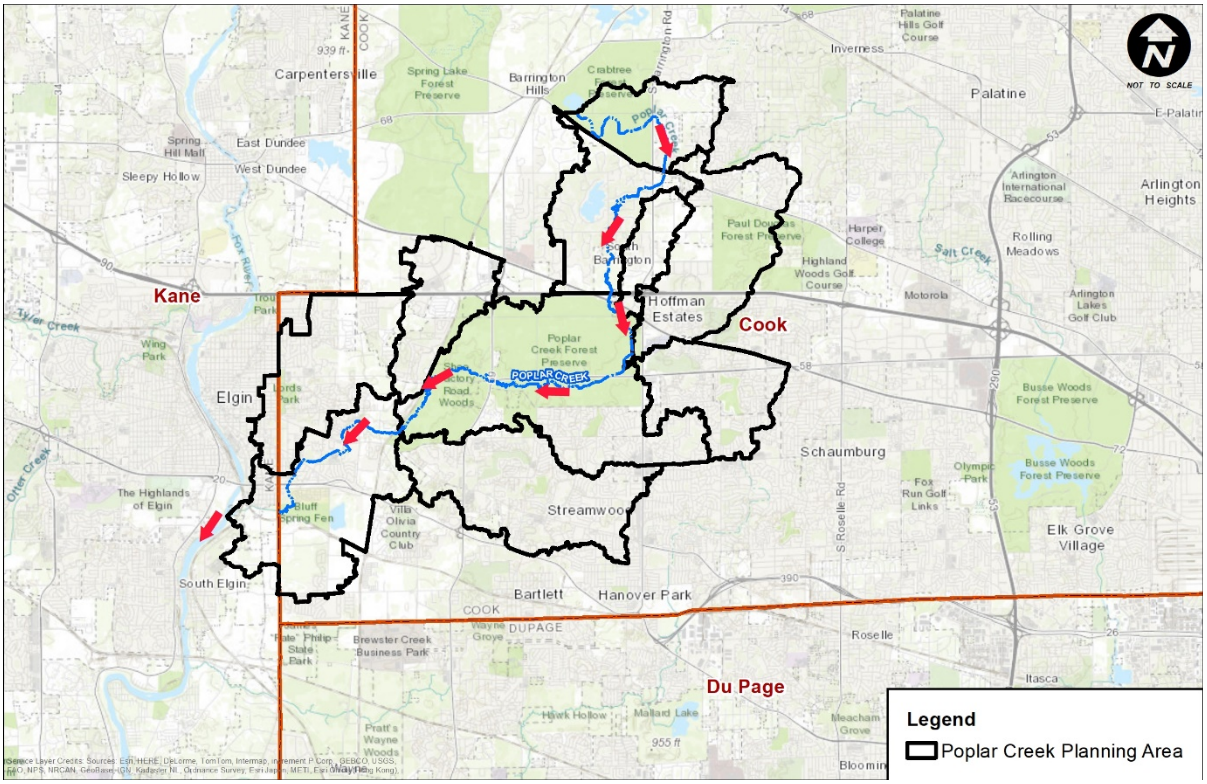


Figure 1.1-2 Poplar Creek Planning Area in Cook County (flow direction in red)

Runoff from the approximately 44 square mile Poplar Creek watershed drains to the Creek which generally flows from north to south before flowing from east to west toward the Fox River. Poplar Creek originates from several wetlands at the Crabtree Forest Preserve located in South Barrington and flows south and then west towards the Fox River, as shown in Figure 1.1-2. There are six tributaries to the mainstem of Poplar Creek. The mainstem and the major tributaries are shown in Figure 1.1-3. Details of the various tributaries and the approximately 44 square mile drainage area are provided in Sections 3.1 and 3.13. Physical Stream Conditions are covered in Section 3.14. The Water Quality Assessment is discussed in Section 3.17. Point sources of water pollution are covered in Section 3.18. This plan identifies the pollutant loadings and causes of impairment in Chapter 4. Watershed protection measures are discussed in Chapter 5 and Plan Implementation and Evaluation are covered in Chapters 6 and 7, respectively.

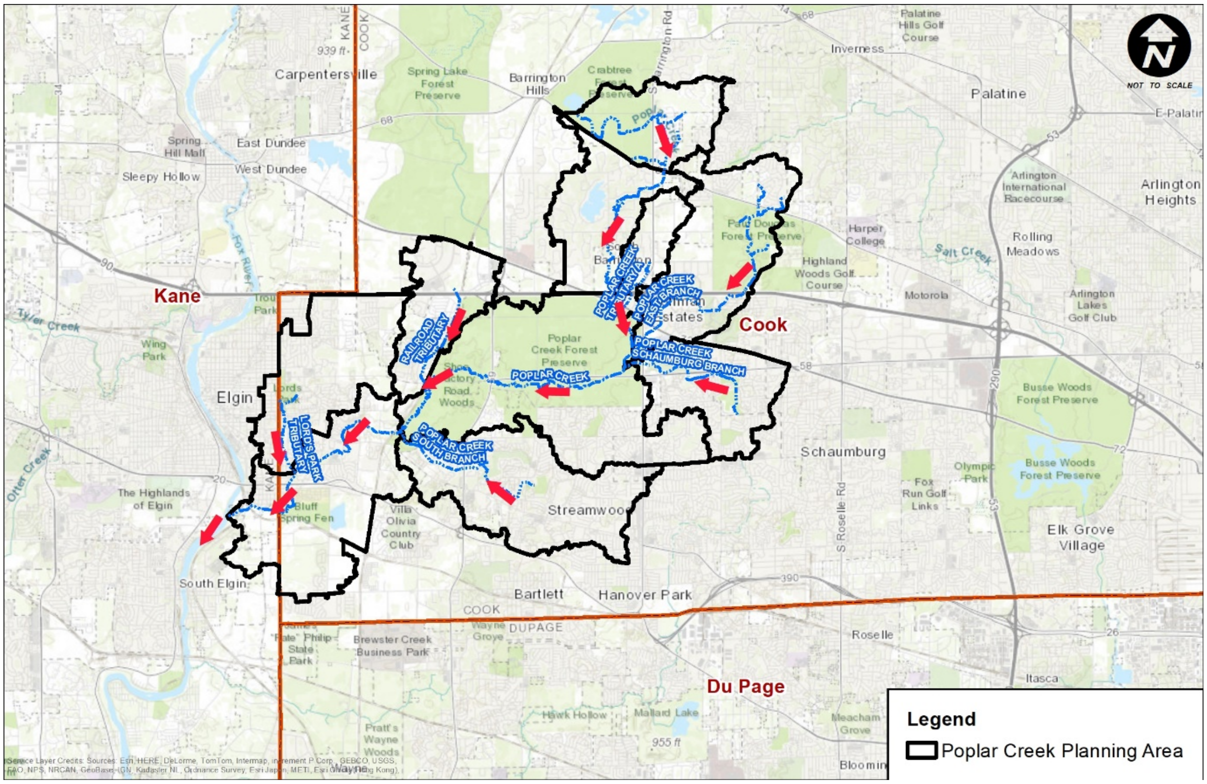
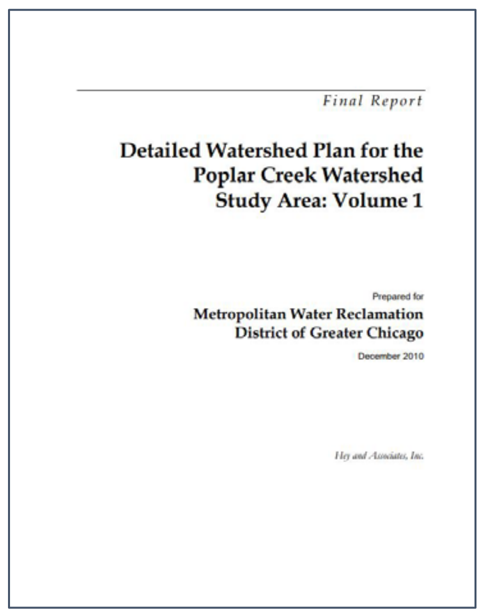


Figure 1.1-3 Poplar Creek Planning Area and Major Tributaries (flow direction in red)

1.2 ADDENDUM TO DETAILED WATERSHED PLAN

This plan addresses water quality as a supplement to the Metropolitan Water Reclamation District of Greater Chicago (MWRD) Detailed Watershed Plan (DWP) for the Poplar Creek Watershed. The DWP addresses flooding concerns in the watershed. This watershed-based plan examines water quality conditions and needs in the tributary drainage areas for Poplar Creek, and recommends measures to reduce pollutant loadings and improve water quality. The BMPs recommended for the watershed in this plan are consistent with the intent of the MWRD Watershed Management Ordinance (WMO) and the Technical Guidance Manual (TGM). Nothing in this plan sets new ordinance requirements with respect to the WMO or water quality. The BMPs identified within the plan are not required to meet the requirements of the WMO, but should work in concert with the WMO to better manage stormwater and restore and protect water quality. Some stormwater retrofit projects that are carried out pursuant to this plan will be beyond WMO requirements, but are warranted to help restore water quality.


Final Report

Detailed Watershed Plan for the Poplar Creek Watershed Study Area: Volume 1

Prepared for

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December 2010

Hey and Associates, Inc.

Figure 1.2-1 The DWP for Poplar Creek

The WMO is a living document that will periodically be updated/amended to address current conditions and stormwater management needs. This plan is intended to be complementary with the WMO including management strategies for detention and volume control.

This watershed-based plan also serves as an update to the Watershed Action Plan for the Poplar Creek Watershed completed in 2007.

1.3 THE NINE MINIMUM ELEMENTS OF A WATERSHED-BASED PLAN

The United States Environmental Protection Agency (US EPA) has identified nine key elements that are critical for achieving improvements in water quality. The Illinois Environmental Protection Agency (Illinois EPA) requires these nine elements be addressed in watershed plans funded with Clean Water Act Section 319 funds. Following are the nine key elements:

1. An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed-based plan (and to achieve any other watershed goals identified in the watershed-based plan).

2. An estimate of the load reductions expected for the management measures described in the plan (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time).

3. A description of the nonpoint source (NPS) management measures that will need to be implemented to achieve the load reductions estimated under paragraph 2. above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification of the critical areas in where those measures will be needed to implement this plan.

4. An 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 this plan. Possible sources of funding, include Section 319 project grants and the State Clean Water Revolving Loan Fund.

5. An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

6. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

7. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.

8. A set of 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 and, if not, the criteria for determining whether this watershed-based plan needs to be revised.

9. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (8) above.

This watershed-based plan addresses the nine elements.

1.4 WHO SHOULD USE THIS PLAN AND HOW SHOULD IT BE USED

This watershed-based plan should be used by municipalities, watershed stakeholders, county and state agencies, and other entities that are charged with or have an interest in restoring and protecting water quality in the watershed. Often local interest groups comprised of citizens that are active in the watershed can have the biggest impact of improving the water quality because of their influence on elected officials. They are the people who see and deal with the water quality daily. The Forest Preserves of Cook County (FPCC), homeowner associations, local watershed groups and private conservation organizations will also have important roles. Support through funding from county, state and federal agencies can assist local agencies and private organizations to complete important projects.

This plan discusses in detail BMPs to reduce loadings of certain water quality constituents. The plan can be used by an individual or groups identified above to help envision and implement water quality projects. Similarly, it can be used by government agencies to establish additional water quality parameters for the watershed or to target improvements to water quality as new development occurs, whether it is a new or improved roadway corridor in the watershed or a new residential or commercial development.

1.5 IMPACTS OF DEVELOPMENT WITHIN THE WATERSHED

The water quality of Poplar Creek and its tributaries is greatly influenced by the various land uses in the watershed. While urban/suburban development covers much of the watershed, there are large areas of open space, many of which are owned and managed by the FPCC. Understanding the impacts of urban/suburban development on water quality and the use of BMPs to offset those impacts is critical to address the sources of pollutant loadings in this watershed.

Chapter 5 discusses ways to counteract the impacts of urban/suburban development with various BMP implementation types. Chapter 6 discusses in more detail ways to make progress toward water quality goals.

1.6 FUNDING FOR THE WATERSHED PLAN

Funding for this watershed-based plan was provided through the Illinois Environmental Protection Agency's (Illinois EPA) Section 319 Nonpoint Source Pollution Control Grant Program. Section 319 grants are available to local units of government and other organizations to protect water quality in Illinois. A request was made by the Metropolitan Planning Council (MPC) to the Illinois EPA for the Section 319 grant. The Poplar Creek Watershed is one of 4 watersheds being studied through the grant funding from Illinois EPA. MPC provided additional funds and resources to complete the Watershed Plans.

CHAPTER 2 WATERSHED PLANNING AREA, VISION, GOALS AND OBJECTIVES

2.1 WATERSHED ISSUES BASED ON STAKEHOLDER INPUT

The scope of this project is the development of a comprehensive watershed plan for the Poplar Creek watershed that identifies actions to improve water quality, and protect and enhance natural resources. A key purpose is to help stakeholders better understand the watershed and spur implementation of watershed improvement projects and programs that will provide for progress toward the water quality goals for this watershed. Another key purpose of the project is to identify projects and project types that can be carried out by watershed stakeholders that will fit into a larger picture and contribute to the restoration and protection of water quality. Nonpoint source control projects identified in a State-approved watershed plan are potentially eligible for Section 319 funding to support project implementation. Having a watershed-based plan will allow Poplar Creek partners to access Section 319 grant funding for restoration projects recommended in this plan.

Water quality issues/challenges and goals for restoration and protection have been established taking into account stakeholder input. MPC and CBBEL have met with the Poplar Creek and Upper Salt Creek Watershed Planning Council (WPC) to discuss the watershed planning work. Dialogue with the WPC and Northwest Municipal Council will continue as plan implementation is undertaken.

2.2 VISION

Surface water bodies (i.e., lakes, rivers, and streams) must meet water quality standards set out to achieve designated uses. As discussed further in the body of this plan, use impairments have been identified by Illinois EPA in the Poplar Creek watershed. Many of the water quality problems identified in the watershed are associated with land use and land cover. Best management practices, including on-the-ground practices as well as new or improved policy initiatives, need to be implemented by municipalities, landowners and other watershed stakeholders to restore and protect water quality.

The water quality vision for the Poplar Creek watershed is to implement strategically planned and located best management practices that will meaningfully reduce pollutant loadings, which will then be reflected in improved ambient water quality that supports aquatic life and recreational uses. The types of BMPs that are appropriate in the watershed and a targeted implementation level are described in ensuing sections of this plan.

2.3 GOALS AND OBJECTIVES

The goal for implementation actions in the Poplar Creek watershed is to improve water quality so that designated uses can be supported. To improve water quality, we need to reduce pollutant loads. In-depth analysis of the sources of water pollution and pollutant loadings revealed that stormwater runoff is the most significant source of pollutant loadings in the watershed. Stormwater BMPs need to be implemented to reduce stormwater discharges and pollutant loadings from runoff to restore and protect water quality. The plan identifies a target level of BMP implementation which will result in the following load reductions:

Nitrogen Reduction	Phosphorus Reduction	BOD Reduction	Sediment Reduction
(lbs/yr)	(lbs/yr)	(lbs/yr)	(tons/yr)
5%	7%	5%	15%

These loading reductions will noticeably contribute to water quality improvement. Along with the pollutant load reductions, many of the stormwater BMPs that will be implemented will help reduce stormwater runoff *volumes*. For example, practices such as permeable pavement and bioretention will result in water being absorbed into the ground, vs. running off and draining into storm sewers. Reducing stormwater volumes will provide significant water quality benefits. The stormwater volumes and energy cause stream channel/ streambank erosion, which results in increased loadings of sediment and other pollutants. The stormwater BMPs will reduce this effect.

The combination of these factors and the measures set out in this plan are expected to result in significant progress toward attainment of designated uses.

Objectives related to this implementation goal are summarized below.

2.4 WATER QUALITY

A primary objective for this plan and for implementation actions is to improve water quality in the Poplar Creek mainstem and tributaries such that aquatic habitat and recreational uses are supported. There are large populations that live close to Poplar Creek. There are significant opportunities for these people to enjoy fishing, swimming, and canoeing/kayaking activities on the creek and some of the larger tributaries. With reduced pollutant loadings to the water bodies, water quality will be improved. Education and outreach efforts can highlight the efforts being made to restore water quality and communicate in an understandable way about water quality conditions and any risks.

2.5 NATURAL RESOURCES

There are valuable natural resources in the watershed, including forest preserve areas, wetlands, and open space/greenspace. An objective for this plan is to restore and protect forested areas and open space to increase habitat and recreational value. Efforts to protect and restore open space will help reduce fragmentation and enhance connectivity.

Priority areas for creation and restoration of greenspace will be riparian areas. Improvements in these areas will produce direct water quality benefits, in addition other natural resource-related benefits.

2.6 STORMWATER MANAGEMENT

As discussed throughout this document, stormwater is a significant source of pollutant loadings in the watershed, and the volumes of stormwater released to water bodies during and after storms produces erosion and other physical impacts to riverine environments. A major objective of this plan is to improve stormwater management in the watershed. This may include use of manufactured devices or other point-source type controls in some areas, but the majority of stormwater management improvements needed are nonpoint source controls – capturing rainwater near where it falls. Nonpoint source control practices can trap pollutants, reducing the amounts of pollutants delivered to water bodies, can slow down the surge of stormwater that occurs during peak runoff periods, and can help reduce the overall stormwater discharge volumes. Nonpoint source control practices can also reduce the severity and frequencies of the stormwater runoff events that would occur. Best management practices relating to stormwater management are described in Chapter 5 of this plan.

2.7 GREEN INFRASTRUCTURE

It is envisioned that many or most of the stormwater management measures implemented to reduce stormwater impacts and improve water quality will be green infrastructure practices. At the landscape scale, green infrastructure practices help restore and expand greenspace. At the site or neighborhood scale, green infrastructure practices remove pollutants and reduce the volume of stormwater discharges through infiltration, evapotranspiration, or harvesting and reusing stormwater. Examples of green infrastructure practices include rain gardens and bioswales, green roofs, permeable pavements, and cisterns. Where green infrastructure is well-designed and properly-maintained, the practices can provide significant co-benefits. For example, green infrastructure may provide habitat for pollinators or other species, and/or may be a park-like amenity for a community area.

2.8 RESPONSIBLE DEVELOPMENT

Population projections for the watershed predict noticeable population growth over the next 25 years. Population growth is accompanied by commercial development. Much of the expected residential and commercial development will utilize available open space or be redevelopment — land developed previously which is vacant or underutilized will be redeveloped to increase density and accommodate the expected growth. Some areas currently in agricultural use may convert to residential or commercial uses. As development occurs, there will be significant opportunities to provide environmental safeguards and implement water quality-related controls. For example, communities can use zoning and comprehensive plans to steer development projects away from sensitive areas and promote infill and transit-oriented development. In addition, stormwater controls will be built in as sites are developed or redeveloped. The Metropolitan Water Reclamation District (MWRD) Watershed Management Ordinance (WMO) and local ordinances will require stormwater detention and volume control (green infrastructure) at development and redevelopment sites. Responsible development and redevelopment will be key aspects of improving quality of life in the watershed and helping to restore and protect water quality.

2.9 EDUCATION

Education and outreach will be crucial to support plan implementation and promote regional, local, and individual decision-making that helps improve water quality. Outreach to community leaders about the goals of the watershed plan, types of projects that would be valuable, as well as partnerships and funding opportunities, will substantively advance plan implementation. Integrating consideration of stormwater and water quality into local comprehensive plans, zoning decisions, and budgets will be important to achieving progress toward water quality goals. Additionally, outreach and education to civic groups, neighborhood organizations, businesses, and households will promote implementation of beneficial practices, such as rain gardens and sensible fertilizing techniques, and will build support for policy decisions and budgets that advance water quality improvement. An objective of the plan is to communicate out to these audiences the contents of the plan and catalyze implementation of the plan, but also to receive feedback on the plan and implementation measures, so that adaptive management concepts can be applied and plan components and implementation can improve over time. A related objective is to capitalize on local partnerships and expertise to enhance intergovernmental coordination for achieving progress toward water quality goals.

CHAPTER 3 POPLAR CREEK WATERSHED RESOURCE INVENTORY

3.1 WATERSHED BOUNDARIES

The Poplar Creek Watershed is situated primarily in northwestern Cook County, but also includes a small portion of northeastern Kane County. A tributary to the Fox River, the Poplar Creek Watershed covers 44 square miles of which 42.66 square miles are located within Cook County. Nine Cook County municipalities are located within the Poplar Creek Watershed. The headwaters of the mainstem can be found in several wetlands at the Crabtree Forest Preserve located in South Barrington. From its headwaters, the mainstem flows south to just south of Illinois Route 72 (Higgins Road) to the confluence with Poplar Creek Tributary A. From the confluence with Poplar Creek Tributary A, the mainstem then continues to flow south to Illinois Route 58 (Golf Road) where it joins the Poplar Creek East Branch and the Poplar Creek Schaumburg Branch. The Poplar Creek East Branch begins in wetlands north of Interstate 90 and west of Ela Road. The Poplar Creek Schaumburg Branch headwaters begin in drainage ditches and ponds near Bode Road in Schaumburg and Hoffman Estates.

From its confluence with the Poplar Creek East Branch and the Poplar Creek Schaumburg Branch, the mainstem of Poplar Creek flows west and southwest until it meets the Poplar Creek Railroad Tributary near the intersection of Poplar Creek, Illinois Route 58, and the EJ&E railroad tracks. The mainstem of Poplar Creek continues to flow westward where it meets the Poplar Creek South Branch just west of the EJ&E Railroad tracks. The Poplar Creek South Branch headwaters are the Dolphin Park Reservoir in Streamwood. From its confluence with the South Branch, the mainstem flows westward where it joins the Lord's Park Tributary just north of the termination of Jay Street at Poplar Creek. The headwaters of the Lord's Park Tributary can be found in Lord's Park located within the City of Elgin. The mainstem of Poplar Creek then continues to flow west where it discharges into the Fox River. The Poplar Creek mainstem is approximately 18 miles in total length.

The majority of the watershed area is urban developed area within the Chicago Metropolitan area with large areas of open space mostly consisting of Forest Preserve property and some open space. Approximately

Previous studies completed for the Poplar Creek Watershed include the Metropolitan Water Reclamation District of Greater Chicago's (MWRD) Detailed Watershed Plan (DWP) for the Poplar Creek Watershed dated 2010 and the Poplar Creek Watershed Action Plan (Action Plan), created by CMAP dated July 2007.

The scope of the Poplar Creek DWP included the development of stormwater improvement projects to address regional problem areas along open waterways, with a focus on flooding. As part of the DWP, the entire Poplar Creek watershed was delineated into roughly 130-acre subbasins. The DWP delineation was based on Cook County 1-foot aerial topography to reflect topographic features and topographic drainage patterns caused by stormwater management infrastructure (storm sewer systems, culverts, etc.). Subbasin boundaries were also intended to encompass areas with similar development patterns. The area addressed in this watershed-based plan for Poplar Creek (IL_DTG-03) is defined by the USGS 12-digit hydrologic unit code (HUC) 071200061205 and is shown in Figure 3.1-1.

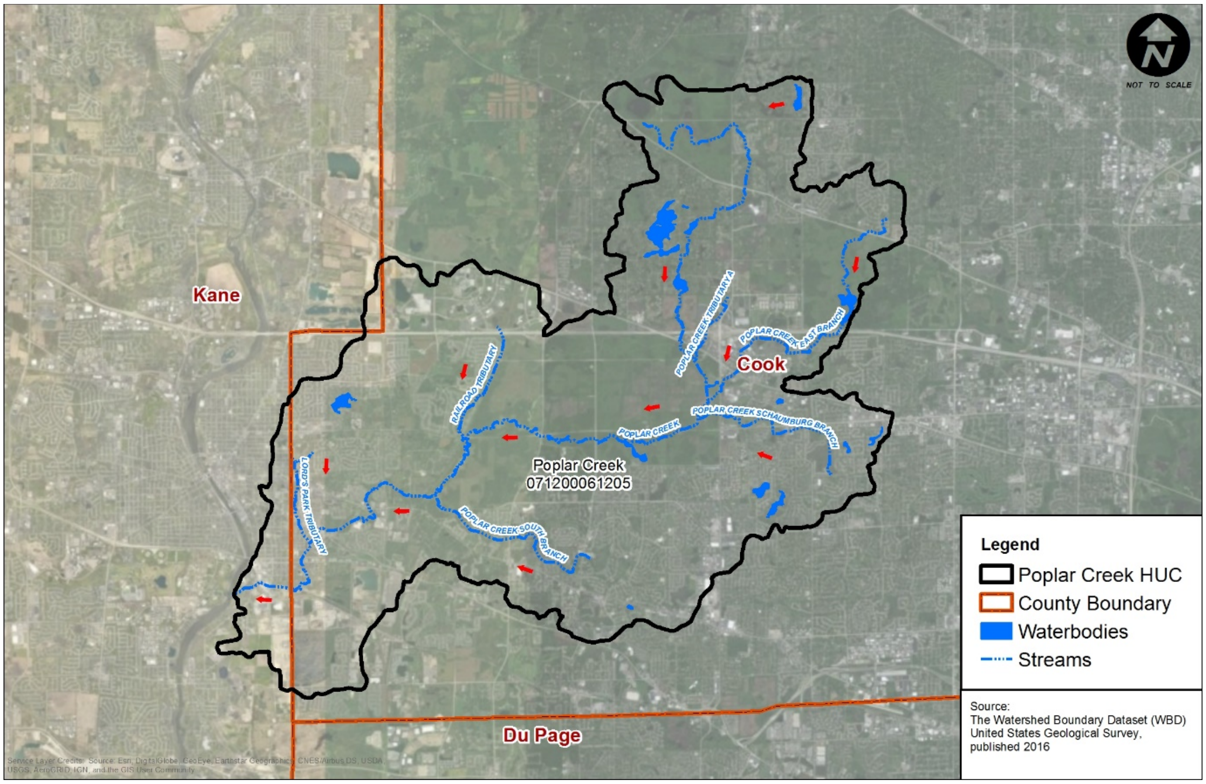

Figure 3.1-1 Poplar Creek Watershed Planning Area by HUCs (flow direction in red)

As a water quality supplement to the MWRD's Poplar Creek DWP, the subbasin and subwatershed delineations developed for the DWP were used as the starting point for delineation of watershed planning units for this watershed-based plan. The DWP subbasins and subwatersheds were overlaid with the USGS delineations for the HUC. The DWP subbasin and subwatershed delineations matched closely with only minor discrepancies with the USGS HUC. For cases where modifications were necessary, the subbasins and subwatersheds created for the DWP have been used in this plan supplement as the MWRD subbasin divides were created using the best available topography data on a 1-foot scale.

For this watershed-based plan, the HUC has been subdivided into 10 *watershed planning units* based on sewersheds, stream confluences, similar land uses as well as overall watercourse topography. The watershed planning units are shown in Table 3.1-1 and Figure 3.1-2. The boundaries of the watershed planning units reflect delineated subbasin boundaries in the DWP, but DWP subbasins have been consolidated where the land use and pollutant sources were found to be similar. The term *watershed planning unit* is used in this plan supplement, to distinguish from *subwatershed* as that term is used in the DWP and the WMO.

It should be noted that while this plan is an addendum to the MWRD DWP for Poplar Creek, it is also an update to the 2007 Action Plan created by CMAP. As such, the subbasins and subwatershed delineations for this plan were compared to the watershed planning units developed in the 2007 Action Plan. The delineation and watershed planning units compared very well with only very minor discrepancies.

	ID	Area (acres)	Area (square miles)	Watercourse
1	PC1	1,720	2.7	Poplar Creek
2	PC2	2,159	3.4	
3	PC3	5,963	9.3	
4	PC4	3,866	6.0	
5	PCEB	3,272	5.1	Poplar Creek East Branch
6	PCLT	2,850	4.5	Lord's Park Tributary
7	PCRR	1,777	2.8	Railroad Tributary
8	PCSB	3,698	5.8	Poplar Creek South Branch
9	PCSC	2,082	3.3	Poplar Creek Schaumburg Branch
10	PCTA	833	1.3	Poplar Creek Tributary A
	Total	**28,220**	**44.1**	

Table 3.1-1 Poplar Creek Watershed Planning Unit Identification and Area.

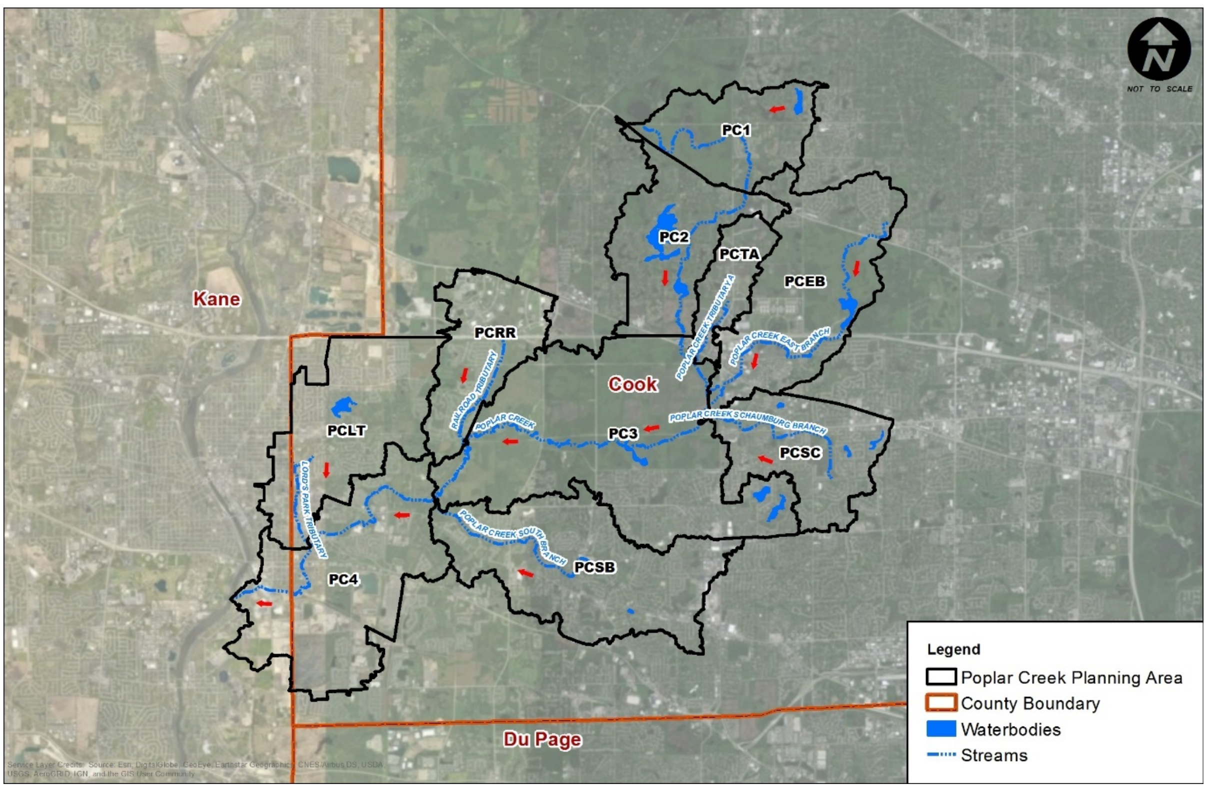

Figure 3.1-2 Poplar Creek Watershed Planning Units

The Poplar Creek major tributaries flow generally south and west to the Poplar Creek mainstem. Topographically, the elevation difference between the headwaters of each northern watershed planning unit and the confluence with Poplar Creek ranges approximately 30 to 100 feet in elevation. Flow in the Poplar Creek mainstem is from northeast to southwest with approximately 170 feet of elevation change between the headwaters located northeast of the watershed and confluence with the Fox River southwest (Figure 3.1-2). Further discussion of each tributary of the Poplar Creek watercourse connectivity is provided in the watershed drainage portion of this Chapter.

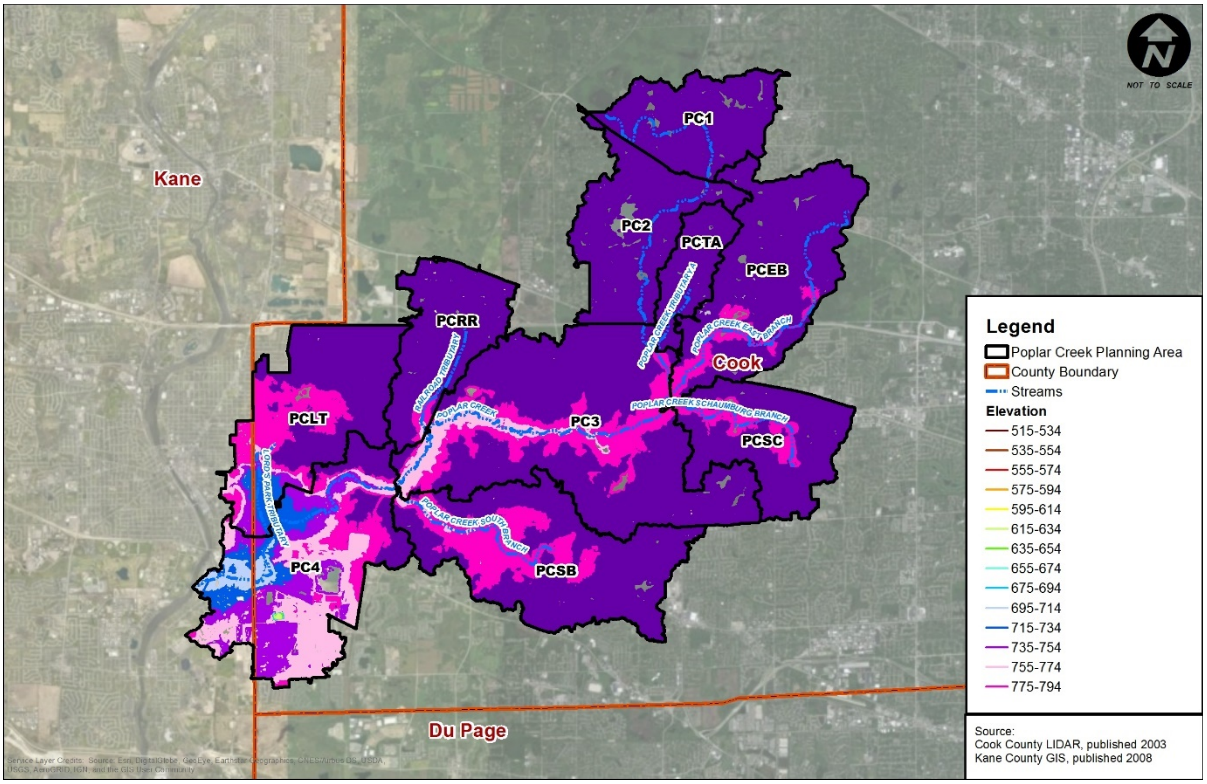

Figure 3.1-3 Poplar Creek Planning Area Topography.

3.2 POPULATION AND DEMOGRAPHICS

Based on the 2010 decennial census, the population (2010) in the planning area is estimated to be 158,164. Chicago Metropolitan Agency for Planning's (CMAP) GO TO 2040 comprehensive regional plan (updated version, October 2014) forecasts a population of 181,241 or 14.6 percent growth. The difference in population over the intervening 30 years translates into a (linear) growth rate of approximately 4.9 percent per decade. This rate of estimated population growth is slightly greater than half of the 28.6 percent rate of growth forecast (Population in Households in 2040) for the entire seven-county region, and is slightly lower than the 17 percent growth forecast for Cook County and much lower than the 55 percent growth forecast for Kane County. The following statistics were collected from City Data for the watershed planning area:

- Average Home Value = $381,865
- Average Income = $109,581
- Average Age = 36.9 years old

Employment forecasts are similarly relevant in that growth will impact land use change, water use, water quality, and other factors. The revised GO TO 2040 forecast totals for the region estimate employment growth to be 55 percent for the planning area, 18 percent in Cook County, 82.3 percent in Kane County, and 31.2 percent for the region. The 2010 employment was 51,564 and the projected 2040 employment is 79,993.

3.2.1 Future Land Use Projections

The watershed planning area outside of the forest preserves is currently moderately developed and populated. Open space that remains available outside of the forest preserves can be expected to be used for future development in the watershed planning area. These areas consist mostly of agricultural land use or open urban land. To accommodate growth, remaining open space parcels or existing agricultural parcels, found primarily in South Barrington and also in portions of Elgin, Hoffman Estates, and unincorporated Cook County may be redeveloped for residential, commercial, or industrial uses. Also, some areas that are currently moderately developed may become more densely developed. For example, townhouses and multi-unit development projects will be planned at infill sites, as will the associated commercial areas.

Based on the expectation that some of the growth that will occur will be infill projects in developed areas, it is anticipated that the watershed planning units that are currently priority areas for BMP implementation are discussed in ensuing sections of this watershed plan supplement. It is expected that the areas that are currently priority areas for implementing BMPs to control stormwater will continue to be priority areas in the future. Measures can be planned and implemented with confidence that they will help improve and protect water quality now and in the future.

There will be new impervious surfaces in areas that will convert from open space or agricultural uses. This will increase runoff amounts and contribute to pollutant loadings. It will be important to incorporate Low Impact Development (LID) / Conservation Development techniques as these areas are developed in order to protect water quality. One additional factor that will be important looking to the future: The stormwater detention and volume control requirements in the Cook County Watershed Management Ordinance (WMO) apply to new developments.

Reflecting the expectation that some population growth will be infill development and LID practices will be incorporated into new development, this plan's goals for nonpoint source water quality improvements will remain reasonable based on future land use projections.

3.3 JURISDICTIONS, LOCAL GOVERNMENTS AND DISTRICTS

In northeastern Illinois, over 1,200 units of government collect revenues and provide services to the seven-county region's residents, businesses, and visitors. Portions of 10 municipalities and 5 townships, are within the Poplar Creek planning area (Table 3.3-1 and Figure 3.3-1). Municipal jurisdictions cover approximately 85% (23,937 acres) of the planning area and townships cover approximately 15% (4,284 acres) of the planning area. Among the larger municipalities in the watershed are Elgin (14.8%), Hoffman Estates (31.3%), South Barrington (11.7%), and Streamwood (15.4%). The largest townships in the watershed are Barrington and Hanover Township containing 21.7% and 56.6% of the area of the watershed, respectively.

Jurisdiction for stormwater management and water quality in the watershed primarily lies with MWRD and the municipalities. In Cook County, the MWRD oversees the implementation of the Watershed Management Ordinance that encompasses stormwater management and wetland and floodplain protection. MWRD is also responsible for treating most of the wastewater in Cook County. The WMO forms the baseline for stormwater requirements in the watershed; development and redevelopment projects must at a minimum meet the requirements of the WMO for detention and volume control (green infrastructure). However, and municipalities can work with MWRD on the enforcement of the ordinances, and municipalities can enact more stringent rules. Townships generally do not have the same ordinance authorities as municipalities and the WMO requirements govern activities in the Townships.

The WMO became effective in January 2014. Stormwater detention and volume control requirements apply to developments and redevelopments throughout the County, excluding the City of Chicago. The volume control requirements are intended to capture runoff from first flush storm events or runoff from the directly connected impervious areas of a development from the first inch of rainfall. Volume control practices are intended to provide treatment of the volume control storage amount through practices including infiltration trenches, infiltration basins and other retention practices. The required practices reduce the volume of stormwater being discharged, and also reduce pollutant loadings. The volume control itself greatly reduces loadings, and volumes not retained generally have lower pollutant concentrations because of the green infrastructure measures. The WMO also addresses soil erosion and sediment control during and after construction of all developments within Cook County. The enforcement of these provisions greatly reduces loadings of sediment and other pollutants.

Watershed planning in the watershed is typically done through the MWRD and six Watershed Planning Councils. Municipalities participate in the Watershed Planning Councils.

As noted above, municipalities can work with MWRD on the enforcement of the County-wide ordinance. This may include reviews of plans for new developments and redevelopments, and/or inspection of sites.

MWRD is responsible for planning for, constructing, operating, and maintaining the larger or regional components of the sewer systems. The larger-scale projects described in the DWP will typically be carried out by MWRD. As discussed further below, with some design modifications many of the flood-oriented projects can also provide significant water quality benefits. MWRD can also provide assistance to municipalities, either financial assistance or technical assistance, on local stormwater projects.

Municipalities and townships typically are responsible for local stormwater systems. This includes not only planning for, constructing, operating, and maintaining local sewers and municipal detention facilities, but also non-structural BMPs such as street sweeping. Maintenance activities such as cleaning out catch basins and non-structural BMPs are very important for reducing nonpoint source pollutant loadings from urban runoff. Municipalities that are regulated Municipal Separate Storm Sewer System (MS4) communities must implement six minimum measures aimed at reducing pollutant loadings in stormwater discharges.

Many stormwater BMP projects identified in this watershed-based plan will likely be planned and carried out by municipalities (in some cases with MWRD technical or financial assistance). BMP projects may also be implemented by a township, a school district, or a non-governmental organization.

The State and the Soil and Waters Conservation Districts help residents conserve, develop, manage, and wisely use land, water, and related resources.

In addition to municipalities and townships, the Poplar Creek Watershed governmental bodies include the following as detailed in Table 3.1-1:

- Forest Preserves of Cook County

- Illinois State Representative Districts (43rd District, 44th District, 49th District, 52nd District, 54th District, 56th District)
- Illinois State Senatorial Districts (22nd District, 25th District, 26th District, 27th District, 28th District)
- US Congressional Districts (6th District, 8th District)
- Park Districts located within Cook County (Bartlett, Elgin, Hoffman Estates, Schaumburg, South Barrington, Streamwood)

Jurisdictional Body	Acres	% of Watershed	Acres of Cook County	% of Cook County	Acres of Kane County	% of Kane County
Cook County	27,181	78.5	27,181	100.0	0	0.0
Kane County	1,040	21.1	0	0.0	1,040	100.0
Total	28,221	100.0	27,181	100.0	1,040	100.0
Municipalities						
Barrington Hills	266	0.9	266	1.0	0	0.0
Bartlett	533	1.9	440	1.6	93	8.9
Elgin	4,169	14.8	3,636	13.4	533	51.3
Hanover Park	126	0.4	126	0.5	0	0.0
Hoffman Estates	8,845	31.3	8,845	32.5	0	0.0
Inverness	519	1.8	519	1.9	0	0.0
Schaumburg	1,744	6.2	1,744	6.4	0	0.0
South Barrington	3,303	11.7	3,303	12.2	0	0.0
South Elgin	89	0.3	0	0.0	89	8.6
Streamwood	4,343	15.4	4,343	16.0	0	0.0
Unincorporated Cook County	3,959	14.0	3,959	14.6	0	0.0
Unincorporated Kane County	325	1.2	0	0.0	325	31.3
Total	28,221	100.0	27,181	100.0	1,040	100.0
Townships						
Barrington	6,133	21.7	6,133	22.6	0	0.0
Elgin	1,040	3.7	0	0.0	1,040	100.0
Hanover	15,982	56.6	15,982	58.8	0	0.0
Palatine	1,596	5.7	1,596	5.9	0	0.0
Schaumburg	3,470	12.3	3,470	12.8	0	0.0
Total	28,221	100.0	27,181	100.0	1,040	100.0
U.S. Congressional Districts						
6th Congressional District	4,366	15.5	3,878	14.3	488	46.9
8th Congressional District	23,855	84.5	23,303	85.7	552	53.1
Total	28,221	100.0	27,181	100.0	1,040	100.0
State Representative Districts						
State Representative District – 43rd	3,581	12.7	3,029	11.1	552	53.1
State Representative District – 44th	13,363	47.4	13,363	49.2	0	0.0
State Representative District – 49th	1,880	6.7	1,392	5.1	488	46.9

Jurisdictional Body	Acres	% of Watershed	Acres of Cook County	% of Cook County	Acres of Kane County	% of Kane County
State Representative District – 52nd	7,089	25.1	7,089	26.1	0	0.0
State Representative District – 54th	1,596	5.7	1,596	5.9	0	0.0
State Representative District – 56th	712	2.5	712	2.6	0	0.0
Total	28,221	100	27,181	100	1,040	100
State Senate Districts						
State Senate District – 22nd	16,944	60.0	16,392	60.3	552	53.1
State Senate District – 25th	1,880	6.7	1,392	5.1	488	46.9
State Senate District – 26th	7,089	25.1	7,089	26.1	0	0.0
State Senate District – 27th	1,596	5.7	1,596	5.9	0	0.0
State Senate District – 28th	712	2.5	712	2.6	0	0.0
Total	28,221	100	27,181	100	1,040	100
Park Districts						
Bartlett	6	0.0	6	0.0	0	0.0
Elgin	123	0.4	123	0.5	0	0.0
Hoffman Estates	283	1.0	283	1.0	0	0.0
Schaumburg	205	0.7	205	0.8	0	0.0
South Barrington	82	0.3	82	0.3	0	0.0
Streamwood	244	0.9	244	0.9	0	0.0
Total	943	3.3	943	3.5	0	0

Table 3.3-1 Poplar Creek Planning Area Jurisdictions

The municipalities in the watershed are shown in Figure 3.3-1. The Poplar Creek watershed is fortunate in that through the MWRD efforts there is an active Watershed Planning Council. Quarterly watershed meetings are convened during which the municipalities and townships and other watershed stakeholders are invited to discuss stormwater issues. MPC and CBBEL have presented information to and solicited information from the Poplar Creek and Upper Salt Creek Watershed Planning Council as part of the watershed planning process.

One of the challenges with stormwater management is that a project or change in one location can affect another location in a separate municipality, especially a downstream jurisdiction. The Watershed Planning Council meetings allow participants to learn about proposed changes in stormwater requirements, proposed stormwater and water quality projects, and discuss problems or suggestions regardless if it is local or multijurisdictional problem. The resources of many municipalities and agencies can benefit the watershed when working together.

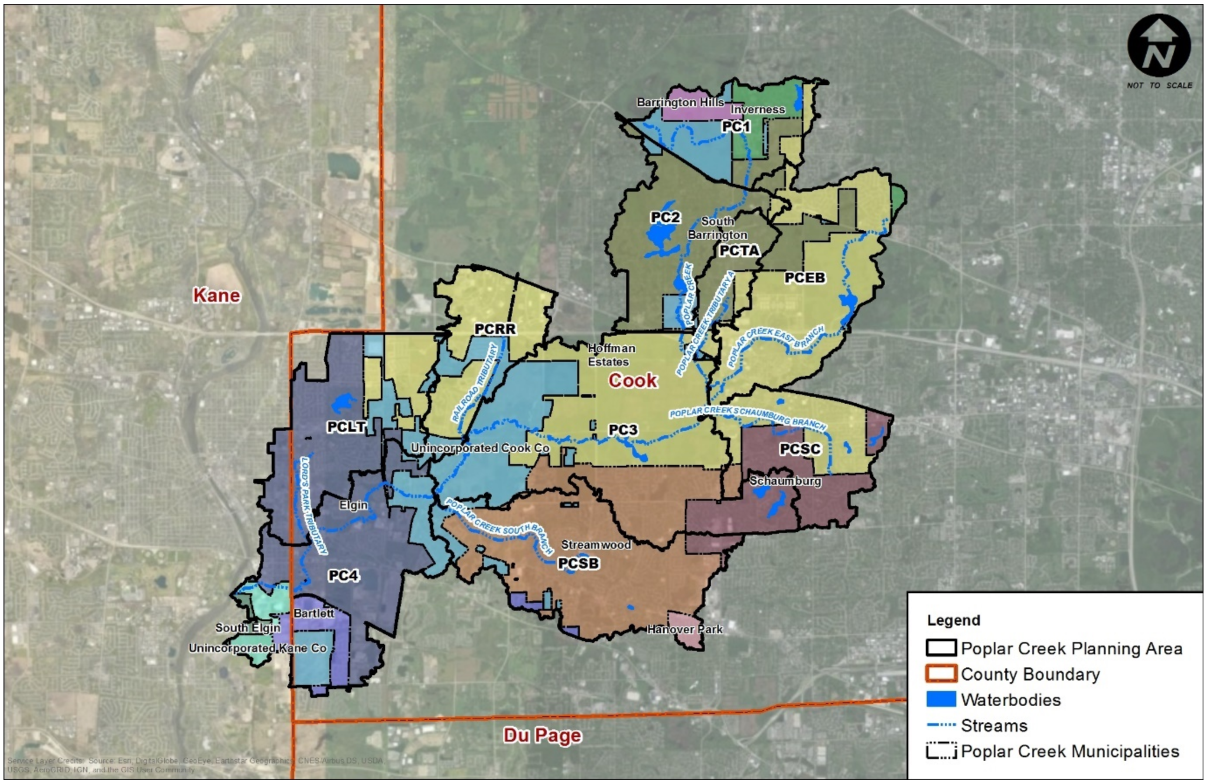

Figure 3.3-1 Municipalities within the Poplar Creek Planning Area

3.4 CLIMATE AND PRECIPITATION

Illinois is situated midway between the western Continental Divide and the Atlantic Ocean, and is often under the polar jet-stream, which creates low pressure systems that bring clouds, wind, and precipitation to the area. There are other environmental factors that affect the climate of Illinois, including solar energy, the proximity of Lake Michigan, and urban areas.

The planning area has a continental climate with hot, wet summers and cold, snowy winters. The seasons' average temperatures are 22˚F in the winter and 70˚F in the summer. Annual rainfall averages 36 inches and snowfall of 37 inches. Consistent with a continental climate, there is no pronounced wet or dry season (according to City Data).

The winter season features the four driest months (December 2.57 in., January 1.92 in., and February 1.80 in., and March 2.38 in.) while summer features the wettest rainfall months (July 4.37 in., and August 4.23 in.). Spring (April through June) and fall (September through November) are similar for their average seasonal precipitation totals, 10.11 in. (3.37 in./mo.) and 9.2 in. (3.07 in./mo.), respectively.

The climate in the watershed planning area is notable for at least two reasons: 1) the threat of rain storms and resultant nonpoint source pollution is a year-round phenomenon, and 2) the lengthy winter season in combination with an extensive road network results in large amounts of applied road salts whose fate has a negative impact on both local surface waters and shallow groundwater.

3.5 CLIMATE CHANGE

While we have discussed the averages for the Illinois climate in the previous section, and the corresponding rainfall amounts, we are aware that the Cook County has experienced significant departures from the "average" rainfall storms many times over the past 20-plus years. Where we would often see rainfall of modest intensity over many hours or days, the Cook County area has been experiencing much more intense rainfall events that have led to significant flooding and degradation of water quality. The rainfall data used in the County and local ordinances typically references Bulletin 70 rainfall data prepared by Angel and Huff for a period 1901 to 1980. Another common source for rainfall data for the watershed is NOAA Atlas 14. Christopher B. Burke Engineering, Ltd. performed a detailed statistical analysis of the Cook County Precipitation Network rainfall dataset. This dataset is a quality controlled and hourly rainfall data for 25 stations throughout Cook County for the period of 1989-2013. The analysis utilized an L-moments approach which ensured that the dataset was homogeneous and used several different regressions to estimate the best fit for the dataset. The results of the analysis were then compared to previous rainfall studies in the region using older rainfall data including Bulletin 70 and NOAA Atlas 14.

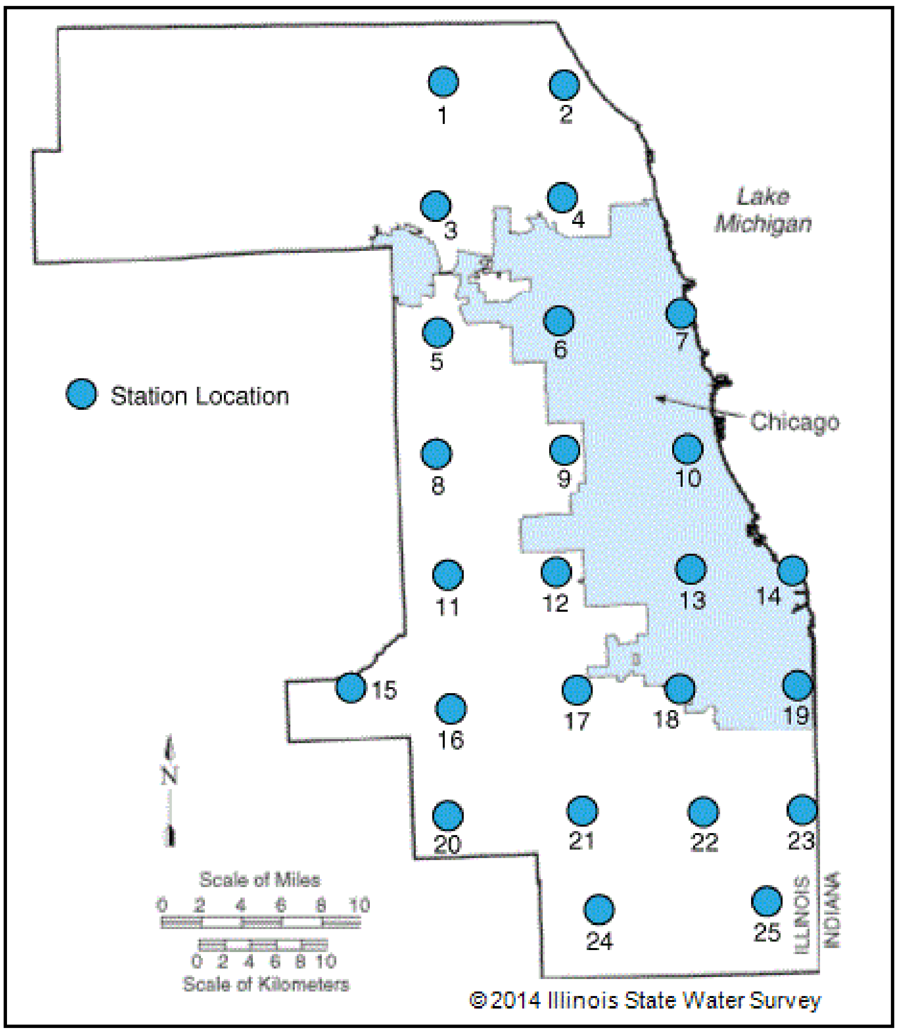

Figure 3.5-1 Cook County Precipitation Network Rain Gauge Location Map

As shown in Figure 3.5-1, the Cook County Precipitation Network contains 25 rain gauge locations throughout the County. Stations 1, 3, and 5 are located east of the Poplar Creek planning area. The results derived in the rainfall study were compared to historical rainfall estimates obtained from Bulletin 70 and NOAA Atlas 14. The estimated intensity which resulted from this study was found to be higher than Bulletin 70 at longer rainfall durations (greater than 3-hour) while in shorter durations (less than 3-hour) the estimated intensities are less than the ones in Bulletin 70. Furthermore, the rainfall estimates from this study was found to be higher than NOAA Atlas 14 study in all durations except for 1-hour duration where lower rainfall depths were estimated. These discrepancies can be explained by differences in the data and methodology used and the studied region. For Bulletin 70, Cook County has been considered as part of a larger section, identified as Northeast Illinois. The NOAA Atlas 14, volume 2, studied the Midwest region including Illinois with 11 stations in Cook County. The results presented herein were derived from actual rainfall data for all durations while in Bulletin 70, the estimates for durations shorter than 24 hours was obtained by applying duration-specific conversions to the 24-hour estimates.

NOAA publishes "Climate Normals" for various climate data, including precipitation over 30-year periods for stations throughout the country. The most recent data was for 1981-2010. Specifically, for precipitation data, the mean number of days per year with various amounts of precipitation is reported. Using the data for our study, the mean number of days annually with the daily precipitation of larger than 0.01-inches, 0.1-inches, 0.5-inches and 1-inch was calculated for all 25 stations in Cook County and the results for stations within the Poplar Creek planning area are presented in Table 3.5-1.

Station #	Mean Number of Days Annually			
	Daily Precipitation			
	>=0.01	>=0.10	>=0.50	>=1.00
1	107.5	66.2	20.6	6.8
3	106.6	66.5	21.6	7.2
5	106.0	66.5	23.1	8.5

Table 3.5-1 Mean Number of Days Annually in Which Variable Precipitation Occurred

The results for station #5, a station east of the Poplar Creek watershed, were compared to the results obtained from NOAA's studies on the O'Hare International Airport station (Table 3.5-2). Data presented in Table 3.5-2, show a higher mean number of days were obtained from this study versus NOAA's study for the more intense rainfalls (greater than 0.5-inch and greater than 1-inch) while for the less intense rainfalls (greater than 0.01-inch and greater than 0.1-inch) a lower number of days were noted from this study versus the NOAA's studies within 1971-2000 and 1981-2010.

Source	Mean Number of Days Annually with Daily Precipitation Greater Than			
	0.01”	0.10”	0.50”	1.00”
NOAA NCDC Chicago O’Hare Intl Airport, IL COOP ID 111549, 1971-2000	127.0	69.9	22.5	8.1
NOAA NCDC Chicago O’Hare Intl Airport, IL COOP ID 111549, 1981-2010	124.1	69.1	22.7	8.3
CBBEL Study, Station #5 (station east of Poplar Creek Watershed), 1989-2013	106.0	66.5	23.1	8.5

Table 3.5-2 Study Results versus NOAA Published Study

Urban runoff and stormwater discharges are the most significant source of pollutant loadings in the Poplar Creek Watershed. Changing rainfall patterns are expected to increase runoff volumes and pollutant loadings. Also, erosion within receiving watercourses can be exacerbated by intense storm events which cause sudden increases in water surface elevations and harshly fluctuating water levels (i.e., flashiness) in streams and lakes. The precipitation analyses discussed here suggests properly-sized BMPs to capture rainfall runoff will be increasingly important for the control of nonpoint source pollution.

3.6 SOILS

For purposes of this watershed resource inventory hydrologic soils groups, hydric soils, soil drainage class, and highly erodible soils will be discussed. A combination of physical, biological and chemical variables, such as topography, drainage patterns, climate, erosion and vegetation, have interacted over centuries to form the variety of soils found in the watershed. It is important to consider these types of soil classifications as they relate to land use/change and water quality. Soils determine the water-holding capacity and include both the erosion potential and infiltration capabilities. Soil characteristics indicate the manner in which soils in a particular area will interact with water in the environment, and therefore are useful in watershed planning. These can help to guide where restoration and best management practices are likely to be successful and where there may be constraints to project implementation. The soils data are obtained from the Soil Survey Geographic (SSURGO) Database produced by the U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS).[1]

3.6.1 Hydrologic Soil Groups

Hydrologic soil groups (HSGs) are categories of soils which feature similar physical and runoff characteristics. Along with land use, management practices, and hydrologic conditions, HSGs determine a soil’s associated runoff curve number which is used in turn to estimate direct runoff from rainfall. This information is particularly useful to planners, builders, and engineers to determine the suitability of sites for projects and their design. Projects might include, for example, stormwater management systems and septic tank/field location or more broadly, new neighborhood design.

[1] The NRCS Soil Survey of Cook County is posted on-line here:
https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/illinois/cookIL2012/Cook_IL.pdf

The four hydrologic soil groups are described as A – soils with low runoff potential when wet / water is transmitted freely through the soil, B – moderately low runoff potential when wet / water transmission through the soil is unimpeded, C – moderately high runoff potential when wet / water transmission is somewhat restricted, and D – high runoff potential when wet / water movement through the soil is restricted or very restricted. If certain wet soils can be drained, they are assigned to dual HSGs (e.g., A/D, B/D) based on their saturated hydraulic conductivity and the water table depth when drained. The first letter refers to the drained condition and the second to an undrained condition (Table 3.6-1).

Hydrologic Soil Group	*Definition/Characteristics*	*Area (acres)*	*Percent of Planning Area*
A	Soils have a low runoff potential when thoroughly wet. Water is transmitted freely through the soil	0	0.0%
A/D	The first letter applied to the drained condition and the second to the undrained condition	58.4	0.2%
B	Soils have a moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded.	3,477.4	12.3%
B/D	The first letter applied to the drained condition and the second to the undrained condition	2,001.1	7.1%
C	Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted.	11,792.7	41.8%
C/D	The first letter applied to the drained condition and the second to the undrained condition	6,316.5	22.4%
D	Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted.	2,917.7	10.3%
Unclassified	n/a	1,657.2	5.9%
	Totals	***28,221.0***	***100.0%***

Table 3.6-1 Characteristics and extent of hydrologic soil groups in the Poplar Creek Planning Area

The majority of the Poplar Creek planning area features Group C soils (nearly 41.8 percent) (Figure 3.6-1). Dual group C/D soils are the second most common group at 22.4 percent, followed by groups B and D accounting for 12.3 and 10.3 percent, respectively. It should be noted that the majority of the B soils are located along the western portion of the planning area, where the Fox River valley begins.

Unclassified soils account for 5.9 percent, which consist of underlying waterbodies and gravel pits or highly urbanized areas where the ground has been previously disturbed and current, accurate data is not available. Figure 3.6-1 illustrates a general pattern of HSG distribution, revealing that A/D and B/D soils are found primarily along stream and river corridors where under saturated condition, infiltration is limited and runoff potential is high.

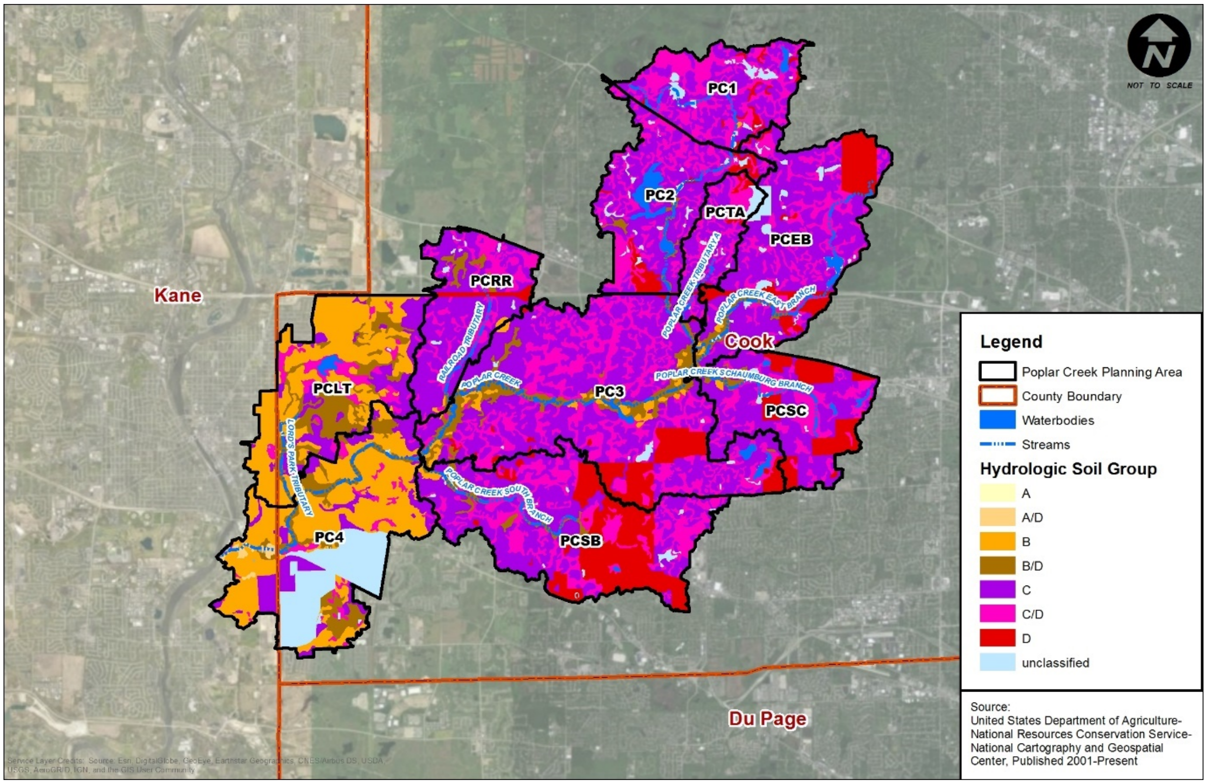

Figure 3.6-1 Hydrologic Soil Groups in the Poplar Creek Planning Area

3.6.2 Hydric Soils

Hydric soils are those soils that developed under sufficiently wet conditions to support the growth and regeneration of hydrophytic vegetation and are sufficiently wet in the upper part of the soil profile to develop anaerobic conditions during the growing season. The presence of hydric soils is used as one of three key criteria for identifying the historic existence of wetlands. Knowledge about hydric soils has both agricultural and nonagricultural applications including land-use planning, conservation-area planning, and potential wildlife habitat. Much like an understanding of hydrologic soils groups, knowledge of the location and pattern of hydric soils can inform planners, builders, and engineers and influence their project design and location decisions. For example, areas with hydric soils and drained hydric soils that do not presently contain wetlands may be candidates for wetland restoration.

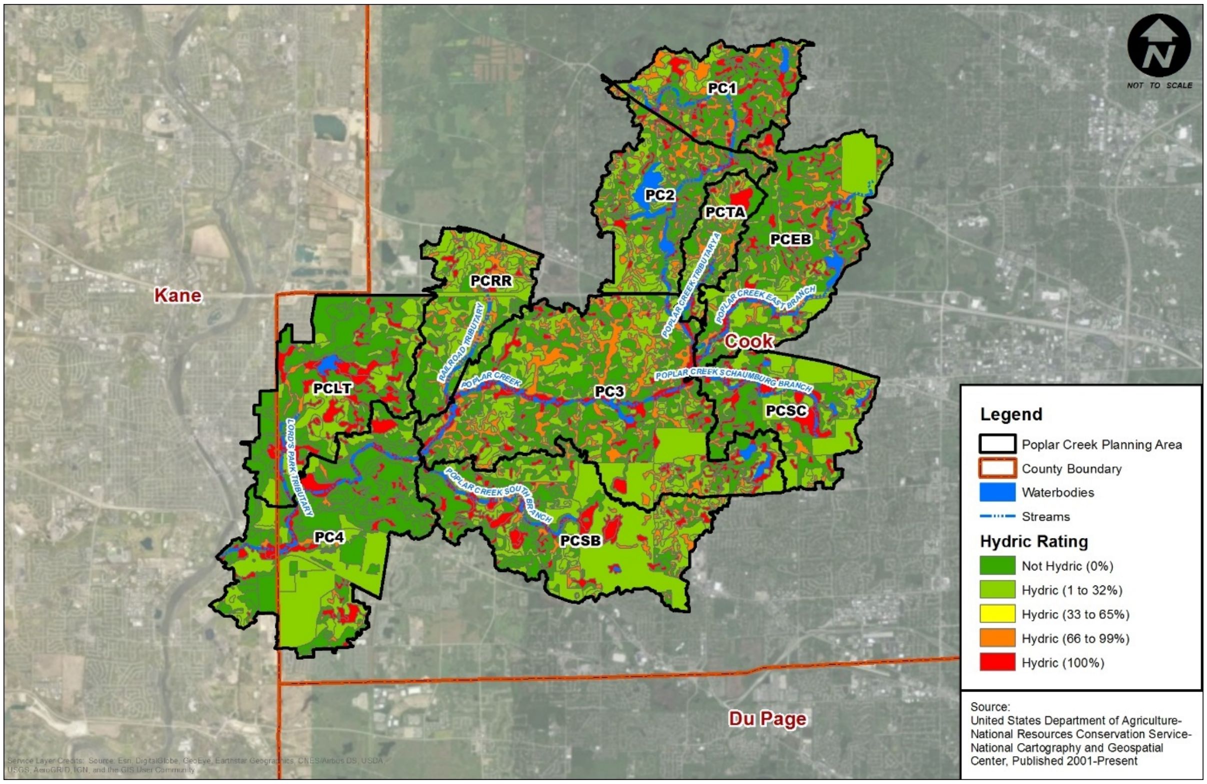

Figure 3.6-2 Hydric Soils in the Poplar Creek Planning Area

The extent of hydric soils within the Poplar Creek planning area is shown in Figure 3.6-2 and summarized in Table 3.6-2. Approximately 77% of the Poplar Creek planning area features "not hydric" soils (rows 1 and 2 in the Table). "All hydric" soils are distributed throughout the planning area, most commonly along stream and river corridors, and represent about 23 percent of the planning area. Muck soils are a category of hydric soils.

Hydric Soil Class	*Area (acres)*	*Percent of Planning Area*
Not Hydric (0%)	11,659.0	41.3%
Hydric (1 to 32%)	10,097.6	35.8%
Hydric (33 to 65%)	0.0	0.0%
Hydric (66 to 99%)	2,833.8	10.0%
Hydric (100%)	3,630.6	12.9%
Totals	***28,221.0***	***100.0%***

Table 3.6-2 Hydric Soil extent in the Poplar Creek Planning Area

3.6.3 Soil Drainage Class

Soils are categorized in drainage classes based on their natural drainage condition in reference to the frequency and duration of wet periods. The classes are Excessively Drained, Somewhat Excessively Drained, Well Drained, Moderately Well Drained, Somewhat Poorly Drained, Poorly Drained, and Very Poorly Drained. The extent of soils in these drainage classes within the Poplar Creek planning area is shown in Figure 3.6-3 and enumerated in Table 3.6-3.

Knowledge of soil drainage class has both agricultural and nonagricultural applications. For example, Well Drained drainage classes (which cover approximately 12.7% of the planning area) indicate areas where stormwater infiltration BMPs may best be utilized. On the other hand, the Somewhat Excessively Drained soils (about 1.1% of the planning area) may not be good locations for siting infiltration.

The Poorly Drained drainage classes indicate soils which limit or exclude crop growth unless artificially drained. Soils in the Somewhat Poorly Drained, Poorly Drained, or Very Poorly Drained drainage class occur on 30.2% of the planning area. These areas that are farmed can be taken as an approximation of the likely extent of artificial drainage given that crop growth on these lands would be severely impacted or even impossible without artificial drainage. BMPs such as rain gardens may need to be constructed with under-drains in areas with these soils.

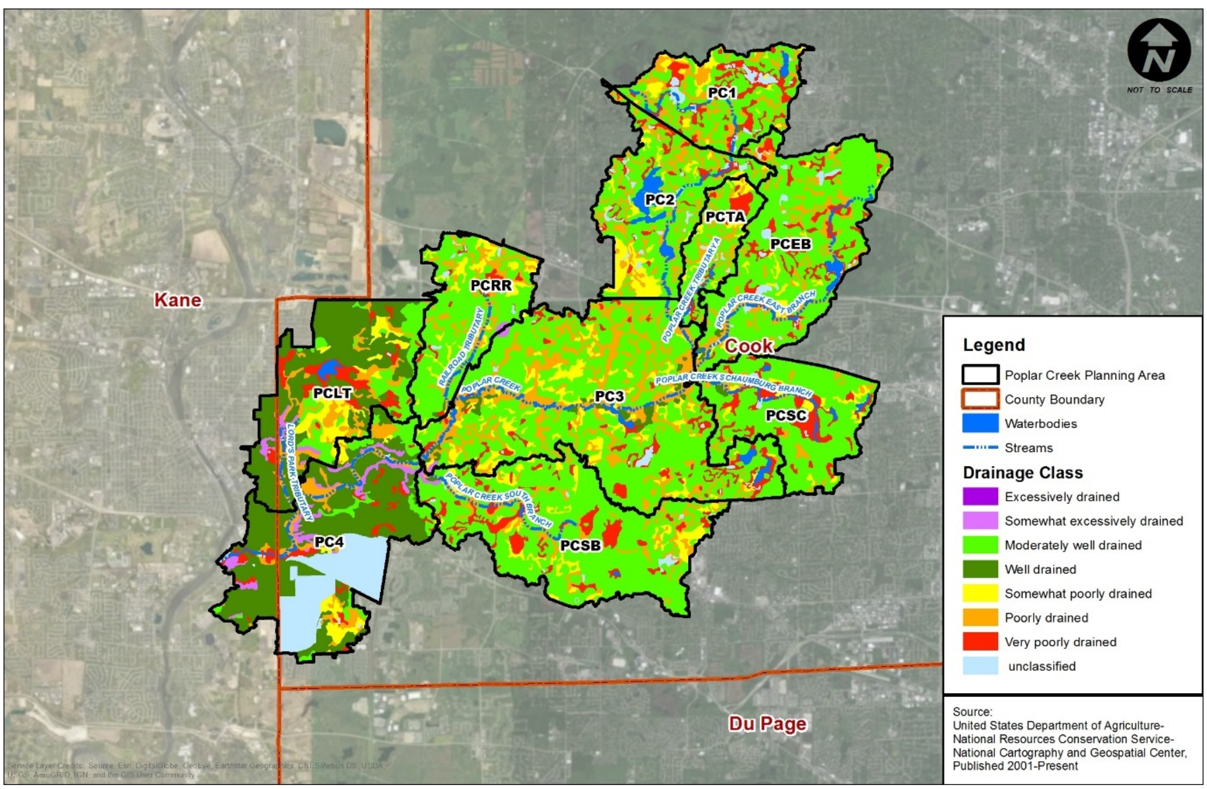

Figure 3.6-3 Soil Drainage Classes in the Poplar Creek Planning Area

Soil Drainage Class	*Area (acres)*	*Percent of Planning Area*
Excessively Drained	0.0	0.0%
Somewhat Excessively Drained	311.1	1.1%
Moderately Well Drained	14,241.9	50.5%
Well Drained	3,580.1	12.7%
Somewhat Poorly Drained	2,062.1	7.3%
Poorly Drained	4,111.3	14.6%
Very Poorly Drained	2,353.1	8.3%
unclassified	1,561.4	5.5%
Totals	***28,221.0***	***100.0%***

Table 3.6-3 Extent of Soil Drainage Classes in the Poplar Creek Planning Area

3.6.4 Highly Erodible Soils

Soil erodibility can be defined by the tendency of soil particles to become detached and mobilized by water and the ground slope. Erodible soils are susceptible to erosion from runoff during storm events due to a combination of slope, particle size, and cohesion. The USDA – NRCS defines a highly erodible soil or soil map unit as one that has a maximum potential for erosion that equals or exceeds eight times the tolerable soil erosion rate (T). The NRCS uses the Universal Soil Loss Equation (USLE) to determine a soil's erosion rate by analyzing rainfall effects, characteristics of the soil, slope length and steepness, and cropping and management practices. The "T factor" is the soil loss tolerance (in tons per acre) that can be used for conservation planning. It is defined as the maximum amount of erosion at which the quality of a soil as a medium for plant growth can be maintained. The T factors are integer values of from 1 through 5 tons per acre per year. The factor of 1 ton per acre per year is for shallow or otherwise fragile soils (shown as red in Figure 3.6-4) and 5 tons per acre per year is for deep soils that are least subject to damage by erosion (shown as green in Figure 3.6-4).

While the T factor is typically used for conservation planning on farms, it is appropriate to use soil tolerance for the objective of identifying the degree of soil loss potential. Highly erodible soils are considered in the watershed plan because erosion from these soils can potentially end up in surface waters, contributing to high amounts of total suspended solids and sediment accumulation in streams and lakes. This results in degradation of water quality due to silt and sediment deposition within the water body. Erodible soils along lakeshores and stream channels, and on disturbed land surfaces (e.g. active croplands and construction sites) are most susceptible to erosion. Therefore, stabilization practices near shorelines and stream channels could reduce erosion. All soils can severely erode when excavated and stockpiled; erosion control practices should be planned for any human disturbance of an area. Land developers are required to follow the National Pollutant Discharge Elimination System (NPDES) regulations regarding soil erosion and sediment control measures during construction.

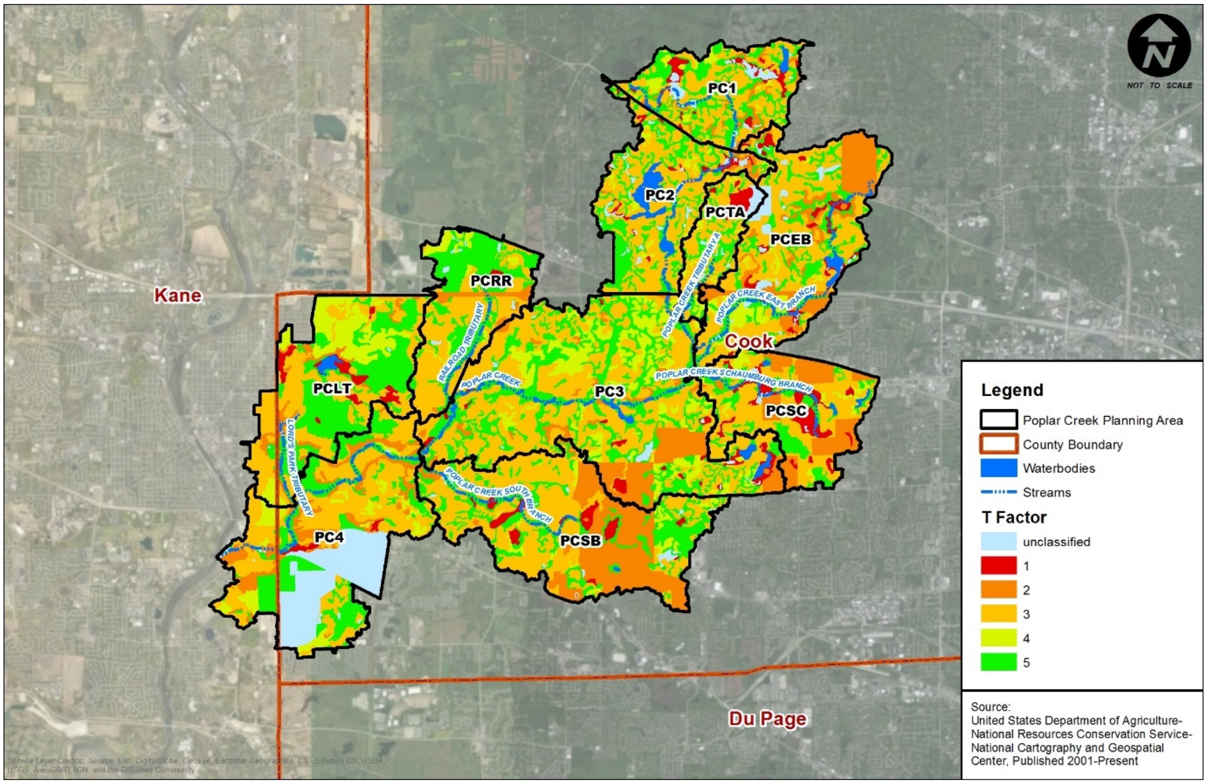

Figure 3.6-4 Highly Erodible Soils in the Poplar Creek Planning Area

T Factor (tons/acre/year)	*Area (acres)*	*Percent of Planning Area*
0/unclassified	1,657.2	5.9%
1	1,041.1	3.7%
2	3,721.3	13.2%
3	12,075.2	42.8%
4	2,429.7	8.6%
5	7,296.5	25.9%
Totals	***28,221.0***	***100.0%***

Table 3.6-4 Extent of Erodibility in the Poplar Creek Planning Area

3.6.5 Groundwater

Prior to glaciation episodes in Illinois, the predominately carbonate bedrock exposed at the land surface in northeastern Illinois was subjected to weathering and dissolution. This resulted in the development of significant secondary porosity, particularly within the upper 125 feet of bedrock, creating a productive aquifer. This aquifer is referred to as the shallow bedrock carbonate aquifer. This aquifer was and in some cases is an important source of groundwater for municipalities, industry, and private homeowners in northeastern Illinois.

The geologic units that comprise this aquifer consist of Silurian-age carbonates (mostly dolomite), the Maquoketa Formation (mostly shales), and the Galena-Platteville Groups (mostly limestone and dolomite). Strata dip towards Lake Michigan. Most of the bedrock in northeastern Illinois is now buried by glacial material, but exposures can be found along creeks and rivers throughout the area or can be seen in quarries.

Figure 3.6-5 below shows the estimated groundwater elevation (head) in feet above mean sea level (AMSL) for the shallow bedrock carbonate aquifer in northeastern Illinois. Groundwater flow generally mimics the land surface topography. Groundwater flow is divided into several flow systems based on topography, connections between the aquifer and streams, and variations in permeability. The highest heads occur in northern McHenry County and extend southward to northwestern Kane County. Another groundwater divide follows the Valparaiso moraine though western Lake County, far northwestern Cook, and western DuPage County, dividing a short westward flow path towards the Fox River and a long flow path towards the Des Plaines River. Groundwater flow systems become more localized farther south in Cook County due to the Des Plaines, DuPage, and Fox Rivers, which cut through glacial deposits to the bedrock in many areas.

In central Cook County a wide and shallow cone of depression has formed where groundwater elevations have dropped below the level of the canals and Lake Michigan. Although there are no major pumping wells in the region, other activities that could lower water levels include the dolomite quarries, the deep tunnels that are part of MWRD's Tunnel and Reservoir Project, and the many cross-connected wells with the underlying Cambrian-Ordovician Sandstones. With a low permeability and a low recharge rate through the thick covering of clay tills on the Chicago Lake Plain, the amount of water flowing through the aquifer is likely very little. (Illinois State Water Survey, Prairie Research Institute)

A comprehensive groundwater study(ies) of the Poplar Creek Watershed has not been conducted within the last 30 years. Several communities in the area are part of the Northwest Suburban Joint Action Water Agency System (JAWA). For these communities water is supplied from Lake Michigan and treated by the city of Chicago. Water is then delivered to the communities via the JAWA system.

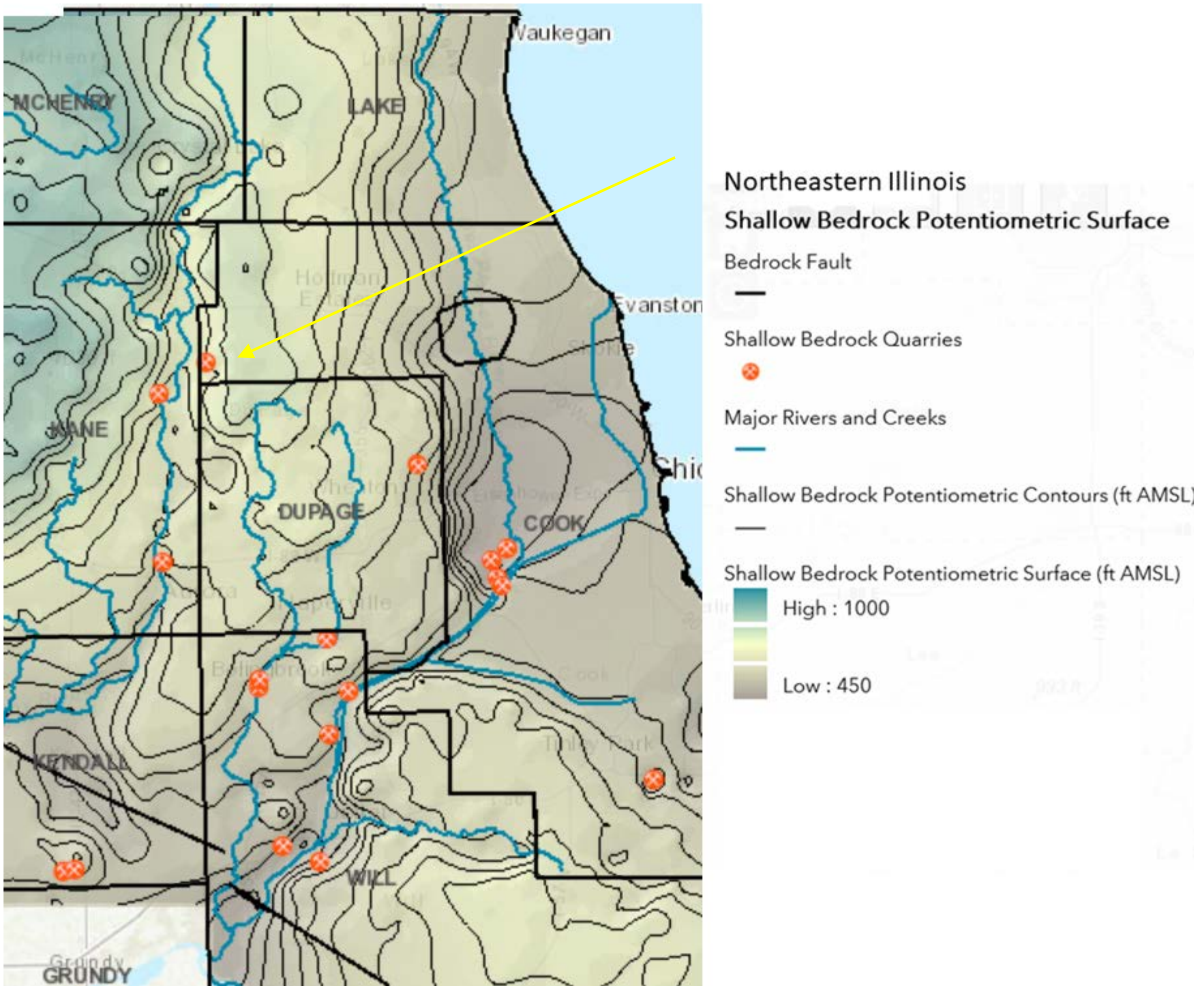

Figure 3.6-5 Shallow Bedrock Potentiometric Surface in Northeastern Illinois
Source: Illinois State Water Survey, Prairie Research Institute

3.7 FLOODPLAINS

A floodplain is defined as any land area susceptible to being inundated by floodwaters from any source. The 100-year floodplain or base flood encompasses an area of land that has a 1% chance of being flooded or exceeded within any given year; the 500-year floodplain has a 0.2% chance of being flooded or exceeded within any given year. Floodways are defined by the National Flood Insurance Program (NFIP) as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height (0.1 foot in Illinois). Floodways are a subset of the 100-year floodplain and carry the deeper, faster moving water during a flood event.

When a natural floodplain is developed for other uses, such uses become susceptible to flooding which can result in property and crop damage as well as degraded water quality. Development in the floodplain can even affect areas that aren't directly adjacent to a waterbody, such that those areas can become flooded in heavy storms. Thus, it is important that floodplains and their relationship to land use be considered in watershed plans as well as any other type of land use planning.

According to floodplain data derived from the Federal Emergency Management Authority (FEMA) Flood Insurance Rate Maps (FIRMs), about 7.3 percent (2,062 acres) lies within the 100-year floodplain limits. The 2,062 acres includes studied and unstudied (Zone A) floodplains. About 0.7 percent (193 acres) of the planning area lies between the studied 100-year and 500-year floodplain (Table 3.7-1, Figure 3.7-1). The total area of the 500-year floodplain is all the Zone A, 100-year and 500-year floodplain which is roughly 2,143 acres or 8.0% of the planning area. Encroachments in the floodplain should be monitored by communities since they can lead to increased upstream and downstream flood elevation.

Floodplain	*Cook County Area (acres)*	*Kane County Area (acres)*	*Percent of Planning Area*
Zone A (unstudied)	531.7	3.3	1.9%
Only 100-year Floodplain	1432.0	95.5	5.4%
Only 500-year Floodplain	179.2	14.1	0.7%
Totals	***2,142.8***	***113.0***	***8.0%***

Table 3.7-1 Floodplains in the Poplar Creek Planning Area

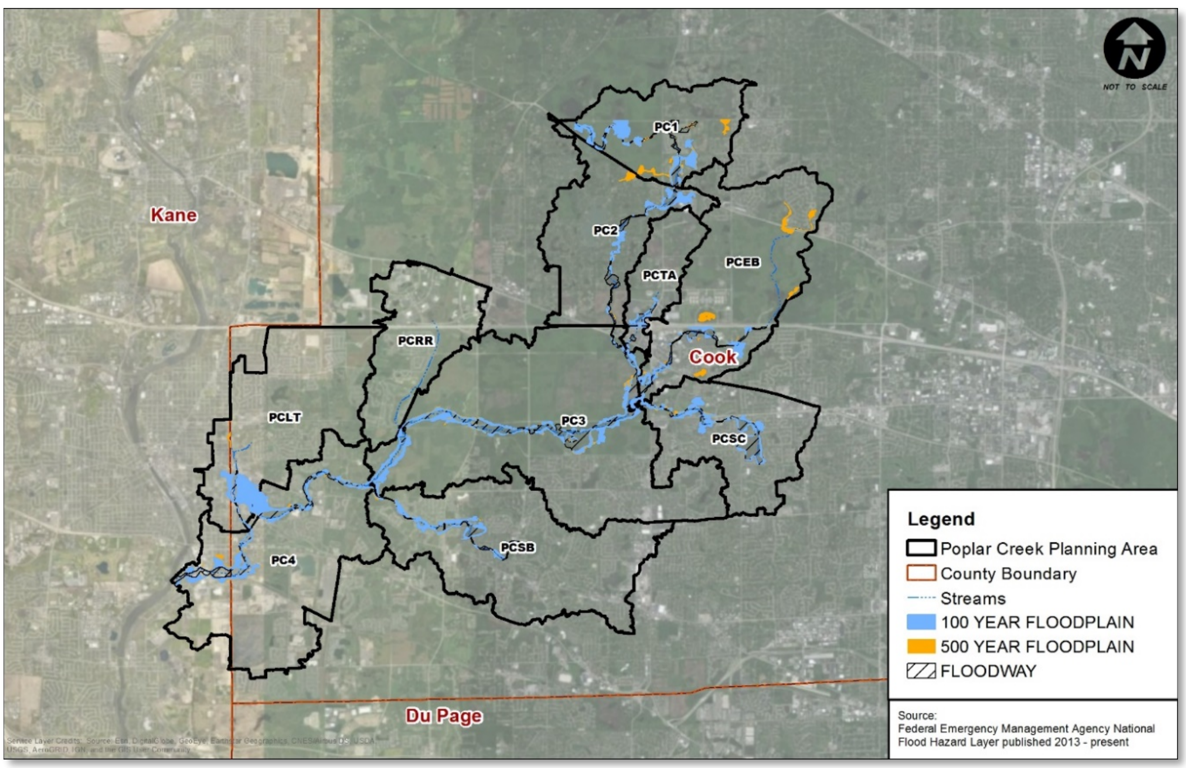

Figure 3.7-1 Floodplains in the Poplar Creek Planning Area

3.8 WETLANDS

Wetlands provide a variety of functions including social, economic, and ecological benefits to communities by providing valuable habitat, protecting natural hydrology and recharging groundwater. They also filter sediments and nutrients in runoff, provide wildlife habitat, reduce flooding, and help maintain water levels in streams. These functions improve water quality and the biological health of waterbodies, making wetlands an integral part of the watershed.

Figure 3.8-1 Wetlands area at point PCEB C

As the area was being developed, settlers altered presettlement wetlands by draining wet areas, channelizing streams, and clearing forests to farm the rich Midwestern soil. There are many wetland functions that generate ecosystem services that are valued by society. Wetlands are an integral part of the movement to conserve green infrastructure and thereby employ nature to help manage hydrology in the built environment. Despite this, the extent of America's wetlands continues to decline.

Based on the National Wetlands Inventory (NWI), there are an estimated 2,018 acres of wetlands, approximately 7% percent of the land area, within the Poplar Creek planning area. Each wetland is categorized by its type (identification code), size and location. The specific function and quality is unknown on a regional scale because a county specific function inventory (e.g. quality, water-quality, habitat, flood reduction) is unavailable. The watershed does have a high concentration of wetlands associated with the FPCC properties and along the Poplar Creek Mainstem in the watershed planning area.

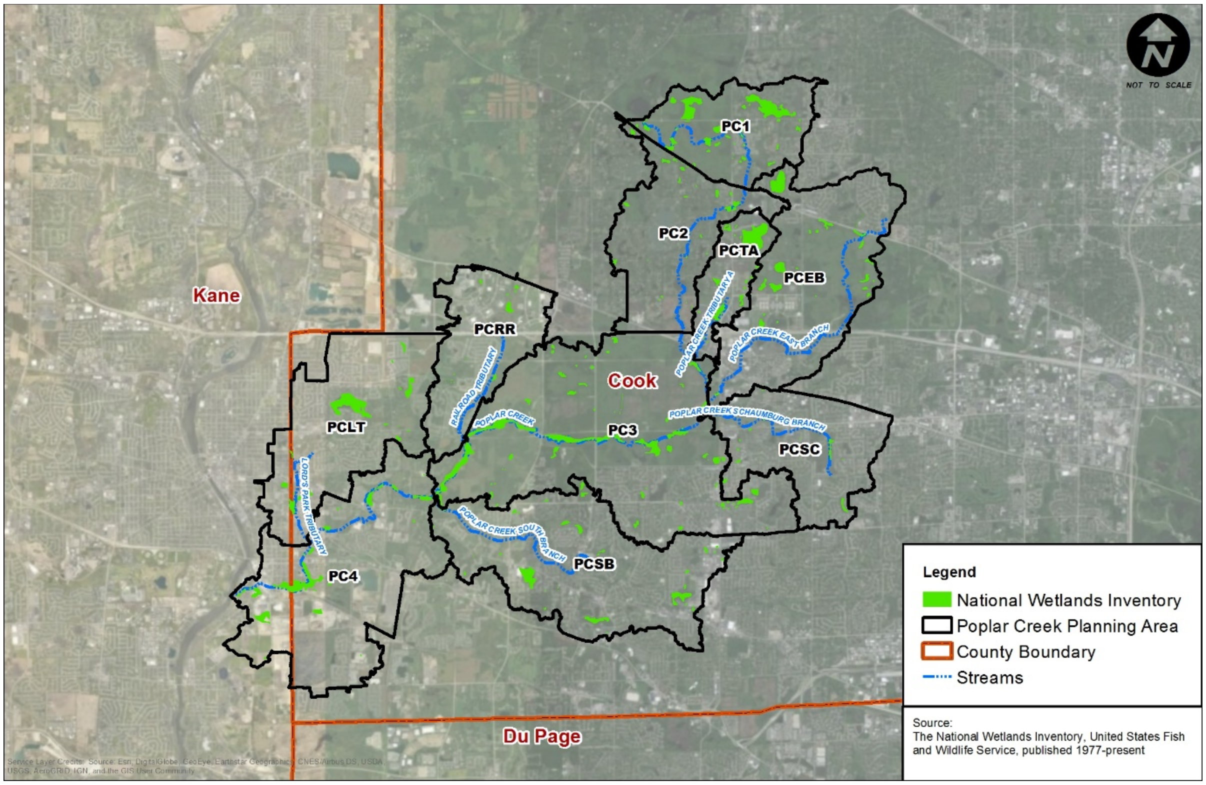

Figure 3.8-2 Wetlands in the Poplar Creek Planning Area

3.9 LAND USE AND LAND COVER

Land use has a significant effect on basin hydrology, affecting the volume and characteristics of runoff produced by a given area. Land use is classified using CMAP's 2013 Land Use Inventory Classification Scheme and data inventory. The land-use scheme employs a new methodology and results in 57 categories of land use that are aggregated under five general categories: Urbanized, Agriculture, Open Space, Vacant or Under Construction, and Water. CMAP's land-use data is parcel based.

For purposes of this watershed inventory, land use within the planning area is organized among ten categories (Figure 3.9-1 and Table 3.9-1). Open space (28.7% of which 24% is forest preserve), Right-of-way (12.7%) and Residential (37.1%) are the most predominant land uses within the planning area. This is due in large part to the FPCC land which is included within the open space category and the developed communities within the Poplar Creek planning area. The large percentage of right-of-way is important to note since these areas may present opportunities for publicly owned and maintained BMPs. Vacant land is the second least common of the area (0.4%) before water (0.0%). Overall the watershed planning area is developed throughout the Poplar Creek planning area with open space outside of the forest preserve district that could be utilized for future development.

Land use within each of the watershed planning unit is shown in Figure 3.9-1 and is tabulated by the 10 major categories in Table 3.9-1. It is extremely important to consider land use in the watershed planning process as land use relates to the types of pollutant runoff that will occur and proposed watershed protection projects.

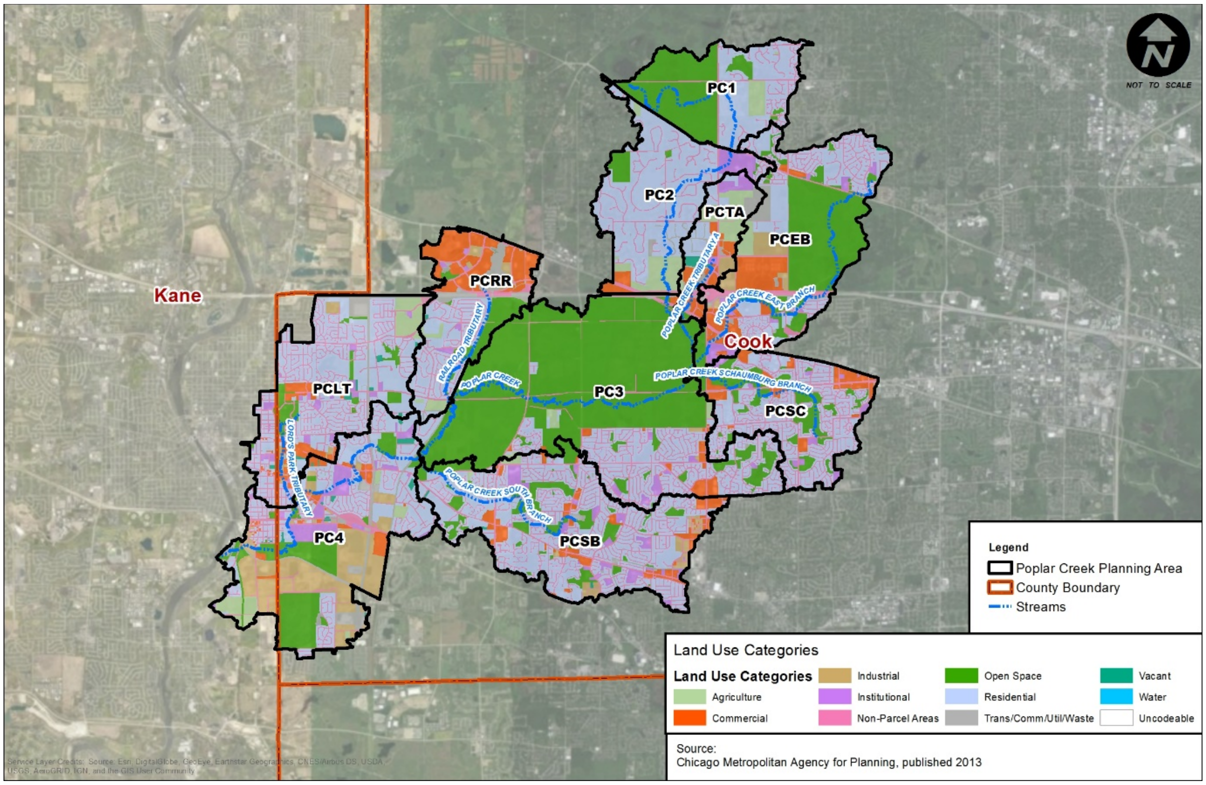

Figure 3.9-1 Land Use in the Poplar Creek Planning Area

Land-Use Category	*Area (acres)*	*Percent of Planning Area*
Agriculture	918.9	3.3%
Residential	10,470.2	37.1%
Commercial	1,853.2	6.6%
Institutional	956.5	3.4%
Industrial	1,318.2	4.7%
T/C/U/W	876.8	3.1%
Open Space	8,100.5	28.7%
Right of Way	3,594.4	12.7%
Vacant/Under Construction	120.3	0.4%
Water	3.8	0.0%
Total	***28,221.0***	***100.0%***

Table 3.9-1 Land-Use Categories and extent within the Poplar Creek Planning Area

Notes: T/C/U/W = transportation, communications, utilities, and wastewater

The CMAP data does not distinguish within agricultural land and pasture land. However, aerial images show that the majority of the 900+ acres of land in agricultural use is row crop agriculture.

It is extremely important to strongly consider land use in the watershed planning process as land use relates the types and amounts of pollutant runoff that will occur and the types of watershed projects that will be most appropriate and most effective.

3.10 IMPERVIOUS SURFACE

Impervious surface is a land cover use that is paved or otherwise overlain with nonporous material (e.g., concrete, asphalt, roofs, etc.) that prevents infiltration of rain and snowmelt and is responsible for generating runoff and nonpoint source pollution. Impervious areas produce significant amounts of runoff, which is often delivered to receiving system rapidly through storm sewer networks. Impervious surface changes local hydrology which often leads to downcutting and widening of stream channels. The resultant erosion of the streambanks and streambeds further aggravates water quality and can negatively impact land resources and infrastructure. Impervious surfaces and the resultant runoff may also contribute to erosion of lakeshore areas. In addition, runoff from impervious areas often picks up pollutants, for example as water runs across a road or parking lot, and these pollutants are delivered to nearby surface waters. Given the impacts of impervious surface on local hydrology, water quality, and other resources, this man-made feature of the landscape warrants special attention in any effort to protect or restore water quality.

The National Land Cover Database 2011 (NLCD 2011) for the watershed planning area is shown in Figure 3.10-2. The NLCD 2011 is the most recent Landsat-based, 30-meter resolution land cover database for the Nation and corresponds well with the CMAP land use database. Each data point or pixel represents a 30-meter square remotely-sensed image of the Earth's surface with a value of imperviousness assigned that ranges from 0 to 100%.

The potential change in impervious surface area due to population increases discussed in the previous section may contribute to higher flow rates and higher volumes of stormwater runoff produced within the watershed. Wide expanses of impervious surfaces without stormwater control result in high amounts of runoff, which in turn causes stream sections to be flashy, which in turn degrades channels and produces erosion and sediment releases. For purposes of this plan, the extent of impervious surface is best understood in the context of its impact on water quality (Figure 3.10-1). As the percentage of land cover imperviousness increases, general watercourse health degrades. This water quality can be understood as a function of impervious area coverage within the tributary area.

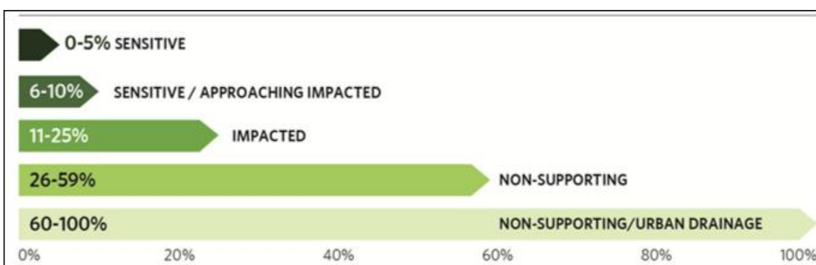

Figure 3.10-1 Stream Health Categories Relative to Extent of Impervious Surface

Figure 3.10-2 displays the pattern and extent of impervious surface within the Poplar Creek planning area. Most of the planning area is at least 40% impervious, with a large portion being associated with major transportation corridors and developed urbanized areas. The largest extent of pervious area in the watershed includes land mostly owned by the FPCC such as Crabtree Nature Center, Paul Douglas

Forest Preserve, and Arthur L. Janura Forest Preserve. The relationship between impervious surface and water quality is best examined at smaller units of geography. More localized land areas have direct impacts on the water quality of nearby lakes and streams.

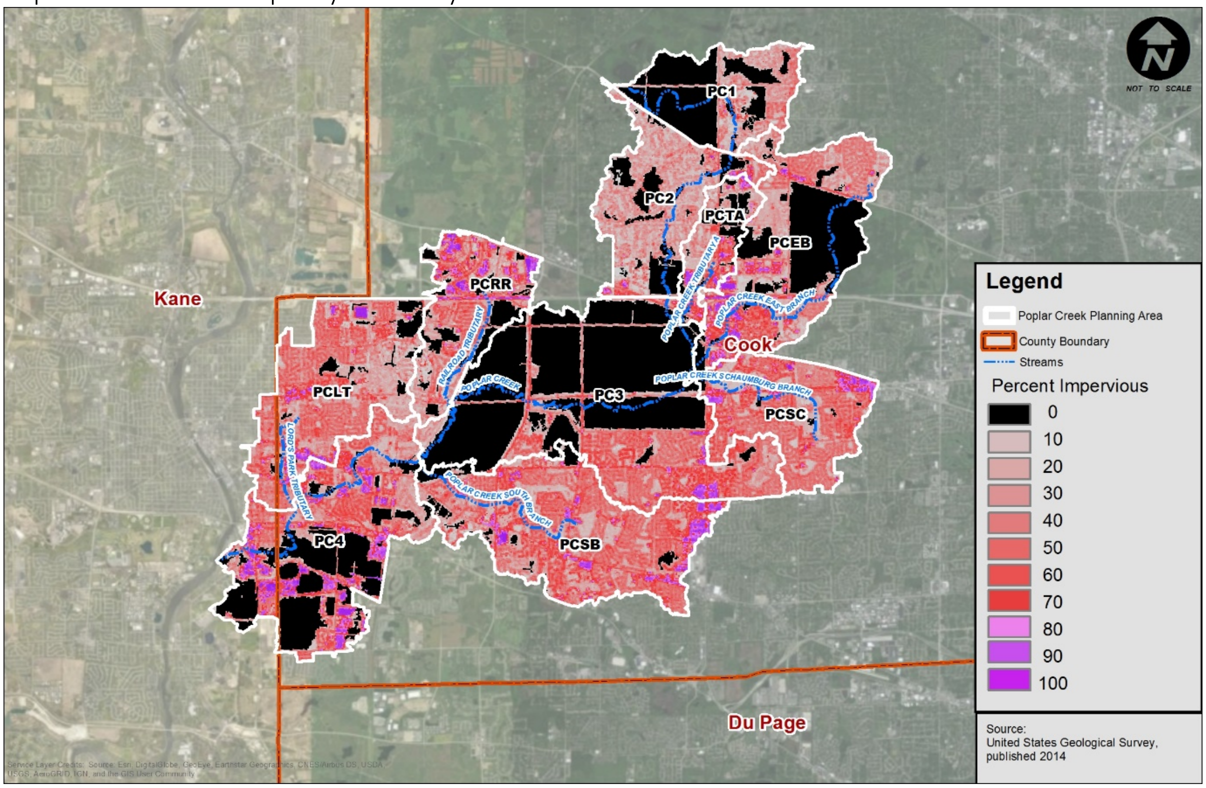

Figure 3.10-2 Impervious Surface (0-100%) in the Poplar Creek Planning Area

Portions of the planning area remain undeveloped (this includes areas currently used for agriculture) and may in the future be converted to residential or commercial uses. These areas warrant special consideration as development proceeds, to maintain relatively good water quality for both this planning area and the downstream watersheds. Conservation development and green infrastructure will need to be implemented as development occurs in the undeveloped watershed planning units. For the existing highly impervious areas, low impact development and site-level green infrastructure should be retrofitted into these areas at the highest levels possible to not worsen the water quality of the entire area. Population and employment growth forecasts for the planning area and County as discussed above suggest that without ordinances and subdivision codes that seek to protect water quality, the likelihood of water resource degradation is great.

3.11 OPEN SPACE RESERVE

Open space reserve is an area of land and/or water that is protected or conserved such that development will not occur on this land at any time in the future. Land that is owned by the FPCC is a core component of the open space reserve within the planning area. Public parks are included along with private land on which a conservation easement is placed (Figure 3.11-1). Also shown on the figure are golf courses and other land that is privately held and could be sold and converted to a type of land use that is neither protected nor considered to be in a conservation status; thus, these lands are not necessarily a permanent part of the open space reserve.

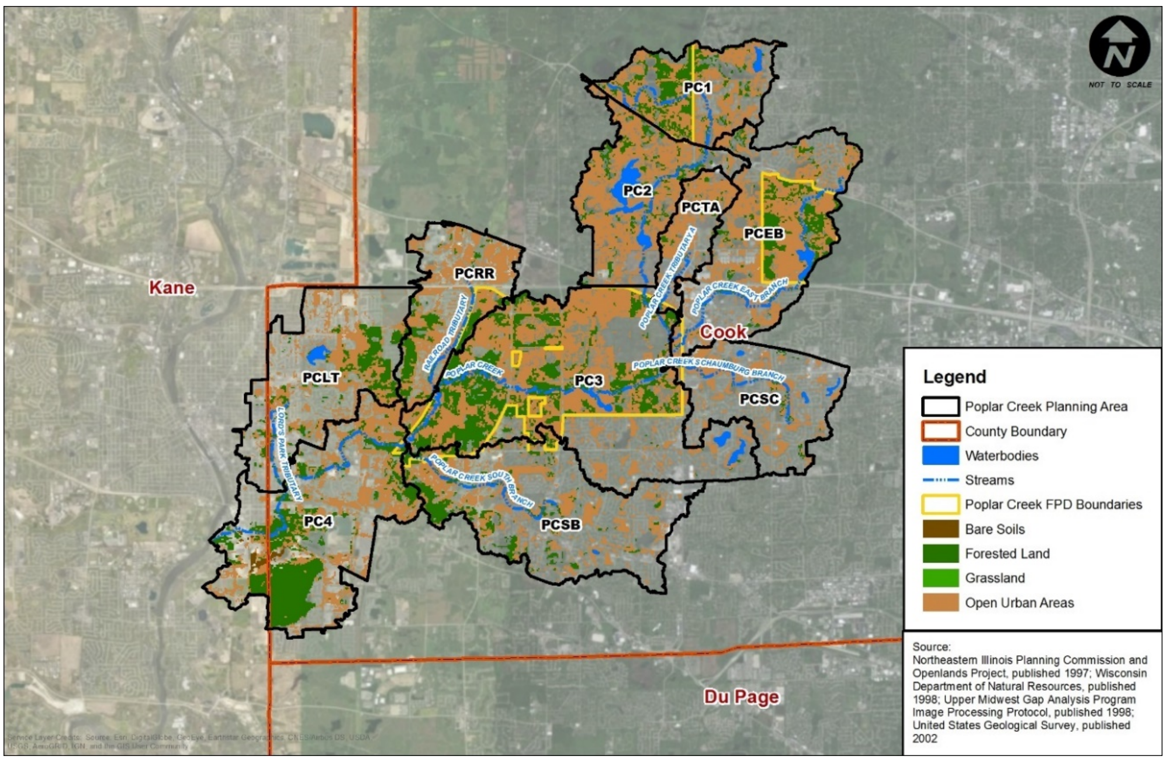

Figure 3.11-1 Greenways and Open Urban Areas in the Poplar Creek Planning Area

Vegetation Type	*Area (acres)*	*Percent of Planning Area*
Bare Soils	45.2	0.2%
Forested Land	4,099.0	14.5%
Grassland	0.0	0.0%
Open Urban Areas	10,403.2	36.9%
Totals	***14,547.4***	***51.5%***

Table 3.11-1 Greenways and Open Urban Areas in the Poplar Creek Planning Area

3.12 PRESETTLEMENT LAND COVER

For a qualitative sense of historical land use change, Figure 3.12-1 shows the presettlement land cover (primarily vegetation) in and around the Poplar Creek Planning Area as surveyed in the early stages of Euro-American settlement in the early 1800s. At that time, the land cover was comprised primarily of forest and prairie along with wetlands (categorized as bottomland, slough, swamp, or other wetland types) and open water. Following European settlement, most of this land was converted to agricultural practices, followed by residential and commercial land uses. This historic land cover can be informative for current land use planning and future ecological restoration projects.

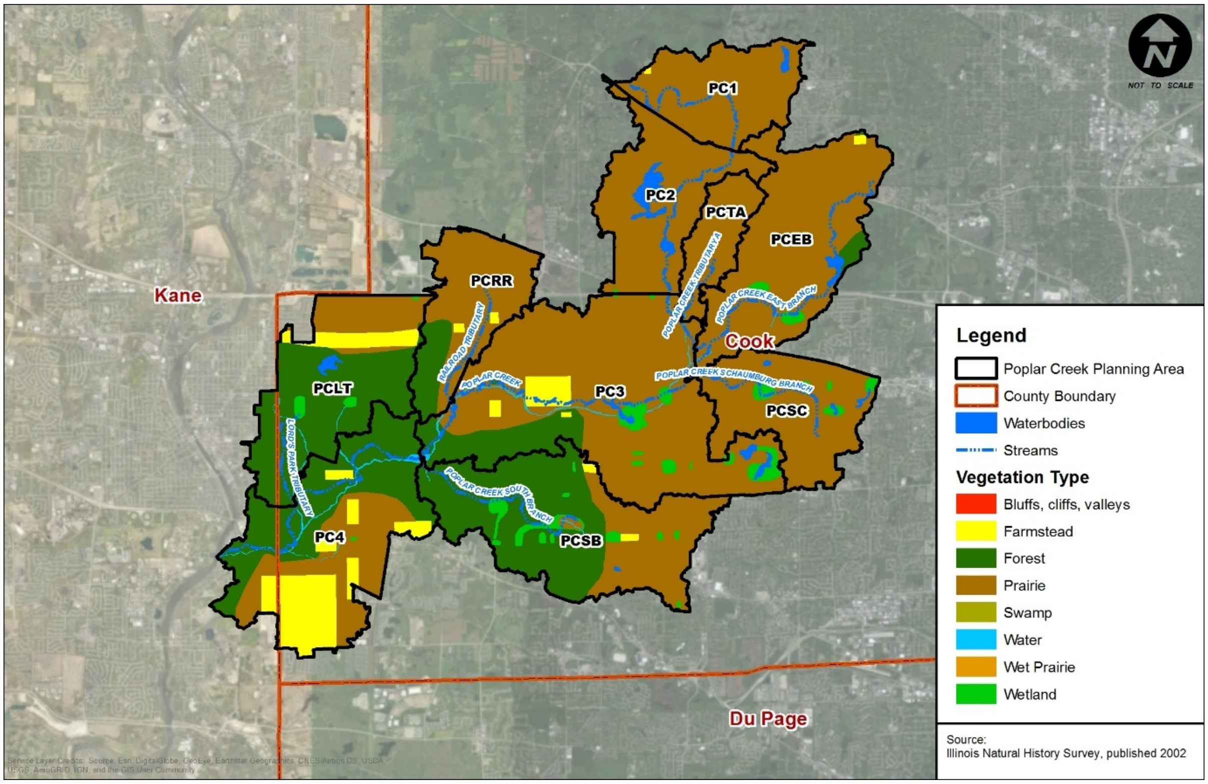

Figure 3.12-1 Presettlement Land Cover in the Poplar Creek Planning Area

Vegetation Type	*Area (acres)*	*Percent of Planning Area*
Bluffs, cliffs, valleys	0.0	0.0%
Farmstead	1,421.2	5.0%
Forest	7,113.3	25.2%
Prairie	18,841.9	66.8%
Swamp	0	0.0%

Vegetation Type	Area (acres)	Percent of Planning Area
Water	174.6	0.6%
Wet Prairie	0	0.0%
Wetland	669.8	2.4%
Totals	***28,221.0***	***100.0%***

Table 3.12-1 Presettlement Land Cover in the Poplar Creek Planning Area.

3.12.1 Coal Tar-Based Sealants

Impervious surfaces including roads and parking lots are of concern from a water quality perspective because water runs off these surfaces, drains into sewers, and is released in large quantities to receiving waters. There are physical effects from the stormwater discharges, in particular erosion from the volumes and energy in the discharges, but there are also chemical effects. The water picks up pollutants as it runs across surfaces and these substances are carried to the water bodies in the watershed. Pollution prevention practices can be employed to help reduce the amount of pollutants in the stormwater.

One practice that has specific and important water quality and public health implications is the sealing of pavements. Pavement sealants are applied to the asphalt pavement of many parking lots, driveways, and even playgrounds in the U.S. When first applied, the sealants cover the pavement with a glossy black and to a degree make the pavement look like new. Sealant products used commercially in the central, eastern, and northern U.S. very often are coal-tar-based (whereas those used in the western U.S. typically are asphalt-based). Although the products look similar, they are chemically different. Coal-tar-based pavement sealants typically are 25-35 percent (by weight) coal tar or coal-tar pitch. Coal tar is a thick black liquid that's a byproduct of coke production. Coal tar contains high concentrations of a family of chemicals known as polycyclic aromatic hydrocarbons or PAHs. Sixteen PAHs have been classified by the U.S. Environmental Protection Agency as "Priority Pollutants." Six are classified as probable human carcinogens, and one (benzo[*a*]pyrene) is classified as a known human carcinogen. These are chemical substance we want to keep out of our air and water.

Coal tar-based pavement sealant products contain, on average, about 70,000 mg/kg of PAHs, on the order of 1,000 times higher than asphalt-based sealant products.[2] The fact that there is sealant on a driveway or parking lot or playground is not a water quality concern in and of itself. However, what happens is the sealant wears off the pavement over time, due to weather and vehicle traffic and snow plowing. The sealant is worn a fine powdery texture that is picked up by stormwater and transported to streams or lakes. PAHs can also accumulate in stormwater detention ponds. Also important, some PAHs can dissolve into stormwater, especially if it rains soon after the sealant is applied. Having PAHs

[2] USGS https://tx.usgs.gov/sealcoat.html

out in the environment is detrimental to the health of water bodies and the health of people. Consequently, PAHs are a pollutant of concern in the Poplar Creek watershed.

A good pollution prevention practice to limit the release of PAHs in a watershed is to use a sealant product other than a coal tar-based sealant. Another option is to not seal pavement at all. In particular, converting a parking lot or driveway or playground to permeable pavement will allow water to soak into the ground and reduce stormwater discharge volumes and pollutant releases.

3.13 WATERSHED DRAINAGE SYSTEM

Water in the approximately 44 square mile Poplar Creek watershed generally flows from northeast to southwest toward the Fox River. There are several smaller watercourses in the watershed planning area north and east of the Poplar Creek Mainstem. The watercourses north of the Poplar Creek Mainstem generally flow south and the watercourses south and east of the Poplar Creek Mainstem flow west. The Poplar Creek planning area consists of the mainstem and the main tributaries, as described below and shown in Figure 3.13-1.

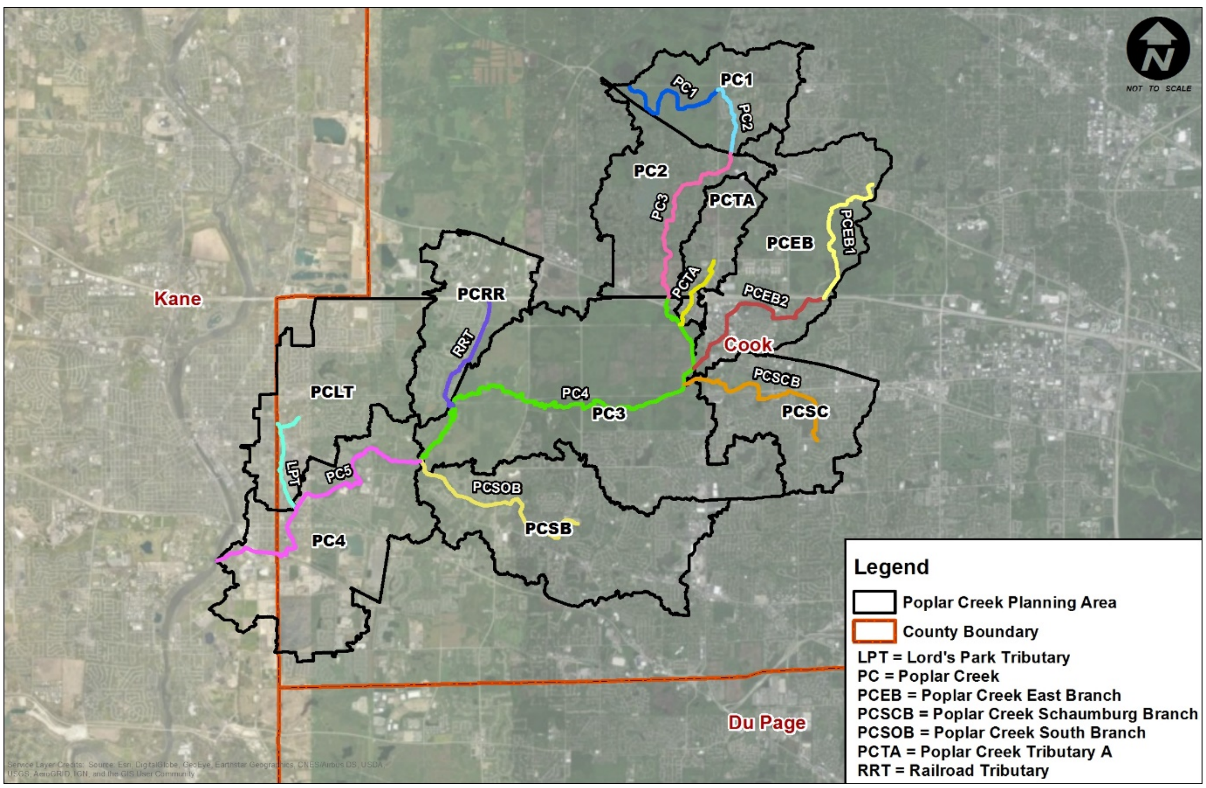

Figure 3.13-1 Watershed Drainage in the Poplar Creek Planning Area

3.13.1 Poplar Creek Mainstem

Figure 3.13-3 Central Poplar Creek (PC3 B)

The Poplar Creek planning area includes the mainstem of the Poplar Creek with six major tributaries including Poplar Creek Tributary A, Poplar Creek East Branch, Poplar Creek Schaumburg, Poplar Creek South Branch, Poplar Creek Railroad Tributary, and Lord's Park Tributary. Poplar Creek is approximately 18.3 miles long. Poplar Creek and its tributaries measure approximately 35.3 miles long. A tributary to the Fox River, Poplar Creek occupies approximately 44 square miles and drains areas within numerous municipalities that have a variety of land usages.

The Poplar Creek Mainstem flows through FPCC sites as well as urban developed areas. The Poplar Creek Mainstem includes one flood control reservoir in Streamwood at the Hillside Park Reservoir. The reservoir, which provides 32 acre-feet of storage in a 100-year event, detains stormwater runoff before releasing it into a sewer that eventually discharges to Poplar Creek unnamed Tributary D. Poplar Creek mainstream has a good condition of riparian areas and a moderate degree of erosion. The creek also has a moderate degree of channelization, which presents a moderate amount of debris blockages.

Figure 3.13-2 Northern Poplar Creek (PC2 A)

There are many lakes along the mainstem of Poplar Creek and its tributaries. Several of the in-line lakes are located within forest preserve property. Two off-line lakes that drain near the headwaters of Poplar Creek are Lake Harrowgate located in the Village of Inverness and Lake of the Coves located in the Village of South Barrington and are approximately 17 acres and 85 acres in size, respectively. The first in-line lake of Poplar Creek mainstem is Lake Rose which then flows into another in-line lake, Lake Adalyn, both located in the Village of South Barrington, and are approximately 2 acres and 22 acres in size. Wetfoot Lake is located in the Village of Hoffman Estates is an in-line lake of the Poplar Creek East Branch watershed unit which is 28 acres in size. The last in-line lake of the mainstem of Poplar Creek is Bode Lake North and South, which are approximately 20 acres in size and located in the Village of Hoffman Estates. More information regarding the aforementioned waterbodies is provided in Section 3.16.

Figure 3.13-4 Western Poplar Creek (PC4 A)

3.13.2 Poplar Creek East Branch

Figure 3.13-5 Poplar Creek East Branch (PCEB A)

The Poplar Creek East Branch watershed planning unit drains approximately 5.1 square miles from the headwaters near the ponds in Charlemagne Park north of Algonquin Road in Hoffman Estates. From there, the Poplar Creek East Branch drains south-southwesterly, approximately 4.9 miles, to its mouth with the mainstem of Poplar Creek just downstream of Barrington Road. Poplar Creek East Branch collects drainage from portions of Hoffman Estates, Inverness, South Barrington, and Unincorporated and FPCC areas. This area contains a mix of industrial, commercial, and residential development as well as open space that is predominantly owned by the FPCC. The East Branch shows a fair condition of riparian areas and a moderate degree of erosion. The branch also depicts a high degree of channelization, which shows that there is a lesser amount of debris blockage.

3.13.3 Lord's Park Tributary

Figure 3.13-6 Lords Park Tributary (PCLT C)

The Lord's Park Tributary watershed planning unit drains approximately 4.5 square miles from the headwaters located in Lord's Park in the City of Elgin. It drains to the south to its mouth with Poplar Creek just downstream of Villa Street. The Lord's Park Tributary is approximately 1.6 miles long. The watershed planning unit drains predominantly suburban residential development from Elgin and Hoffman Estates along with unincorporated areas. The Lord's Park Tributary has a fair condition of riparian areas with a high degree of erosion. This tributary also has a high degree of channelization, which shows that there is a small amount of debris blockage.

3.13.4 Poplar Creek Railroad Tributary

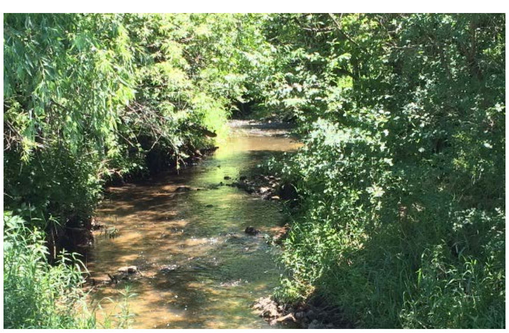

Figure 3.13-7 Poplar Creek Railroad Tributary (PCRR A)

The Poplar Creek Railroad Tributary watershed planning unit drains approximately 2.8 square miles starting from the headwaters of a large wetland complex located north of Interstate 90 in the Village of Hoffman Estates. From this location, Poplar Creek Railroad Tributary flows south to its mouth just downstream of Golf Road into Poplar Creek. The Poplar Creek Railroad Tributary is approximately 2.1 miles long draining portions of Hoffman Estates and Unincorporated and FPCC areas. The watershed planning unit drains developed residential and commercial areas as well as open land from FPCC. The Railroad Tributary shows a poor condition of riparian areas, along with a high degree of erosion. It also has a moderate degree of channelization, which then presents a moderate amount of debris blockage.

3.13.5 Poplar Creek South Branch

Figure 3.13-8 Poplar Creek South Branch (PCSB B)

The Poplar Creek South Branch watershed planning unit drains approximately 5.8 square miles from its headwaters located in Dolphin Park, a flood control reservoir located in the Village of Streamwood. Additionally, Oak Hill Reservoir is an offline reservoir located adjacent to the Streamwood public works building that also provides flood storage. Poplar Creek South Branch drains in a westerly direction to its mouth just downstream of Schaumburg Road into Poplar Creek. The Poplar Creek South Branch is approximately 3.9 miles long. The watershed planning unit drains areas mostly from Streamwood with some contribution from Schaumburg, Hanover Park Bartlett and Unincorporated and FPCC areas. The predominant land usage is residential with commercial, industrial and open space within the watershed planning unit as well. The South Branch gives a fair condition of riparian areas and a low degree of erosion. There is also a presence of a high degree of channelization, which gives information to a smaller amount of debris blockage in the branch.

3.13.6 Poplar Creek Schaumburg Branch

Figure 3.13-9 Poplar Creek Schaumburg Branch (PCSC A)

The Poplar Creek Schaumburg Branch watershed planning unit drains approximately 3.3 square miles from its headwaters in drainage ditches and ponds near Bode Road in Schaumburg and Hoffman Estates. The Poplar Creek Schaumburg Branch continues to drain westerly to its mouth just downstream of Barrington Road into Poplar Creek, approximately 3.2 miles. The watershed planning unit drains predominately urbanized areas containing mostly residential, commercial and open space from Hoffman Estates and Schaumburg along with a small contributing area of Streamwood. The Schaumburg Branch has a fair condition of riparian areas and a low degree of erosion. The branch also shows a high degree of channelization, which then presents a low amount of debris blockage.

3.13.7 Poplar Creek Tributary A

Figure 3.13-10 Poplar Creek Tributary A (PCTA A)

The Poplar Creek Tributary A watershed planning unit drains approximately 1.3 square miles. The Poplar Creek Tributary A headwaters area a series of detention basins at the intersection of Lakewood Boulevard and Barrington Road in Hoffman Estates. From this location, Poplar Creek Tributary A, approximately 1.2 miles long, drains in a south-southwesterly direction to its mouth just upstream of Shoe Factory Road into Poplar Creek. The watershed planning unit drains a mix of agricultural, residential and commercial areas from South Barrington and Hoffman Estates. The Poplar Creek Tributary A gives the information about a fair condition of riparian areas, along with a moderate degree of erosion. This tributary also has a high degree of channelization, which shows a smaller amount of debris blockage.

3.14 PHYSICAL STREAM CONDITIONS

3.14.1 Watercourse Assessment Methodology

A desktop analysis was combined with field investigations to create an inventory of streams and tributaries with respect to streambed and bank conditions. The assessment focused on erosion, degree of channelization, condition of riparian areas and areas of debris blockages. The desktop analysis is based on review of high resolution aerial photography from 2013 through 2017. Aerial photography was used to identify large scale issues including stream alterations, land uses that could contribute to nonpoint source pollution impairments, presence or absence of stream buffers, evidence of streambank erosion, in-channel impoundments, or other features of interest.

The review of aerial photography was conducted in conjunction with drainage class and soil erodibility mapping ("T" factor) previously created for each watershed planning unit. As previously discussed, T factors are integer values of from 1 through 5 tons per acre per year. The factor of 1 ton per acre per year is for shallow or otherwise fragile soils (shown as red in Figure 3.14-) and 5 tons per acre per year is for deep soils that are least subject to damage by erosion (shown as green in Figure 3.14-). While the T factor is typically used for conservation planning on farms, it is appropriate to use soil tolerance for the objective of identifying the degree of soil loss potential and in this case quantification of erosion. For the case of the Poplar Creek planning area, the T factor is used in conjunction with aerial photography review to identify areas of low, moderate or high erosion.

Figure 3.14-1 Lord's Park Tributary (PCLT B)

Channels with high erodibility factors were identified as a channel susceptible to erosion. The combination of aerial reviews, identification of soil erodibility factors, and field assessments allowed for the assessment of overall erosion conditions, including streambed erosion. The field assessments generally included observations at bridges or other structures crossing a watercourse to both bolster and verify assessments made during the desktop analysis. The field assessment focused on the collection of data including bank heights, degree of bank erosion, degree of streambed erosion, streambed material, streambed sediment depth, streambed width, overall streambed description and water column description. Aerial photography and Google street views were assessed as these street views provided detail in areas where watercourses have been highly channelized and hard armored as in the case through portions of the Lord's Park Tributary Ditch watershed planning unit.

Figure 3.14-2 Poplar Creek Mainstem (PC4 A)

Data collected included a visual assessment of stream condition, adjacent land use, and environmental factors that could be attributed to altered flows and nonpoint source pollution. The findings of the desktop analysis, field notes, and photographs of conditions at each location visited were compiled as a part of the evaluation. This comprehensive analysis was used to identify vulnerable locations within the streams and streambeds where bank and streambed erosion control measures can be implemented as in the case through the Poplar Creek Mainstem (PC4 A) watershed planning unit.

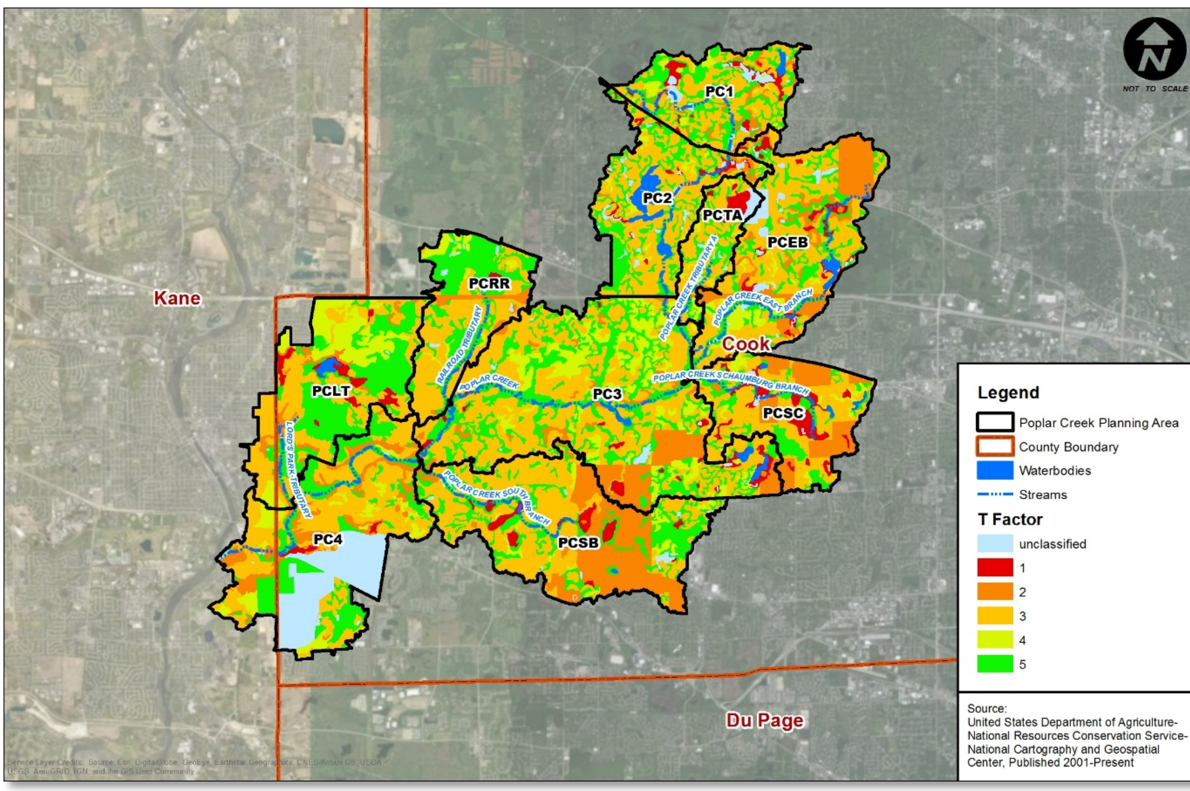

Figure 3.14-3 Highly Erodible Soils in the Poplar Creek River Planning Area

3.14.2 Channel Assessment Methodology

Channelization refers to the straightening of natural, meandering stream channels or the construction of channels for drainage (Figure 3.14-4). In natural meandering streams, channelization has the effect of reducing the overall length of the stream and increasing the gradient of the channel and therefore velocity. Channelization destroys in-stream and riparian habitat while disconnecting the stream from its floodplain. Channelization can also cause channel instability by reducing sinuosity while increasing streambank erosion. See Figure 3.14-5. To restore and protect habitat and water quality, opportunities for re-meandering and reconnecting the stream with its floodplain should be pursued wherever possible.

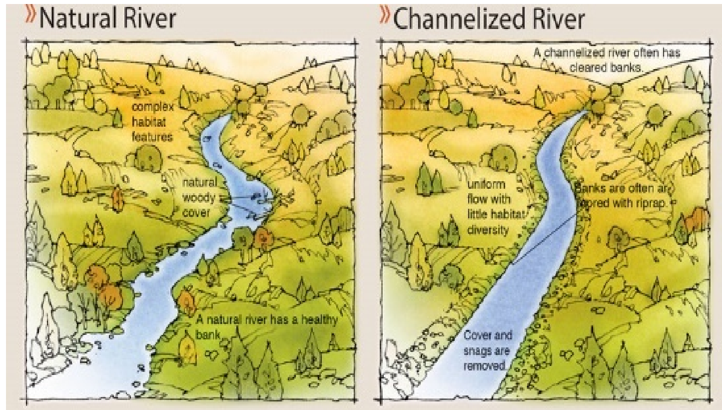

Figure 3.14-4 Channelization (Natural vs Channelized)

Figure 3.14-6 shows the degree of channelization through the Poplar Creek planning area. Channelization is described as low, moderate or high degree.

Figure 3.14-5 Example of high channelization at Polpar Creek Watershed

Figure 3.14-7 provides information on stream channel erosion in the mainstem and major tributaries in the Poplar Creek planning area.

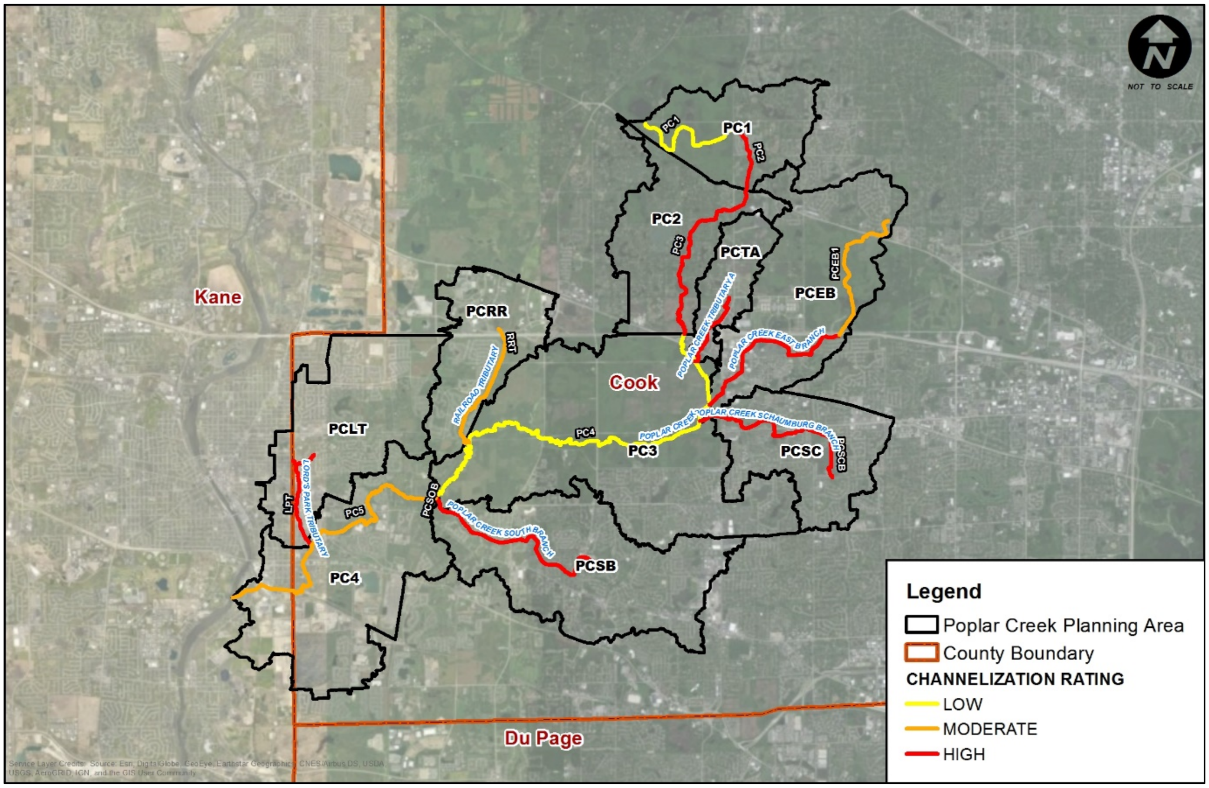

Figure 3.14-6 Summary of Channelization in the Poplar Creek Planning Area

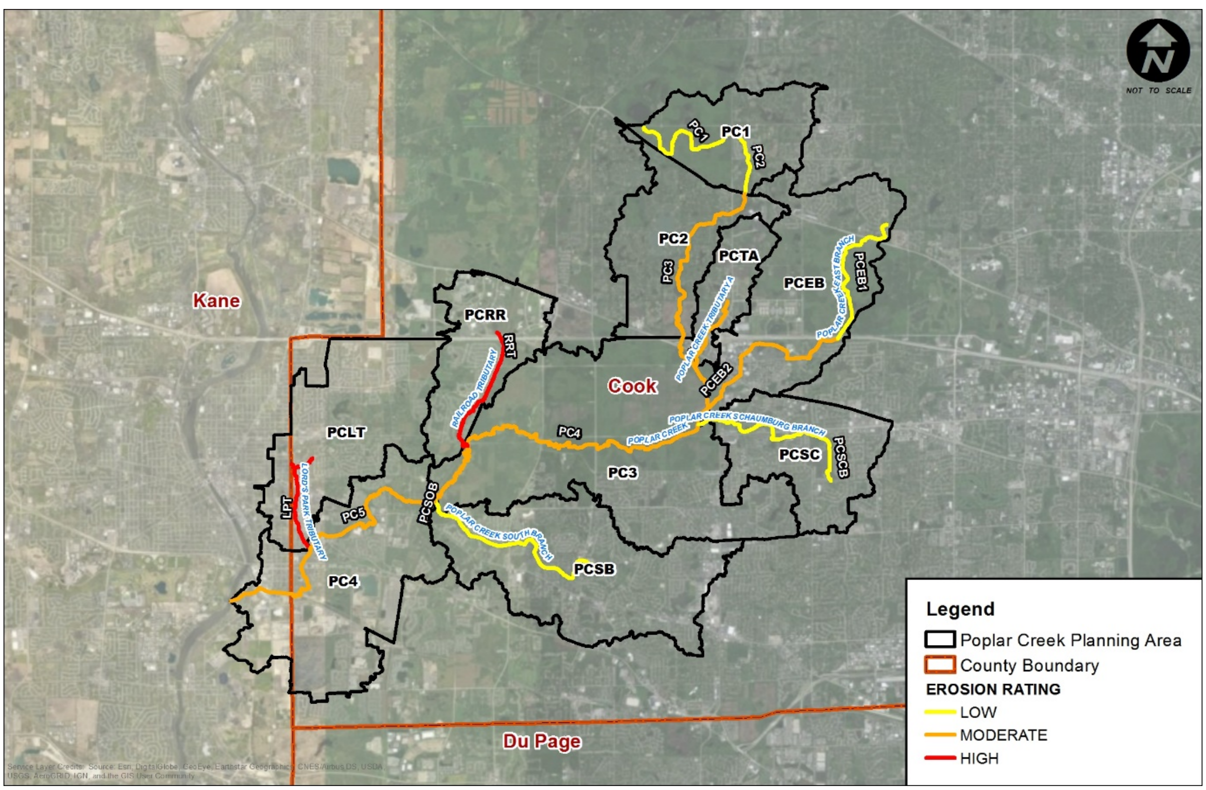

Figure 3.14-7 Summary of Stream Channel Erosion in the Poplar Creek Planning Area

The locations of the field assessment verifications are shown in Figure 3.14-8. A summary of the data collected is shown below in Table 3.14-1.

Segment	Bank Height		Sediment Depth		Channel Width		Channel Description	Streambed Description	Water Column Description
	Min	Max	Min	Max	(top of bank)	(normal water level)			
	(ft)	(ft)	(ft)	(ft)	ft	ft			
PC2 A	1	3	N/A	N/A	14.9	9.93	High channelization	Rocky bottom, little erosion, tree debris	Sediment laden water
PC3 A	0.5	2	N/A	N/A	31.8	26.4	High channelization	Erosion, tree debris	Sediment laden water, yet transparent
PC3 B	0.8	3.5	N/A	N/A	25.6	19.7	Medium channelization	Little erosion, muddy bottom	Sediment laden water
PC3 C	1.65	2.15	0.9	1.1	11	9	Medium channelization	Muddy bottom, low erosion, debris, wildlife	Sediment laden water
PC3 D	0.55	1.25	0.4	0.6	41	34	High channelization	Falling trees and tree debris, erosion	Sediment laden water
PC4 A	0.15	2.35	0.4	0.4	28.7	20.3	Low channelization	High flow, erosion with tree roots showing, debris	Transparent water
PC4 B	65.5	77.5	0.2	0.2	39	35.3	High channelization	Grassy bank, little erosion, rocky bottom	Transparent water
PCTA A	0.65	0.95	0.2	0.2	4	7	Low channelization	Little erosion, tree debris, rocky bottom	Transparent water
PCEB A	0.95	1.65	0.2	0.6	40	30	High channelization	Erosion	Sediment laden water
PCEB B	0.3	5	N/A	N/A	16.6	12	High channelization	Muddy bottom, heavy erosion, tree debris, tree roots showing	Sediment laden water
PCEB C	1.35	2.35	0.4	1.7	24	16.5	High channelization	Debris, grassy bank	Sediment laden water
PCLT A	0.65	1.65	1	1	43.4	37.5	Low channelization	Muddy bank, little erosion, flooding near	Transparent water
PCLT B	1.05	1.65	0.5	0.9	10	15	Medium Channelization	Grassy bank, little erosion, rocky bottom	Transparent water
PCLT C	0.65	3.15	N/A	N/A	21.3	15.5	High channelization	Grassy and muddy bank, high erosion	Sediment laden water
PCRR A	0.65	1.15	0.2	0.2	14.65	9.1	Medium channelization	Rocky bottom	Transparent water
PCSB A	0.5	1.5	N/A	N/A	12	18	High channelization	Muddy bank, high flow, heavy erosion	Transparent water
PCSB B	0.65	1.65	0.7	1	30.5	19.7	Low channelization	High erosion with tree roots showing, tree debris, rocky bottom	Transparent water
PCSC A	0.65	1.65	0.7	1	22	19	High channelization	Erosion, grassy bank	Sediment laden water

Table 3.14-1 Summary of Stream Channel Field Data

The number of locations with sediment laden water highlight that erosion is occurring contributing to sediment loads, and that there are sediment loadings from urban and suburban runoff.

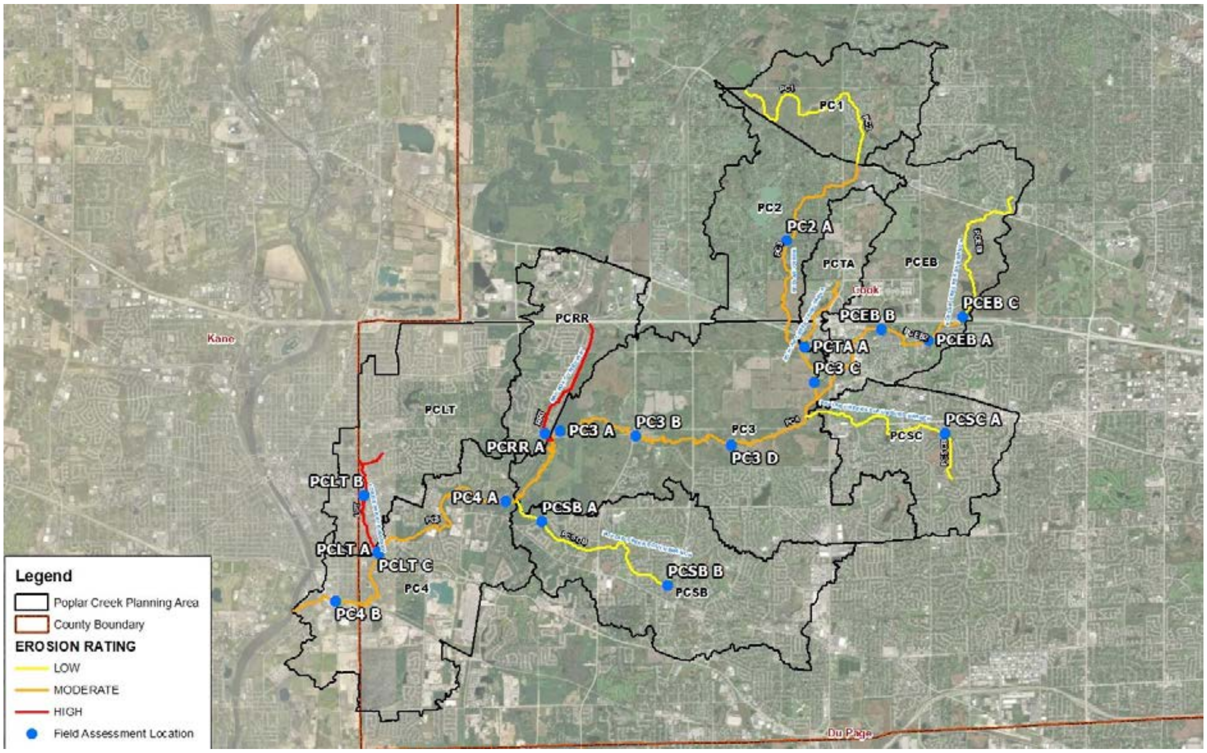

Figure 3.14-8 Streambed Field Data Collection Locations

3.14.3 Riparian Area Assessment Methodology

A riparian zone or riparian area is the interface between land and a river or stream. A riparian area is comprised of vegetation, habitats, or ecosystems that are associated with bodies of water (streams or lakes) or are dependent on the existence of perennial, intermittent, or ephemeral surface or subsurface water drainage. Figure 3.14-9 provides photos of riparian areas in various places in the watershed.

An overall exhibit of the riparian area in the watershed planning area is shown in Figure 3.14-10. High resolution aerial imagery was used to assess riparian buffer conditions within 50-100 feet to each side of the watercourses throughout the watershed planning area. Figure 3.14-11 shows the condition of the riparian areas. "Good" riparian condition was typically characterized by woodland, prairie, and/or wetland vegetation dominant on both sides of the stream. A "poor" condition was defined by turf grass and developed areas. A "fair" condition was noted as having at least some vegetative buffer along the stream to filter runoff from upland developed areas. Reaches with a "good" riparian condition were assessed based solely on aerial interpretation.

Figure 3.14-9 Images Taken from Southern Area of the Poplar Creek Watershed -Railroad Tributary, Poplar Creek Mainstem, and Poplar Creek South Branch (PCSB B, PC4 A, PC3 B, PCRR A, PCSB A, PC3 A)

It should be noted that these areas may be dominated by invasive species, such as buckthorn, honeysuckle, reed canary grass, and phragmites, among others, and compromised in their pollutant filtering and settling capacities. The morphological changes produced in the alluvial terraces, including the channel reduction due to channelization and armoring activities lower the assessment. The elimination of meanders and construction of large closed conduit conveyance systems is also considered. Several figures and summary tables follow in the discussion below.

Table 3.14-2 quantifies the stream lengths associated with the characterized riparian areas. Protecting and enhancing riparian areas will be helpful for protecting water quality in Poplar Creek and its tributaries.

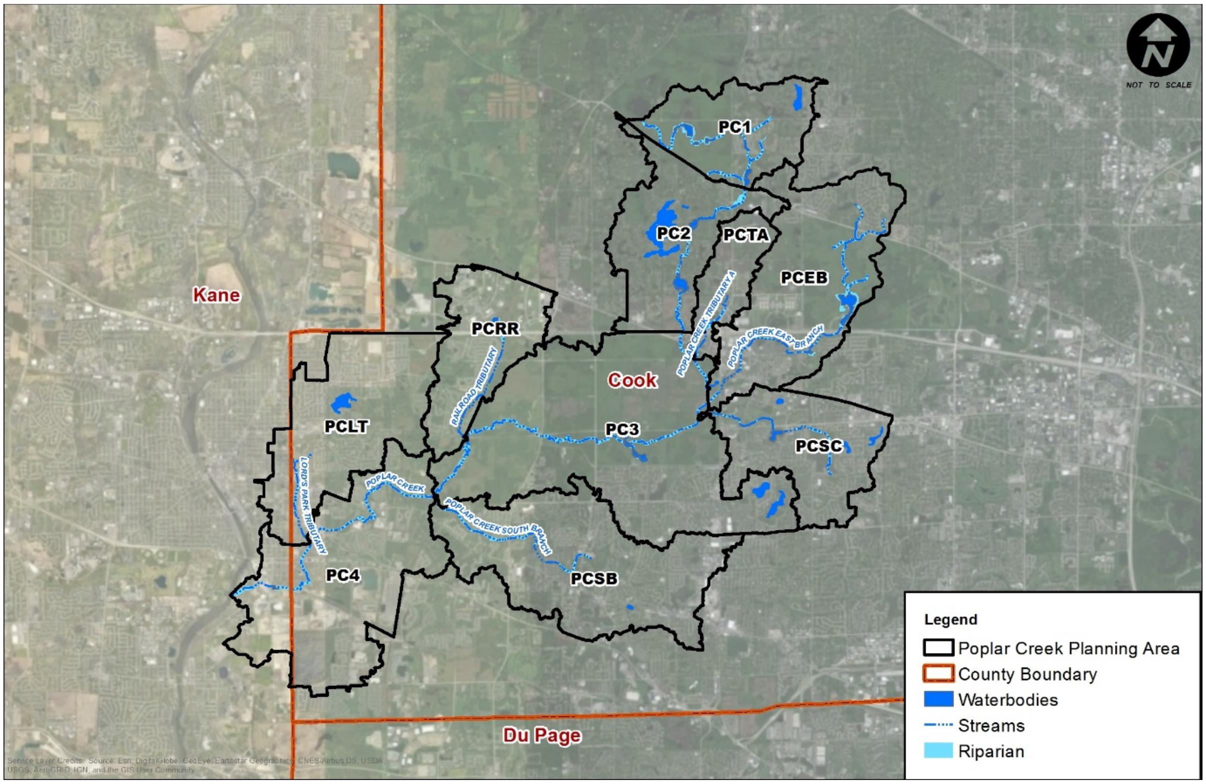

Figure 3.14-10 Riparian Corridors in the Poplar Creek Planning Area

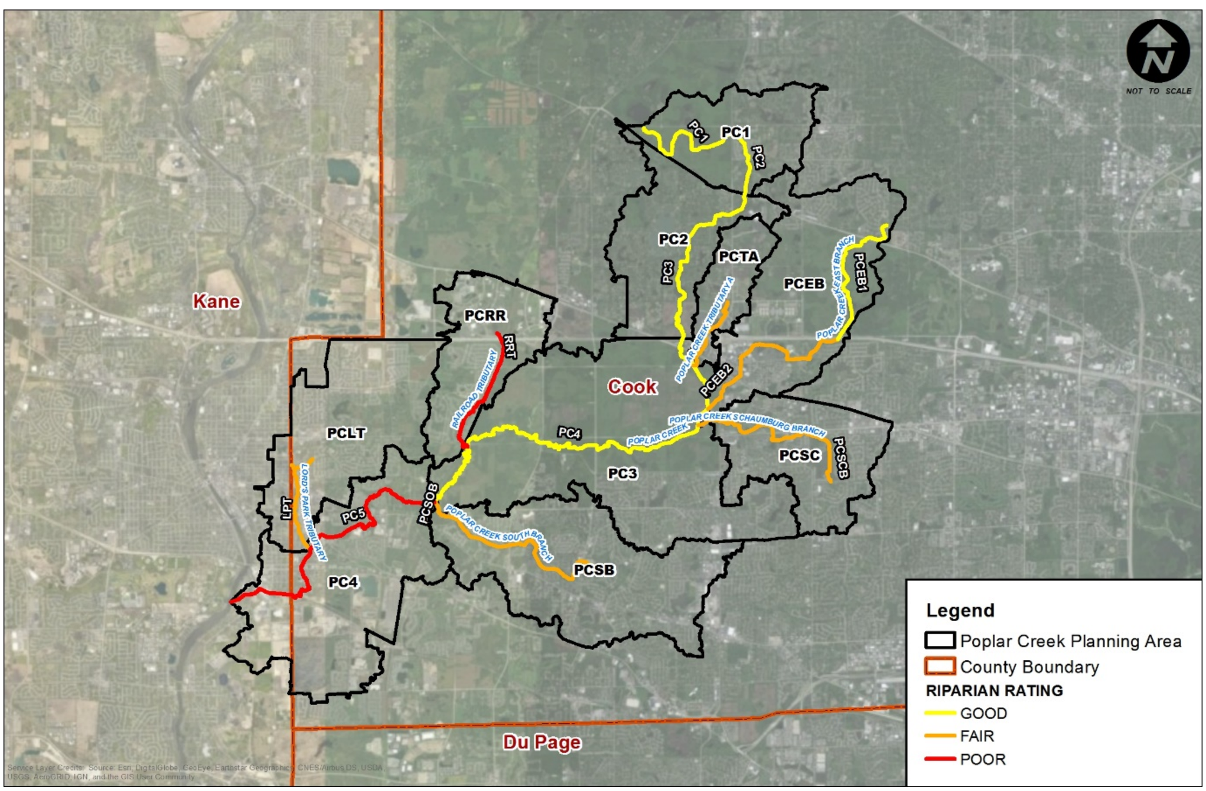

Figure 3.14-11 Summary of Riparian Areas in the Poplar Creek Planning Area

All the tributary watercourses assessed travel through relatively densely developed areas and are channelized with exception of a portion of the East Branch Poplar Creek and mainstem of Poplar Creek through the FPCC lands. Erosion is low to moderate through the East, Schaumburg, and South branches of Poplar Creek as the watercourses have been channelized using various methods. While the northern reach of the mainstem of Poplar Creek (PC1) has not been channelized, it too exhibits minimal erosion. Although the riparian area associated with tributary watercourses exhibit urban land use, an overwhelming majority of the watercourses promote a fair to good riparian habitat despite land constraints. The Railroad Tributary and southwest reach of the Poplar Creek mainstem (PC5), are notable exceptions with poor riparian habitats. The Poplar Creek mainstem has a good riparian zone upstream of the confluence with the Poplar Creek South Branch, as it mostly flows through forest preserve and naturalized areas.

Figure 3.14-12 Poplar Creek Mainstem (PC3 B)

Watercourse Name	Reach Code	Stream Length Assessed (feet)	Total Length (feet)	% of Total	Degree of Channelization	Riparian Area Condition	Degree of Erosion
LORD'S PARK TRIBUTARY	LPT	8,290	8,290	100%	HIGH	FAIR	HIGH
POPLAR CREEK	PC1	10,804	96,624	11%	LOW	GOOD	LOW
	PC2	5,614		6%	HIGH	GOOD	LOW
	PC3	16,095		16%	HIGH	GOOD	MODERATE
	PC4	39,297		41%	LOW	GOOD	MODERATE
	PC5	24,814		26%	MODERATE	POOR	MODERATE
POPLAR CREEK EAST BRANCH	PCEB1	11,913	25,978	46%	MODERATE	GOOD	LOW
	PCEB2	14,065		54%	HIGH	FAIR	MODERATE
POPLAR CREEK SCHAUMBURG BRANCH	PCSCB	17,054	17,054	100%	HIGH	FAIR	LOW
POPLAR CREEK SOUTH BRANCH	PCSOB	20,645	20,645	100%	HIGH	FAIR	LOW
POPLAR CREEK TRIBUTARY A	PCTA	6,442	6,442	100%	HIGH	FAIR	MODERATE
RAILROAD TRIBUTARY	RRT	11,141	11,141	100%	MODERATE	POOR	HIGH

Table 3.14-2 Summary of Channelization, Riparian Corridor and Erosion in the Poplar Creek Planning Area

3.14.4 Debris Jams

Obstructions to flow and fish passage can occur when debris falls into the stream and accumulates at specific locations. Most streams transport some amount of debris such as tree limbs, brush, and leaves. Because debris transport is a naturally occurring stream process, some debris can provide habitat and contribute to a diverse instream environment. However, too much debris can be problematic and may result in large debris jams, causing backwater flooding and sediment deposition. Debris jams can also cause erosion of the stream banks that can lead to damage of riparian lands and property.

MWRD operates a Small Streams Maintenance Program (SSMP) to allow for fish passage and other water quality-related benefits, and to help prevent costly flood damage. The program is implemented throughout Cook County. Dedicated crews provide a valuable service by removing debris from creeks, streams, and waterways. Project sites are determined based on reports from local municipalities and residents or from MWRD routine inspections. Besides removing existing blockages, MWRD crews and engineers also work to identify and fix potential problems before they become serious. Dead and dying trees, which can eventually fall into streams and cause blockages, are removed from the banks. Harmful invasive plant species are also removed. Buckthorn is particularly harmful and thrives in our climate; it chokes out native plants and has weak root systems, leaving the ground vulnerable to erosion. The success of the SSMP depends on cooperation and coordination among all communities and FPCC to collaboratively manage the waterways, and on reports from local stakeholders on debris jams.[3]

3.14.5 Watercourse Conditions Summary

The results of the watercourse assessment indicate that channelization is high with riparian areas in good to fair condition throughout the planning area. These areas of high channelization and fair to good riparian buffers are associated with densely urbanized areas where the watercourse is channelized but efforts have been made to somewhat maintain habitat and vegetative buffers. Erosion is low to moderate as many of the watercourses have some type of hard armoring to prevent further erosion. The combination of channelization and hard armoring has assisted with conveyance through the watercourse, however the loss of in stream habitat and meandering negates the natural removal process of constituents found in stormwater runoff. **This condition highlights the need for BMPs to restore in stream habitat and protect any remaining open space or conversion of problematic land uses to open space within the riparian corridors.** BMPs selected to restore the natural process may also include strategically planned and implemented streambank stabilization projects to assist with access to the riparian areas during storm events.

The results of this watercourse assessment also correspond well with the erodible soils map; areas within the vicinity of the Poplar Creek mainstem are less erodible and exhibit less erosion (mainly due to the established riparian areas). While areas east of the Poplar Creek mainstem like the Poplar Creek East Branch and Schaumburg Branch have more erodible soils, their low erosion ratings can be attributed to channelization of significant portions of each reach. Notable reaches that received high erosion ratings include Lord's Park Tributary and the Rail Road Tributary (RRT). As the name suggests, RRT flows parallel to a railroad. Aerial photography indicates multiple locations of newly installed gravel along the railroad corresponding to locations where RRT was immediately adjacent to the railroad which was factored in to its high erosion rating.

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[3] Stakeholders can notify MWRD of debris jams at this website: https://gispub.mwrd.org/ssmp/main.html

Figure 3.14-13: Images Taken from Eastern Area of Poplar Creek Watershed- Poplar Creek East Branch, Poplar Creek Tributary A, Poplar Creek Mainstem, and Poplar Creek Schaumburg Branch (PCEB B, PCTA A, PCEB A, PC3 C, PC2 A, PCSC A)

3.15 DETENTION BASIN INVENTORY

Figure 3.15-1 PC- 199

Detention basins are man-made features that are used to temporarily store stormwater runoff during and after a storm. Detention basins can either be dry (during dry weather periods) or contain a permanent pool of water. The primary role of a detention basin is to store stormwater to reduce the risk of flooding, and basins can (but frequently do not) include design features to help protect local waterways. Detention basins are constructed to capture stormwater from storm events and snow melt, and then slowly release the water to a receiving watercourse. Problems such as streambank erosion and water pollution are just a few of the consequences of poorly managed stormwater. Degraded watercourses can be restored by employing BMPs, including retrofitting detention basins to incorporate features to restore and protect water quality.

Figure 3.15-2 PC- 184

Initial identification of detention basins within the Poplar Creek planning area was accomplished using aerial photography. Additional information from the MWRD permitting database was analyzed and inventory information was expanded to include all applicable MWRD detention basins receiving a permit after 2012. Figure 3.15-3 displays the inventory of detention basins in the watershed planning area. The condition of the basin is identified, pointing to opportunities for basin retrofits. Inventory data is shown by municipality, watershed planning unit, tributary land use and type (dry or wet bottom). Detention basins often show signs of erosion where the fluctuation of water surface elevations from incoming stormwater can cause a ring of bare soil susceptible to erosion around shorelines. BMPs can be employed to retrofit eroding or unstable detention basins e.g., to flatten and naturalize the shorelines. A detailed summary of retrofit types and locations is provided in Section 6.4.1 of this watershed-based plan.

Detention Basin ID	*Municipality*	*Watershed Planning Unit*	*Tributary Land Use*	*Type*	*Stable/Needs Improvement*
PC-1	Barrington Township	PC1	REC	Wet	Stable
PC-2	Barrington Township	PC1	REC	Wet	Stable
PC-3	Barrington Hills	PC1	REC	Wet	Stable
PC-4	Barrington Hills	PC1	REC	Wet	Stable
PC-5	Inverness	PC1	SF	Wet	Needs Improvement
PC-6	Inverness	PC1	SF	Wet	Needs Improvement
PC-7	Inverness	PC1	SF	Wet	Needs Improvement
PC-8	Barrington Hills	PC1	SF	Wet	Stable
PC-9	Inverness	PC1	SF	Wet	Needs Improvement
PC-10	Inverness	PC1	SF	Wet	Needs Improvement
PC-11	Inverness	PC1	SF	Wet	Needs Improvement
PC-12	Inverness	PC1	SF	Wet	Needs Improvement
PC-13	Barrington Township	PC2	SF	Wet	Needs Improvement
PC-14	Inverness	PC1	SF	Wet	Stable
PC-15	South Barrington	PC2	SF	Wet	Stable
PC-16	South Barrington	PC2	SF	Wet	Needs Improvement
PC-17	South Barrington	PC2	SF	Wet	Needs Improvement
PC-18	South Barrington	PC1	SF	Wet	Stable
PC-19	South Barrington	PC1	SF	Wet	Stable
PC-20	South Barrington	PC1	SF	Wet	Stable
PC-21	Inverness	PCEB	SF/REC	Wet	Needs Improvement
PC-22	South Barrington	PC2	INST	Wet	Stable
PC-23	South Barrington	PC2	SF	Wet	Stable
PC-24	South Barrington	PC2	SF	Wet	Needs Improvement
PC-25	South Barrington	PC2	SF	Wet	Needs Improvement
PC-26	South Barrington	PC2	SF	Wet	Needs Improvement

Detention Basin ID	*Municipality*	*Watershed Planning Unit*	*Tributary Land Use*	*Type*	*Stable/Needs Improvement*
PC-27	South Barrington	PC2	SF	Wet	Needs Improvement
PC-28	South Barrington	PC2	SF/REC	Wet	Needs Improvement
PC-29	South Barrington	PC2	SF	Wet	Stable
PC-30	South Barrington	PC2	INST	Wet	Needs Improvement
PC-31	South Barrington	PCTA	INST	Wet	Stable
PC-32	South Barrington	PCTA	INST	Wet	Stable
PC-33	South Barrington	PCTA	INST	Wet	Needs Improvement
PC-34	South Barrington	PCTA	SF	Wet	Needs Improvement
PC-35	South Barrington	PC2	SF	Wet	Needs Improvement
PC-36	South Barrington	PCTA	C	Wet	Stable
PC-37	South Barrington	PCEB	SF	Wet	Stable
PC-38	Hoffman Estates	PCEB	REC	Wet	Stable
PC-39	Hoffman Estates	PCEB	IND	Wet	Stable
PC-40	Hoffman Estates	PCEB	IND	Wet	Stable
PC-41	Hoffman Estates	PCEB	IND	Wet	Stable
PC-42	Hoffman Estates	PCTA	C	Wet	Needs Improvement
PC-43	South Barrington	PCTA	C	Wet	Stable
PC-44	South Barrington	PC2	SF	Wet	Needs Improvement
PC-45	South Barrington	PC2	SF	Wet	Needs Improvement
PC-46	South Barrington	PC2	SF	Wet	Stable
PC-47	Hoffman Estates	PCEB	C	Wet	Stable
PC-48	South Barrington	PC2	SF	Wet	Stable
PC-49	South Barrington	PC2	C	Wet	Needs Improvement
PC-50	Hoffman Estates	PC3	C	Wet	Needs Improvement
PC-51	Hoffman Estates	PCEB	C	Wet	Needs Improvement
PC-52	Hoffman Estates	PCEB	MF	Wet	Needs Improvement
PC-53	Hoffman Estates	PCEB	MF	Wet	Needs Improvement
PC-54	Hoffman Estates	PCEB	INST	Wet	Stable
PC-55	Hoffman Estates	PCEB	INST	Wet	Stable
PC-56	Hoffman Estates	PCEB	INST	Wet	Stable
PC-57	Hoffman Estates	PC3	REC	Wet	Stable
PC-58	Hoffman Estates	PCSC	C	Wet	Needs Improvement
PC-59	Hoffman Estates	PCSC	SF	Wet	Needs Improvement
PC-60	Hoffman Estates	PCSC	SF	Wet	Needs Improvement

Detention Basin ID	*Municipality*	*Watershed Planning Unit*	*Tributary Land Use*	*Type*	*Stable/Needs Improvement*
PC-61	Hoffman Estates	PCSC	C	Wet	Stable
PC-62	Hoffman Estates	PCSC	REC	Wet	Stable
PC-63	Hoffman Estates	PCSC	REC	Wet	Needs Improvement
PC-64	Hoffman Estates	PCSC	REC	Wet	Stable
PC-65	Hoffman Estates	PCSC	REC	Wet	Stable
PC-66	Hoffman Estates	PCSC	REC	Wet	Stable
PC-67	Hoffman Estates	PC3	REC	Wet	Stable
PC-68	Hoffman Estates	PCSC	C	Wet	Needs Improvement
PC-69	Hoffman Estates	PCSC	SF	Wet	Stable
PC-70	Streamwood	PC3	REC	Wet	Stable
PC-71	Streamwood	PCSB	MF	Wet	Stable
PC-72	Schaumburg	PC3	SF	Wet	Stable
PC-73	Schaumburg	PCSB	SF	Wet	Needs Improvement
PC-74	Schaumburg	PCSB	SF/C	Wet	Stable
PC-75	Streamwood	PCSB	SF	Wet	Stable
PC-76	Streamwood	PCSB	SF	Wet	Stable
PC-77	Streamwood	PCSB	SF	Wet	Stable
PC-78	Streamwood	PCSB	SF	Wet	Stable
PC-79	Streamwood	PCSB	SF	Wet	Stable
PC-80	Streamwood	PCSB	SF	Wet	Stable
PC-81	Streamwood	PCSB	SF	Wet	Stable
PC-82	Streamwood	PCSB	SF	Wet	Needs Improvement
PC-83	Hoffman Estates	PC3	REC	Wet	Stable
PC-84	Hoffman Estates	PCRR	C	Wet	Stable
PC-85	Hoffman Estates	PCRR	C	Wet	Stable
PC-86	Hoffman Estates	PCRR	TCU	Dry	Needs Improvement
PC-87	Hoffman Estates	PCRR	TCU	Wet	Needs Improvement
PC-88	Hoffman Estates	PC3	REC	Wet	Stable
PC-89	Hoffman Estates	PC3	REC	Wet	Stable
PC-90	Streamwood	PC3	SF	Wet	Needs Improvement
PC-91	Streamwood	PC3	SF	Wet	Needs Improvement
PC-92	Streamwood	PCSB	SF	Wet	Stable
PC-93	Streamwood	PCSB	SF	Wet	Stable
PC-94	Streamwood	PCSB	SF	Wet	Stable

Detention Basin ID	*Municipality*	*Watershed Planning Unit*	*Tributary Land Use*	*Type*	*Stable/Needs Improvement*
PC-95	Streamwood	PCSB	SF	Wet	Stable
PC-96	Bartlett	PCSB	SF	Wet	Needs Improvement
PC-97	Bartlett	PCSB	SF	Wet	Needs Improvement
PC-98	Streamwood	PCSB	SF	Wet	Stable
PC-99	Streamwood	PCSB	SF	Wet	Stable
PC-100	Streamwood	PCSB	SF	Wet	Stable
PC-101	Streamwood	PCSB	SF	Wet	Stable
PC-102	Streamwood	PCSB	SF/INST	Wet	Needs Improvement
PC-103	Hoffman Estates	PCRR	IND	Wet	Needs Improvement
PC-104	Hoffman Estates	PCRR	IND	Wet	Needs Improvement
PC-105	Hoffman Estates	PCRR	C	Wet	Stable
PC-106	Hoffman Estates	PCRR	C	Wet	Needs Improvement
PC-107	Hoffman Estates	PCRR	C	Wet	Stable
PC-108	Hoffman Estates	PCRR	IND	Wet	Stable
PC-109	Hoffman Estates	PCRR	C	Wet	Stable
PC-110	Streamwood	PCSB	SF	Wet	Stable
PC-111	Streamwood	PCSB	SF	Wet	Stable
PC-112	Streamwood	PCSB	SF	Wet	Stable
PC-113	Streamwood	PCSB	SF	Wet	Stable
PC-114	Streamwood	PCSB	SF	Wet	Stable
PC-115	Streamwood	PCSB	C	Wet	Stable
PC-116	Bartlett	PCSB	SF	Wet	Needs Improvement
PC-117	Streamwood	PCSB	SF	Wet	Stable
PC-118	Streamwood	PCSB	SF	Wet	Stable
PC-119	Streamwood	PCSB	SF	Wet	Stable
PC-120	Streamwood	PCSB	SF	Wet	Stable
PC-121	Streamwood	PCSB	SF	Wet	Stable
PC-122	Streamwood	PCSB	SF	Wet	Stable
PC-123	Streamwood	PCSB	SF	Wet	Stable
PC-124	Streamwood	PCSB	SF	Wet	Stable
PC-125	Streamwood	PCSB	SF	Wet	Stable
PC-126	Streamwood	PCSB	SF	Wet	Stable
PC-127	Hoffman Estates	PCRR	SF	Wet	Stable
PC-128	Hoffman Estates	PCRR	SF	Wet	Stable

Detention Basin ID	*Municipality*	*Watershed Planning Unit*	*Tributary Land Use*	*Type*	*Stable/Needs Improvement*
PC-129	Hoffman Estates	PCRR	SF	Wet	Stable
PC-130	Hoffman Estates	PCRR	INST	Wet	Needs Improvement
PC-131	Hoffman Estates	PCRR	SF	Wet	Stable
PC-132	Hoffman Estates	PCRR	SF	Wet	Stable
PC-133	Hoffman Estates	PCRR	TCU	Wet	Stable
PC-134	Hoffman Estates	PCRR	C	Wet	Stable
PC-135	Hoffman Estates	PCRR	C	Wet	Stable
PC-136	Hoffman Estates	PCRR	C	Wet	Stable
PC-137	Hoffman Estates	PCRR	C	Wet	Stable
PC-138	Hoffman Estates	PCRR	C	Wet	Stable
PC-139	Hoffman Estates	PCRR	SF	Wet	Stable
PC-140	Hanover Township	PCRR	SF	Wet	Needs Improvement
PC-141	Hoffman Estates	PCRR	SF	Dry	Stable
PC-142	Hoffman Estates	PCRR	SF	Dry	Stable
PC-143	Hanover Township	PCLT	SF	Wet	Stable
PC-144	Hoffman Estates	PCLT	SF	Dry	Stable
PC-145	Hoffman Estates	PCLT	SF	Wet	Stable
PC-146	Hanover Township	PCLT	SF	Wet	Needs Improvement
PC-147	Hoffman Estates	PCLT	SF/REC	Wet	Stable
PC-148	Elgin	PCLT	SF	Wet	Stable
PC-149	Elgin	PC4	SF	Wet	Stable
PC-150	Elgin	PC4	SF	Wet	Stable
PC-151	Elgin	PC4	IND	Wet	Stable
PC-152	Elgin	PC4	IND	Dry	Stable
PC-153	Elgin	PC4	IND	Wet	Needs Improvement
PC-154	Elgin	PC4	IND	Wet	Stable
PC-155	Elgin	PC4	IND	Wet	Stable
PC-156	Elgin	PC4	IND	Wet	Needs Improvement
PC-157	Elgin	PCLT	INST	Wet	Stable
PC-158	Hoffman Estates	PCLT	SF	Dry	Stable
PC-159	Elgin	PCLT	SF	Wet	Needs Improvement
PC-160	Elgin	PCLT	SF	Wet	Needs Improvement
PC-161	Elgin	PCLT	SF	Wet	Needs Improvement
PC-162	Elgin	PCLT	SF	Wet	Stable

Detention Basin ID	*Municipality*	*Watershed Planning Unit*	*Tributary Land Use*	*Type*	*Stable/Needs Improvement*
PC-163	Elgin	PCLT	C	Wet	Needs Improvement
PC-164	Bartlett	PC4	IND	Wet	Stable
PC-165	Bartlett	PC4	SF	Wet	Needs Improvement
PC-166	Elgin	PCLT	SF	Wet	Needs Improvement
PC-167	South Elgin	PC4	SF	Wet	Needs Improvement
PC-168	South Elgin	PC4	SF	Wet	Stable
PC-169	South Elgin	PC4	SF	Wet	Stable
PC-170	Elgin Township	PC4	REC	Wet	Stable
PC-171	Bartlett	PC4	C	Wet	Needs Improvement
PC-172	Elgin	PCLT	C	Dry	Stable
PC-173	Elgin	PCLT	INST	Wet	Needs Improvement
PC-174	Elgin	PCLT	C	Wet	Stable
PC-175	Elgin	PCLT	C	Dry	Stable
PC-176	Elgin	PCLT	REC	Dry	Stable
PC-177	Elgin	PCLT	REC	Wet	Needs Improvement
PC-178	Elgin	PCLT	REC	Wet	Needs Improvement
PC-179	Elgin	PCLT	SF	Dry	Stable
PC-180	Elgin	PC4	INST	Dry	Stable
PC-181	Elgin	PC4	IND	Wet	Stable
PC-182	Elgin	PC4	IND	Dry	Stable
PC-183	Elgin	PC4	IND	Dry	Stable
PC-184	Hanover Township	PC4	REC	Wet	Needs Improvement
PC-185	Hoffman Estates	PCLT	SF/REC	Dry	Stable
PC-186	Hanover Township	PCLT	TCU	Wet	Needs Improvement
PC-187	Streamwood	PCSB	SF	Wet	Stable
PC-188	Hanover Township	PCRR	SF	Dry	Stable
PC-189	Hoffman Estates	PCRR	C	Wet	Stable
PC-190	Streamwood	PCSB	SF	Dry	Stable
PC-191	Streamwood	PCSB	SF	Wet	Stable
PC-192	Streamwood	PCSB	MF	Dry	Stable
PC-193	Streamwood	PC3	C	Wet	Needs Improvement
PC-194	Streamwood	PCSB	INST	Dry	Stable
PC-195	South Barrington	PCTA	SF	Dry	Stable
PC-196	South Barrington	PCTA	SF	Dry	Stable

Detention Basin ID	*Municipality*	*Watershed Planning Unit*	*Tributary Land Use*	*Type*	*Stable/Needs Improvement*
PC-197	Hoffman Estates	PCTA	C	Dry	Stable
PC-198	Schaumburg	PC3	SF	Wet	Stable
PC-199	Streamwood	PCSC	SF	Dry	Needs Improvement
PC-200	Hoffman Estates	PCSC	REC	Dry	Stable
PC-201	Hoffman Estates	PCEB	C	Wet	Stable
PC-202	Hoffman Estates	PCEB	INST	Dry	Stable
PC-203	Inverness	PC1	SF	Dry	Stable
PC-204	Inverness	PC1	SF	Wet	Stable
PC-205	Schaumburg	PC3	SF	Dry	Needs Improvement
PC-206	Hoffman Estates	PCSC	SF	Dry	Stable
PC-207	Hoffman Estates	PCSC	C	Dry	Stable
PC-208	Hoffman Estates	PCEB	REC	Dry	Stable
PC-12147	Hanover Township	PC4	IND	Not Applicable	Not Applicable
PC-12154	Hoffman Estates	PCSC	C	Dry	Stable
PC-13087	Schaumburg	PCSC	SF	Dry	Not Applicable
PC-13098	South Barrington	PCTA	INST	Wet	Stable
PC-13238	South Barrington	PCTA	C	Wet	Stable
PC-13262	Hoffman Estates	PCEB	C	Wet	Needs Improvement
PC-15013	Hoffman Estates	PCRR	C	Dry	Needs Improvement
PC-15098	Schaumburg	PCSC	C	Underground	Not Applicable
PC-15235	Hoffman Estates	PCRR	C	Dry	Stable
PC-15250	Streamwood	PCSB	C	Dry	Stable
PC-15256	Hoffman Estates	PCEB	C	Underground	Not Applicable
PC-15286	Hoffman Estates	PCEB	C	Dry	Needs Improvement
PC-15288	Hoffman Estates	PCEB	C	Wet	Needs Improvement
PC-15313	Hoffman Estates	PCEB	C	Dry	Stable
PC-15367	Schaumburg	PCSC	C	Underground	Not Applicable
PC-15379	Hoffman Estates	PCEB	C	Wet	Needs Improvement
PC-16039	Streamwood	PCSB	C	Wet	Needs Improvement
PC-16252	Hoffman Estates	PCLT	AGR	Not Applicable	Not Applicable

Table 3.15-1 Inventory of Detention Basins in the Poplar Creek Planning Area

Notes:
PC – Poplar Creek Mainstem; PCEB – Poplar Creek East Branch; PCLT – Lord's Park Tributary; PCRR – Poplar Creek Railroad Tributary; PCSB – Poplar Creek South Branch; PCSC – Poplar Creek Schaumburg; PCTA – Poplar Creek Tributary A

SF – Single Family Residential, MF – Multifamily, C – Commercial, IND – Industrial, INST – Institutional, REC - Recreation/Open Space, AGR – Agriculture, TCU – Transportation/Communications/Utilities

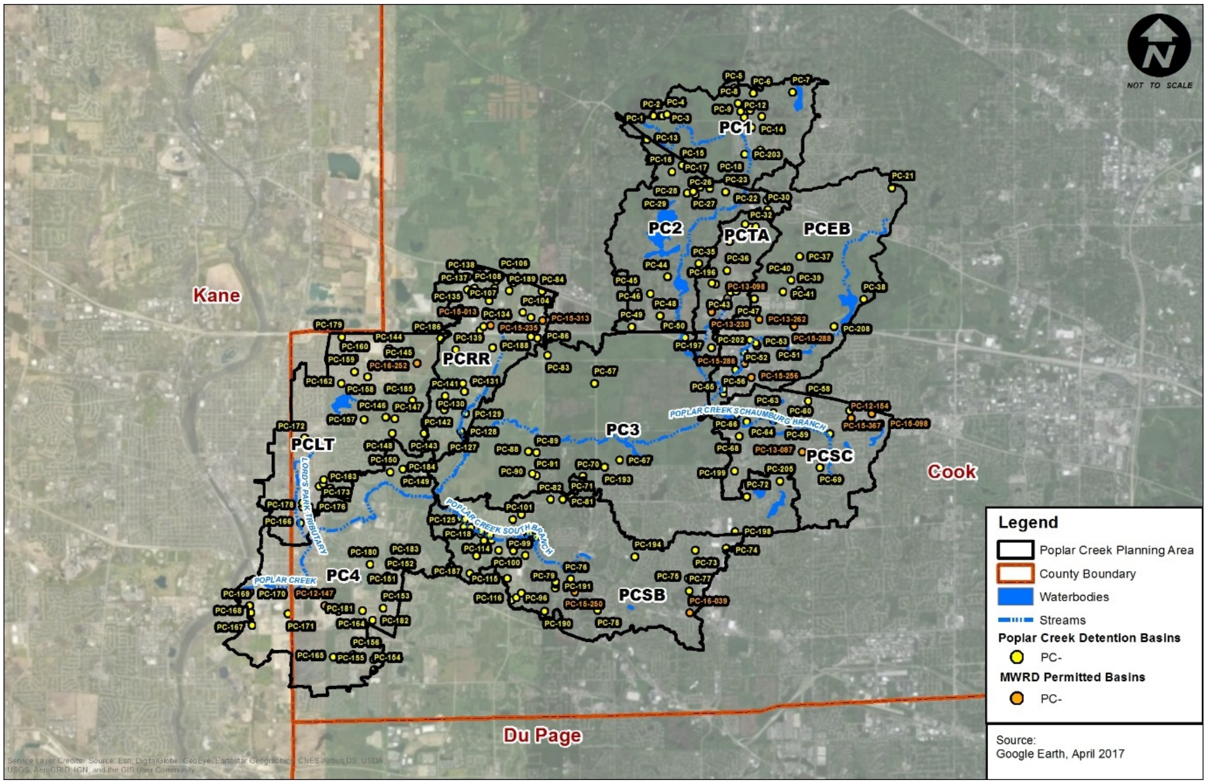

Figure 3.15-3 Poplar Creek Planning Area Detention Basin Inventory

3.16 COOK COUNTY FOREST PRESERVE DISTRICT AND POPLAR CREEK PLANNING AREA LAKES

Much of the upper portions of Poplar Creek planning area is relatively developed (68%) with open bodies of water mostly located within residential areas and several lakes located on FPCC property. Notable lakes within the developed residential area include Lake of the Coves (approximately 85 acres with 13,571 feet of shoreline), Cobblers Crossing (approximately 25 acres with 7,130 feet of shoreline), Gray Farm Lake (approximately 24 acres and 6,432 feet of shoreline), Lake Adalyn (approximately 22 acres with 4,843 feet of shoreline), Harrow Gate Lake (approximately 17 acres with 5,007 feet of shoreline) and Prairie Park (approximately 16 acres with 3,953 feet of shoreline).

Figure 3.16-1 Lake of the Coves

The largest open water body in the watershed is Lake of the Coves consisting of approximately 85 acres of open water with approximately 2.6 miles of shoreline (Figure 3.16-1). Lake of the Coves consists of numerous open bodies of water located in the upper portion of the planning near the headwaters of Poplar Creek mainstem. The Lake of the Coves system is located in the Village of South Barrington and is situated northeast of Watergate Drive, south of Penny Road, and west of Witt Road. The area is associated with the Stillman Nature Center. Overall, the lake system drains south and east under Witt Road where it the system continues south as the mainstem Poplar Creek. Erosion around the slough is low due to the use of hard armoring however the riparian area is essentially non-existent as the system is surrounded by residential land use and highly manicured areas.

The second largest open water body in the watershed planning area is Wetfoot Lake consisting of approximately 28 acres of open water with approximately 1.44 miles of shoreline. Wetfoot Lake is in the Poplar Creek East Branch watershed planning unit (Figure 3.16-2) located north of W. Central Road, south of W. Algonquin Road, west of Ela Road, and east of S. Freeman Road. It is located within on FPCC property in the Village of Hoffman Estates and is an on-line lake of Poplar Creek East Branch, with the creek flowing north to south through the lake, where the lake outlets at the southern tip. Shoreline erosion is non-existent and the riparian area is in good condition.

Figure 3.16-2 Wetfoot Lake

- Cobblers Crossing


Figure 3.16-3 Cobblers Crossing

Cobblers Crossing is located within the Poplar Creek Lord's Park Tributary watershed planning unit consisting of approximately 25 acres of open water with approximately 1.35 miles of shoreline (Figure 3.16-3). Cobblers Crossing is located in the City of Elgin and is situated north of Coldspring Road, south of Inglewood Lane, east of Ripple Brook Lane, and west of Berner Drive. According to Cook County 1-foot aerial topography the lake drains southwest towards the headwaters of Lord's Park Tributary in Lord's Park. Erosion around the lake is low however approximately two-thirds of the perimeter riparian area consists of managed turf grass for recreation and lake accessibility.

- Barrington Road Pond


Figure 3.16-4 Barrington Road Pond

Barrington Road Pond is located within the FPCC in the Village of Hoffman Estates and is situated north of Golf Road, south of W. Higgins Road, east of Bartlett Road, and west of Barrington Road. The pond is immediately adjacent to the mainstem of Poplar Creek, located approximately 100 feet east of the mainstem. Based on Cook County 1-foot aerial topography the pond overtops to the southwest and drains into Poplar Creek. The pond has a surface area of 2.4 acres and a shoreline length of 0.42 miles. According to the field data collected by FPCC – Dissolved Oxygen (DO) levels throughout the water column are on average 1.5 mg/L, with a maximum depth measured at 1.5 meters. This does not meet the Illinois EPA's standard for DO (>5 mg/L). The measured values for nitrate, phosphate, and ammonia are elevated (2.5 mg/L, 0.71 mg/L, and 0.41 mg/L) respectively at the surface.

- Bode Lake North & South

Bode Lake North & South is located within the FPCC in the Village of Hoffman Estates and is situated north of Bode Road, south of Golf Road, east of Bartlett Road and west of Barrington Road. According to Cook County 1-foot aerial topography, Bode Lake South outlets north into Bode Lake North via an approximately 10-foot long open channel. Bode Lake North is an on-line lake of the mainstem of Poplar Creek. Poplar Creek enters the lake from the east, flows in a westerly direction, and outlets at the west side of the lake. The two connected lakes have a surface area of approximately 20 acres and a shoreline length of 1.32 miles. According to the field data collected by FPCC – Dissolved Oxygen (DO) levels throughout the water column for the north end are 8.37 mg/L at the surface, 2.84 mg/L one meter deep, 0.74 mg/L two meters deep, and 0.21 mg/L at its max depth of four meters. The south end's DO levels are 9 mg/L at the surface, 8 mg/L two meters deep, and 4 mg/L four meters deep. These levels meet the Illinois EPA's standard for DO (>5 mg/L) at the surface of both ends of the lake. The measured values at the north end for nitrate, phosphate, and ammonia are elevated (2.9 mg/L, 0.61 mg/L, and 1.94 mg/L) respectively at the surface. Bode Lake South's values for nitrate, phosphate, and ammonia are elevated (2.2 mg/L, 0.29 mg/L, and 0.39 mg/L) respectively at the surface.

Figure 3.16.5 Bode Lake North

Figure 3.16.6 Bode Lake South

- Chestnut Lake Park

Chestnut Lake Park is located in the Village of Hoffman Estates and is situated north of Warwick Circle, south of W. Dexter Lane, east of N. Dovington Drive, and west of Gannon Drive. The lake outlets to a storm sewer draining west to the Poplar Creek Schaumburg Branch. The lake has a surface area of 4.2 acres and a shoreline length of 0.43 miles.

- Colony Lake Park

Colony Lake Park is located in the Village of Schaumburg and is situated northwest of Salem Drive and southeast of Colony Lake Drive. The lake outlets to a storm sewer draining west to Poplar Creek Schaumburg Branch. The lake has a surface area of 5.5 acres and a shoreline length of 0.84 miles.

- Gray Farm Lake

Gray Farm Lake is located in the Village of Schaumburg and is situated northwest of Cloverdale Lane and southeast of N. Walnut Lane. Gray Farm Lake is associated with the Gray Farm Park and

Conservation Area owned by the Schaumburg Park District. Gray Farm Park & Conservation Area is a 47-acre multi-use park. The south end of the park contains a picnic gazebo, bike trail, playground and fishing lake, while the remaining area consists of a large open water marsh. The lake drains west to a storm sewer toward Poplar Creek mainstem. The lake has a surface area of 24 acres and a shoreline length of 1.22 miles.

- Lake Harrowgate

Lake Harrowgate is in the Village of Inverness and is situated north of E. Palatine Road, south of Bradwell Road, east of Harrow Grate Drive, and west of Castaway Lane. The lake outlets into a storm sewer at the southern tip where it drains southwest through a large wetland complex north of Palatine Road before reaching the headwaters of Poplar Creek Unnamed Tributary #2. The lake has a surface area of 17 acres and a shoreline length of 0.95 miles.

- Kollar Pond

Kollar Pond is located in the Village of Streamwood and is situated north of Arnold Avenue, southwest of Irving Park Road, and east of Nippert Drive. The pond outlets to a storm sewer at its northwest corner and drains northwest until it reaches Poplar Creek South Branch. The pond has a surface area of 2 acres and a shoreline length of 0.24 miles.

- Lake Adalyn

Lake Adalyn is located in the Village of South Barrington and is situated within Lake Adalyn Drive south of Mundhank Road. Lake Adalyn is an on-line lake of Poplar Creek mainstem, with the creek flowing north to south through the lake. The lake has a surface area of 22 acres and a shoreline length of 0.92 miles.

- Leftfoot Lake

Leftfoot Lake is located in the Village of South Barrington and is situated north of Overbrook Road, south of Dalton Court, west of Old Coach Drive and east of Witt Road. The lake outlets to a storm sewer at its eastern tip, continues east for approximately 350 feet and then veers southeast before reaching the mainstem of Poplar Creek just upstream of Rose Lake.

- Prairie Park Lake

Prairie Park Lake is located in the Village of Schaumburg and is situated north of Hitching Post Lane, south of Primrose Lane, east of Knollwood Drive and west of N. Walnut Lane on Schaumburg Park District property. The lake drains west through storm sewer pipes toward the mainstem of Poplar Creek. The lake has a surface area of 16.1 acres and a shoreline length of 0.75 miles.

- Rose Lake

Rose Lake is located in the Village of South Barrington and is situated northwest of Covered Bridge Road, south of Overbrook Road, and east of Witt Road. It is an on-line lake of Poplar Creek mainstem. The creek enters the lake at its northeast corner and the outlet at its southern perimeter. The lake has a surface area of 15 acres and a shoreline length of 0.62 miles.

- Sheffield Park

Sheffield Park is located in the Village of Hoffman Estates and is situated north of Crescent Lane, south of Brookside Lane, east of Brookside Drive and west of Volid Drive. The lake outlets to a storm sewer at its southwest corner and continues to travel southwest toward a detention basin within the Bridges of Poplar Creek Country Club. The detention basin drains directly into Poplar Creek Schaumburg Branch at its southern tip via culvert. The lake has a surface area of 3.3 acres and a shoreline length of 0.28 miles.

- Wetfoot Lake

Wetfoot Lake is located within the FPCC in the Village of Hoffman Estates and is situated north of W. Central Road, south of W. Algonquin Road, west of Ela Road, and east of S. Freeman Road. It is and on-line lake of Poplar Creek East Branch. The creek flows north to south through the lake and outlets at the southern tip of the lake. The lake has a surface area of 28 acres and a shoreline length of 1.44 miles.

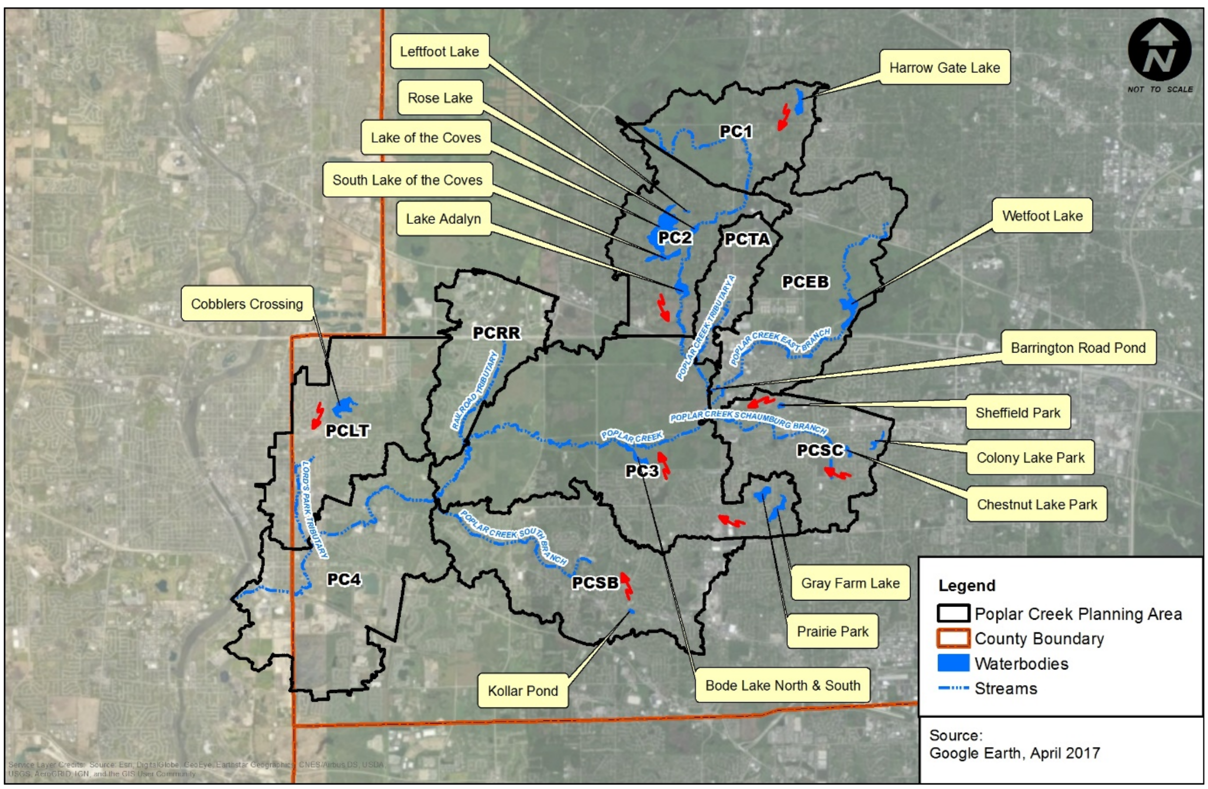

Figure 3.16-5 Cook County Forest Preserve District and Poplar Creek Planning Area Lakes

In addition to the water quality information collected by the FPCC, a field assessment was conducted to enhance the desktop assessment completed for several of the lakes above as well as others. Table 3.6-1 and Table 3.6-2 show the condition of shoreline buffer based on field work conducted in summer 2018 and degree of erosion for the lakes assessed.

Lake Name	Reach Code	Shoreline Length Assessed (ft)	Good Condition (ft/%)		Fair Condition (ft/%)		Poor Condition (ft/%)	
Barrington Road Pond	BRP	2,180	0	0%	0	0%	2,180	100%
Bode Lake North & South	BL	6,821	1,023	15%	1,364	20%	4,434	65%
Chestnut Lake Park	CHLP	2,276	0	0%	569	25%	1,707	75%
Cobblers Crossing	CC	6,878	1,720	25%	1,720	25%	3,439	50%
Colony Lake Park	COLP	4,391	0	0%	0	0%	4,391	100%
Gray Farm Lake	GFL	5,883	5,883	100%	0	0%	0	0%
Harrow Gate Lake	HGL	4,716	1,886	40%	0	0%	2,830	60%
Kollar Pond	KP	1,185	0	0%	356	30%	830	70%
Lake Adalyn	LA	4,728	0	0%	0	0%	4,728	100%
Lake of the Coves	LC	12,853	0	0%	0	0%	12,853	100%
Leftfoot Lake	LL	1,127	225	20%	225	20%	676	60%
Prairie Park	PP	3,900	780	20%	1,170	30%	1,950	50%
Rose Lake	RL	6,095	610	10%	1,219	20%	4,267	70%
Sheffield Park	SP	1,482	0	0%	222	15%	1,260	85%
South Lake of the Coves	SLC	6,228	0	0%	311	5%	5,917	95%
Wetfoot Lake	WL	8,201	8,201	100%	0	0%	0	0%
Total		78,944	20,328	26%	7,156	9%	51,462	65%

Table 3.16-1 Field Data in Support of Shoreline Buffer Condition for Lakes in the Poplar Creek Planning Area

Lake Name	Reach Code	Shoreline Length Assessed (ft)	None or Low Erosion (ft/%)		Moderate Erosion (ft/%)		High Erosion (ft/%)	
Barrington Road Pond	BRP	2,180	2,180	100%	0	0%	0	0%
Bode Lake North & South	BL	6,821	5,798	85%	1,023	15%	0	0%
Chestnut Lake Park	CHLP	2,276	2,276	100%	0	0%	0	0%
Cobblers Crossing	CC	6,878	1,720	25%	5,159	75%	0	0%
Colony Lake Park	COLP	4,391	4,391	100%	0	0%	0	0%
Gray Farm Lake	GFL	5,883	5,883	100%	0	0%	0	0%
Harrow Gate Lake	HGL	4,716	4,716	100%	0	0%	0	0%
Kollar Pond	KP	1,185	0	0%	1,185	100%	0	0%
Lake Adalyn	LA	4,728	4,728	100%	0	0%	0	0%
Lake of the Coves	LC	12,853	12,853	100%	0	0%	0	0%

Lake Name	Reach Code	Shoreline Length Assessed (ft)	None or Low Erosion (ft/%)		Moderate Erosion (ft/%)		High Erosion (ft/%)	
Leftfoot Lake	LL	1,127	0	0%	1,127	100%	0	0%
Prairie Park	PP	3,900	1,950	50%	1,950	50%	0	0%
Rose Lake	RL	6,095	6,095	100%	0	0%	0	0%
Sheffield Park	SP	1,482	222	15%	1,037	70%	222	15%
South Lake of the Coves	SLC	6,228	6,228	100%	0	0%	0	0%
Wetfoot Lake	WL	8,201	6,151	75%	2,050	25%	0	0%
Total		78,944	65,191	83%	13,531	17%	222	0%

Table 3.16-2 Field Data in Support of Shoreline Erosion for Lakes in the Poplar Creek Planning Area

3.17 WATER QUALITY ASSESSMENT

3.17.1 Surface Water Quality Assessment (Illinois EPA)

Seven creek reaches were evaluated in the Poplar Creek planning area watercourse assessment with respect to designated uses and water quality standards. Two of the seven watercourses within the Poplar Creek planning area were included in the Illinois EPA Integrated Water Quality Report and Section 303(d) List (2016). One of the watercourses failed to meet at least one of their designated uses and was considered impaired (i.e., included on the 303(d) List): Poplar Creek. The causes and sources for the impairments are included in Table 3.17-1 and shown in Figure 3.17-1.

Stream Name	*Illinois EPA AUID*	*Impairment*	*Use Attainment*			*Source*
			Not Supporting	*Fully Supporting*	*Not Assessed*	
Poplar Creek (PC 1-4)	IL_DTG-02	Total Suspended Solids (TSS), Chloride, Fecal Coliform	Aquatic Life, Primary Contact Recreation	---	Aesthetic Quality, Fish Consumption, Secondary Contact	Urban Runoff/Storm Sewers, Highway/Road/Bridge Runoff (Non-Construction)

Stream Name	Illinois EPA AUID	Impairment	Use Attainment			Source
			Not Supporting	Fully Supporting	Not Assessed	
East Branch Poplar Creek (PCEB)	No Assessment Available	---	---	---	Aquatic Life, Fish Consumption, Primary Contact Recreation, Secondary Contact, Aesthetic Quality	No source identified

Table 3.17-1 Summary of Impaired Watercourses in the Poplar Creek Planning Area

Notes:

(1) Only stream segments with Assessment Unit Identification (AUID) numbers from the Illinois EPA 2016 Integrated Water Quality Report and Section 303(d) List are included in the table above.

Source: Resource Management Mapping Service (2017); Illinois Integrated Water Quality Report and Section 303(d) List (2016).

The Table shows that aquatic life uses were not met in Poplar Creek. Primary contact recreation was also shown to be impaired for Poplar Creek. Recreational uses are affected by bacteria in the water body, which can make the water unsafe for wading or swimming or kayaking (see discussion below on water quality standards). Stormwater BMPs, structural and non-structural, can also help reduce bacteria pollutant loadings. These BMPs are discussed in ensuing sections of this watershed plan.

The Illinois Department of Natural Resources (IDNR) has biological stream ratings for Illinois streams. These ratings can be used to identify aquatic resource quality, including biologically diverse streams and those with a high degree of biological integrity. The diversity and integrity scores fall within one of five ratings ranging from A to E, with A representing the highest biological integrity or diversity of evaluated stream segments. A portion of Poplar Creek was rated by IDNR (2008) as C (diversity) and D (integrity). The other streams did not have IDNR (2008) stream ratings for diversity or integrity within the study area. No streams in the planning area were identified as Biologically Significant Streams.

Water pollution control programs are designed to protect the beneficial uses of the water resources of the state. Each State has the responsibility to set water quality standards that protect these beneficial uses, also called “designated uses.” Illinois waters are designated for various uses including aquatic life, wildlife, agricultural use, primary contact (e.g., swimming, water skiing), secondary contact (e.g., boating, fishing), industrial use, public and food-processing water supply, and aesthetic quality. Illinois’ water quality standards and water quality criteria provide the basis for assessing whether the beneficial uses of the state’s waters are being attained. The Illinois Pollution Control Board is responsible for setting water quality standards to protect designated uses. The Illinois EPA is responsible for developing scientifically-based water quality standards and proposing them to the Illinois Pollution Control Board for adoption into state rules and regulations. The federal Clean Water Act requires States to review and update water quality standards every three years. Illinois EPA, in conjunction with USEPA, identifies and prioritizes those standards to be developed or revised during this three-year period.

The Illinois Pollution Control Board has established four primary sets (or categories) of narrative and numeric water quality standards for surface waters:

- General Use Standards, which are intended to protect aquatic life, wildlife, agricultural, primary contact, secondary contact, and most industrial uses;
- Public and Food Processing Water Supply Standards for waters associated with human consumption;
- Secondary Contact and Indigenous Aquatic Life Standards are intended to protect limited uses of those waters not suited for general use activities but are nonetheless suited for secondary contact uses and capable of supporting indigenous aquatic life limited only by the physical configuration of the body of water, characteristics, and origin of the water and the presence of contaminants in amounts that do not exceed these water quality standards. Secondary Contact and Indigenous Aquatic Life standards apply only to waters in which the General Use standards and the Public and Food Processing Water Supply standards do not apply including Poplar Creek; and
- Lake Michigan Basin Water Quality Standards.

Inland Lakes have a total pond acreage of 318,477 in the State. More than 91,400 inland lakes and ponds exist in Illinois, 3,256 of which have a surface area of six acres or more (IDNR 1999). The term inland lake is used for any Illinois lake other than Lake Michigan and its bays/harbors. About three-fourths of Illinois' inland lakes are man-made, including dammed stream and side-channel impoundments, strip-mine lakes, borrow pits, and other excavated lakes. Natural lakes include glacial lakes in the northeastern counties, sinkhole ponds in the southwest, and oxbow and backwater lakes along major rivers. As with streams, lakes are assessed as Fully Supporting (good), Not Supporting (fair), or Not Supporting (poor), for each applicable designated use. Five lakes within the Poplar Creek planning area were included in the Illinois EPA Integrated Water Quality Report and Section 303(d) List (2016). All five lakes within the planning area were noted but not assessed and include: Lake Adalyn, Rose Lake, Left Foot Lake, Bode Lake South, and Harrow Gate Lake.

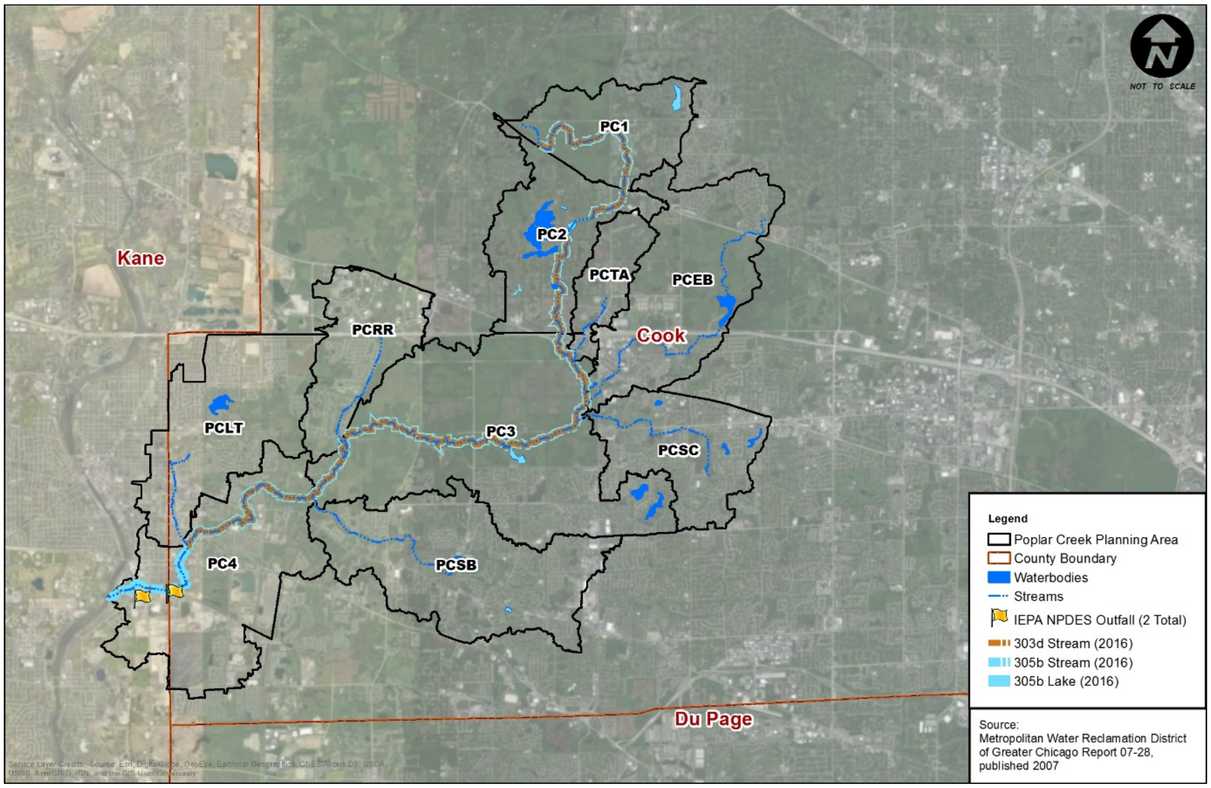

Figure 3.17-1 Summary of Illinois EPA Impaired Watercourses in the Poplar Creek Planning Area

3.17.2 MWRD Water Quality Sampling

MWRD had been monitoring water quality constituents as part of its Ambient Water Quality Monitoring in the Poplar Creek planning area from 2001 to 2012. The list of constituents for which data is available is widespread and data is somewhat sporadic as sampling programs may have been stopped or started for various reasons. Thus, is must be understood that the data is not sufficiently systematic or robust such that conclusions can be drawn regarding if water quality standards are being met. Nevertheless, it is illuminative to review the MWRD water quality information.

Comparison criteria for evaluating water quality data are shown below in Table 3.17-2. The comparison criteria include enacted water quality standards for some parameters and other practical comparison values for other substances.

Water Quality Parameter	Reference	Comparison Criterion
Chloride	Illinois Administrative Code. Title 35: Environmental Protection; Subtitle C: Water Pollution; Chapter I: Pollution Control Board; *Part 302 Water Quality Standards Section 302.304*	500 mg/L
Phosphorus	Wisconsin State Legislature, Administrative Code, Department of Natural Resources; Chapter NR 102.06 (3.a): Water quality Standards for Wisconsin Surface Waters *WQS for P adopted by Wisconsin*	0.1 mg/L
Total Suspended Solids	Illinois Administrative Code. Title 35: Environmental Protection; Subtitle C: Water Pollution; Chapter I: Pollution Control Board; *Part 304 Effluent Standards* *Note these are Effluent Standards not WQS*	15.0 – 30.0 mg/L
Dissolved Oxygen	Illinois Administrative Code. Title 35: Environmental Protection; Subtitle C: Water Pollution; Chapter I: Pollution Control Board; *Part 302 Water Quality Standards Section 302.206*	Summer: Minimum 5.0 mg/L Winter: Minimum 3.5 mg/L
Biochemical Oxygen Demand (BOD)	Illinois Administrative Code. Title 35: Environmental Protection; Subtitle C: Water Pollution; Chapter I: Pollution Control Board; *Part 304 Effluent Standards for discharges to the Lake Michigan basin* *Note these are Effluent Standards not WQS*	< 4.0 mg/L

Table 3.17-2 Water Quality Comparison Criteria

The MWRD sampling location in the watershed planning area is shown on Figure 3.17-2. Monitoring at this station was performed from 2001 through 2012, after which time data was discontinued.

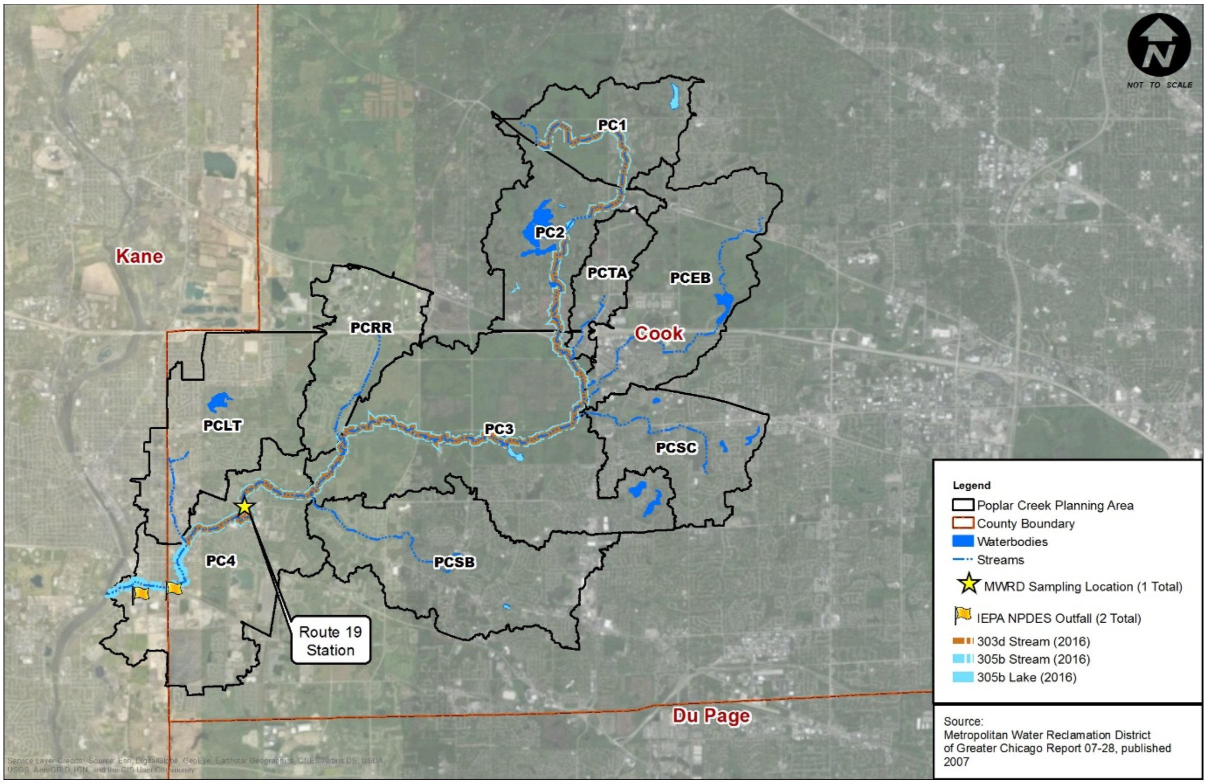

Figure 3.17-2 MWRD Sampling Locations – Poplar Creek Planning Area

Average concentrations of DO, total phosphorus, total kjeldahl nitrogen and chloride based on MWRD data are shown in the following figures for the monitoring locations within the watershed planning area. In some cases comparison criteria values are shown on the charts.

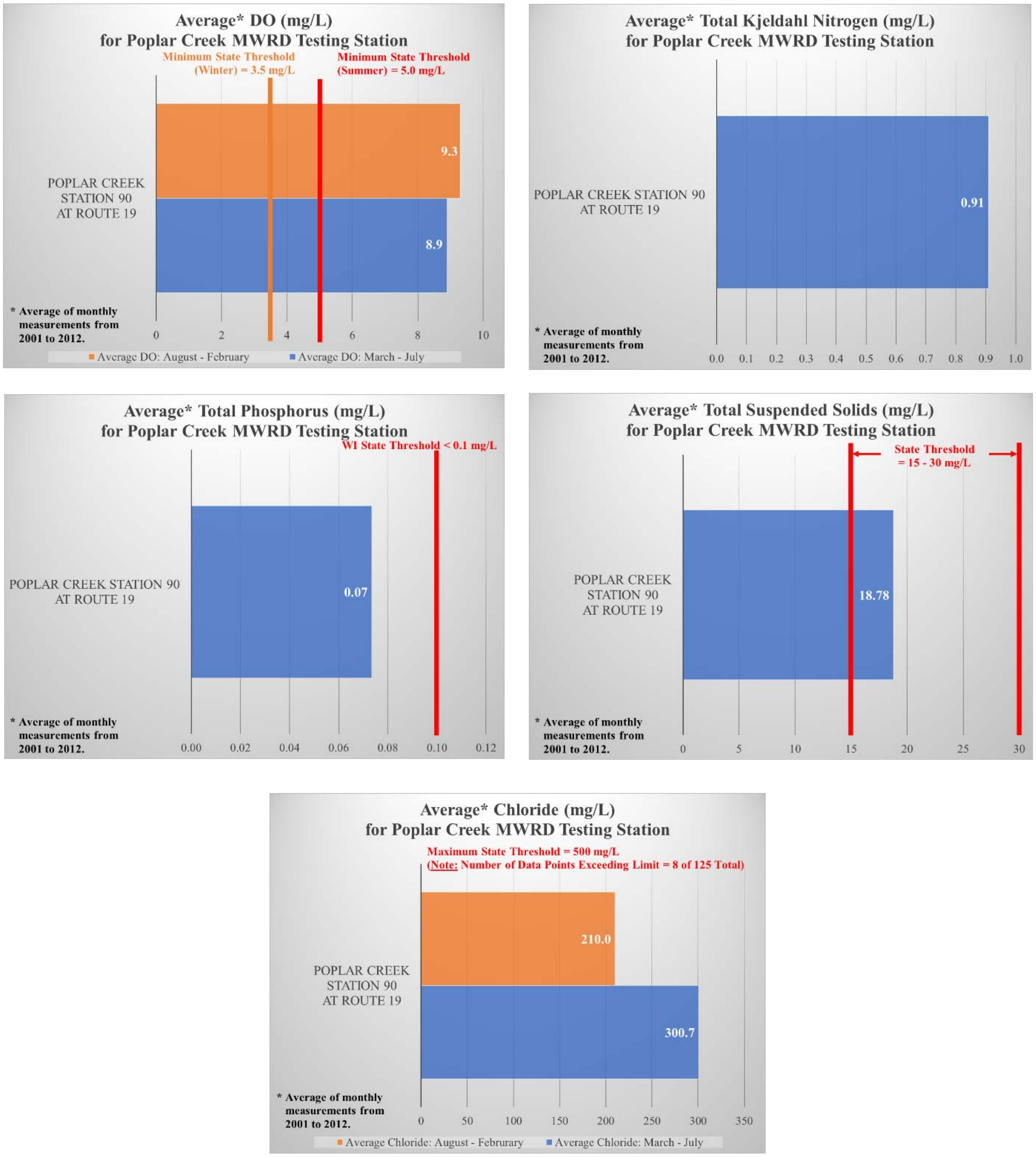

Figure 3.17-3 Poplar Creek Planning Area Water Quality Sampling Data – MWRD Sampling Program

The summaries of the MWRD data shown in Figure 3.17-3 depict averages from sampling once a month from 2001 to 2012. There are various times when sampling was not conducted during this time period. At the station within the Poplar Creek planning area, BOD was not measured. For most of the parameters the data represents a "snap shot" of constituent level for one day in a single month. For some parameters, the monitoring data is only available for a relatively short time period. Thus, the data presented above should not be interpreted as a strong indicator as to if water quality goals are being met. However, the data are useful for confirming priority pollutants and pointing toward priority pollutant sources.

Chloride and DO are reported as a monthly average for winter and summer months and includes the number of times the water quality criterion for Chloride was exceeded. The average monthly DO values are greater than the minimum state thresholds during both seasons.

Continued and possibly more focused monitoring will be needed to more definitively assess the extent to which water quality criteria are being met.

3.17.3 Nonpoint Sources Pollutant Load Modeling

Based on water quality monitoring and the characteristics of the watershed, there are a number of pollutants that are of concern and will be focused on in this plan. These include sediment, nutrients (nitrogen and phosphorus), bacteria, and chlorides. The presence of these pollutants in the watershed and BMPs to address these pollutants are discussed in subsequent sections of this plan.

A nonpoint source of pollution can be defined as a source of pollution that releases from widely distributed or pervasive elements. Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. Nonpoint source (NPS) pollution comes from many diffuse sources, and is distinguished from point sources, where pollutants are released to a water body via a constructed ditch or pipe. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers wetlands and ground waters. To provide recommendations within the watershed plan supplement, it is critical to identify pollutants of concern and sources within the watershed planning area. The relative magnitude of pollutant loads from each land use can then be quantified on a watershed based scale.

The analyses completed for the Poplar Creek watershed quantified NPS loadings of total nitrogen, total phosphorus, and total suspended solids (sediment) as pollutant loads based on land use type. The analysis also included biological oxygen demand (BOD) as a function of land use for each watershed planning unit. An analysis of chloride loadings is provided in the ensuing section.

The Spreadsheet Tool for Estimating Pollutant Loads (STEPL), created by the U.S. EPA, was used to quantify pollutant loadings in the watershed planning area. The tool uses simple algorithms to calculate nutrient and sediment loads from various land uses. The tool can then calculate load reductions that would result from implementing various BMPs. For each watershed planning unit, the annual nutrient loading is calculated based on the runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as land use distribution and land management practices. Annual sediment load (sheet and rill erosion only) is calculated based on the Universal Soil Loss Equation (USLE) and the sediment delivery ratio.

Pollutant load estimates were developed for the 10 watershed planning units. Calculations for total nitrogen, total phosphorus, total suspended solids and BOD were performed using STEPL. STEPL is a simple planning tool with certain limitations, it is not an in-stream response model and is an un-calibrated tool which estimates only watershed pollutant loading based on coarse data, such as event mean concentrations. Specific limitations and considerations of the spreadsheet model include:

- annual nutrient loading is based on runoff volume
- runoff pollutant concentrations are based on land use
- a single event mean concentration represents pollutant concentration for all storm events
- pollutant loads are estimated only for storm events based on average rainfall amount
- stream channel erosion is not accounted for as a pollutant source
- drain tiles and constructions sites are not included as a pollutant source.

Inputs for this loadings analysis included land use data from CMAP's 2013 Land Use Inventory for Northeast Illinois and an annual rainfall of 35.01 inches per year (weather station: IL CHICAGO MIDWAY AP 3). The CMAP land use data consists of a geodatabase and supporting documentation depicting land use in northeast Illinois divided into 60 categories. For STEPL, land use category input includes: urban, cropland, pastureland, forest, user defined, and feedlots. Within STEPL, the urban category was further broken down by commercial, industrial, institutional, transportation, multi-family, single-family, urban-cultivated, vacant (developed), and open space. Forest preserves and forested area were separated from the open space category and entered into STEPL as Forest to specifically capture the notable forest preserves in the watershed planning area. CMAP previously characterized open space into 5 categories including residential recreation areas and forested areas. Therefore, we quantified the open space subset 'forest' to capture forested areas and forest preserves.

Table 3.17-3 shows the calculated loadings of total nitrogen, total phosphorus, total suspended solids and BOD for each watershed planning unit. These results highlight that based on existing watershed conditions, the PCRR watershed planning unit is the largest nonpoint source contributor of total nitrogen (17.2%), total phosphorous (20.3%), sediment load (44.4%), and BOD (15.8%). BMPs will need to be strategically planned and implemented throughout the watershed planning units to protect and restore water quality in the Poplar Creek planning area.

Watershed Planning Unit	Total Nitrogen Load Estimate (lb/ac/yr)	Total Phosphorous Load Estimate (lb/ac/yr)	Sediment Load Estimate (t/ac/yr)	BOD Load Estimate (lb/ac/yr)
PC1	3.3	0.6	0.2	11.8
PC2	5.9	1.2	0.5	21.4
PC3	3.0	0.7	0.3	10.0
PC4	6.9	1.3	0.4	23.9
PCEB	5.5	0.9	0.2	19.5
PCLT	6.8	1.2	0.3	24.6
PCRR	10.8	2.4	2.2	34.6

Watershed Planning Unit	Total Nitrogen Load Estimate (lb/ac/yr)	Total Phosphorous Load Estimate (lb/ac/yr)	Sediment Load Estimate (t/ac/yr)	BOD Load Estimate (lb/ac/yr)
PCSB	6.2	1.0	0.2	23.0
PCSC	6.2	1.0	0.2	22.9
PCTA	8.3	1.5	0.5	27.5
Total	62.9	11.8	5.0	219.2

Table 3.17-3 Summary of Pollutant Loading per Watershed Planning Unit in the Poplar Creek Planning Area

In nature, wetlands are often described as filtering out pollutants from water or serving as sinks for total suspended solid as well nutrients and often function as closed systems with respect to nonpoint source pollution. Constructed wetlands are increasingly being used as an effective BMP for nutrient removal.

For this plan, it is assumed that lakes and wetland complexes are not land uses contributing to annual pollutant loads and therefore loadings from lake shorelines, open water and wetlands have not been quantified. Loadings per land use category relevant to annual pollutant loadings from nonpoint sources have been analyzed using the STEPL spreadsheets and are summarized in Table 3.17-4

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	142,205	23,092	527,899	3,333
Cropland	5,706	1,378	11,791	656
Forest & Grassland	1,825	889	4,461	64
Streambank	12,797	4,927	25,594	7,998
Total	162,533	30,286	569,746	12,051

Table 3.17-4 Summary of Pollutant Loadings per Land Use in the Poplar Creek Planning Area

Table 3.17-4 shows total nitrogen, total phosphorous, total suspended solids, and BOD loadings for each land use type. These results indicate that based on existing watershed conditions, urban land is the largest nonpoint source contributor of total nitrogen (87.5%), total phosphorous (76.2%), and BOD (92.6%), while streambank erosion is the largest nonpoint source contributor of sediment (66.4%). BMPs will need to be strategically planned and implemented in the developed areas to protect and restore water quality in the Poplar Creek planning area.

Cropland in the land use table includes all agricultural land use. The land use dataset provided by CMAP is the best available land use dataset and does not break cropland into row crops and pasturelands. Per the CMAP classification of land use database; agricultural land classed by the county assessor as agricultural, is noted as parcel dominated by: row crops, field crops & fallow field farms & pasture, horse, dairy, livestock, and mixed, including dairy and other livestock agricultural processing.

Agricultural land use makes up approximately 3.3% of the Poplar Creek Planning Area. A review of aerial photography indicated that most of the agricultural activity that remains in the watershed is row crop agriculture.

This section of the resource inventory is intended to characterize and identify the existing watershed pollutant loads in each watershed planning unit. A detailed discussion and identification of annual pollutant load reduction *targets* for the Poplar Creek watershed are provided in ensuing sections of this plan. The targets are based on the information characterized in this chapter and the loading reductions that are expected to occur with a planned level of BMP implementation.

3.17.4 Quantification of Chloride Loadings

Within the primarily urbanized Poplar Creek planning area, the primary source of chloride loading is from roadway, parking lot and sidewalk deicing activities. Chloride loads have been estimated for each municipality in the watershed planning area, as municipalities are responsible for purchasing and applying on public streets and parking areas the majority of chloride deicers. It is necessary to estimate the loadings based on an established methodology because currently there is no data readily available for the rates of use of chloride deicing materials being used throughout the watershed planning area.

Chloride loads were analyzed using methodology drawn from the 2014 Thorn Creek Watershed Based Plan Addendum, prepared by Geosyntec Consultants, Inc. and CMAP. This method was used in large part to be consistent with other communities in the region. The Thorn Creek Watershed Based Plan estimated the application of chloride-based deicers using de-icing survey information collected by the DuPage River Salt Creek Workgroup for several local municipalities.

According to the Thorn Creek Watershed Based Plan, usable survey responses were received from the following Illinois units of local government: Addison, Bloomingdale, Bolingbrook, DuPage County, Hanover Park, Naperville, West Chicago, and Woodridge. These areas represent a typical jurisdiction within the Poplar Creek planning area. For the winter for 2011-2012, jurisdictions reported using between 230 and 1,071 pounds of salt per lane-mile per salt application event. The reported mean, standard deviation and median were 490, 313, and 327 pounds of salt per lane-mile per salt application event, respectively. With this data, the Thorn Creek methodology included chloride loading assuming applications of 300, 400, 500, and 800 pounds per lane-mile per salt application event.

To be consistent with the application rates used in the Thorn Creek Plan, it was determined that the chloride deicing methods were applied approximately 18 times per year between 2011 and 2012. The estimated chloride loadings per jurisdiction and per watershed planning unit are shown in Table 3.17-5 and Table 3.17-6, respectively.

Jurisdiction	Lane Miles	300 lb per lane-mile (tons/year)	400 lb per lane-mile (tons/year)	500 lb per lane-mile (tons/year)	800 lb per lane-mile (tons/year)
Unincorporated Kane County	4	11	15	19	30
Unincorporated Cook County	53	145	193	241	386
Barrington Hills	4	11	15	18	29
Bartlett	24	66	87	109	175
Elgin	231	631	841	1,052	1,683
Hanover Park	14	39	52	65	104
Hoffman Estates	353	963	1,284	1,604	2,567
Inverness	19	51	68	85	135
Schaumburg	137	373	498	622	996
South Barrington	114	311	415	518	829
South Elgin	4	11	15	18	29
Streamwood	266	727	970	1,212	1,940
TOTAL	**1,223**	**3,339**	**4,452**	**5,565**	**8,904**

Table 3.17-5 Summary of Estimated Chloride Loadings per Jurisdiction in the Poplar Creek Planning Area

Watershed Planning Unit	Lane Miles	300 lb per lane-mile (tons/year)	400 lb per lane-mile (tons/year)	500 lb per lane-mile (tons/year)	800 lb per lane-mile (tons/year)
PC1	49	134	179	224	358
PC2	84	231	307	384	615
PC3	190	518	691	863	1,381
PC4	136	372	496	620	991
PCEB	127	347	462	578	925
PCLT	174	476	634	793	1,268
PCRR	71	194	258	323	517
PCSB	210	574	765	956	1,530
PCSC	148	403	537	672	1,074
PCTA	34	92	122	153	245
TOTAL	**1,223**	**3,339**	**4,452**	**5,565**	**8,904**

Table 3.17-6 Summary of Estimated Chloride Loadings per Watershed Planning Unit in the Poplar Creek Planning Area

It should be noted these estimates are based on the use of deicers by municipalities mostly for deicing roads and public parking lots. Private contractors also apply deicers to privately-owned parking lots. Thus, actual loadings to water bodies in the Poplar Creek planning area are in actually higher than these estimated values. To protect designated uses, BMPs to reduce chloride loadings will need to be implemented in the Poplar Creek planning area.

3.18 POINT SOURCES

3.18.1 National Pollutant Discharge Elimination System (NPDES)

The Clean Water Act prohibits the discharge of "pollutants" through a "point source" into a "water of the United States" unless the discharge is covered by a National Pollutant Discharge Elimination System (NPDES) permit. Municipalities discharging stormwater to the watercourses in the Poplar Creek watershed planning area are regulated under Illinois EPA's NPDES program. The NPDES stormwater program was created to improve the water quality of stormwater runoff from urban and suburban areas, and requires that municipalities obtain permit coverage for discharges of stormwater.

In Illinois, discharges from small MS4s are regulated under Illinois EPA's General NPDES Permit No. ILR40. This permit requires that MS4 operators develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants. A permittee's stormwater management program must include at least the following six minimum control measures:

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

In addition to the regulated stormwater discharges, there are other "point source" discharges of pollutants in the Poplar Creek watershed. The permit will contain effluent, monitoring and reporting requirements, and other provisions to ensure that the discharge does not harm water quality or public health.

As part of the Illinois EPA's NPDES program, point sources and outfall locations to receiving waters are monitored for discharge quality. Figure 3.18-1 shows the location of the 2 Illinois EPA NPDES permitted outfalls located within the Poplar Creek planning area. One (1) of these outfalls discharges effluent from a sewage treatment plant, and one (1) discharges runoff from an industrial facility.

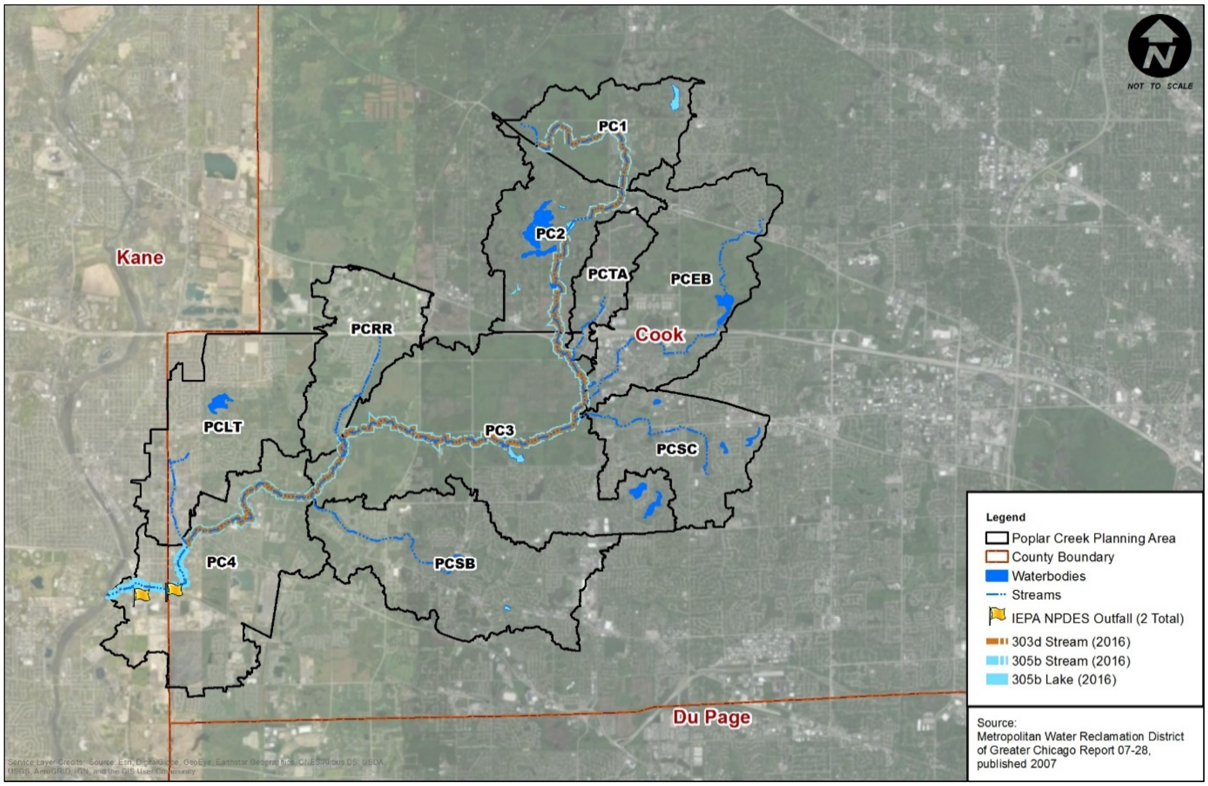

Figure 3.18-1 Poplar Creek IEPA NPDES Outfall Locations

CHAPTER 4 WATERSHED PROBLEM ASSESSMENT

A watershed assessment is one of the most important aspects of watershed management as the assessment attempts to transform scientific data into policy-relevant information that can support decision-making and action. The following chapter of this plan focuses on the problems and watershed stressors identified in the watershed resource inventory for the Poplar Creek planning area (Chapter 3).

The Poplar Creek planning area is a moderately developed (71%) watershed. Water quality if affected by watershed stressors stemming from land use conditions and the impact of land use change on aquatic and natural resources. This includes the creation of extensive areas of impervious surfaces, elimination of naturalized and/or riparian areas, and changes to overall stream corridors. The problems identified throughout this chapter include several current and potential future problems and concerns.

4.1 LAND USE CHANGE

Land use change has widely been noted as the cause for water quality and watershed degradation. As part of the National Water Quality Assessment (NAWQA) Program, the USGS conducted a study of Effects of Urbanization on Stream Ecosystems (EUSE). The study was performed for nine metropolitan areas from 2003 through 2012 where biological, physical (hydrology and habitat) and chemical components were measured along reaches. The USGS study looks at a watercourses biological community, hydrology, habitat and chemistry and how these elements change as related to urban development across the country. The results of the USGS efforts indicate that the cause of degradation and sources of pollutant loadings are multi-faceted and interrelated. No single environmental factor was identified that can be used in explaining why the health of streams decline as levels of urban development increase. Overall, the study showed that urban development can alter hydrology, habitat and stream chemistry which in turn cause multiple stressors that can degrade aquatic ecosystems. In addition, urban development leads to increased storm flow variability, often creating a “flash” of stormwater in receiving systems because of engineered drainage. This in

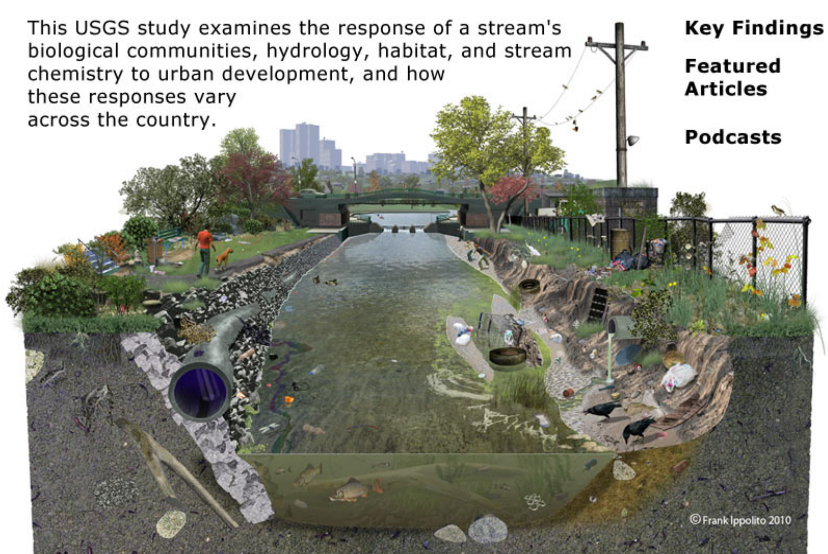

Figure 4.1-1 Effects of Urbanization on Stream Ecosystems (USGS, 2012)

turn leads to temperature fluctuation, erosion, increased velocities and channelization (Beaulieu et al., 2012). The USGS study is consistent with findings regarding conditions in the Poplar Creek watershed and helps inform plans to reduce nonpoint pollution sources.

The main takeaway from the USGS study is that water quality stressors are specific to regions throughout the country and that no one specific component alone leads to overall ecosystem degradation. A combination of factors including physical effects and pollutant loadings, impact water quality and biological communities. Streams in different regions of the country respond differently to urban development. In this region and specific to the Poplar Creek planning area, the resource inventory for which data is available and compiled, indicates a moderately dense urbanized watershed. The physical changes to all watercourses throughout the Poplar Creek planning area are most notable as the resource inventory indicates that majority of the watercourses assessed have fair to good riparian area with low to moderate erosion. The only instance in the watershed where riparian areas are poor are those located on densely urbanized areas with a small amount of open water area.

The conversion of a historically wet prairie combined with wetland networks and forested watershed (as seen in the presettlement vegetation cover) to urban/suburban areas has degraded water quality and the aquatic ecosystem in the planning area. The removal of these ecosystems, the creation of impervious surfaces, and the alteration of stream networks have altered the hydraulic processes of interception and infiltration while increasing stormwater quantities and the mobility of potential harmful constituents.

While much of the watershed was developed after the adoption of ordinances requiring stormwater management, particularly detention, portions of the watershed were developed before stormwater management practices were implemented. The changes to land use combined with lack of appropriate stormwater management measures implemented as development progressed have contributed to the degradation of water quality. This can be seen through some of the planning area south of the Creek where municipal incorporation dates as far back as the 1950s. Development in these municipalities occurred sporadically. The period which the most notable increases in population occurred was from the 1960s through the 1990s. For example, the Village of Streamwood’s population grew from approximately 4,800 in the 1960s to 32,800 in the 1990s (Encyclopedia of Chicago). The timing of new development in the watershed is important with respect to stormwater management. Many stormwater systems did not include detention basins or other controls in the 1950’s and 60’s. The MWRD did not begin to regulate stormwater until 1972 with the adoption of the Sewer Permit Ordinance. In addition, it was not until May 2014 that MWRD adopted the WMO which directly addresses stormwater and water quality. Likewise, the NPDES program was created in 1972, which was after much of the development of the planning area. Thus, these areas release large volumes of stormwater which surge into the waterways delivering pollutants and contributing to erosion.

The overall land use change and impervious surface creation has led to increased runoff volumes, creating altered hydrologic conditions for receiving streams. This is most notable in the channelization and erosion characterization shown in Chapter 3.

4.2 LAND USE CHANGE AND STORMWATER QUALITY – CAUSES OF IMPAIRMENTS

A strong correlation exists between impervious area cover and degradation of aquatic ecosystems in receiving waters. This correlation has been validated in many scientific studies across the country. As stormwater runoff increases in volume and velocity, there is increased potential for erosion and the types and concentration of pollutants entering receiving waters increases. The lack of infiltration resulting from land use change eliminates the natural breakdown and filtering processes of the soil profile that normally cleanses and filters water as part of the natural water cycle (Miller, 2002). Many studies have shown a strong link between increased impervious area coverage and increased pollutant/constituent levels in receiving waters (Brabec et al., 2002).

The land use changes that have occurred in the Poplar Creek planning area have altered stormwater runoff and water quality. According to the existing condition land use data, the areas of the watershed not dedicated to forest preserve areas are partially developed with moderate percentages of impervious areas whether there is residential, transportation or commercial land use.

Stormwater runoff from urbanized areas is known to contain a wide range of pollutants coming from various point and nonpoint sources. Urban nonpoint source pollution is a significant contributor to water quality degradation (Brezonik and Stadelmann, 2002). MWRD has been monitoring water quality constituents as part of its Ambient Water Quality Monitoring in the Poplar Creek since 2001. The list of constituents for which data is available is widespread and somewhat limited to the Poplar Creek sampling location. This location is near point sources or inflow location from smaller tributaries. To quantify nonpoint source constituents from within the watershed, a characterization of typical constituents found in stormwater runoff was performed as seen in Chapter 3. As previously discussed, the nonpoint source pollutant loadings were calculated using the EPAs developed and widely accepted STEPL spreadsheet tool.

The nonpoint source constituents or watershed stressors characterized in the Poplar Creek planning area are typical water quality stressors in urbanized areas and include:

- Sediment (Total Suspended Solids)
- Nutrients (Nitrogen and Phosphorus)
- Biological Oxygen Demand (BOD) – Indication of oxygen demanding substances
- Chlorides

Following the pollutant loading characterization, an analysis was conducted combining the pollutant loading results, field and desk-top assessments of watercourses, channelization, riparian areas and overall erodibility assessments to identify priority areas within the planning area. The characterization results for each constituent or stress factor were ranked using 4 quartiles (1 = low; 4= high) and sorted based on rank and land use to determine watershed priority areas.

Overall, developed area dominates the watershed planning area. The exceptions are the areas of forest preserve, which constitute approximately 24% of the Poplar Creek planning area. The planning area is a moderately developed area suggesting that the watershed is susceptible to elevated pollutant levels associated with urban/suburban development and stormwater runoff from impervious area. The following is a discussion of the impairments and summary of the priority areas analysis completed for the Poplar Creek planning area.

4.2.1 Sediment (Total Suspended Solids)

US EPA identifies sediment as the most common pollutant in rivers, stream and lakes. Sediment in stream beds disrupts the natural food chain by destroying the habitat where the smallest stream organisms live and causing massive declines in fish populations (EPA). Sediment also acts as a vehicle for other stormwater pollutants providing a mechanism to transport nutrients, hydrocarbons, metals and pesticides. Sediment loading in runoff can come from many sources including streets, lawns, driveways, roads, construction activities, and channel erosion (EPA).

Elevated total suspended solids (TSS) in water bodies can result from several natural and anthropogenic sources. Natural sources include erosion of stream banks and bed materials and resuspension of sediment and organic material, as well as particulates carried into streams from the surrounding landscape by runoff. Anthropogenic sources of TSS include erosion from human activities that result in vegetation and soil disturbance such as site development or redevelopment, perturbation of the stream channel such as dredging, and rill, gully, and stream channel erosion resulting from concentrated or increased runoff caused by land use and land cover changes. The change in watershed hydrology associated with urban/suburban development in the Poplar Creek planning area has caused channel erosion, widening and scouring which has adversely impacted the urban stream ecology. Some impacts to watercourses throughout the Poplar Creek planning area include eroded and exposed stream banks, sedimentation, and turbid conditions. The physical impacts have led to the degradation of water quality and habitat due to sediment loadings and is seen throughout the planning area. The increase in sediment within the water column throughout the Poplar Creek planning area may reduce the penetration of light at depths and limit the growth of aquatic plants. Sediment loadings on stream beds can destroy stream bed habitat where the smallest stream organisms live causing a disrupted food chain condition. This can lead to the overall decline in biodiversity at all levels.

Stormwater runoff is a major source of sediment loadings in developed areas. The stormwater BMPs recommended in the plan typically do a very good job of reducing amounts of sediment/total suspended solids.

The indication of higher levels of sediment loading due to increased impervious area suggests increased levels of hydrocarbons, organic and inorganic compounds and heavy metals as sediment particles act as vehicles for these constituents (Hwang and Foster 2006,). Hydrocarbon pollutant loads resulting from stormwater runoff to a receiving stream are associated with high concentrations of suspended sediments. This is explained by the sorption properties of street dust, suspended solids and streambeds (Herrmann 1981). Water quality sampling conducted by MWRD at a sampling location along the Poplar Creek Mainstem generally confirms these findings from the literature; the monitoring conducted indicates the presence of many constitutes, including the following:

Dissolved Oxygen	Boron	Alkalinity	Manganese
pH	Cadmium	Chloride	Mercury
Ammonium	Calcium	Fluoride	Selenium
Total Nitrate	Chromium	Total Concentrated Solids	Silver
Total Phosphorus	Copper	Phenols	Zinc
Sulfate	Iron	Cyanide	Benzene
Total Dissolved Solids	Lead	Cyanide Weak Acid Disposable	Ethylbenzene
Turbidity	Magnesium	Fecal Coliform	Xylenes
Arsenic	Barium	E-coli	

The presence of these constituents was identified at the MWRD sampling location during single monthly measurements from 2001 – 2012. The list includes metals, hydrocarbons and synthetic organic compounds. The somewhat limited sampling data confirms these pollutants exist in the watershed and can be found in runoff from the impervious, urbanized areas. As noted above, hydrocarbon pollutant loads are associated with loadings of suspended sediments, which primarily are associated in this watershed with stormwater runoff. Consequently, this plan places a strong focus on BMPs and other measures to reduce sediment loads. Loading of metals and hydrocarbons will be reduced through the control of sediment loadings.

4.2.2 Sediment Loading

The characterization results as determined from STEPL for total suspended solids were ranked by watershed planning unit using 4 quartiles (Table 4.2-1). A spatial reference of the sediment loading ranking results is shown in Figure 4.2-1. The pollutant priority area ranking shows sediment loadings are greatest from the residential areas and transportation-related corridors when the ranking dataset is sorted by the Transportation land use category. Likewise, the riparian areas and channelized reaches within each watershed planning unit are grouped together when sorted by the transportation land use category. Thus, the watershed planning areas with a quartile ranking of 4 (shown in red) are priority areas for implementing BMPs and other measures to reduce sediment loadings. Areas where the riparian condition is identified as *Poor* are priority areas for buffers and restoration of riparian areas. The watershed planning unit areas that are in most serious condition from sediment loading are PCRR, PCTA, and PC2.

SUB	COM	IND	INS	TRA	RES	VAC	OPEN	WAT	FOR	AGR	t/yr	t/ac	Rank	Channel	Riparian	Erosion
PCRR	26%	3%	1%	25%	30%	0%	3%	0%	9%	3%	3921	2.21	4	MOD	POOR	HIGH
PCTA	18%	4%	9%	22%	19%	3%	0%	0%	1%	24%	427	0.51	4	HIGH	FAIR	MOD
PCLT	6%	2%	3%	21%	56%	1%	6%	0%	1%	4%	796	0.28	2	HIGH	FAIR	HIGH
PCSC	9%	0%	3%	20%	48%	0%	14%	0%	6%	0%	412	0.20	1	HIGH	FAIR	LOW
PCSB	7%	3%	5%	18%	54%	0%	8%	0%	4%	1%	621	0.17	1	HIGH	FAIR	LOW
PC4	4%	24%	7%	17%	28%	1%	2%	0%	15%	4%	1705	0.44	3	MOD	POOR	MOD
PCEB	11%	5%	3%	17%	26%	1%	4%	0%	32%	2%	801	0.24	2	HIGH	FAIR	MOD

SUB	COM	IND	INS	TRA	RES	VAC	OPEN	WAT	FOR	AGR	t/yr	t/ac	Rank	Channel	Riparian	Erosion
PC2	3%	0%	5%	11%	68%	0%	0%	0%	4%	9%	1053	0.49	4	HIGH	GOOD	MOD
PC3	2%	0%	1%	9%	18%	0%	3%	0%	66%	1%	2043	0.34	3	LOW	GOOD	MOD
PC1	0%	0%	0%	8%	39%	0%	1%	0%	47%	4%	272	0.16	1	HIGH	GOOD	LOW

Table 4.2-1 Summary of STEPL results for Sediment Loading by Watershed Planning Unit, Ranked and Sorted by Transportation Land Use

Notes: COM – Commercial; IND – Industrial; INS – Institutional (hospitals, schools, churches, cemeteries); TRA – Transportation (ROW, Rail, Roadways); RES – Residential; VAC – Vacant, OPEN – Open Space (e.g., Golf Courses); WAT – Water; FOR – Forest Preserve; AGR – Agriculture.

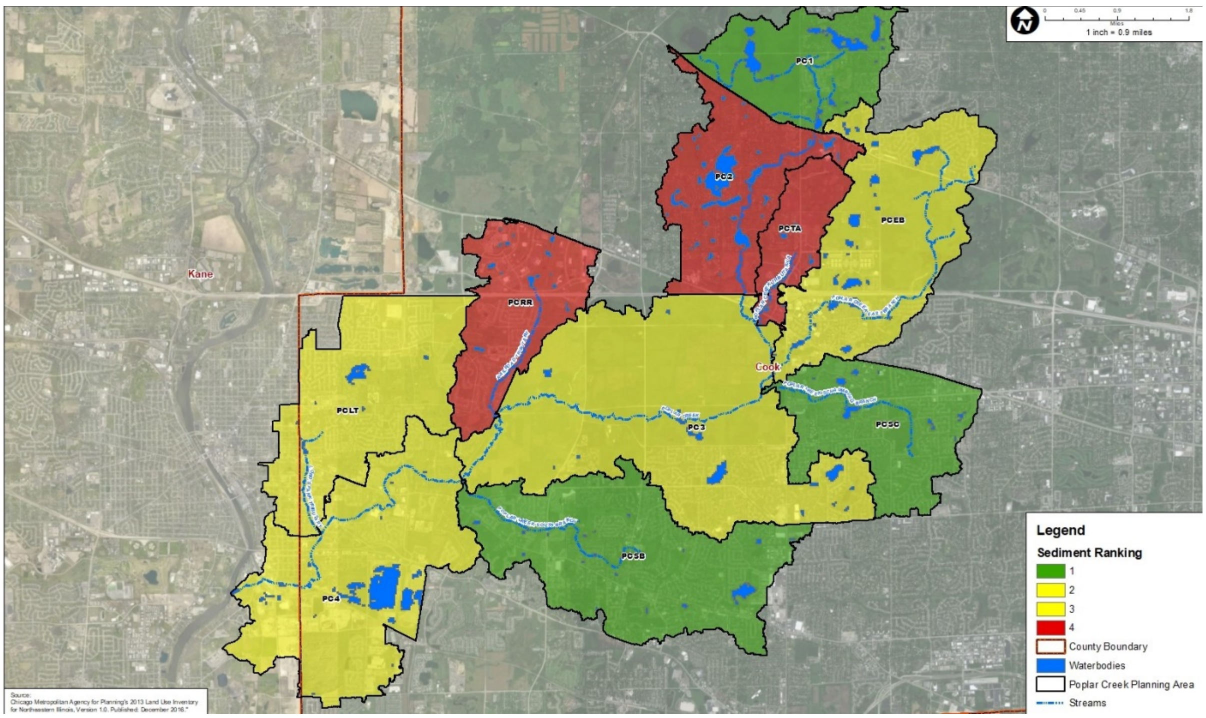

Figure 4.2-1 Sediment Load Ranking by Watershed Planning Unit

Figure 4.2-1 correlates with Table 4.2-1, and depicts the ranking or categorization of the sediment loadings within each watershed planning unit. The priority area rankings show that sediment loadings are greatest for watershed planning units with the most intensive transportation land use. Watershed planning areas shaded in red are priority areas for BMPs and other measures to reduce sediment loadings.

4.2.3 Nutrients (Nitrogen and Phosphorus)

Nutrient pollution is one of America's most widespread, costly and challenging environmental problems. Nutrient pollution is the process where too many nutrients (nitrogen and phosphorus) are introduced into receiving streams and act like fertilizer in the water, leading to massive overgrowth of algae. Algae creates nuisance conditions limiting recreational uses, and certain types of algae emit toxins creating serious health risks.

With respect to water quality and aquatic habitat, excessive amounts of nutrients can lead to low levels of dissolved oxygen. Severe algal growth blocks light in the water column that is needed for plants to grow. In addition, when algae die and decay, this process uses the oxygen in the water leading to low levels of dissolved oxygen in the water. The lack of growth and use of remaining oxygen in the water greatly reduces water quality for aquatic ecosystems.

The primary sources of nutrient pollution are from human activities and include runoff of fertilizers, animal manure, sewage treatment plant discharges, stormwater runoff, car and power plant emissions, and failing septic tanks. While nutrients are a necessary part of the natural ecosystem, too much can be harmful to water quality. Increased nutrient levels are evident throughout the Poplar Creek planning area where excess algae growth in receiving streams, lakes and ponds is visible in majority of the locations that will be inspected during the watershed resource inventory assessment to be performed Summer 2018 (Chapter 3).

To quantify nutrient loading from nonpoint sources or land use types, the water quality characterization results as determined from STEPL for nitrogen and phosphorus, were ranked per watershed planning unit using 4 quartiles (Table 4.2-2). A spatial reference of the phosphorus and nitrogen load is shown in Figure 4.2-2 and Figure 4.2-3 respectively. The priority area rankings show phosphorus and nitrogen loadings are greatest for watershed planning units with the most intensive commercial and transportation land use, as seen when the ranking dataset is sorted by the transportation land use category. The relatively higher loadings of nutrients where there is intensive commercial and transportation land uses are a reflection of the conspicuous amounts of impervious surfaces and vehicle emissions. Watershed planning areas with rows highlighted in red are priority areas for BMPs and other measures to reduce nutrient loadings. Practices to reduce sediment loads and nutrient loads are discussed in ensuing sections of this plan.

SUB	COM	IND	INS	TRA	RES	VAC	OPEN	WAT	FOR	AGR	Nitrogen			Phosphorus		
											lb/yr	lb/ac	Rank	lb/yr	lb/ac	Rank
PCRR	26%	3%	1%	25%	30%	0%	3%	0%	9%	3%	19267	10.8	4	4292	2.4	4
PCTA	18%	4%	9%	22%	19%	3%	0%	0%	1%	24%	6898	8.3	4	1237	1.5	4
PCLT	6%	2%	3%	21%	56%	1%	6%	0%	1%	4%	19486	6.8	3	3375	1.2	3
PCSC	9%	0%	3%	20%	48%	0%	14%	0%	6%	0%	12970	6.2	3	2131	1.0	2
PCSB	7%	3%	5%	18%	54%	0%	8%	0%	4%	1%	22781	6.2	2	3782	1.0	2
PC4	4%	24%	7%	17%	28%	1%	2%	0%	15%	4%	26754	6.9	4	4858	1.3	4
PCEB	11%	5%	3%	17%	26%	1%	4%	0%	32%	2%	17867	5.5	1	3062	0.9	1
PC2	3%	0%	5%	11%	68%	0%	0%	0%	4%	9%	12698	5.9	2	2500	1.2	3
PC3	2%	0%	1%	9%	18%	0%	3%	0%	66%	1%	18178	3.0	1	3934	0.7	1
PC1	0%	0%	0%	8%	39%	0%	1%	0%	47%	4%	5635	3.3	1	1115	0.6	1

Table 4.2-2 Summary of STEPL results for Phosphorus and Nitrogen Loading by Watershed Planning Unit, Ranked and Sorted by Transportation Land Use

Notes:

COM – Commercial; IND – Industrial; INS – Institutional (hospitals, schools, churches, cemeteries); TRA – Transportation (ROW, Rail, Roadways); RES – Residential; VAC – Vacant, OPEN – Open Space (e.g., Golf Courses); WAT – Water; FOR – Forest Preserve; AGR – Agriculture.

Table 4.2-2 shows that relatively greater amounts of phosphorus and nitrogen loadings were found in watershed planning units with extensive street and road networks, i.e., used heavily for transportation. The number of pounds per year of phosphorus and nitrogen found within these watershed planning units correlate with the percentage of the transportation use areas. According to Table 4.2-2, phosphorus and nitrogen loads are relatively more critical to reduce within areas presenting a quartile ranking of 4 (shown in red).

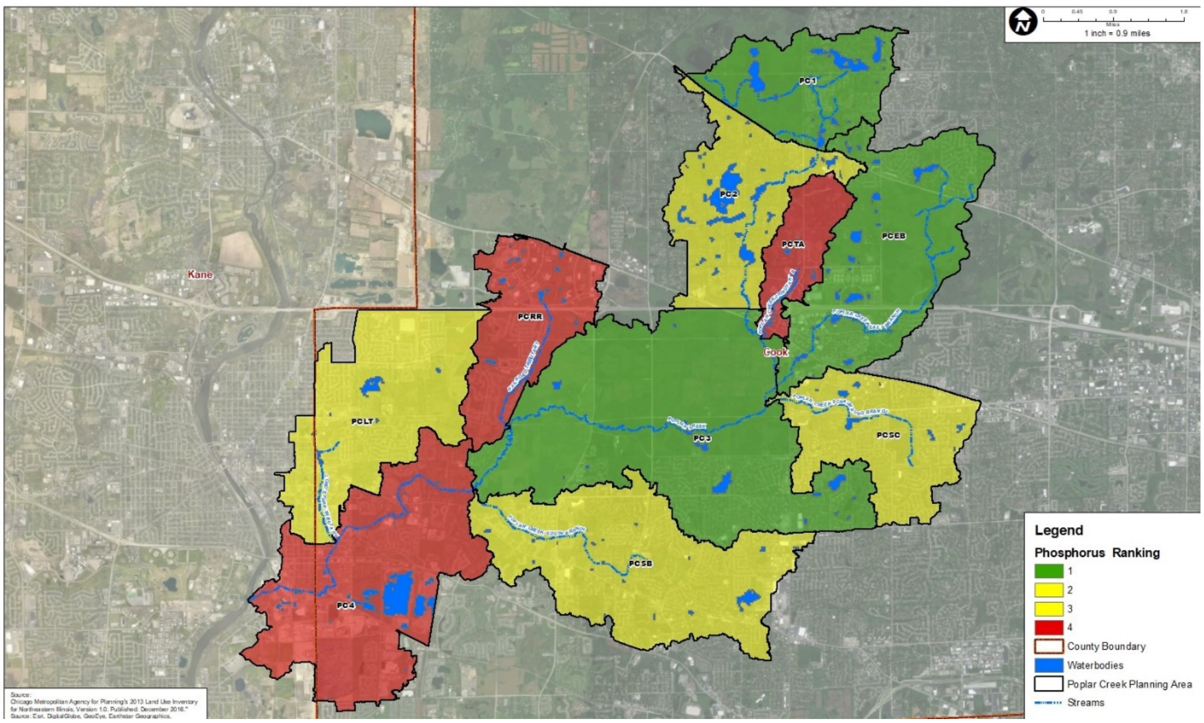

Figure 4.2-2 Phosphorus Load Ranking by Watershed Planning Unit

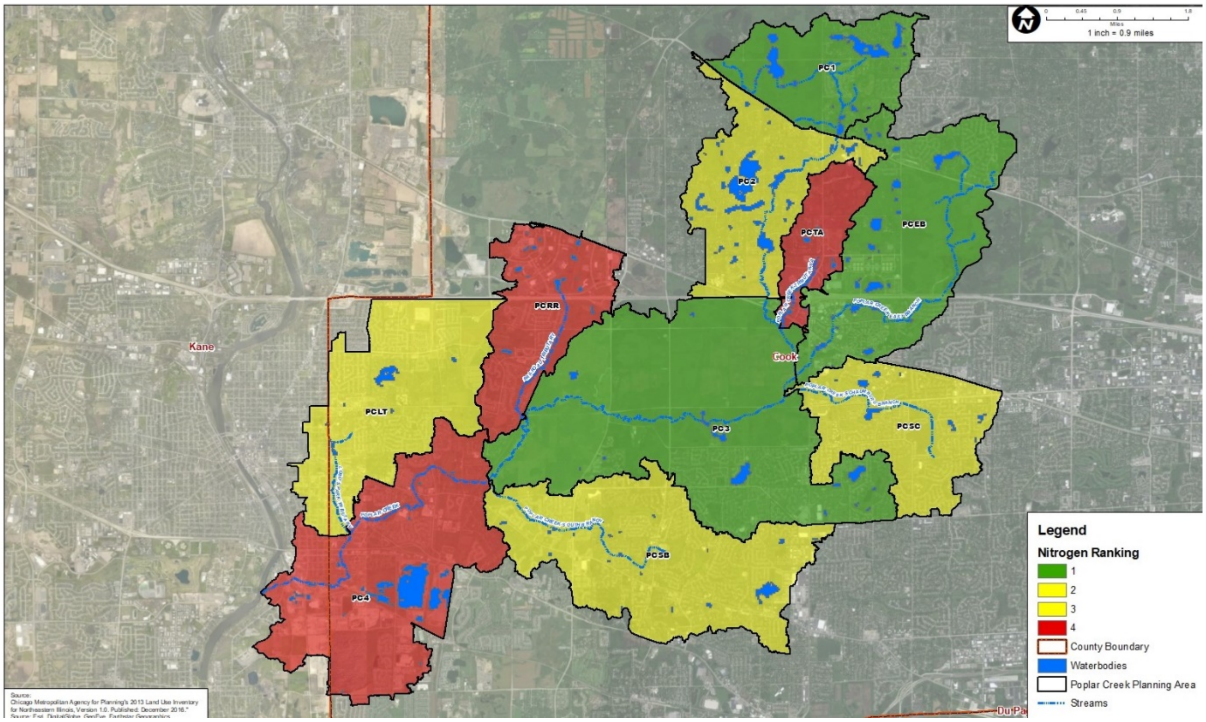

Figure 4.2-3 Nitrogen Load Ranking by Watershed Planning Unit

A spatial reference of the phosphorus and nitrogen load is shown above in Figure 4.2-2 and Figure 4.2-3, respectively. As noted above, the priority area map shows phosphorus and nitrogen loadings are greatest for watershed planning units with the most intensive transportation land use. The relatively higher loadings of nutrients where there is intensive transportation land use reflect the conspicuous amounts of impervious surfaces. In these areas there are releases of organic matter, which de-composes, and vehicle emissions. Figure 4.2-2 and Figure 4.2-3 show the Watershed Planning Units have very similar phosphorus and nitrogen loading rankings. Watershed planning areas with noted on the map in red are priority areas for BMPs and other measures to reduce nutrient loadings. Practices to reduce sediment loads and nutrient loads are discussed in ensuing sections of this plan.

4.2.4 Biological Oxygen Demand (BOD)

Dissolved oxygen (DO) in waterbodies is essential for aquatic life. The amount of DO in waterbodies is dependent on water temperature, the amount of oxygen taken out of the system by respiring and decaying organisms, and the amount of oxygen put back into the system by photosynthesizing plants, stream flow, and aeration. The temperature of a waterbody affects the amount of dissolved oxygen present because less oxygen dissolves in warm water than cold water.

Urban runoff can act as a food source for water-borne bacteria as discussed in the previous nutrient section. Bacteria in the waterbody uses DO to decompose organic matter thereby reducing DO present for aquatic ecosystems. The degradation of organic matter often occurs to the point where DO is reduced to a point that aquatic life is impaired. Biochemical oxygen demand (BOD) is the measure of the amount of oxygen that bacteria will consume while decomposing organic matter under aerobic conditions (presence of oxygen). High BOD loadings will result in low DO levels. Reduced DO concentrations in waterbodies in urbanized areas often occurs just after storm events because of oxygen demanding substances in receiving waters due to stormwater runoff (Erickson et. al., 2013).

DO concentrations can also be a surrogate for overall water quality as a low concentration of DO suggest the presence of oxygen demanding pollutants. These pollutants may include nutrients, metals, hydrocarbons, synthetic organic and inorganic compounds as discussed above.

The sampling of BOD conducted by the MWRD at one sampling location provides a snapshot of the Poplar Creek mainstem and is limited to single monthly measurements. To quantify BOD loadings from nonpoint sources or land use types, the water quality characterization results as determined from STEPL for BOD loadings were ranked per watershed planning unit using 4 quartiles (Table 4.2-3). A spatial reference of the BOD load is shown in Figure 4.2-4. The priority area ranking shows BOD loadings are greatest for watershed planning units with the most transportation land use. Residential areas with extensive road networks can be significant contributors of BOD. Watershed planning areas with a quartile ranking of 4 (highlighted in red) are priority areas for BMPs and other measures to reduce BOD loads.

SUB	COM	IND	INS	TRA	RES	VAC	OPEN	WAT	FOR	AGR	lb/yr	lb/ac	Rank
PCRR	26%	3%	1%	25%	30%	0%	3%	0%	9%	3%	61495	34.6	4
PCTA	18%	4%	9%	22%	19%	3%	0%	0%	1%	24%	22900	27.5	4
PCLT	6%	2%	3%	21%	56%	1%	6%	0%	1%	4%	70155	24.6	4
PCSC	9%	0%	3%	20%	48%	0%	14%	0%	6%	0%	47580	22.9	2
PCSB	7%	3%	5%	18%	54%	0%	8%	0%	4%	1%	85169	23.0	3
PC4	4%	24%	7%	17%	28%	1%	2%	0%	15%	4%	92355	23.9	3
PCEB	11%	5%	3%	17%	26%	1%	4%	0%	32%	2%	63946	19.5	1
PC2	3%	0%	5%	11%	68%	0%	0%	0%	4%	9%	46136	21.4	2
PC3	2%	0%	1%	9%	18%	0%	3%	0%	66%	1%	59735	10.0	1
PC1	0%	0%	0%	8%	39%	0%	1%	0%	47%	4%	20276	11.8	1

Table 4.2-3 Summary of STEPL results for BOD Loading by Watershed Planning Unit, Ranked and Sorted by Transportation

Notes:

COM – Commercial; IND – Industrial; INS – Institutional (hospitals, schools, churches, cemeteries); TRA – Transportation (ROW, Rail, Roadways); RES – Residential; VAC – Vacant, OPEN – Open Space (e.g., Golf Courses); WAT – Water; FOR – Forest Preserve; AGR – Agriculture.

According to Table 4.2-3 and Figure 4...2-4, BOD loads are relatively more critical to reduce within areas presenting a quartile ranking of 4 (shown in red). Sub watershed ID areas such as, PCRR, PCTA, and PCLT were found to have relatively higher amounts of BOD loading as compared to the other watershed planning units.

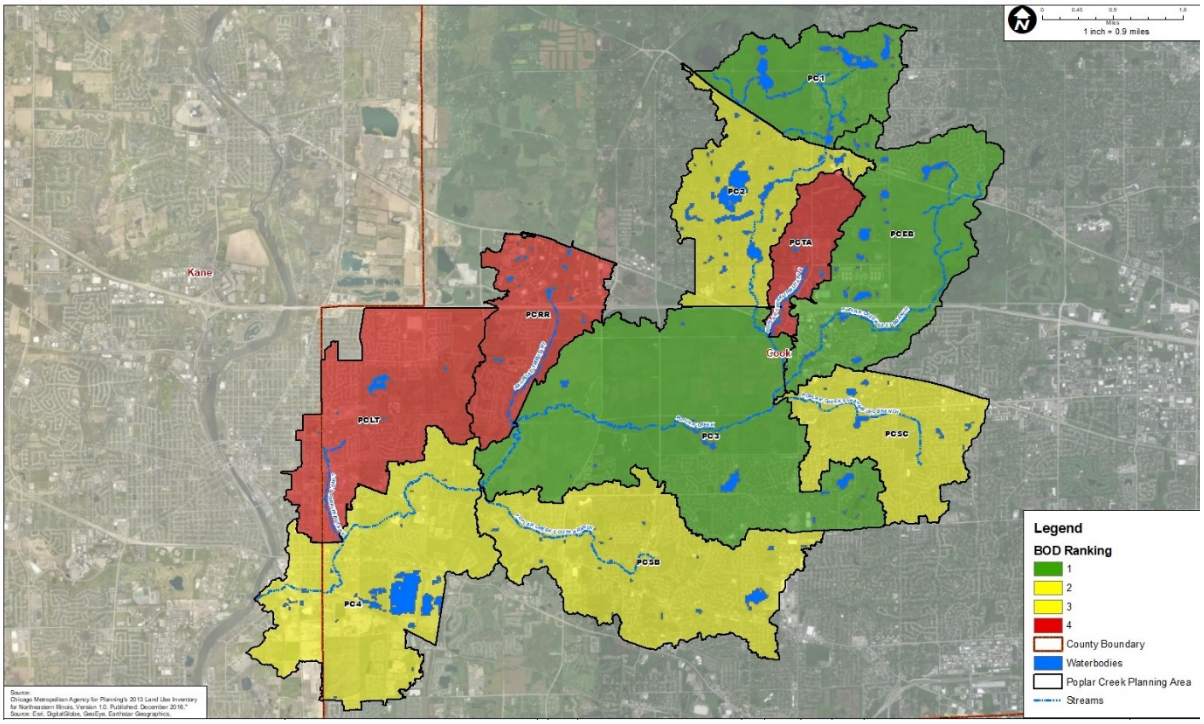

Figure 4.2-4 BOD Load Ranking by Watershed Planning Unit

The Watershed Planning Units with high BOD loadings are similar but not the same as the Watershed Planning Units with high rankings for phosphorus and nitrogen. Also shown in Figure 4.2-4 are higher BOD loadings in areas dominated by development and high percentages of impervious area. Figure 4.2-4 corresponds well with Figure 3.10-2 (with respect to impervious areas). BOD in urban runoff is directly correlated with the percentage of the watershed developed or the percentage impervious (Erickson et. al., 2013). Any foreign oxidizing organic material found in stormwater can deplete dissolved oxygen from a receiving watercourse. This includes oils and greases (often higher concentration associated with transportation corridors) as well as grass clippings, mulch, compost, surfactants and pet waste (often associated with urban land uses).

Areas shown in green in Figure 4.2-4 had relatively had the lowest BOD loadings. These are areas with open space, included FPCC lands. This highlights the need to protect and restore habitat and other pervious areas in the watershed.

4.2.5 Chlorides

Chlorides are an emerging pollutant of concern. Chlorides can impair uses and in high concentrations are toxic to aquatic ecosystems. The primary source of chloride loadings within the Poplar Creek planning area is deicing activities. Elevated chloride concentrations have been shown to be directly correlated with the percent of impervious surface area (Kaushal et. al., 2005). Following application to a roadway surface, chloride (road salt) will run off into receiving waterbodies where the concentration in the waterbody will increase, particularly throughout the winter months when chloride concentrations spike. Chloride levels in soils and waterbodies can also continue to be elevated several months after winter has ended. In a study conducted by the USGS, chloride concentrations have increased substantially over time with average concentrations approximately doubling from 1990 to 2011. The USGS study suggests that the rapid rate of chloride concentration increase is likely due to a combination of possible increased road salt application rates, increased baseline concentrations, and greater snowfall in the Midwestern U.S. during the study period (Corsi, et. al., 2014).

The moderately urbanized Poplar Creek planning area consists of significant roadway and ROW land uses; ROW makes up nearly 10-20% of the developed watershed planning units. To quantify chloride loading from nonpoint sources or land use types, the water quality characterization results as determined for chloride using application rates and lane miles within a watershed planning unit were ranked using 4 quartiles (Table 4.2-4). The priority area ranking shows chloride loadings are greatest for watershed planning units with the highest residential land use as seen when ranking the dataset according to residential land use. This is due to the street networks in the residential areas and current deicing practices implemented on streets, driveways, and parking lots. Measures to reduce chloride loads are important in all areas, but are especially critical in watershed planning areas with a quartile ranking of 4 (shown in red).

SUB	COM	IND	INS	TRA	RES	VAC	OPEN	WAT	FOR	AGR	lb/yr	lb/ac	Rank
PC2	3%	0%	5%	11%	68%	0%	0%	0%	4%	9%	384	0.18	2
PCLT	6%	2%	3%	21%	56%	1%	6%	0%	1%	4%	793	0.28	4
PCSB	7%	3%	5%	18%	54%	0%	8%	0%	4%	1%	956	0.26	4
PCSC	9%	0%	3%	20%	48%	0%	14%	0%	6%	0%	672	0.32	4
PC1	0%	0%	0%	8%	39%	0%	1%	0%	47%	4%	224	0.13	1
PCRR	26%	3%	1%	25%	30%	0%	3%	0%	9%	3%	323	0.18	3
PC4	4%	24%	7%	17%	28%	1%	2%	0%	15%	4%	620	0.16	1
PCEB	11%	5%	3%	17%	26%	1%	4%	0%	32%	2%	578	0.18	2
PCTA	18%	4%	9%	22%	19%	3%	0%	0%	1%	24%	153	0.18	3
PC3	2%	0%	1%	9%	18%	0%	3%	0%	66%	1%	863	0.14	1

Table 4.2-4 Summary of Chloride Loading by Watershed Planning Unit, Ranked and Sorted by Residential

Notes:

COM – Commercial; IND – Industrial; INS – Institutional (hospitals, schools, churches, cemeteries); TRA – Transportation (ROW, Rail, Roadways); RES – Residential; VAC – Vacant, OPEN – Open Space (e.g., Golf Courses); WAT – Water; FOR – Forest Preserve; AGR – Agriculture.

In Table 4.2-4, greater amounts of chloride loading from nonpoint sources are determined to be found within predominantly higher percentages of residential areas. The amount of lane miles of chloride found within these watershed planning units correlate with the percentage of their residential areas. Chloride loads are relatively more critical to reduce within areas presenting a quartile ranking of 4 (shown in red). Watershed planning units such as, PCLT, PCSB, and PC3, were found to have higher amounts of chloride loading compared to the other watershed planning units.

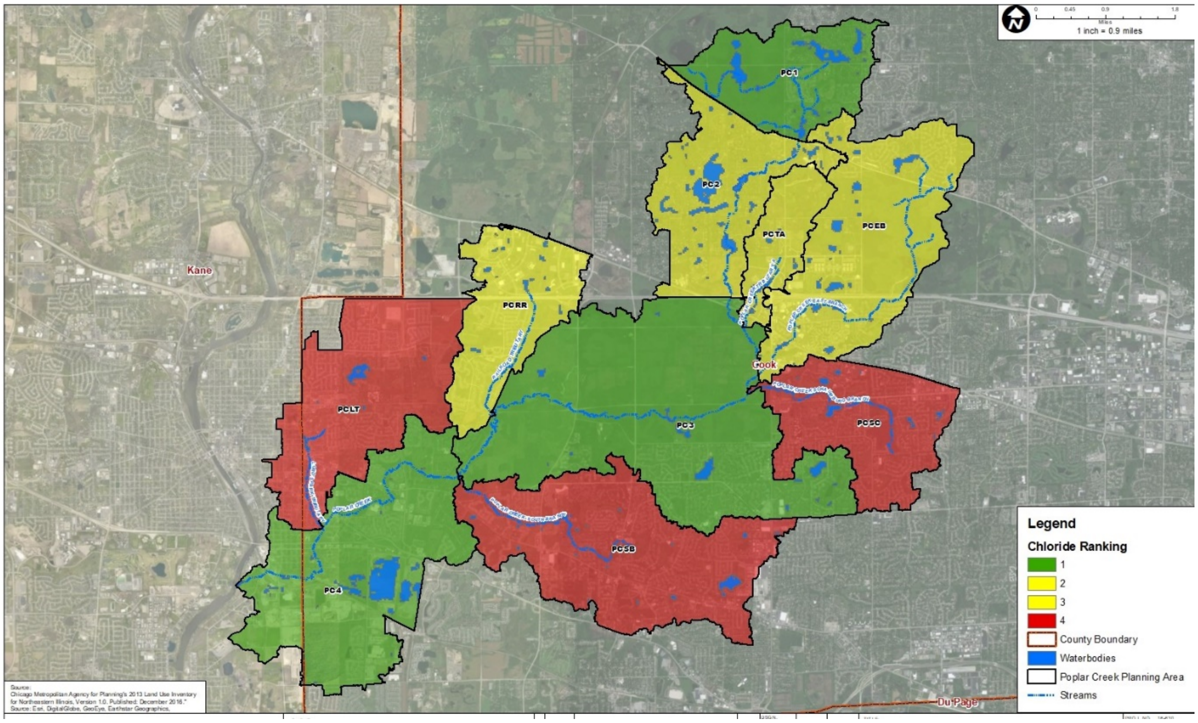

Figure 4.2-5 Chloride Load Ranking by Watershed Planning Unit

4.2.6 Stream, Shoreline, and Riparian Impairments

Most watercourses in the Poplar Creek planning area have been channelized to some extent except for those reaches through forest preserve property. Most of the tributary watercourses of the Poplar Creek including Lord's Park Tributary, North of Poplar Creek Mainstream, Poplar Creek East and South Branch, Poplar Creek Tributary A flow through developed areas and are highly channelized. Erosion through these watercourses is moderate to minimal as the watercourses have been channelized using various engineered methods to promote conveyance. Additionally, developed portions of the watershed have incorporated stormwater management practices that maintain riparian areas and habitat. In areas where the waterbody is not channelized (forest preserve) and has not been developed, streambank erosion contributes to sediment loads and degraded habitat. The deposition of excess sediment and organic matter has degraded streambed habitat.

Railroad Tributary and Poplar Creek Mainstream southwest of Poplar Creek flow through residential areas. While these watercourses exhibit moderate channelization, the upper portions through the residential areas are highly channelized with very limited riparian areas. Loadings to the Poplar Creek Tributary A, Railroad Tributary and lower portion of Poplar Creek are relatively greater as these areas receive runoff from residential and roadway ROW land uses. The loss of habitat and riparian areas due to land use change and sediment loading has degraded water quality and reduced aquatic biodiversity.

4.3 OVERALL WATERSHED ASSESSMENT

When compared to other recently approved watershed based plans of similar land uses (e.g., Long Run Creek and Buffalo Creek), nonpoint source loadings are relatively higher on average in the Poplar Creek planning area for key pollutants. The data summarized in Chapter 3 and sections above indicate there is impaired water quality in some reaches, caused by urban/suburban development which creates expanses of impervious area which greatly increases runoff volumes and pollutant loadings.

The Illinois EPA Integrated Water Quality Report indicates that the mainstem of the Poplar Creek is impaired (Table 3.17-1). The Illinois EPA lists Poplar Creek as impaired for total suspended solids (TSS), chloride, and fecal coliform bacteria. The Poplar Creek watershed does not fully support aquatic life and primary contact recreation uses.

Recreational uses are affected by bacteria in a water body, which can make the water unsafe for wading or swimming or kayaking. Sources of bacteria loadings can include point source discharges as well as urban runoff. The applicable water quality standard in Illinois for fecal coliform bacteria is a 200 cfu/100ml geometric mean based on a minimum of five samples taken over any 30 day period or a 400 cfu/100ml maximum not to be exceeded in more than 10% of samples taken during any 30 day period. Bacteria loadings can be contributed by point sources and nonpoint sources. In a moderately urbanized watershed such as Poplar Creek, stormwater can be a significant source of bacteria loadings.

That stormwater is a predominant source of pollutant loadings is confirmed in the 303d list where the Illinois EPA identified the causes for the identified impairments as: Urban runoff/stormwater sewers, highway/road/ bridge runoff (non-construction). The other tributary watercourse assessed by the Illinois EPA in the Poplar Creek planning area is East Branch Poplar Creek. However, there is no Assessment Available for the East Branch included in the Integrated Water Quality Report.

The water quality assessment reveals that water quality conditions in the Poplar Creek planning area can be attributed primarily to the amounts and characteristics of runoff from the watershed areas draining to the water bodies. As such, water quality in Poplar Creek reflects the upland land use practices and changes. As land use has changed and impervious areas increased, stormwater discharge volumes and pollutant loadings have increased, and overall water quality in the Poplar Creek has degraded. The data compiled and analyzed here suggests that urban/suburban development and increases in impervious area and the associated stormwater discharges are the primary sources of pollutant loadings in the Poplar Creek planning area. These data also point to a conclusion that stormwater BMPs and projects to restore and protect stream corridors and riparian areas are what is needed to restore and protect water quality.

4.4 ASSESSMENT OF PREDICTED FUTURE LAND USE CHANGE AND STORMWATER QUALITY

Understanding future development patterns and impacts and building in appropriate controls as development occurs is an important proactive strategy to address water quality issues as growth occurs within the planning area. The population forecast presented in Chapter 3 indicates that the population density is expected to increase from 5.6 people per acre to 6.4 people per acre. The Poplar Creek planning area outside of the forest preserve areas is 70% developed. It is anticipated that land use changes in the future will consist mainly development in the remaining vacant or open space areas (including agricultural areas but not including forest preserves), and modifications to already impervious areas to accommodate population increase.

A factor that will help maintain water quality and riparian habitat conditions as development or redevelopment occurs is the MWRD WMO. The WMO establishes requirements for stormwater detention and volume control (green infrastructure) for many development and redevelopment projects, as well as provisions to protect wetlands and floodplains. Many municipalities have similar stormwater ordinances. Thus, measures which will help reduce loadings and maintain riparian habitat will be built into the watershed, helping to reduce loadings even as growth occurs.

A primary conclusion from this plan is that existing priority areas for implementing BMPs to control stormwater will continue to be priority areas in the future. Measures can be planned and implemented in the priority areas with confidence that they will help improve and protect water quality now and in the future. LID and conservation design practices need to be incorporated into development in open space and agricultural areas as land uses change over time. The goals established for nonpoint source water quality improvements will remain useful and reasonable even reflecting future growth projections.

CHAPTER 5 WATERSHED PROTECTION MEASURES

As shown in the previous chapters, the Poplar Creek planning area is about 71% developed. Runoff from impervious area and land use change in the planning area is a major cause for degraded water quality in the waterbodies. Past stormwater management practices in the planning area have primarily focused on conventional stormwater management designed to convey and drain stormwater runoff from developed areas as efficiently as possible to prevent localized flooding. While much of development in portions of the planning area occurred prior to the adoption of conventional stormwater management, detention basins and flow reduction strategies have been implemented on developments since the early 1970s. However, insufficient focus has been given to water quality and existing stormwater management practices (e.g., flood-oriented detention basins) typically lack water quality components.

Green infrastructure is a stormwater management tool that can be used to reduce pollutant loads in runoff resulting from urbanization and land use change. Green infrastructure practices also reduce the volume of stormwater discharged to waterbodies by infiltrating into the ground or evaporating into the air.

According to the EPA, green infrastructure, or nature-based solutions, is a term that describes a number of best management practices designed to reduce and treat stormwater runoff at its source while delivering environmental, social and economic benefits. Green infrastructure is an approach to stormwater management that mimics the natural hydrologic cycle by allowing and promoting infiltration and creating habitat. Using engineered systems and methodology, green infrastructure can provide a beneficial connection between natural environmental processes and gray stormwater management (conventional piped drainage) practices.

The purpose of this chapter is to identify and describe nonpoint source best management practices suitable to reduce pollutant loadings in the Poplar Creek planning area. The target or goal of these implemented practices is to reduce pollutant loads. While achieving water quality goals is affected by many factors, the following measures including both policy and on-the-ground improvements, have been identified as the most significant for making progress toward watershed goals.

5.1 GREEN INFRASTRUCTURE AND NONPOINT SOURCE MANAGENMENT MEASURES

BMPs can be implemented to reduce or prevent pollution from entering waterbodies. These practices can be non-structural, such as a watershed program and policy change, or can be structural -- individual practices or combinations of structures used to physically detain, treat and/or prevent pollution from reaching the waterbody. Generally, a combination of practices is the most effective stormwater management program.

Structural BMPs are effective for the treatment of runoff from smaller storm events and for the initial volumes of runoff from large storm events. The initial stormwater runoff at the beginning of a rain event will be more polluted than the stormwater runoff later in the event. This is because the initial runoff washes off pavements and "cleanses" the catchment. The stormwater containing this high initial pollutant load is called the "first flush". To be effective and efficient, the placement and sizing of a BMP should be considered such that the design involves the capture of the first flush from frequent, small storm events. Intercepting the first 40% of runoff volume can remove 55% of TSS load, 53% of COD load, 58% of total nitrogen load, and 61% of total phosphorus load (Dongya et. al., 2015). Treating the first flush is most effective on small catchments or individual properties, particularly if a high proportion of the catchment is impervious (as is the case in many catchments in the Poplar Creek planning area). On an individual property or in a neighborhood, the first flush collection system can form an integral part of the stormwater pollution control system.

The following sections describe potential BMPs to reduce loadings from stormwater throughout the planning area. The Illinois Urban Manual is a resource for BMP planning. Table 2,1 in the Manual (AISWCD, 2009) provides a tool for applicable structural BMP selection. Also, BMP efficiency (performance) studies on BMPs can be found at the International Stormwater BMP Database[4].

5.1.1 Stormwater Infrastructure Retrofits

Older developments (generally pre-1970) in an urban/suburban setting were constructed prior to stormwater management requirements and before modern design criteria had been established. While current stormwater management regulations intend to limit increases in pollution associated with new development, they do not specifically address the hydrologic modification associated with runoff from existing development (Bitting, et. al., 2008). **Retrofits** include new installations or upgrades to existing BMPs in developed areas where there is a lack of adequate stormwater treatment. Stormwater retrofit goals may include the correction of prior design or performance deficiencies, flood mitigation, disconnecting impervious areas, improving recharge and infiltration performance, addressing pollutants of concern, demonstrating new technologies, and supporting stream restoration activities (EPA, 2011). Examples of a stormwater retrofit is to install rain gardens or bioswales to take runoff from streets or parking lots, or to convert driveway or parking areas to permeable pavements. In some situations, improvements can be made to catch-basins. Communities and land owners can also install filtration BMPs downstream of government maintenance, industrial and commercial facilities; new infrastructure and improvement projects; transportation runoff collection points; and other land uses potentially generating a heavy load of pollutants. Filtration BMPs may also be appropriate upstream of sensitive areas affected by stormwater releases. Retrofitting BMPs or other measures into areas with existing development can significantly reduce pollutant loadings from stormwater discharges.

5.1.2 Detention Basin Retrofits

Potential **detention basin retrofits** include repurposing an existing basin to act as extended detention, wet pond, or constructed wetland. These types of retrofits will provide for improved removal of pollutants while still allowing detention basins to provide flood control benefits. In many situations

[4] www.bmpdatabase.org

detention basins can be modified to provide greater water quality benefits at a fairly low cost. Extended detention utilizes an under-sized restrictor, which causes water to back up and be stored temporarily within the pond or wetland allowing particulate pollutants to settle out. Extended detention is often utilized with other treatment options such as wet ponds and constructed wetlands to improve performance and aesthetics. **Dry extended detention ponds** have efficiencies of 70% TSS removal, 20% total phosphorous removal, and 25% total nitrogen removal. Wet ponds promote pollutant removal through settling in a permanent pool of standing water, with a residence time that can range from days to several weeks. Wet ponds are an ideal retrofit based on their consistent and high pollutant removal. **Wet ponds** have removal efficiencies of 80% TSS, 50% total phosphorous, and 30% total nitrogen. **Constructed wetlands** are shallow depressions (typically less than one foot deep except at forebays and micropools) with long residence times that promote gravitational settling, biological uptake, and microbial activity. Constructed wetlands replicate a natural wetland ecosystem that enables consistent pollutant removal. Constructed wetlands have removal efficiencies of 70% TSS removal, 50% total phosphorous removal, and 25% total nitrogen removal (Center for Watershed Protection, 2007).

5.1.3 Building Rooftop Retrofits

Rooftop retrofits to a building consisting of either a green or blue roof, which detain stormwater runoff and reduce the peak rate of discharge, resulting in less runoff compared to a conventional rooftop. A **green roof** is comprised of a layer of vegetation and soil on top of a rooftop that stores and treats rooftop runoff. Green roofs can be either extensive or intensive systems, by being either a thin layer of soil and cover of grass or moss, or a thick layer of soil which contains vegetation such as trees, shrubs, or plants, respectively (Center for Watershed Protection, 2007). Green roofs provide runoff reduction but typically don't provide active removal of suspended solids, and may increase loadings of total phosphorous and total nitrogen (Massachusetts Stormwater Handbook, 2008).

5.1.4 Rainwater Cistern

A **rainwater cistern** is a container for temporarily holding water. They are typically used for rainwater catchment and storing rainwater that has run off a building roof. Different models of rainwater cisterns offer an assortment of different features. Some are equipped with pumps and filters. Each of these variations serve a specific purpose in harvesting and re-using rainwater. Rainwater cisterns provide a unique way to capture runoff from the first flush from a storm event and allow particulates to settle.

5.1.5 Bioretention Basins and Swales

Bioretention basins and swales consist of landscaping features adapted to increase infiltration and provide on-site removal of pollutants from stormwater runoff. Surface runoff is directed into shallow, landscape depressions, which are designed to incorporate many of the pollutant removal mechanisms that operate in forested or other natural (prairies, wetlands, etc.) ecosystems. Bioretention elements include rain gardens, sidewalk planters, curb extensions and other plant or soil systems designed to infiltrate and/or evapotranspirate stormwater (EPA, 2010). The removal efficiency for a bioretention basin is approximately 75% TSS removal and 16% total nitrogen removal. The total phosphorous removal efficiency is typically less significant (International Stormwater BMP Database, 2017). The reason for this is bioretention practices can commonly capture particulate phosphorus by settling or filtration, but leave dissolved phosphorus (typically phosphates) untreated. This untreated phosphorus accounts on average for 45%of total phosphorus in stormwater runoff and can be up to 95%of the total phosphorus, depending on the storm event (Erickson et al., 2012). Dissolved phosphorus is bioavailable and represents a significant concern for surface water quality.

Soil components and amendments that have been shown to be effective in increasing chemical sorption of dissolved phosphorus. Media that can be used to enhance the removal of dissolved phosphorus by green infrastructure practices include iron filings (Erickson et al., 2012) and steel wool (Erickson et al., 2007).

It should be noted that bioretention practices will usually infiltrate more rainwater more quickly in areas with A or B soils, as compared to C or D soils. If a bioretention practice will not hold/infiltrate all the water that will flow into it during a rain event, the practice can be designed with an underdrain. The underdrain will release excess water to the storm sewer system and thus prevent the practice from overtopping. Bioretention practices provide volume control and pollutant reduction benefits even if there is an underdrain, as some water is held in the soil, some is released back in the air through evapotranspiration, and some pollutants are filtered out as the rainfall runoff drains through the soil.

5.1.6 Vegetated Swales

A **vegetated swale** consists of an earthen channel vegetated with either native plants or conventional turf grasses. The vegetation slows down the movement of the water, which promotes the filtering of pollutants and sediments. Stormwater volumes are reduced through the process of infiltration during the conveyance of runoff. Native plantings provide the potential for greater pollutant removal vs. turf grasses as they are taller and provide more retardance, thus slowing down the runoff through the channel and trapping more pollutants. Side slopes no greater than 3:1 are recommended, with side slopes of 4:1 or less being ideal. The removal efficiency for a vegetated swale is approximately 83% TSS removal, 29% total phosphorous removal, and 25% total nitrogen removal (DuPage County, 2008).

5.1.7 Vegetated Filter Strips

A **vegetated filter strip** is a vegetated section flat land or low slope that treats runoff from impervious areas as sheet flow across the strip. Pollutants are reduced through vegetative filtering while encouraging runoff to infiltrate the underlying soil. Filter strips used as a BMP can act as a landscaping feature or buffer between buildings and other developments. The removal efficiency for a vegetated filter strip is depended on length and removal rates increase as length is increased. The removal efficiency for vegetated filter strips 20 feet long is approximately 50% TSS removal, 25% total phosphorous removal, and 25% total nitrogen removal (DuPage County, 2008).

5.1.8 Permeable Pavement

Permeable pavement consists of permeable pavement material or pavement block designs which allows distributed infiltration of rainfall runoff into the underlying soil. There may typically be an underlying stone reservoir that temporarily stores the surface runoff before it infiltrates into the underlying soil. Examples include porous asphalt, permeable concrete, permeable block pavers (EPA, 2010). Permeable pavements have removal efficiencies of approximately 72% TSS removal, and 42% total phosphorous removal. Limited data is available on expected total nitrogen removal (International Stormwater BMP Database, 2017). Besides filtering pollutants, permeable pavements can significantly reduce the volume of runoff discharged to waterbodies. This helps reduce the erosive effects of stormwater. Permeable pavements can be an important component of measures to restore and protect water quality as land areas can be used as they were before -- driveways, parking lots, etc. The paved surfaces are still used, they are just converted from impervious to pervious. Some studies have shown permeable pavements require somewhat less de-icing as compared to conventional pavements, and thus this practice may provide benefits related to reducing chloride loadings.

5.1.9 Manufactured BMP Structures

Many **manufactured BMPs** and control devices exist on the market ranging from oil and grit (debris) separators to sand or biomass filters. They are capable of trapping debris, oil, grease, sediment, and other floatables that would otherwise be discharged to water resources (DuPage County, 2008). Manufactured BMPs are typically installed at outfall locations or at key junctures within a storm sewer network. Sizing and flow-through requirements are site-specific and typically dictated by the manufacturer specifications. Likewise, removal rates are specified by the manufacturer depending on site-specific applications. Typically, removal rates are 80% for TSS, 80% for free floatable hydrocarbons (DuPage County, 2008). Maintenance of manufactured devices is critical to ensure continued effective performance.

Manufactured control devices may be considered as point source controls, particularly if they are installed at outfall locations, and thus may not be eligible for Section 319 grant funding. However, installation of such devices by a municipality may be eligible for low interest loan financing from the State Revolving Fund (SRF).

5.1.10 Stream or Channel Restoration

Stream or channel restoration consists of returning a degraded corridor and aquatic ecosystem to a stable and healthy condition. This BMP involves both channel restoration and bank stabilization. Channel restoration involves constructed structures to address channel erosion and fish migration depending on the stream flow characteristics. Examples include rock vanes, w-weirs, current deflectors, mid-channel deflectors, channel constrictors, cross-channel logs and revetments. It should be noted that before any channel modifications to address erosion or deposition are implemented, upland watershed problems and processes (e.g., land use change sub-division development) must first be assessed. Correcting upstream problems should be the priority before channel modifications are implemented; otherwise the benefits of the restoration will be short-lived (NOAA Restoration Center).

Streambank stabilization involves using native deep rooted vegetation, tree stumps and logs; synthetic geo-fabrics/textiles such as coir fiber logs and mats; stone and other materials to minimize erosion potential on regraded banks. A wide variety of geo-fabrics and textiles can be used by providing a temporary organic material cover material until a natural vegetation cover is established (NOAA Restoration Center).

In the Poplar Creek watershed, where land is available and the project area is suitable, it may be possible to convert armored streambanks to naturalized streambanks with flatter slopes and vegetation. This would help slow down flows, thus reducing erosion potential, and help trap pollutants. Stream daylighting can similarly be beneficial where tributary sections are currently piped. However, dense development patterns (as development moves forward in the future) could preclude these types of stream restoration projects. Planning for protection of riparian areas to allow for naturalized streambanks will be valuable as areas currently in open space or agricultural uses are developed.

Stream or channel restoration projects employ the Natural Channel Design Methodology as well as other methodologies that result in the creation of a stable dimension, pattern, and profile for a stream type and channel morphology appropriate to its landform and valley. The channel is designed such that over time, is self-maintaining, meaning its ability to transport the flow and sediment of its watershed without aggrading or degrading. These design methods promote the use of instream structures, bio-engineering, functional riparian corridors and floodplain connectivity (U.S. Fish & Wildlife Service, 2013)

5.1.11 Riparian Corridor and Riparian Buffer Strip Restoration

Riparian corridor restoration can often be the most cost-effective means for restoring water quality in streams impacted by nonpoint source pollution (U.S. EPA, 1996), and should always be considered when evaluating restoration options. A critical step for any riparian restoration is the establishment of a riparian reserve or buffer strip (Kauffman et al. 1997).

A **riparian buffer strip** is a linear band of permanent vegetation adjacent to an aquatic ecosystem intended to maintain or improve water quality by trapping and removing various nonpoint source pollutants (e.g., contaminants from herbicides and pesticides; nutrients from fertilizers; and sediment from upland soils) from both overland and shallow subsurface flow. **Buffer strips** occur in a variety of forms, including herbaceous or grassy buffers, grassed waterways, or forested riparian buffer strips (Fischer and Fischenich, 2000). A **riparian corridor** is a strip of vegetation that connects two or more larger patches of vegetation or habitat through which an organism will likely move over time. These landscape features are often referred to as conservation corridors, wildlife corridors, and dispersal corridors. Some scientists have suggested that corridors are a critical tool for reconnecting fragmented habitat (Fischer and Fischenich, 2000). Methods for restoring fragmented riparian corridors may include buy-outs of properties adjacent to watercourses where land use is unproductive. These buy-outs may also include properties that are inundated by flooding during frequent smaller storm events.

When used in concert with bank stabilization projects, the **riparian buffer strip and corridor restoration** will consist of re-grading streambanks to a stable slope, placing topsoil and other materials needed for sustaining plant growth, and selecting, installing and establishing appropriate vegetative species.

5.1.12 Two-Stage Ditch

To restore and protect habitat and water quality, opportunities for re-meandering and reconnecting the stream with its floodplain should be pursued wherever possible. Riverine floodplains are dynamic systems that play an important role in the function and ecology of rivers. Floodplains are inundated periodically where the intermittent interaction between base flow in a rivers channel combines with the riparian or terrestrial overbank areas where some of the most fertile and bio-diverse conditions exist. Floodplains also disperse high flow energy while mitigating erosive potential and allow sediment deposition.

In the Poplar Creek watershed, many floodplains and riparian corridors have been developed and compromised to accommodate urban/suburban land uses. In these situations, land use and site constraints prohibit the reconnection of floodplains due to challenges that largely include land ownership. A viable option in some such situations may be a two-stage channel. Two-stage ditches mimic natural floodplains and offer a unique solution to floodplain and riparian corridor reconnection by creating a channel and floodplain/riparian interaction within a smaller footprint. A two-stage ditch design incorporates benches on either side of the main channel by removing the ditch banks roughly 2-3 feet above the channel invert for a width of about 10 feet on each side. The laid-back banks at an elevation 2-3 feet above the channel invert allows the water to expand while decreasing velocity (energy). The benched areas become vital habitat allowing sedimentation and nutrient load reduction from the mainstem channel while improving ditch stability and reducing erosion.

5.1.13 Forebay Retrofits - Treatment at Existing Storm Sewer Outfalls and Hydraulic Structure Retrofits

A forebay is a pool or settling basin constructed at the incoming point of a BMP. The purpose of a forebay is to provide retention for a portion of the first flush stormwater runoff and allow sediment to settle out from the incoming stormwater before it reaches the larger BMP. The forebay traps pollutants and litter, and protects the practice from being clogged. Forebays facilitate maintenance as they are easier and less expensive to clean out as compared to repairing or replacing the full BMP.

While typically used as a component of a larger BMP (for example, bioretention areas, wetland bottom and wet bottom detention basins), forebay retrofits at existing storm sewer outfalls allow treatment of the first flush from existing storm sewer networks outletting to a watercourse. Storm sewer outfalls are typically constructed to discharge at a watercourse often bypassing the infiltration benefits of a riparian corridor or buffer strip. The introduction of a forebay with the existing outfall "set back" from the watercourse mainstem will promote infiltration and allow some materials/litter to be removed before being released to the water body. Storm sewer outfalls at receiving waters are often in easements, further enhancing the forebay potential at an existing outfall.

5.1.14 Floating Wetlands

Floating wetlands are man-made islands that float in the water and are planted with wetland vegetation. The vegetation roots grow into the water and are used to filter the water by providing water-cleansing microorganisms. The islands typically take several years to establish. As the plant roots grow beneath the island, they absorb excess nutrients from fertilizer runoff, animal waste and other sources. Thus an important benefit of the floating wetlands is that they reduce nitrogen, phosphorus, TSS, pathogens and heavy metals. They also improve dissolved oxygen by reducing biological oxygen demand from organic muck build up. Floating wetlands may also provide habitat benefits for certain species.

The islands are typically located at the inlet of a pond so that runoff entering a basin passes by the floating wetlands. To keep them at a desired location, they are usually anchored with weights that allow the island to rise and fall with the change in elevation. Floating wetlands are not limited to a specific shape or area.

5.1.15 Forestation and Reforestation

Reforestation contributes to watershed protection. Tree canopies intercept rainwater and reduce the amount of runoff that needs to be managed. The root systems of trees also help absorb rainwater and trees provide other benefits such as helping to reduce urban heat island effects, soil productivity, better wildlife habitat, and recreation opportunities. Reforestation can occur on forested lands that have been disturbed, damaged, or destroyed, planned or unplanned. Reforestation is beneficial through a faster development of forest structure and series composition. Watersheds benefit from reforestation through their consumption of stormwater and nutrient removal. Plants can remove nutrients and contaminants from the soil and water, which can then be used for growth in reforestation.

Dependent on the situation, reforestation is done through either relying on natural regeneration or tree planting. When a seed source is lost, tree planting is needed to restore trees to the site. When reforestation is due to planned timber harvest activities, reforestation is typically paid for by receipts from timber sale purchases and reforestation partners funding the needs.

Forestation may also be an option on lands that in recent times were not forested, for example at a municipal park or on vacant parcels. Trees can also provide significant value in parkways or street right-of-ways.

5.1.16 Debris Jams

Most streams transport some amount of debris such as tree limbs, brush, and leaves. Because debris transport is a naturally occurring stream process, some debris can provide habitat and contribute to a diverse instream environment. However, too much debris can be problematic and may result in large debris jams, causing backwater flooding and sediment deposition. Debris jams can also cause erosion of the stream banks that can lead to damage of riparian lands and property.

MWRD operates a Small Streams Maintenance Program (SSMP) to allow for fish passage and other water quality-related benefits, and to help prevent costly flood damage. The program is implemented throughout Cook County. Dedicated crews provide a valuable service by removing debris from creeks, streams, and waterways. Project sites are determined based on reports from local municipalities and residents or from MWRD routine inspections. Besides removing existing blockages, MWRD crews and engineers also work to identify and fix potential problems before they become serious. Dead and dying trees, which can eventually fall into streams and cause blockages, are removed from the banks. Harmful invasive plant species are also removed. Buckthorn is particularly harmful and thrives in our climate; it chokes out native plants and has weak root systems, leaving the ground vulnerable to erosion. The success of the SSMP depends on cooperation and coordination among all communities to efficiently and respectfully manage the waterways, and on reports from local stakeholders on debris jams[5].

5.1.17 Chloride Reduction Strategies

Studies show that chlorides in urban streams have increased substantially over the last 50 years, especially in northern metropolitan areas like Chicago. While some structural BMPs can reduce chloride loadings to receiving waters (e.g. permeable pavement), significant chloride reduction needs to come from chloride reduction (pollution prevention) measures. This can be achieved through the adoption of standards and improved practices for winter salt use to help reduce the increasing trend in background salt levels.

In 2015, the Illinois Pollution Control Board adopted a new water quality standard for chloride in the Chicago Area Waterway System (CAWS) which includes Poplar Creek and its tributaries. Nonpoint source and point source controls will be needed to reduce chloride levels in the CAWS and ensure that the new standards are met. MWRD has convened and is coordinating a stakeholder group to address chloride concerns. The CAWS Chloride Initiative Workgroup is developing a technical report, which will address best management practices to reduce salt usage and also the social, environmental, and economic impacts of salt use reduction. The CAWS Chloride Initiative Workgroup is assessing current water conditions, documenting current road deicing activities, identifying opportunities to reduce road salt runoff while maintaining public safety, and developing pollutant minimization strategies. The report will be released in 2018. It is expected that the report will recommend best practices which can be implemented by municipalities and other stakeholders.

This watershed-based plan recommends *a low-salt diet* when it comes to de-icing pavements in the winter. Following are generally accepted best practices for reducing chloride loadings:

- Plow, shovel, and blow accumulated snow. Do not use salt or other de-icing chemicals to "burn-off" snow.
- Calibrate de-icing equipment. Knowing equipment is calibrated and the application rate is accurate will save chemical costs and will reduce environmental impacts. Calibrate annually and keep a record in the vehicle for spreader settings.

[5]Stakeholders can notify MWRD of debris jams at this website: https://gispub.mwrd.org/ssmp/main.html

- Choose the right material and apply the correct amount. Know the limits of deicing chemicals. For example, rock salt is not effective at temperatures below 15°F no matter how much is applied. Check application rates given the current weather conditions.
- Use ground speed controls on spreaders. Application rates should correspond with vehicles speed.
- Pre-wet the salt. Adding brine to salt before it is applied will jump start the melting process and help keep the salt in place by reducing bounce and scatter. Pre-wetting salt can reduce application rates by 20 percent.
- Use anti-icing. Be proactive by applying de-icing chemical prior to snow and ice accumulation. It can reduce the amount of chemical needed by 30 percent.
- Don't mix salt and sand. Salt is for melting and sand is for traction on top of the ice, they work against each other.
- Consider possible alternative to salt. For example beet juice is a de-icer.
- Be familiar with sensitive areas (such as wetlands or a small lake) to which stormwater may drain. Consider designating reduced salt areas or identifying safe alternatives to road salt in these areas.
- Proper storage and handling of road salt limits loss of salt to the environment and provides cost savings. The Salt Institute has published a Salt Storage Handbook (Salt Institute, 2006) with recommended practices and design criteria for storage facilities. The Illinois Department of Transportation already has standard designs which can be adopted by municipalities. Existing facilities should be evaluated for improvement and bulk handling practices reviewed.
- Department of Public Works supervisors and staff should attend training workshops and stay up to date with new technologies and practices.
- Educating the public is often a first step in any water quality improvement campaign. Increased awareness about the application of road salt and the effects of excessive loading to waterbodies can increase community support for chloride use reduction. Information about what homeowners and businesses can do to limit chloride salt application in addition to municipal leadership should be included.

A valuable source of information is the Chloride Usage Education and Reduction Program Study prepared by the DuPage River Salt Creek Workgroup, posted at http://www.drscw.org/.

This watershed-based plan recommends these generally accepted practices, and other good ideas that may be recommended in the CAWS Chloride Initiative Workgroup report. The ultimate goal is to improve deicing practices so that less salt is used (and that the salt which is applied is used most effectively) with the result that chloride loadings to the watershed are reduced.

5.1.18 Tree Boxes

Tree boxes can be constructed at the base of trees in or adjacent to sidewalks, streets, or parking lots. Tree boxes mimic miniature bioretention areas installed beneath trees and can be very effective at treating runoff. Runoff is directed to the tree box, where vegetation and soil media have an opportunity to filter the runoff before it can enter a catch basin. The runoff collected by the tree box helps irrigate the tree while slowing and filtering runoff. Tree box filters are based on bioretention processes with improvements that enhance constituent removal, increased performance, ease of construction and improved aesthetics (http://lowimpactdevelopment.org/).

As noted above, planning for tree planting along roadways, along sidewalks, and in plazas can provide significant stormwater benefits. Tree canopies intercept rainwater and reduce the amount of runoff that needs to be managed. The root systems of trees also help absorb rainwater. Tree boxes can help enhance the survivability of street trees, which often struggle to have enough water and oxygen due to constraints on the growth of root systems.

5.1.19 MS4 Compliance

As previously discussed in Chapter 3, many units of government within the Poplar Creek planning area are operators of small municipal separate storm sewer systems (MS4s). MS4s collect urban stormwater runoff, and discharge stormwater to local water bodies and, consequently are regulated under the State MS4 permitting program.

In Illinois, discharges from small MS4s are covered under Illinois EPA's General NPDES Permit No. ILR40. This permit requires that MS4 operators develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants through the municipality's sewer system. The permittee's stormwater management program must include six minimum control measures:

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

Effective local MS4 programs are an important component of the overall strategy for improving water quality in the Poplar Creek watershed. For example, the non-structural BMPs that will be carried out by MS4 communities, such as street sweeping and good housekeeping for municipal operations, will reduce loadings of pollutants and complement the structural BMPs described above, such as rain gardens and bioswales and permeable pavement.

Many of the structural BMPs reduce pollutant loadings through methods such as sediment trapping and runoff reduction. Generally speaking, these BMPs do not target bacteria reduction. As noted in Chapter 3, bacteria is included on the 303d list as a stressor. Stormwater can be a source of bacteria loadings. Two examples how bacteria can get into stormwater are: (1) Pet waste is not picked up, and fecal matter is washed off urban surfaces by stormwater; and (2) There can be cross-connections between sanitary and storm sewers, allowing sewage to be mixed the stormwater.

Effective implementation of the MS4 six minimum measures is a primary way of reducing bacteria loadings from stormwater. For example, minimum measure 3. is intended to find and eliminate inappropriate connections to the storm sewer system, including cross connections with the sanitary sewers. This program element can also help address other stressors, including visible oil. Street sweeping helps reduce loadings of bacteria as well as sediment and other pollutants, including removing organic material (which is used by bacteria as food). Public education programs can highlight the need for residents to pick up pet wastes as a way to help protect the watershed. Compliance with municipalities' MS4 permit requirements is a critical aspect of efforts to reduce and prevent loadings of bacteria and other pollutants affecting the Poplar Creek watershed.

5.1.20 Street Sweeping

Street sweeping is typically an important component of a community's MS4 program. Street sweeping has been a common practice for many years for aesthetic purposes and has been shown to be effective at removing large items like litter, leaves and twigs, and road debris. Sweeper technology has advanced from mechanical broom cleaners to regenerative air vacuum sweepers to high efficiency vacuum-assisted dry sweepers. This most recent technology has the capability of picking up a very high percentage of the finest sediment particles (where most water quality pollutants are attached) in dry, wet, or even frozen conditions. A well-designed street sweeping program using high efficiency street sweepers is a cost effective method to reduce water quality pollutants from urban runoff. Communities should schedule sweeping taking into account the timing/frequency appropriate to specific areas. Sweep frequency can be adjusted by municipal area (central business district, arterials, commercial/industrial, etc.) and if possible, timing should be prior to storm events. On-street parking requirements should be set up to facilitate effective use of sweepers and in turn provide for increased pollutant removal.

High efficiency sweepers have been found to be extremely effective in removing fine sediments and preventing escape to the air with efficiencies ranging from 70% for particles less than 63 µm to 96% for particles larger than 6370 µm (Sutherland and Jelen, 1997; RWMWD, 2005). Street sweeping is a cost-effective practice because the long-term removal costs per pound of materials when compared to other methods is low. It can also reduce pollutant loadings to other structural BMPs which will reduce maintenance costs and improve effectiveness to those structures.

5.1.21 Ordinance Authorities

Municipalities have authority under State law to adopt and enforce ordinances to meet community goals and needs. MS4 communities can use their authorities to adopt ordinances aimed at reducing key sources of pollutant loadings. Examples are to adopt ordinance provisions:

- Restricting the use of phosphorus based fertilizers for turf areas.
- Restricting the use of coal tar-based sealants on parking lots and driveways.
- Establishing tree preservation standards to preserve tree quantity and quality
- Allowing for turf grass areas and open space to be planted with native vegetation (some landscaping ordinances directly or indirectly restrict the use of native plants).

A useful source of information on model development requirements and a sample code and ordinance review worksheet can be found in Better Site Design: A Handbook for Changing Development Rules in Your Community (Center for Watershed Protection, 1998). US EPA has also developed a “Water Quality Scorecard” that can be used to evaluate local codes and ordinance to identify requirements that can improve stormwater management.

5.1.22 Selecting and Implementing BMPs

This section of the watershed-based plan identifies recommended BMPs to address the different land covers and sources of pollution from runoff within the watershed. It should be noted that the plan identifies *types* of BMPs that would effectively address the sources of loadings. For example, bioretention basins and swales can be located and designed to capture runoff from parking lots and other impervious surfaces to reduce stormwater discharge volumes and pollutant loads. However, this plan does not list or *prescribe* specific BMPs to be implemented in specific places. The sizes and designs of BMPs and the optimal places for BMPs will need to be determined by communities and other stakeholders taking into account where benefits will be the greatest as well as numerous other factors including land ownership, budgets, community buy-in, and how maintenance will be assured. Also, new concepts or designs for BMPs may be developed during the plan implementation period. The plan intends there be flexibility to incorporate new BMP concepts if they cost-effectively reduce pollutant loadings from urban runoff and stormwater discharges.

CHAPTER 6 PLAN IMPLEMENTATION

Various water quality projects and BMP scenarios were reviewed and plan elements are identified per watershed planning unit, based on a review of the information collected in the watershed assessment as well as the potential pool of BMPs. BMP selection was based largely on site-specific land use, soil infiltration capacity, constructability and available space or site constraints. The following sections outline how the potential BMPs will be applied as a function of land use, where BMPs should be implemented, cost of implementation and overall reductions that will be achieved as a result of implementation.

6.1 BMP SYNTHETIC SCENARIO SELECTION

The following is an example of how BMP choices simulated in STEPL can be applied to the Poplar Creek planning area. BMP combinations are set out for the different land uses in the watershed. These BMP scenarios were developed based on: 1) land use; 2) BMP effectiveness; 3) infiltration capacities; and 4) quantifying load reductions using STEPL. A sensitivity analysis was completed to determine how a particular BMP selected from STEPL's suite of BMP choices performs and to determine which BMP is appropriate for a particular land use type. It should be noted that these BMP scenarios have not been optimized and could vary based on site constraints. While the implementation of load reductions does not need to be limited to the scenarios set out below, these BMP combinations are suitable for these land uses. BMP implementation levels and associated loading reductions have been quantified and used in establishing reduction goals.

6.1.1 Residential Land Use (BMP Scenario)

1. Rain gardens or *bioretention* area at a rate of 0.06 acre/acre (50 feet x 50 feet per acre) of residential area.
2. Detention pond retrofits:
    a. Conversion of dry bottom ponds to a naturalized bottom for area of pond to create *extended wet detention*.
        i. Addition of forebays or *settling basins* at a rate of 0.03 acre / acre of pond (25 feet x 50 feet per acre of pond) x 2.
    b. Enhancement of wet bottom ponds for area of pond to create *extended wet detention*.
        i. Addition of forebays or *settling basins* at a rate of 0.03 acre / acre of pond (25 feet x 50 feet per acre of pond) x 2.
    c. Enhancement of wetland ponds to create *wetland detention* for the area of pond. Invasion species maintenance and management, increase bio-diversity.

6.1.2 Industrial / Commercial / Institutional Land Use (BMP Scenario)

1. Planter boxes or *bioretention* as landscaped median and parking islands 5 feet wide x 3 feet long; 1 per 200 feet of 3 sides of site perimeter. Assumed to be applied to 50% of total area.

2. *Infiltration trench* as 5 feet wide along 3 sides of perimeter of site to be applied downstream of planter boxes.
3. *Oil and grit separators* or mechanical BMPs to be applied 1 per 10 acre.
4. Detention pond retrofits:
    a. Conversion of dry bottom ponds to a naturalized bottom for area of pond to create *extended wet detention*.
        i. Addition of forebays or *settling basins* at a rate of 0.03 acre / acre of pond (25 feet x 50 feet per acre of pond) x 2.
    b. Enhancement of wet bottom ponds for area of pond to create *extended wet detention*.
        i. Addition of forebays or *settling basins* at a rate of 0.03 acre / acre of pond (25 feet x 50 feet per acre of pond) x 2.
    c. Enhancement of wetland ponds to create *wetland detention* for the area of pond.
5. *Bioretention* as green roofs assuming 15% of rooftop for all buildings.
6. *Rain harvesting* as cistern to collect the first inch of rainfall across the rooftops of all buildings.
7. *Porous pavement* to be applied to 10% of impervious areas.

6.1.3 Roadway ROWs and Transportation Hubs (BMP Scenario)

1. *Porous pavement* to be applied to 10% of impervious areas.
2. *Bioretention* as bioswales to be applied assuming the bioswale is 5 feet wide and the length of the roadways applied at a rate of 50% of the total area.
3. *Weekly street sweeping* total area of roadways only.
4. *Water quality inlets* = 1 per 500 feet of roadway based on perimeter of roadway.

6.1.4 Open spaces and Forest Areas (BMP Scenario)

1. *Vegetated filter strips* around perimeter of property at 5 feet wide.
2. *Water quality inlets* = 1 per 500 feet of roadway based on perimeter of roadway.
3. *Porous Pavement to be applied to parking lots associated with forest preserves (10% of impervious areas).*

6.1.5 Urban Cultivated and Vacant Land Use (BMP Scenario)

1. *Agricultural filter strips* around perimeter of property at 5 feet wide.

6.1.6 Various Land Use – applied throughout where opportunities exist (BMP Scenario)

1. Rain gardens or *bioretention* area at a rate of 0.06 acre/acre (50 feet x 50 feet per acre) of residential area.
2. Detention pond retrofits:
    a. Conversion of dry bottom ponds to a naturalized bottom for area of pond to create *extended wet detention*.
        i. Addition of forebays or *settling basins* at a rate of 0.03 acre / acre of pond (25 feet x 50 feet per acre of pond) x 2.

b. Enhancement of wet bottom ponds for area of pond to create *extended wet detention*.
    i. Addition of forebays or *settling basins* at a rate of 0.03 acre / acre of pond (25 feet x 50 feet per acre of pond) x 2.
c. Enhancement of wetland ponds to create *wetland detention* for the area of pond. Invasion species maintenance and management.

6.1.7 Streambank and Riparian Corridor Restoration (BMP Scenario)

1. Watercourse specific *streambank restoration/stabilization* and enhancements including but not limited to channel regrading/re-meandering (pools, riffles, vanes), sediment removal, 2-stage ditches, bank regrading, slope stabilization (naturalized armoring, root wads, vegetated mechanically stabilized earth bank) and bio-engineering.
    a. Applications based on watercourse assessment and should not be limited to only areas identified in this plan as there are areas in the planning area that are unassessed.
2. Riparian area restoration and stream corridor or habitat restoration. Replacement of rip-rap, concrete and turf grass banks and adjacent areas with deep-rooted native vegetation.
    a. Applications based on watercourse assessment and should not be limited to only areas identified in this plan as there are areas in the planning area that are unassessed.

The BMP scenarios or templates presented above are among many combinations that could be implemented. However, the scenarios presented are well-suited for the land cover and land use in the Poplar Creek watershed, and represent an ambitious but practicable level of implementation. STEPL can and has been used to quantify the loading reductions that would be achieved with these particular combinations of BMPs. The italicized and underlined BMPs in the sections above represent the corresponding identifier in STEPL.

It is anticipated that as implementation proceeds there will be variations to the BMP combinations presented above in the watershed planning units. As summarized above, this watershed-based plan does not list or *prescribe* specific BMPs to be implemented in specific places. The sizes and designs of BMPs and the optimal places for BMPs will need to be determined by communities and other stakeholders considering where benefits will be the greatest as well as other factors including land ownership, budgets, community buy-in, and how maintenance will be assured. In some watershed planning units, certain BMP types may prove to be relatively more (or less) implementable, considering these factors. Thus, actual BMP combinations within a watershed planning unit can and likely will vary from these templates. The pollutant load reduction goals for the watershed planning units can remain steady, while there can be flexibility in selecting and siting the BMPs to meet the reduction goals.

The template scenarios presented above are representative of a typical and appropriate combination of BMPs within a watershed planning unit and are used within this plan to develop cost-estimates and quantify loading reductions that can be achieved.

6.2 BMP COST ESTIMATING

The following cost estimates for BMPs to be applied in the Poplar Creek planning area have been generated from a combination of project specific experience from both design and construction phases as well as a succinct review of previous watershed based plans. The cost estimates presented reflect an expected economy of scale for potential BMP projects and should be validated for site-specific projects based on actual site constraints as cost estimates may range significantly. Where costs are shown on a per acre basis, the costs reflect implementing a number of de-centralized practices that cumulatively amount to one acre green infrastructure area. This amount of retrofitting would have the capacity to manage runoff from a significantly larger acreage. Cost estimates have not been provided for policy change or education and outreach programs as these practices, while important, are not readily quantifiable.

Best Management Practice	Unit	Unit Cost
Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft^2	Ac	$177,700
Bioretention as Green Roof (assuming structurally sound) @ ~ $30/ft^2	Ac	$1,346,200
Bioretention as Bioswale @ ~ $15/ft^2	Ac	$653,400
Extended Wet Detention (Detention Basin Retrofit - native planting in dry bottom pond)	Ac	$12,900
Extended Wet Detention (Detention Basin Retrofit - wet bottom pond restoration and bank enhancement)	Ac	$8,200
Cistern (Assuming a 10,000 gal Tank per 0.37 acers of tributary area)	Ac	$12,800
Settling Basins (To be included in all detention basin retrofits 4 ft deep) @ ~445 CY / AC @ $30 / CY)	Ac	$13,900
Porous Pavement @ ~ $8/ft^2	Ac	$359,000
Vegetated Filter Strips @ ~ $3/ft^2	Ac	$134,900
Infiltration Trench @ ~ $6/ft^2	Ac	$269,300
Mechanical BMPs (assuming 1 per 10 acres of tributary area)	Ea	$10,300
Weekly Street Sweeping	Ac	$1,000
Water Quality Inlets (does not include maintenance)	Ea	$400
Wetland Restoration	Ac	$15,500
Streambank Stabilization	LF	$134
BMPs not assessed using STEPL		
Streambank Enhancement – Replacement of hardscape with native	LF	$103
Riparian Corridor Enhancement – Habitat Enhancement and Creation	Ac	$9,300
Hydraulic Outfall Structure Retrofits with Forebay Retrofits	Ea	$77,300
Floating Wetlands (quantified as unit(s) per acre of open water)	Ac	$10,300

6.3 POPLAR CREEK WATERSHED PRIORITY IMPLEMENTATION AREAS

A ranking system was used to determine which watershed planning units are severely impaired and are critical to BMP implementation to provide a watershed planning unit and overall watershed benefit. Each pollutant load, as described in Chapter 4, was given a score from 1-4, with 1 being the least polluted to 4 being severely polluted, within each watershed planning unit. In addition, the riparian area of each watershed planning unit was given a score of 0 to 3, with 0 being not applicable (i.e., creek is enclosed in a pipe) to 3 with the riparian being in poor condition. The pollutant and riparian scores were then added to determine an overall score. The prioritization of each watershed planning unit was determined based on the overall score, with the most severely impaired watershed planning units having the highest score. Table 6.3-1 is a summary of the ranking system for each watershed planning unit. Priority was given to the watershed planning units in the top 20% of the overall scoring.

SUB	N Load (lb/ac)		P Load (lb/ac)		BOD Load (lb/ac)		Sed Load (t/ac)		Chloride Load (t/ac)		Channel	Riparian	Erosion	RIP Score	Priority Score
PCRR	10.8	4	2.4	4	34.6	4	2.21	4	0.18	3	MOD	POOR	HIGH	3	22
PCTA	8.3	4	1.5	4	27.5	4	0.51	4	0.18	3	HIGH	FAIR	MOD	2	21
PC4	6.9	4	1.3	4	23.9	3	0.44	3	0.16	1	MOD	POOR	MOD	3	18
PCLT	6.8	3	1.2	3	24.6	4	0.28	2	0.28	4	HIGH	FAIR	HIGH	2	18
PCSB	6.2	2	1.0	2	23.0	3	0.17	1	0.26	4	HIGH	FAIR	LOW	2	14
PCSC	6.2	3	1.0	2	22.9	2	0.20	1	0.32	4	HIGH	FAIR	LOW	2	14
PC2	5.9	2	1.2	3	21.4	2	0.49	4	0.18	2	HIGH	GOOD	MOD	1	14
PCEB	5.5	1	0.9	1	19.5	1	0.24	2	0.18	2	HIGH	FAIR	MOD	2	9
PC3	3.0	1	0.7	1	10.0	1	0.34	3	0.14	1	LOW	GOOD	MOD	1	8
PC1	3.3	1	0.6	1	11.8	1	0.16	1	0.13	1	HIGH	GOOD	LOW	1	6

Table 6.3-1 Poplar Creek Planning Area Pollutant Priority Ranking by Watershed Planning Unit

The watershed planning units that are the highest priority based on loadings are dominated by impervious area. Watershed planning units with the lowest overall pollutant loadings are generally in the upper portions of the watershed and dominated by forest preserves, with less than 50% residential land use. It should be noted that although some of the watershed planning units have a low prioritization score, BMPs can nevertheless be implemented in these areas to help improve the quality of Poplar Creek and its tributaries.

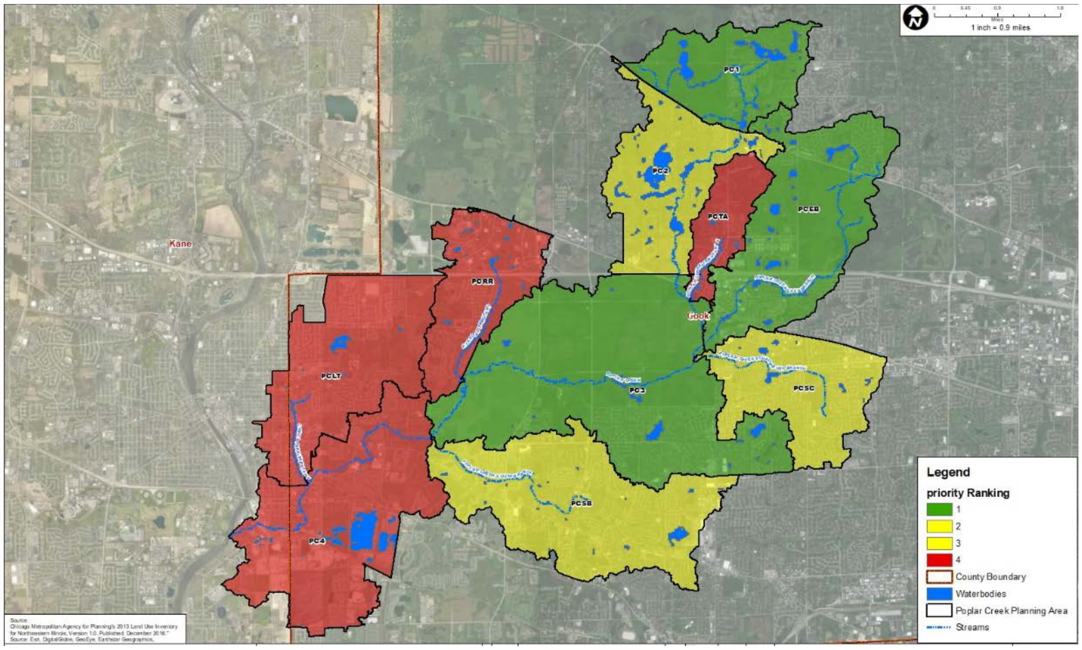

Figure 6.3-1 Poplar Creek Watershed Priority Area Ranking by Watershed Planning Unit

6.4 BMP IMPLEMENTATION, LOAD REDUCTIONS AND COST

Following the priority area analysis, special care was considered in how to apply BMPs pragmatically to land use types as described in Section 6.1 which is largely controlled by site constraints. Using both design and construction experience, various BMPs were selected for each individual watershed planning unit to generate the highest pollutant load removal and BMP efficiency per land use.

Overall reductions for a system of BMPs for each land use, in each watershed planning unit, were determined using the BMP Calculator in the STEPL suite combined with removal efficiencies per BMP as described in Section 5.1. An average BMP reduction value was derived from BMPs for urban areas, commercial and roadway / transportation areas. Following implementation, cost estimates of the implemented BMPs by watershed planning unit were determined using the information collected in Section 6.2. Cost estimates are valued in current 2017 pricing, and do not have a multiplier to reflect inflation over time. This decision was made so that the costs provided by this plan can be interpreted accurately in the future without having to calculate from inaccurate inflation rate projections.

Based on short- and long-term goals, stakeholder engagement, and funding considerations, the loading reductions and costs were determined for a target level of BMP implementation was developed for load reductions and cost. The following sections describe the methodology used to determine the load reductions (using STEPL) and cost estimates associated with the target implementation level. In addition to the developed areas, there are existing lakes, wetlands and detention basins that can be enhanced. These improvement opportunities have been identified and incorporated into the BMP scenarios selected for each land use type. Of the 18 detention basin in the MWRD detention basin database within the watershed that received a Sewerage Permit for development, 6 detention basins have been identified for improvement. An additional 67 open water areas were identified within the watershed. These open water areas and detention basin improvements have been incorporated into the BMP implementation analysis.

As discussed in Section 4.4, the predicted population increase in the Poplar Creek planning area is from 5.6 people per acre to 6.4 people per acre. That the Poplar Creek planning area outside of the forest preserve and open space areas is 71% developed. Assuming that some growth will be infill development in areas already developed, and that LID/conservation design practices are implemented as growth occurs in other areas, the following loading analyses although prepared for existing land uses also reflect projected future land use.

6.4.1 20% Implementation

The target level of BMP implementation is 20%. What this means is that runoff from 20% of the various land use areas within the watershed planning units will have runoff/stormwater controls as outlined above in Section 6.1. For example, if a watershed planning unit has residential areas, 20% of the residential land would have rain gardens or bioretention areas installed and would have detention pond retrofits. The target or objective of implementing BMPs to capture/treat runoff from 20% of the source areas is based on practicability and feasibility. It will be most feasible to implement BMPs in public areas, such as municipal parking lots, public parks, and road right-of-ways. BMPs can also be implemented on private property, but this presents certain challenges such as ensuring the practices will be preserved and maintained over time. The majority of the land in the watershed is privately owned. Our analysis concluded that the goal of implementing BMPs to manage/treat runoff from 20% of the source areas is the amount of implementation that is practicable and realistic.

Through education and outreach watershed stakeholders can encourage implementation of BMPs on private property. This would result in a higher percentage of areas being treated, and further reductions to pollutant loadings. However, the quantification of effects presented in this watershed-based plan focuses on implementation of BMPs that can be designed to meet appropriate technical standards and will be reliably maintained, which corresponds to runoff from 20% of the land areas is treated with a BMP(s).

The numbers/scale of BMPs applied within each watershed planning unit (reflecting the Section 6.1 scenarios) are shown in Appendix 1. Appendix 1 displays BMP projects per watershed planning unit based on a detailed assessment of land cover/land use within the watershed planning unit. Information from this table was an input into the BMP Calculator in STEPL. Table 6.4-1below shows the compiled pollutant loading reductions and costs per watershed planning unit, reflecting the land cover in that planning area and the Section 6.1 scenarios. The loading reductions were calculated from the BMP Calculator in the STEPL Suite to determine the "Combined BMP efficiency" as if numerous BMPs are applied in the watershed planning unit. Based on land use and the total BMPs applied, the Table shows the estimated loading reductions as computed from STEPL's Combined BMP selection within the Urban BMP Tool. Load reductions are shown for a suite of BMPs applied to a particular watershed planning unit as the overall BMP efficiency to depict a realistic application rate of multiple BMPs throughout a watershed planning unit.

Planning Unit ID	BMP	Amount	Unit	Cost	Nitrogen Reduced (lbs/yr)	Phosphorus Reduced (lbs/yr)	BOD Reduced (lbs/yr)	Sediment Reduced (tons/yr)	Costs to Implement BMP
PC1 (1720 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	10.72	Ac	$ 177,700					$ 1,904,130
	Infiltration Trench	0.00	Ac	$ 269,300					$ -
	Oil/Grit Separators	0.00	Ac	$ 10,000					$ -
	Bioretention (Green Roof) @ ~ $30ft²	0.00	Ac	$ 1,346,200					$ -
	Bioretention as Bioswale @ ~ $15/ft²	2.59	Ac	$ 653,400					$ 1,690,612
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	$ 12,800					$ -
	Porous Pavement @ ~ $8/ft²	8.76	Ac	$ 359,000					$ 3,145,423
	Weekly Street Sweeping	131.21	Ac	$ 1,000					$ 131,209
	Water Quality Inlets (does not include maintenance)	131.21	Ea	$ 400					$ 52,484
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	$ 13,000					-
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	0.59	Ac	$ 8,200					$ 4,813
	Settling Basins	0.04	*Ac*	$ 13,900					$ 490
	Vegetated Filter Strips @ ~ $3/ft²	1.22	*Ac*	$ 134,900					$ 164,049
	Wetland Restoration	106.56	Ac	$ 15,500					$ 1,651,623
	Streambank Stabilization	6602.40	LF	$ 134					$ 884,722
Planning Unit Total					229	68	1,296	32	$ 9,629,555
PC2 (2159 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	21.66	Ac	$ 177,700					$ 3,849,687
	Infiltration Trench	0.00	Ac	$ 269,300					$ -
	Oil/Grit Separators	0.00	Ac	$ 10,000					$ -
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	$ 1,346,200					$ -
	Bioretention as Bioswale @ ~ $15/ft²	4.06	Ac	$ 653,400					$ 2,655,016
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	$ 12,800					$ -
	Porous Pavement @ ~ $8/ft²	3.47	Ac	$ 359,000					$ 1,244,610

Planning Unit ID	BMP	Amount	Unit	Cost	Nitrogen Reduced (lbs/yr)	Phosphorus Reduced (lbs/yr)	BOD Reduced (lbs/yr)	Sediment Reduced (tons/yr)	Costs to Implement BMP
	Weekly Street Sweeping	34.67	Ac	$ 1,000					$ 34,669
	Water Quality Inlets (does not include maintenance)	34.67	Ea	$ 400					$ 13,868
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	$ 13,000					$ -
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	2.20	Ac	$ 8,200					$ 18,029
	Settling Basins	0.13	*Ac*	$ 13,900					$ 1,834
	Vegetated Filter Strips @ ~ $3/ft^2	0.00	*Ac*	$ 134,900					$ -
	Wetland Restoration	264.30	Ac	$ 15,500					$ 4,096,603
	Streambank Stabilization	6472.80	LF	$ 134					$ 867,355
Planning Unit Total					563	191	3,506	151	$ 12,781,670
	Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2	22.54	Ac	$ 177,700					$ 4,005,967
	Infiltration Trench	0.00	Ac	$ 269,300					$ -
	Oil/Grit Separators	0.00	Ac	$ 10,000					$ -
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	$ 1,346,200					$ -
	Bioretention as Bioswale @ ~ $15/ft^2	9.46	Ac	$ 653,400					$ 6,184,009
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	$ 12,800					$ -
	Porous Pavement @ ~ $8/ft^2	6.85	Ac	$ 359,000					$ 2,458,374
PC3 (5963 acres)	*Weekly Street Sweeping*	68.48	Ac	$ 1,000					$ 68,478
	Water Quality Inlets (does not include maintenance)	68.48	Ea	$ 400					$ 27,391
	Detention Basin Retrofit - native planting in dry bottom pond	0.17	Ac	$ 13,000					$ 2,166
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	0.42	Ac	$ 8,200					$ 3,477
	Settling Basins	0.04	*Ac*	$ 13,900					$ 493
	Vegetated Filter Strips @ ~ $3/ft^2	4.45	*Ac*	$ 134,900					$ 600,068
	Wetland Restoration	147.14	Ac	$ 15,500					$ 2,280,726
	Streambank Stabilization	15803.60	LF	$ 134					$ 2,117,682

Planning Unit ID	BMP	Amount	Unit	Cost	Nitrogen Reduced (lbs/yr)	Phosphorus Reduced (lbs/yr)	BOD Reduced (lbs/yr)	Sediment Reduced (tons/yr)	Costs to Implement BMP
Planning Unit Total					768	268	2,465	326	$ 17,748,831
PC4 (3866 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	22.66	Ac	$ 177,700					$ 4,026,003
	Infiltration Trench	143.37	Ac	$ 269,300					$ 38,610,773
	Oil/Grit Separators	18.27	Ac	$ 10,000					$ 182,722
	Bioretention (Green Roof) @ ~ $30ft2	13.70	Ac	$ 1,346,200					$ 18,448,566
	Bioretention as Bioswale @ ~ $15/ft²	7.69	Ac	$ 653,400					$ 5,025,582
	Cistern (10,000 Gal Tank/ 0.37 Ac)	246.92	Ea	$ 12,800					$ 3,160,603
	Porous Pavement @ ~ $8/ft²	4.32	Ac	$ 359,000					$ 1,550,703
	Weekly Street Sweeping	43.20	Ac	$ 1,000					$ 43,195
	Water Quality Inlets (does not include maintenance)	43.20	Ea	$ 400					$ 17,278
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	$ 13,000					$ -
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	2.55	Ac	$ 8,200					$ 20,896
	Settling Basins	0.15	*Ac*	$ 13,900					$ 2,125
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	$ 134,900					$ -
	Wetland Restoration	204.78	Ac	$ 15,500					$ 3,174,071
	Streambank Stabilization	9979.20	LF	$ 134					$ 1,337,213
Planning Unit Total					1,454	368	3,780	247	$ 75,599,731
PCEB (3272 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	18.34	Ac	$ 177,700					$ 3,259,579
	Infiltration Trench	0.00	Ac	$ 269,300					$ -
	Oil/Grit Separators	0.00	Ac	$ 10,000					$ -
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	$ 1,346,200					$ -
	Bioretention as Bioswale @ ~ $15/ft²	7.96	Ac	$ 653,400					$ 5,198,332
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	$ 12,800					$ -
	Porous Pavement @ ~ $8/ft²	4.98	Ac	$ 359,000					$ 1,789,085
	Weekly Street Sweeping	49.84	Ac	$ 1,000					$ 49,835

Planning Unit ID	BMP	Amount	Unit	Cost	Nitrogen Reduced (lbs/yr)	Phosphorus Reduced (lbs/yr)	BOD Reduced (lbs/yr)	Sediment Reduced (tons/yr)	Costs to Implement BMP
	Water Quality Inlets (does not include maintenance)	49.84	Ea	$ 400					$ 19,934
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	$ 13,000					$ -
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	1.63	Ac	$ 8,200					$ 13,402
	Settling Basins	0.10	*Ac*	$ 13,900					$ 1,363
	Vegetated Filter Strips @ ~ $3/ft²	3.74	*Ac*	$ 134,900					$ 504,423
	Wetland Restoration	118.57	Ac	$ 15,500					$ 1,837,909
	Streambank Stabilization	10655.60	LF	$ 134					$ 1,427,850
Planning Unit Total					406	107	1,604	84	$ 14,101,713
PCLT (2850 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	28.44	Ac	$ 177,700					$ 5,054,047
	Infiltration Trench	0.00	Ac	$ 269,300					$ -
	Oil/Grit Separators	0.00	Ac	$ 10,000					$ -
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	$ 1,346,200					$ -
	Bioretention as Bioswale @ ~ $15/ft²	9.30	Ac	$ 653,400					$ 6,078,002
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	$ 12,800					$ -
	Porous Pavement @ ~ $8/ft²	7.74	Ac	$ 359,000					$ 2,777,094
	Weekly Street Sweeping	77.36	Ac	$ 1,000					$ 77,356
	Water Quality Inlets (does not include maintenance)	77.36	Ea	$ 400					$ 30,943
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	$ 13,000					$ -
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	1.26	Ac	$ 8,200					$ 10,337
	Settling Basins	0.08	*Ac*	$ 13,900					$ 1,051
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	$ 134,900					$ -
	Wetland Restoration	145.92	Ac	$ 15,500					$ 2,261,705
	Streambank Stabilization	3638.40	LF	$ 134					$ 487,546
Planning Unit Total					532	139	2,395	76	$ 16,778,081

Planning Unit ID	BMP	Amount	Unit	Cost	Nitrogen Reduced (lbs/yr)	Phosphorus Reduced (lbs/yr)	BOD Reduced (lbs/yr)	Sediment Reduced (tons/yr)	Costs to Implement BMP
PCRR (1777 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	12.65	Ac	$ 177,700					$ 2,247,660
	Infiltration Trench	101.74	Ac	$ 269,300					$ 27,398,572
	Oil/Grit Separators	9.20	Ac	$ 10,000					$ 92,009
	Bioretention (Green Roof) @ ~ $30ft2	6.90	Ac	$ 1,346,200					$ 9,289,695
	Bioretention as Bioswale @ ~ $15/ft²	4.70	Ac	$ 653,400					$ 3,068,734
	Cistern (10,000 Gal Tank/ 0.37 Ac)	124.34	Ea	$ 12,800					$ 1,591,508
	Porous Pavement @ ~ $8/ft²	2.84	Ac	$ 359,000					$ 1,019,733
	Weekly Street Sweeping	28.40	Ac	$ 1,000					$ 28,405
	Water Quality Inlets (does not include maintenance)	28.40	Ea	$ 400					$ 11,362
	Detention Basin Retrofit - native planting in dry bottom pond	0.37	Ac	$ 13,000					$ 4,872
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	1.02	Ac	$ 8,200					$ 8,353
	Settling Basins	0.08	*Ac*	$ 13,900					$ 1,162
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	$ 134,900					$ -
	Wetland Restoration	55.13	Ac	$ 15,500					$ 854,516
	Streambank Stabilization	4473.20	LF	$ 134					$ 599,409
Planning Unit Total					1,783	530	3,446	704	$ 46,215,990
PCSB (3698 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	35.88	Ac	$ 177,700					$ 6,375,699
	Infiltration Trench	0.00	Ac	$ 269,300					$ -
	Oil/Grit Separators	0.00	Ac	$ 10,000					$ -
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	$ 1,346,200					$ -
	Bioretention as Bioswale @ ~ $15/ft²	11.71	Ac	$ 653,400					$ 7,654,001
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	$ 12,800					$ -
	Porous Pavement @ ~ $8/ft²	8.73	Ac	$ 359,000					$ 3,133,839
	Weekly Street Sweeping	87.29	Ac	$ 1,000					$ 87,294

Planning Unit ID	BMP	Amount	Unit	Cost	Nitrogen Reduced (lbs/yr)	Phosphorus Reduced (lbs/yr)	BOD Reduced (lbs/yr)	Sediment Reduced (tons/yr)	Costs to Implement BMP
	Water Quality Inlets (does not include maintenance)	87.29	Ea	$ 400					$ 34,917
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	$ 13,000					$ -
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	1.17	Ac	$ 8,200					$ 9,613
	Settling Basins	0.07	*Ac*	$ 13,900					$ 978
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	$ 134,900					$ -
	Wetland Restoration	181.28	Ac	$ 15,500					$ 2,809,789
	Streambank Stabilization	6678.00	LF	$ 134					$ 894,852
Planning Unit Total					566	139	2,861	42	$ 21,000,981
PCSC (2082 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	19.63	Ac	$ 177,700					$ 3,488,992
	Infiltration Trench	0.00	Ac	$ 269,300					$ -
	Oil/Grit Separators	0.00	Ac	$ 10,000					$ -
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	$ 1,346,200					$ -
	Bioretention as Bioswale @ ~ $15/ft²	7.68	Ac	$ 653,400					$ 5,016,124
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	$ 12,800					$ -
	Porous Pavement @ ~ $8/ft²	13.93	Ac	$ 359,000					$ 5,000,537
	Weekly Street Sweeping	139.29	Ac	$ 1,000					$ 139,291
	Water Quality Inlets (does not include maintenance)	139.29	Ea	$ 400					$ 55,716
	Detention Basin Retrofit - native planting in dry bottom pond	0.23	Ac	$ 13,000					$ 3,006
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	0.42	Ac	$ 8,200					$ 3,472
	Settling Basins	0.04	*Ac*	$ 13,900					$ 546
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	$ 134,900					$ -
	Wetland Restoration	242.52	Ac	$ 15,500					$ 3,759,069
	Streambank Stabilization	6121.60	LF	$ 134					$ 820,294
Planning Unit Total					542	107	2,239	45	$ 18,287,046

Planning Unit ID	BMP	Amount	Unit	Cost	Nitrogen Reduced (lbs/yr)	Phosphorus Reduced (lbs/yr)	BOD Reduced (lbs/yr)	Sediment Reduced (tons/yr)	Costs to Implement BMP
PCTA (833 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	1.41	Ac	$ 177,700					$ 250,855
	Infiltration Trench	0.00	Ac	$ 269,300					$ -
	Oil/Grit Separators	0.00	Ac	$ 10,000					$ -
	Bioretention as Bioswale @ ~ $15/ft²	1.41	Ac	$ 653,400					$ 922,389
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	$ 1,346,200					$ -
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	$ 12,800					$ -
	Porous Pavement @ ~ $8/ft²	0.70	Ac	$ 359,000					$ 251,774
	Weekly Street Sweeping	7.01	Ac	$ 1,000					$ 7,013
	Water Quality Inlets (does not include maintenance)	7.01	Ea	$ 400					$ 2,805
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	$ 13,000					$ -
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	0.75	Ac	$ 8,200					$ 6,129
	Settling Basins	0.04	*Ac*	$ 13,900					$ 623
	Vegetated Filter Strips @ ~ $3/ft²	66.89	*Ac*	$ 134,900					$ 9,023,069
	Wetland Restoration	104.61	Ac	$ 15,500					$ 1,621,399
	Streambank Stabilization	2561.60	LF	$ 134					$ 343,254
Planning Unit Total					532	158	2,521	94	$ 12,429,310
Watershed Total					7,375	2,075	26,113	1,800	$ 244,572,910

Table 6.4-1 BMP Implementation, Load Reductions and Cost – Poplar Creek Planning Area

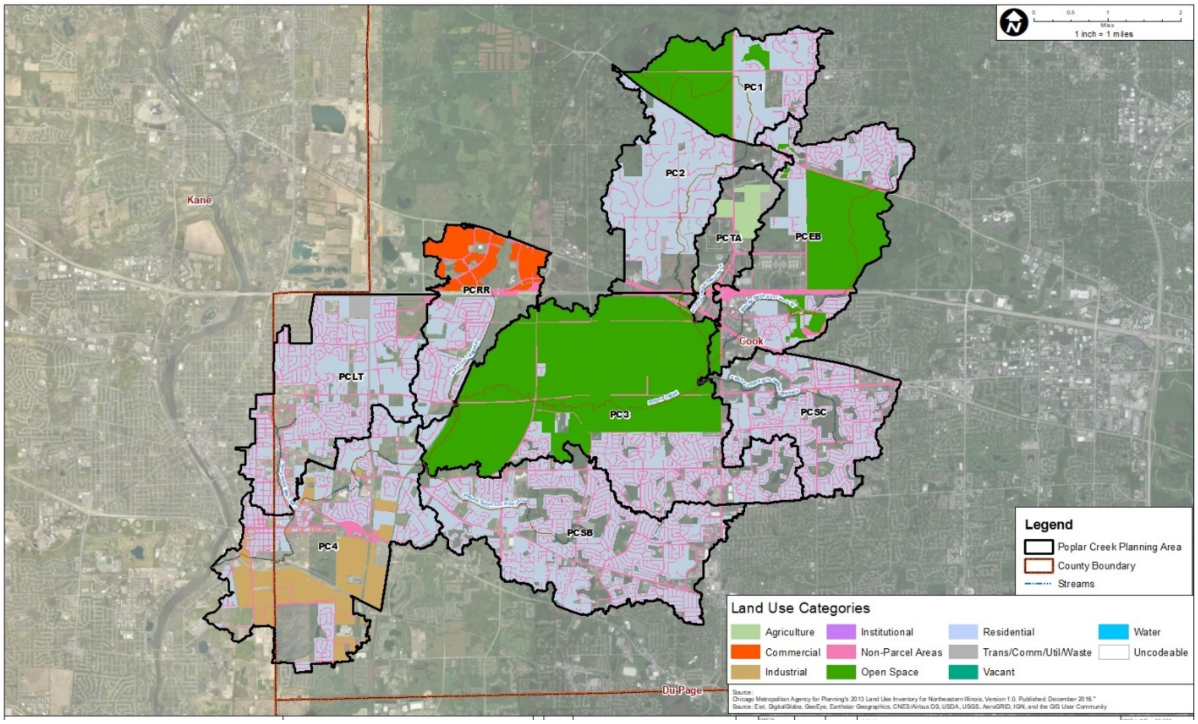

Figure 6.4-1 BMP Applications per Land Use –Poplar Creek Planning Area

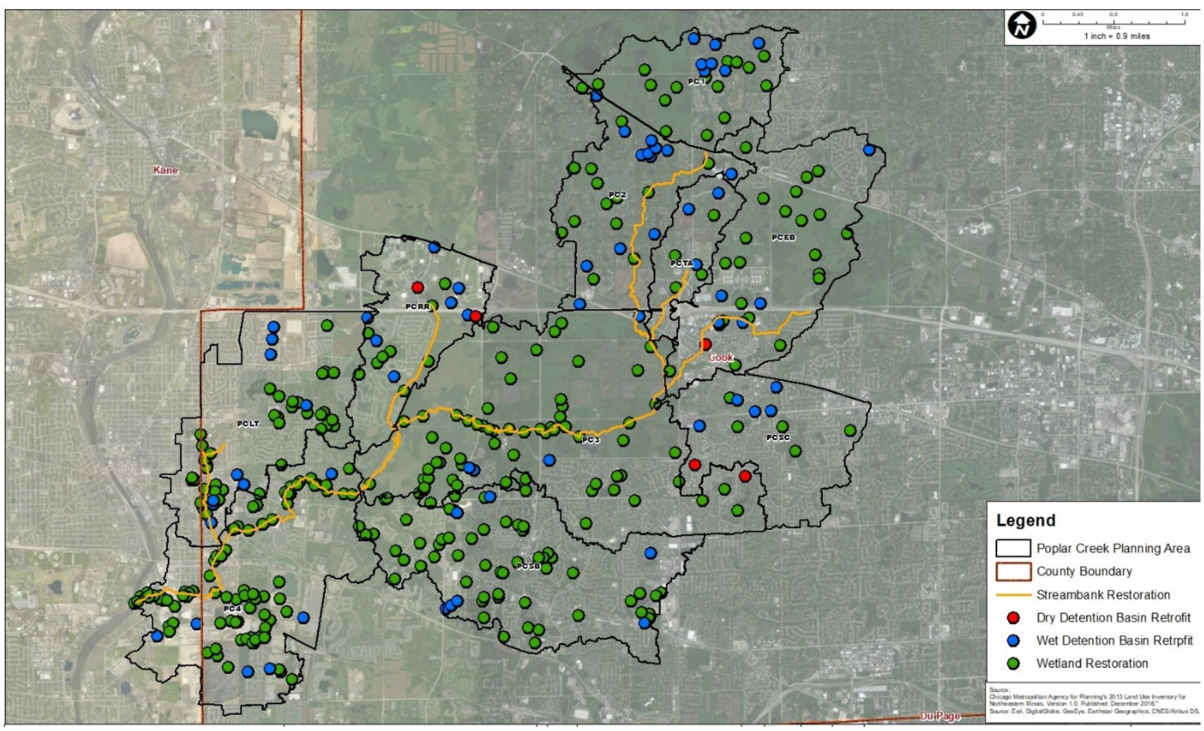

Figure 6.4-2 Detention Basin Retrofits and Restoration –Poplar Creek Planning Area

Targeting an implementation rate of 20% watershed wide results in a substantial reduction in sediment loading – 15% -- with an overall cost of $225 million. The sediment load reduction is significant for water quality improvement, and also, as discussed above, reductions in sediment loading couples with reductions in other pollutants through reduction in transport of phosphorus, heavy metals and hydrocarbons. In addition, the existing high sediment accumulation in the watercourses (as assessed in Chapters 3 and 4) is one of the main stressors for habitat degradation leading to the creation of anaerobic conditions in streambeds and causing aquatic life impacts.

Nitrogen, phosphorus and BOD reductions vary on a percentage basis as compared to sediment. Media can be designed in to some practices to enhance the removal of dissolved phosphorus where nutrients are a particular concern, e.g., upstream of lakes. Also, policy change effects (nonstructural BMPs) are not reflected in the STEPL results. For example, a community can implement ordinance provisions to require non-phosphorus fertilizers, which would have the effect of reducing nutrient loadings in stormwater. Overall, the predicted effects and the assessment of the watershed conditions and needs highlight the need for sediment load reductions to improve water quality and support uses.

As indicated in previous sections, chloride reductions will need to be addressed through policy recommendations and non-structural BMPs (such as enhanced de-icing practices due to the high solubility and residence time of chloride. Costs and effects associated with policy recommendations and changes are not included in Table 6.4-1.

This target level of BMP implementation will significantly reduce loadings and contribute to water quality improvement. It is difficult to precisely quantify and characterize the water quality rebound that will result from implementation of watershed wide nonpoint source pollution control measures. A key to understanding BMP implementation response within the watercourses is lag time. Even when management changes are well-designed and fully implemented, water quality monitoring efforts may not show definitive results if the monitoring period, program design, and sampling frequency are not sufficient to address the lag between treatment and response. The main components of lag time include the time required for an installed practice to produce an effect, the time required for the effect to be delivered to the water resource, the time required for the water body to respond to the effect, and the effectiveness of the monitoring program to measure the response (Meals, et al. 2009). Water quality characteristics are also affected by a variety of other factors, for example climate effects and activities in upstream watersheds.

Recognizing the difficulty in quantifying and characterizing the water quality rebound that will result and the timing of effects, this watershed plan is nevertheless establishing a target BMP implementation level. When considering a practical and reasonable implementation rate, the target for this plan is the 20% implementation rate. This will be an average across the watersheds, with priority areas targeted for a higher percentage of land area being addressed. While this target implementation level will involve very significant expenditures, implementation can occur over a 25-year period, spreading out the costs and allowing vehicles for funding, implementation, outreach and response to take effect.

As discussed further below, this plan envisions that watershed monitoring will continue and the effects of plan implementation can be assessed. The plan will be reviewed and updated at 10-year increments. In between plan updates adaptive management techniques can be used to fine-tune BMP implementation plans, for example placing greater focus on BMPs shown to be practicable and effective.

6.4.2 Plan Implementation Responsibility

Jurisdiction for stormwater management and water quality lies primarily with the MWRD and the municipalities within the watershed planning area.

As discussed above, it is anticipated MWRD will play a lead role on regional-scale stormwater projects, such as retrofitting possible flood control projects to provide water quality benefits (see Section 6.6). MWRD will also continue to implement, and periodically update, the WMO.

It is anticipated municipalities will play major roles in planning and implementing on-the-ground BMPs, such as implementing bioretention or permeable pavement in road right-of-ways or city parking lots. In most cases municipalities will also be responsible for maintenance of BMPs. MWRD may provide technical or financial assistance to municipalities for certain projects. MS4 communities will continue to implement their MS4 programs, including the six minimum measures.

Some BMP projects may also be implemented by other watershed stakeholders, such as school districts, not-for-profit organizations, or churches.

MWRD hosts quarterly Watershed Planning Council (WPC) meetings during which municipal stakeholders within the Poplar Creek planning area are informed of information including on-going capital improvement projects, completed projects, maintenance practices, chloride reduction strategies, and upcoming funding opportunities.

The local stakeholders who regularly attend the Poplar Creek WPC meetings are from the communities in the watershed. The WPC meetings provide an opportunity for mayors and managers within the planning area to discuss capital improvement projects as well as water quality. Local officials can describe their needs and proposed projects, and look for opportunities to collaborate with neighboring communities. As discussed further below, the quarterly WPC meetings will be an important component of tracking plan implementation progress.

6.5 ADDITIONAL BMP IMPLEMENTATION

None of the 16 lakes in the Poplar Creek Watershed, listed in Chapter 3, have been assessed by or included on the Illinois EPA list of impaired lakes. Lake water quality in the watershed is predominantly affected by pollutant loads coming into the lakes from upstream areas. Although no lakes are being shown as impaired, water quality improvements in the lakes will occur as BMPs are implemented in the upstream developed and undeveloped areas. Implementation of BMPs in upstream areas that reduce nutrient loads will have significant beneficial effects on the lakes. Aquatic habitat in lakes and recreational activities on the lakes are significantly affected by algae growth which, as explained above, is dramatically affected by nutrient loadings. Implementation of BMPs as described above is expected to enhance and protect the lakes in the watershed.

Overall the focus of this plan is treatment of stormwater runoff and the impact that impervious surfaces have on water quality. The projects in this plan are identified with the goal of re-establishing or mimicking the watershed's historical drainage characteristics while reducing pollutant loadings in runoff as a function of volume reduction. The plan identifies recommended BMPs to address the different land covers and sources of pollution from runoff within the watershed. It should be noted that the plan identifies *types* of BMPs that would address the sources of loadings, but does not list or prescribe specific BMPs in specific places. The sizes and designs of BMPs and the optimal places for BMPs will need to be determined by communities and other stakeholders taking into account where benefits will be the greatest but also numerous factors including land ownership, budgets, community buy-in, and how maintenance will be assured. Also, new concepts or designs for BMPs may be developed during the plan implementation period. The plan intends there be flexibility to incorporate new BMP concepts if they cost-effectively reduce pollutant loadings from urban runoff and stormwater discharges.

6.6 MWRD DETAILED WATERSHED PLAN AND PROJECT RETROFITS

This plan addresses water quality as a supplement to the MWRD Detailed Watershed Plan for Poplar Creek. A promising and cost-effective approach for implementing pollutant reduction projects is to integrate pollutant control features into projects being designed for flood control. As such, many projects already identified in the DWP to address flooding concerns can be slightly modified or enhanced to provide a water quality component (Figure 6.6-1).

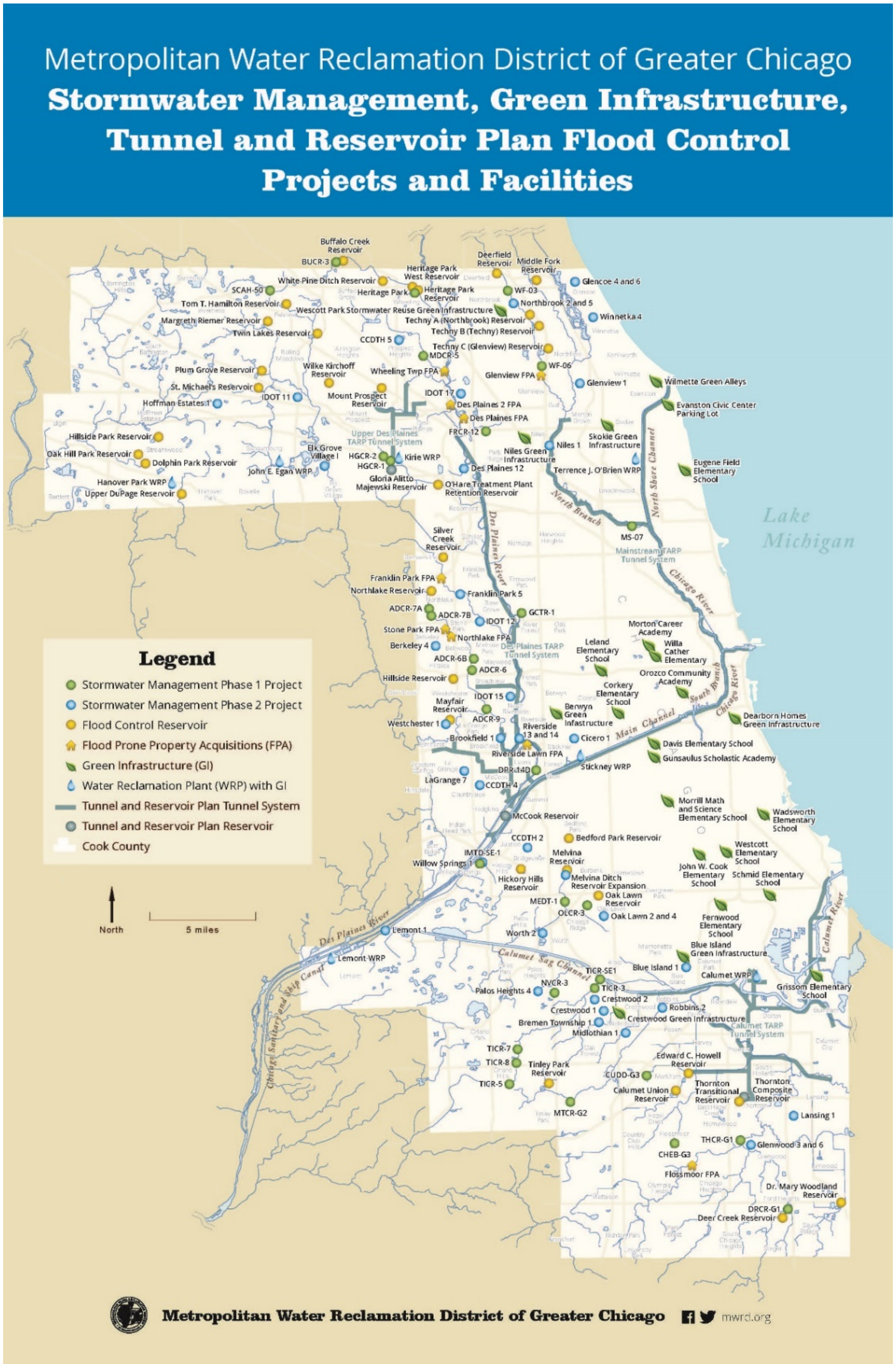

Figure 6.6-1 MWRD Facilities and Projects

As part of the MWRD DWP for Poplar Creek, a total of 10 projects were analyzed, with the main goal of reducing overbank flooding within the watershed. Of these 10 projects, which range in cost from $700,000 to $200 million dollars (2011 dollars), 6 projects were recommended as part of the DWP. For this plan, all projects, whether recommended or not, were reviewed to determine if water quality projects could be implemented/incorporated into the potential projects at these same locations. Six (6) of the projects in the DWP could potentially have a water quality benefit, 5 of which were ultimately recommended in the DWP. To meet the goal of improvements in water quality, the project alternative identified in the DWP was reassessed to determine if a viable water quality component could be added to the flood control project. A list of the site-specific projects identified in the DWP for the purposes of water quality improvements to be implemented as part of this plan is shown in Table 6.6-1.

Subwatershed Plan ID	MWRD Subbasin ID	Cost	BC Ratio	Project Description	Plan Reco	DWP Reco
PC	PCMS-1	$205,148,700	0.01	2000 ac-ft reservoir	Y	N
PC	PCMS-3	$715,700	0.56	Bank Stabilization	Y	Y
PC	PCMS-4	$745,200	0.47	Bank Stabilization	Y	Y
PC	PCMS-5	$874,000	0.79	Bank Stabilization	Y	Y
PCSCB	PSCH-1	$3,282,500	0.08	Enlarge existing Barrington Road crossing of Poplar Creek Railroad Schaumburg Branch	Y	Y
RRT	PCRR-1	$1,486,400	0.002	Enlarge existing railroad crossing of Poplar Creek Railroad Tributary near Golf Road	Y	Y

Table 6.6-1 Potential MWRD Projects Identified in the Poplar Creek DWP Recommended for Water Quality Enhancements in this WBP

The projects listed in Table 6.6-1 have been either identified or recommended in the DWP for flood control. They are identified in this plan as projects that have a potential to contain a viable water quality component. The projects envisioned in the DWP will require modification to include a water quality component. The cost to modify the projects identified in the DWP with water quality components has not been included in this plan. The cost in Table 6.6-1 reflects the cost estimate from the DWP only. It is expected that the incremental cost change to incorporate a water quality component(s) would be relatively low as compared to the overall project costs. The projects highlighted in Table 6.6-1 have been included in the total reach lengths to be restored as described in the synthetic BMP application and have been assessed in the pollutant load reduction discussion for implementation. These reach lengths are part of the overall stream length that is assessed in the STEPL calculations.

6.7 TECHNICAL AND FINANCIAL ASSISTANCE

Implementation of the plan will require substantial resources and partnerships with local, state, and federal organizations to fund planning, design, and implementation. There are many sources of funding program available. Below is a list of various programs available. Most of the programs require a local match of funds or in-kind services.

Illinois EPA Section 319

- Under Section 319, states, territories, and Indian tribes can receive grant money to support a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of projects that have been implemented. Grant provides up to 60% cost-share for eligible projects/activities that reduce nonpoint source pollution.

MWRD Green Infrastructure Assistance Program

- MWRD is committed to providing administrative and technical assistance to communities to facilitate the implementation of green infrastructure projects. MWRD funds projects based on the likelihood of flooding and/or basement backup reduction, number of structures benefitting, project cost, project location with respect to maintenance and outreach opportunities and socio-economic considerations.

MWRD Phase II Stormwater Projects

- In addition to supporting green infrastructure projects, MWRD also supports other stormwater projects through its Phase II stormwater assistance program. Government entities, including municipalities, townships, and county agencies, can apply for funding, engineering, or other MWRD assistance to address local flooding through the MWRD's Phase II Stormwater Management Program. Many of these projects can also provide water quality benefits. The project types under Phase II include the installation or improvement of "gray" infrastructure, localized detention, upsizing critical storm sewers and culverts, pump stations and establishing drainage ways.

EPA Clean Water State Revolving Fund (CWSRF)

- The CWSRF program is a federal-state partnership that provides communities a permanent, independent source of low-cost financing for a wide range of water quality projects. The program funds water quality protection projects for wastewater infrastructure, stormwater management, nonpoint source pollution control and estuary management.

National Fish and Wildlife Foundation – Five Star and Urban Waters Restoration Program

- The Five Star and Urban Waters Restoration Program seeks to develop nation-wide-community stewardship of local natural resources, preserving these resources for future generations and enhancing habitat for local wildlife. Projects seek to address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff, and degraded shorelines caused by development.

Local Program Initiatives

- Communities will have a leadership role in implementing many BMP projects under this plan. Communities can and will seek out grant opportunities to help fund project implementation. In most cases the costs for maintaining BMPs will need to be covered by the project owner/sponsor. And certain high priority projects will need to be implemented even if grant funding cannot be obtained. To have a reliable, steady source of revenue for stormwater projects and maintenance, it is recommended that the communities in the watershed consider establishment of a stormwater utility and fee system. MPC's Steady Streams report provides information on establishment of a stormwater fee system.

6.8 SCHEDULE FOR IMPLEMENTATION

The following schedule is based on an implementation plan executed over the course of the next 25 years to make progress toward the established BMP implementation goals and the associated pollutant loading reduction targets:

2018-2019

- o Outreach to municipalities and stakeholder groups regarding the components of the plan and Section 319 funding.
- o Municipalities and stakeholder groups prepare project plans for beneficial projects, particularly in priority areas, and develop Section 319 grant applications for submittal to Illinois EPA.
- o Municipalities and stakeholder groups prepare project plans for beneficial projects, particularly in priority areas, and develop SRF loan application materials for NPS or capital projects that will significantly contribute to watershed improvement.
- o Outreach to teachers and schools.
- o Work with MWRD to build water quality components into plans/designs for identified flood control projects.
- o Track/inventory watershed projects.
- o Continue watershed monitoring efforts and expand to the extent funding is available.

2020 - 2027

- o Municipalities and stakeholder groups implement project plans where funding has been provided or local governments have appropriated funds.
- o On-going outreach to municipalities and stakeholder groups regarding the components of the plan and Section 319 funding.
- o Municipalities and stakeholder groups prepare project plans for beneficial projects, particularly in priority areas, and develop Section 319 grant applications for submittal to Illinois EPA.
- o Municipalities and stakeholder groups prepare project plans for beneficial projects, particularly in priority areas, and develop SRF loan application materials for NPS or capital projects that will significantly contribute to watershed improvement.
- o On-going outreach to teachers and schools. Develop and carry out events for in-service learning.
- o MWRD, working with local partners, implements flood control projects which include water quality components.
- o Track/inventory watershed projects.
- o Continue watershed monitoring efforts.

2028

- o Continue activities as above.
- o Evaluate plan implementation. What has worked well? What barriers have been encountered? How have pollutant sources changed? How have water quality conditions changed?
- o Update Watershed Plan and submit to Illinois EPA for approval.

2029 - 2037

- o Continue implementation activities as laid out in the updated Watershed Plan.
- o Track/inventory watershed projects.
- o Continue watershed monitoring efforts.

2038

- o Continue implementation activities.
- o Evaluate Plan implementation. What has worked well? What barriers have been encountered? How have pollutant sources changed? How have water quality conditions changed?
- o Update Watershed Plan and Submit to Illinois EPA for approval.

2039 - 2042

- o Continue implementation activities as laid out in the updated Watershed Plan.
- o Track/inventory watershed projects.
- o Continue watershed monitoring efforts.

2043

- o Evaluate Plan implementation. Have the 25-year goals for BMP implementation efforts and estimated loading reductions been achieved? How have water quality conditions changed?
- o Plan next steps.

6.9 EDUCATION AND OUTREACH

The education and outreach component of the plan will be implemented to enhance public understanding and encourage positive behaviors and beneficial budgetary and policy decisions. Community engagement, education, and outreach are essential components of any watershed protection efforts. Such activities are crucial to the implementation of a watershed plan since they:

- o Raise awareness of local water resource issues and foster support for solutions;
- o Provide tools to help motivate changes in behavior among stakeholders and other targeted audiences;
- o Provide engaged stakeholders with the necessary tools to become watershed stewards and help implement the watershed plan;
- o Leverage partnerships among stakeholders and other public and private entities to implement watershed recommendations.

Effective education and outreach is crucial to a watershed plan's success since many watershed problems result from human actions and solutions. Also, when constituents understand watershed issues and sources of pollutant loadings there this will lead to increased support for policy changes and investments needed to improve water quality. The education and outreach strategy will encourage continued public participation in selecting, designing, implementing and maintaining the nonpoint source pollution management measures which will be implemented.

Issues within watersheds are often the outcome of many small actions which to an individual or small group may not be understood as a source of degradation to local waterways. Remedies to watershed scale issues are often voluntary and need effective public support and willing participation to yield results. For this to be successful, stakeholders must become engaged in watershed stewardship activities and alter behaviors which adversely affect the watershed. Having a basic understanding of current issues and how both individual and collective actions can contribute toward improving and protecting natural resources helps in both motivating and providing a basis for changing behaviors and addressing watershed issues. Pollutant reduction campaigns across the watershed can be developed by working with watershed groups, community groups, or individuals, and appropriate methods of education and outreach will vary based audience.

6.9.1 Education and Outreach Goals and Objectives

The USEPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (Handbook) was used in the development of the Poplar Creek Watershed education and outreach strategy. The

Handbook outlines a 6-step approach for developing and implementing an education and outreach program:

1. Define the driving forces, goals and objectives;
2. Identify and analyze the target audience;
3. Create the message;
4. Package the message;
5. Distribute the message; and
6. Evaluate the outreach campaign.

Implementing these steps will allow the watershed stakeholders achieve their education and outreach goals and objectives, and contribute toward watershed restoration and protection goals. The *Handbook* informed and provided a template for the education and outreach components of this plan.

6.9.2 Target Audiences

There are specific audiences to target and partner with for education and outreach activities. These audiences include but are not limited to residents, municipalities, businesses and organizations located or that work within the watershed. Levels of understanding of watershed issues varies across these audiences, so education needs to be tailored accordingly. Likewise, education and outreach should not be a one-time effort, but rather an ongoing occurrence that is mutually beneficial and allows for 2-way communication -- feedback and ideas should be collected from target audiences. The goal is to be receptive to current partners and to attract future partners who have not yet engaged in watershed improvement activities.

Education and outreach partners are expected to include the following entities:

- Local Government Officials and Agencies
  - Continued support from local governments and public landowners will be required to engage in projects on public lands and communicate with residents to encourage participation in watershed improvement. Communities in the watershed will be asked to adopt the watershed plan and participate as part of this education and outreach process.
- Residents
  - It is necessary to inform, educate, and motivate residents and partner with municipal programs across the watershed to achieve its goals.
- Schools and Youth Groups
  - Education programs specifically created for schools and youth groups are necessary to accomplish watershed improvements in the future. School and youth group participation in outdoor activities, such as river cleanups or invasive species control, are excellent ways to engage youth in learning about watershed conditions.
- Developers, Contractors and Consultants
  - This group has the potential to negatively or positively affect the watershed through design and development processes.
  - Already regulated by local ordinances, compliance with a variety of best development standards, regulations, codes and ordinances to protect the watershed will demonstrate a culture for concern of the health for waterways, which will eventually benefit their clients and their product.

- Consultants and contractors will play a key role in bringing education and outreach messages to their clients through influence for BMPs and watershed improvements.

- Landscapers/Lawn Care and Snow Removal Contractors
    - Contractors tasked with landscape and lawn care, as well as winter snow and ice removal have the potential to make a large impact on improving water quality within the watershed by implementing best management practices. By implementing best practices these enterprises can contribute toward significant reductions in nutrient and chloride loadings to the watershed and positive water quality changes.
    - Communities in the watershed can support education by maintaining registries for landscape, lawn care and winter maintenance providers with pollution reduction programs.
- Non-governmental Organizations
    - Our region has a wealth of non-governmental organizations committed to improved stormwater management, water quality and reduced flooding. Partnering with these agencies will help align goals, projects, resources and overall beneficial impacts for improved watershed conditions.

6.9.3 Partner Organizations

Several education and outreach programs are currently being implemented by other organizations in the Poplar Creek planning area that stakeholders can take advantage of. These organizations include the following:

- MWRD
    - With this watershed-based plan being supplemental to the Poplar Creek Watershed DWP, MWRD has been a partner with the development of this watershed plan from the start. The MWRD has provided numerous data sets, mapping tools and information throughout the watershed. In addition, MWRD is responsible for spearheading many improvement projects in the watershed as well as performing on-going stream maintenance and restoration projects while hosting community events. MWRD will continue to convene quarterly WPC meetings to discuss water quality-related topics.

- Poplar Creek Watershed Planning Peer Review Committee
    - This group formed as a function of creating this plan, consists of private consultants, nonprofit groups and governmental organizations to provide technical guidance and input on the watershed plan. Members of the review committee include:
        - Christopher B. Burke Engineering, Ltd.
        - Metropolitan Planning Council
        - Geosyntec Consultants
        - The Sierra Club
        - The Conservation Foundation
        - Illinois Environmental Protection Agency
        - Cook County Forest Preserve
        - Cook County Planning and Development
        - Illinois Department of Natural Resources

      The varied backgrounds and experience of these members brings valuable insight to the watershed planning process.

- Illinois Environmental Protection Agency
    - As a sponsor, Illinois EPA has provided valuable support in the form of grant funds for watershed planning and detailed review for the Poplar Creek watershed resource inventory and watershed-based plan.

- Chicago Metropolitan Agency for Planning
    - CMAP is the land use planning organization for northeastern Illinois. CMAP has provided detailed reviews of watershed documents, providing data, maps, exhibits, and statistics about the watershed. CMAP will play a valuable role improving stormwater management in the coming years through its release of the On-to-2050 regional plan and its Local Technical Assistance (LTA) program.

- North Cook Soil and Water Conservation District
    - In conjunction with Natural Resources Conservation Service (NRCS), the District regulates and provides information for compliance with soil erosion and sediment control measures related natural resources.

6.9.4 General Message Guidance

Regional and local decision-makers today are bombarded with information and messages. As a result audiences are selective about what information they take in and even more selective about what information is acted upon. For this reason the education and outreach program needs to be strategic about how messages are formulated and communicated, so that they achieve positive results.

Target audiences will need specifically tailored messages through a variety of delivery methods for the education and outreach program to be effective. To encourage audiences to understand and act upon a key point, single issue messages are often simple and effective and simple. However, water quality improvement has many dimensions and many effects, so messages may sometimes be created to address multiple issues such as linking hydrology and stream health. General guidelines for education and outreach efforts in the Poplar Creek watershed include the following:

- Use terms which the public can readily understand and which speak to their values and priorities.
- Keep messages simple and straightforward with only a few key take-home messages. Use graphics and photos to illustrate the message.
- Repeat messages frequently and consistently, sometimes using different media to communicate the message.
- Use community events as an opportunity to communicate messages.
- Highlight connections between messages such as: storms, streams, land management, flooding and the urban landscape and streets.
- When with a target group, focus specifically on the elements of a project which are most applicable to their town, neighborhood, or property.
- Create several messages for topic areas, such as a broad message for the general public and additional targeted messages for specific audiences within the watershed such as landowners, business owners, and municipalities.
- Organize materials and education strategies with partner organizations to combine efforts, share costs, access new networks and create a consistent message.

- Materials and messages should all promote local watershed groups with contact information as well as a brief note on how to get involved.
- Provide background information on watersheds when needed. Certain audiences may benefit from a briefing on biology, the water cycle, and basics of watersheds.
- Share information on websites and in popular public and private locations such as parks, forest preserves, libraries, cafes, grocery shops and municipal administration buildings.

6.9.5 Media and Marketing Campaign

The Poplar Creek planning area stakeholders do not have funding sources at present to deploy a professional media and/or marketing campaign. However, such a campaign would be an appropriate strategy for several of the listed target audiences. In addition, the following methods have been utilized by other watershed groups and could be considered and used when applicable:

- Package together a media kit and identify potential media outlets (radio, TV, newspaper, websites, etc.). Seek to take advantage of public service announcements on local TV or radio.
- Install road signs at stream crossings and at watershed boundaries clearly stating that one is entering the watershed and urging citizens to protect the watershed and/or stream.
- Implement a public relations and marketing campaign to include advertisements and outreach through newspapers, village newsletters, homeowner association circulars, and community meetings.
- Post and distribute watershed maps, posters and brochures which include pollution control strategies, current projects, future projects, and fun facts about the watershed.

6.9.6 Public Involvement, Stewardship and Community Event Strategies

The following strategies have been used by other groups to increase the influence of education and outreach messages. Different groups within the watershed may choose to engage in one of more of these activities.

- Create an “Adopt-a-River” program with an individual or group accepting responsibility for managing a specific reach.
- Create and publish a self-led tour of the watershed which notes scenic spots, natural areas, wetlands, trails, and areas of concern such as streambank erosion sites, stormwater outfalls, and urban runoff sites.
- Publish a directory of outstanding watershed management projects and hold an annual award ceremony for exemplary projects.
- Establish a form of recognition for watershed improvement efforts of industry, business, schools, citizens, elected officials, and environmental groups which implement watershed improvement projects.
- Start a storm drain stenciling or button campaign, noting when storm drains lead directly to local water bodies. Distribute door hangers to educate residents on storm drain stenciling efforts.
- Arrange tours to visit BMP sites and install interpretive signs at BMP installation sites.

Efforts should be made to reach out to local officials and partner organizations to plan events and initiatives and to advertise and communicate about watershed events. Information should also be shared widely through partner organizations about projects underway or completed and other watershed success stories.

6.9.7 Primary and Secondary Education

Stewardship activities targeted for schools and youth programs may include education and outreach activities such as the following:

- o Build a hands-on watershed curriculum which includes watershed ecology and nonpoint source pollution training for teachers, home-based educators, field trips, chemical test kits, nets, sampling equipment, and wildlife identification books. There are potential partnership opportunities with the Soil and Water Conservation Districts for sponsorship.
- o Facilitate seminars and workshops for teachers, home-based educators, and/or an annual student congress.
- o Maintain a group of trained student and teacher volunteers and create annual service learning opportunities such as clean ups and monitoring for students.

Outreach to school officials and teachers can be planned to prompt these types of initiatives.

6.9.8 Demonstration Projects with Educational Signage

Other watershed groups have installed demonstration projects (bioswales, rain gardens, etc.) coupled with interpretive signage to promote education and outreach. These types of on-the-ground projects can provide watershed improvements as well as provide public outreach and education. Events like ribbon-cutting ceremonies can be used to highlight the beneficial practices. Volunteers can sometimes be enlisted to carry out projects, such as to build a rain garden at a school or park.

6.9.9 Evaluating the Outreach Plan

Measured improvements in water quality in the watershed is the ultimate indicator of the effects of education and outreach and other plan implementation activities. While connecting improvements in water quality to specific programs or activities is quantitatively difficult, it is expected that increased public understanding of improved water quality will support beneficial policy actions and motivate future involvement watershed improvement efforts. For events and activities planned measures of participation and effect will be used to the extent possible, for example tracking numbers of participants at events, volunteer clean-ups, etc. Follow-up surveys can be used selectively to try to ascertain if messages received or events participated in resulted in beneficial watershed actions.

6.9.10 Watershed Information and Education Resources

In addition to this plan, there are numerous resources which provide targeted outreach messages, effective delivery methods, watershed management planning, media relations, and strategies to help in developing a successful outreach campaign. These resources include:

- o USEPA Watershed Academy
- o USEPA NPS Outreach Toolbox
- o The Center for Watershed Protection
- o The Illinois River Watershed Partnership

These organizations and resources can be downloaded and customized for the Poplar Creek Watershed. Some of the education and outreach methods discussed in this section can be incorporated into established work, projects, and education programs in the watershed, within existing budgets. Some activities (workshops, demonstration projects, and other large-scale actions) may require financial cost-share from public, private, or grant funding sources to support implementation.

6.9.11 Education and Outreach Initiatives

The watershed plan for the Upper Des Plaines River Watershed (Lake County) has suggested a number of education and outreach initiatives that may also be suitable and valuable in the nearby Poplar Creek watershed, including:

- Provide Information and training to riparian landowners on best practices for stream and Lake Shoreline restoration and maintenance that will reduce erosion and increase water quality.
- Conduct a watershed outreach campaign to inform and engage the public about watershed issues, landowner responsibilities, and available resources.
- Continue to educate local municipalities, landowners, and public works staff on road salt alternatives and application BMPs to minimize the use of road salt by public and private snow removal providers.
- Inform the public and distribute educational materials on the importance of watershed health (water quality, flood prevention/mitigation, soil conservation and agricultural production, green infrastructure, water-based recreation) to the economy of watershed communities.
- Inform homeowners and municipalities about water quality problems associated with sump pump, septic systems, and illicit storm drain hookups.
- Provide information on mosquito prevention measures for individual homeowners, including removing stagnant water in tires, buckets, clogged gutters, etc.
- Inform developers, municipalities, and residents about the negative impacts that untreated or unmitigated impervious surface coverage has on water resources.
- Inform municipalities, businesses, and homeowner associations about detention basin and stormwater inlet maintenance practices that improve water quality and reduce flooding.
- Offer and provide technical assistance to the public and local government for funding and cost-share opportunities and support with project development to implement the watershed plan.
- Provide watershed residents with a report card that illustrates the ecological health of the watershed and reports progress towards watershed goals.
- Support and promote the Conservation at Home program to reduce stormwater runoff.
- Facilitate public training and engage students, teachers, riparian landowners, lake associations, and homeowner associations to volunteer for lake, stream, and natural area stewardship and monitoring of water resources.
- Non-profit organizations choose a school to work with to naturalize open space and implement green infrastructure in schoolyards and parking areas.
- Promote the removal of invasive plants by providing trainings aimed at species identification/control (species such as: phragmities, teasel, garlic mustard, buckthorn).
- Outreach campaign, demonstration site, and workshop promoting the establishment of native plants and proper plant selection.
- Inform homeowner’s associations about the importance of funding and maintaining open space in developments.
- Include stream name signs at all stream crossings.
- Incorporate watershed signage and information at public properties such as forest preserves, public parks, and public lake.

CHAPTER 7 PLAN EVALUATION

Monitored water quality within Poplar Creek is the fundamental indicator of success in implementing measures to restore and protect water quality -- the effects of measures implemented throughout the watershed will ultimately be reflected in changes to water quality. However, the changes will occur slowly over time, and water quality data will be affected by a number of other factors, including future development, weather, and infrastructure projects. Thus, to gauge plan implementation over shorter time horizons and identify plan implementation successes, indicators can be used to track progress. Indicators can include the number and scale of BMP projects planned and implemented, as well as the estimated pollutant loading reductions achieved. Recommended measures and milestones are presented in this section, along with recommendations regarding tracking and monitoring systems.

7.1 MEASUREABLE MILESTONES

The watershed assessment for the Poplar Creek watershed has indicated that the most significant source of pollutant loadings is urban runoff and stormwater. The plan has identified BMP types and target levels of BMP implementation to reduce stormwater volumes and pollutant loadings. The measurable milestones being established to gauge plan implementation reflect the plan's emphasis on BMP implementation.

The table below sets out measurable milestones by BMP type for each watershed planning unit. The 5-, 10-, and 25-year implementation targets are cumulative numbers. The associated estimated sediment reductions associated with the 25-year goals are also shown for each watershed planning unit.

In addition to establishing milestones for BMP implementation, sediment loading reduction is used here as the metric or indicator for plan implementation tracking purposes. This is valid, as sediment/TSS levels in the water bodies are elevated, which contributes to use impairment. In addition, reductions in sediment loadings are typically coupled with reductions of loadings of other pollutants present in urban stormwater. As previously noted, sediment loadings also bring with them increased levels of hydrocarbons, organic and inorganic compounds and heavy metals, as sediment particles act as vehicles for these constituents. Reducing sediment loads results in reductions of loadings of other key pollutants. It should also be noted the methodology used to estimate sediment load reductions can also be used to estimate loading reductions for total phosphorus, nitrogen and BOD. This table focuses on sediment as the most useful surrogate or indicator pollutant.

Planning Unit ID	BMP	Amount	Unit	2-Year Goal	5-Year Goal	10-Year Goal	25-Year Goal	Sediment Reduction Achieved (tons/yr) by Year 25
PC1 (1720 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	10.72	Ac	0.43	1.71	4.29	10.72	
	Infiltration Trench	0.00	Ac	0.00	0.00	0.00	0.00	
	Oil/Grit Separators	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention (Green Roof) @ ~ $30	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention as Bioswale @ ~ $15/ft²)	2.59	Ac	0.10	0.41	1.03	2.59	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	0.00	0.00	0.00	0.00	
	Porous Pavement @ ~ $8/ft²	8.76	Ac	0.35	1.40	3.50	8.76	
	Weekly Street Sweeping	131.21	Ac	5.25	20.99	52.48	131.21	
	Water Quality Inlets (does not include maintenance)	131.21	Ea	5.25	20.99	52.48	131.21	
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	0.00	0.00	0.00	0.00	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	0.59	Ac	0.02	0.09	0.23	0.59	
	Settling Basins	0.04	*Ac*	0.00	0.01	0.01	0.04	
	Vegetated Filter Strips @ ~ $3/ft²	1.22	*Ac*	0.05	0.19	0.49	1.22	
	Wetland Restoration	106.56	Ac	4.26	17.05	42.62	106.56	
	Streambank Stabilization	6602.40	LF	264.10	1,056.38	2,640.96	6,602.40	
Subwatershed Total								32
PC2 (2159 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	21.66	Ac	0.87	3.47	8.67	21.66	
	Infiltration Trench	0.00	Ac	0.00	0.00	0.00	0.00	
	Oil/Grit Separators	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention as Bioswale @ ~ $15/ft²	4.06	Ac	0.16	0.65	1.63	4.06	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	0.00	0.00	0.00	0.00	
	Porous Pavement @ ~ $8/ft²	3.47	Ac	0.14	0.55	1.39	3.47	
	Weekly Street Sweeping	34.67	Ac	1.39	5.55	13.87	34.67	
	Water Quality Inlets (does not include maintenance)	34.67	Ea	1.39	5.55	13.87	34.67	
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	0.00	0.00	0.00	0.00	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	2.20	Ac	0.09	0.35	0.88	2.20	
	Settling Basins	0.13	*Ac*	0.01	0.02	0.05	0.13	
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	0.00	0.00	0.00	0.00	
	Wetland Restoration	264.30	Ac	10.57	42.29	105.72	264.30	
	Streambank Stabilization	6472.80	LF	258.91	1,035.65	2,589.12	6,472.80	
Subwatershed Total								151
PC3 (5963 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	22.54	Ac	0.90	3.61	9.02	22.54	
	Infiltration Trench	0.00	Ac	0.00	0.00	0.00	0.00	
	Oil/Grit Separators	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention as Bioswale @ ~ $15/ft²	9.46	Ac	0.38	1.51	3.79	9.46	

Planning Unit ID	BMP	Amount	Unit	2-Year Goal	5-Year Goal	10-Year Goal	25-Year Goal	Sediment Reduction Achieved (tons/yr) by Year 25
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	0.00	0.00	0.00	0.00	
	Porous Pavement @ ~ $8/ft²	6.85	Ac	0.27	1.10	2.74	6.85	
	Weekly Street Sweeping	68.48	Ac	2.74	10.96	27.39	68.48	
	Water Quality Inlets (does not include maintenance)	68.48	Ea	2.74	10.96	27.39	68.48	
	Detention Basin Retrofit - native planting in dry bottom pond	0.17	Ac	0.01	0.03	0.07	0.17	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	0.42	Ac	0.02	0.07	0.17	0.42	
	Settling Basins	0.04	*Ac*	0.00	0.01	0.01	0.04	
	Vegetated Filter Strips @ ~ $3/ft²	4.45	*Ac*	0.18	0.71	1.78	4.45	
	Wetland Restoration	147.14	Ac	5.89	23.54	58.86	147.14	
	Streambank Stabilization	15803.60	LF	632.14	2,528.58	6,321.44	15,803.60	
Subwatershed Total								326
PC4 (3866 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	22.66	Ac	0.91	3.62	9.06	22.66	
	Infiltration Trench	143.37	Ac	5.73	22.94	57.35	143.37	
	Oil/Grit Separators	18.27	Ac	0.73	2.92	7.31	18.27	
	Bioretention (Green Roof) @ ~ $30ft2	13.70	Ac	0.55	2.19	5.48	13.70	
	Bioretention as Bioswale @ ~ $15/ft²	7.69	Ac	0.31	1.23	3.08	7.69	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	246.92	Ea	9.88	39.51	98.77	246.92	
	Porous Pavement @ ~ $8/ft²	4.32	Ac	0.17	0.69	1.73	4.32	
	Weekly Street Sweeping	43.20	Ac	1.73	6.91	17.28	43.20	
	Water Quality Inlets (does not include maintenance)	43.20	Ea	1.73	6.91	17.28	43.20	
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	0.00	0.00	0.00	0.00	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	2.55	Ac	0.10	0.41	1.02	2.55	
	Settling Basins	0.15	*Ac*	0.01	0.02	0.06	0.15	
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	0.00	0.00	0.00	0.00	
	Wetland Restoration	204.78	Ac	8.19	32.76	81.91	204.78	
	Streambank Stabilization	9979.20	LF	399.17	1,596.67	3,991.68	9,979.20	
Subwatershed Total								247
PCEB (3272 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	18.34	Ac	0.73	2.93	7.34	18.34	
	Infiltration Trench	0.00	Ac	0.00	0.00	0.00	0.00	
	Oil/Grit Separators	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention as Bioswale @ ~ $15/ft²	7.96	Ac	0.32	1.27	3.18	7.96	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	0.00	0.00	0.00	0.00	
	Porous Pavement @ ~ $8/ft²	4.98	Ac	0.20	0.80	1.99	4.98	
	Weekly Street Sweeping	49.84	Ac	1.99	7.97	19.93	49.84	
	Water Quality Inlets (does not include maintenance)	49.84	Ea	1.99	7.97	19.93	49.84	
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	0.00	0.00	0.00	0.00	

Planning Unit ID	BMP	Amount	Unit	2-Year Goal	5-Year Goal	10-Year Goal	25-Year Goal	Sediment Reduction Achieved (tons/yr) by Year 25
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	1.63	Ac	0.07	0.26	0.65	1.63	
	Settling Basins	0.10	*Ac*	0.00	0.02	0.04	0.10	
	Vegetated Filter Strips @ ~ $3/ft²	3.74	*Ac*	0.15	0.60	1.50	3.74	
	Wetland Restoration	118.57	Ac	4.74	18.97	47.43	118.57	
	Streambank Stabilization	10655.60	LF	426.22	1,704.90	4,262.24	10,655.60	
Subwatershed Total								84
PCLT (2850 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	28.44	Ac	1.14	4.55	11.38	28.44	
	Infiltration Trench	0.00	Ac	0.00	0.00	0.00	0.00	
	Oil/Grit Separators	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention as Bioswale @ ~ $15/ft²	9.30	Ac	0.37	1.49	3.72	9.30	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	0.00	0.00	0.00	0.00	
	Porous Pavement @ ~ $8/ft²	7.74	Ac	0.31	1.24	3.09	7.74	
	Weekly Street Sweeping	77.36	Ac	3.09	12.38	30.94	77.36	
	Water Quality Inlets (does not include maintenance)	77.36	Ea	3.09	12.38	30.94	77.36	
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	0.00	0.00	0.00	0.00	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	1.26	Ac	0.05	0.20	0.50	1.26	
	Settling Basins	0.08	*Ac*	0.00	0.01	0.03	0.08	
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	0.00	0.00	0.00	0.00	
	Wetland Restoration	145.92	Ac	5.84	23.35	58.37	145.92	
	Streambank Stabilization	3638.40	LF	145.54	582.14	1,455.36	3,638.40	
Subwatershed Total								76
PCRR (1777 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	12.65	Ac	0.51	2.02	5.06	12.65	
	Infiltration Trench	101.74	Ac	4.07	16.28	40.70	101.74	
	Oil/Grit Separators	9.20	Ac	0.37	1.47	3.68	9.20	
	Bioretention (Green Roof) @ ~ $30ft2	6.90	Ac	0.28	1.10	2.76	6.90	
	Bioretention as Bioswale @ ~ $15/ft²	4.70	Ac	0.19	0.75	1.88	4.70	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	124.34	Ea	4.97	19.89	49.73	124.34	
	Porous Pavement @ ~ $8/ft²	2.84	Ac	0.11	0.45	1.14	2.84	
	Weekly Street Sweeping	28.40	Ac	1.14	4.54	11.36	28.40	
	Water Quality Inlets (does not include maintenance)	28.40	Ea	1.14	4.54	11.36	28.40	
	Detention Basin Retrofit - native planting in dry bottom pond	0.37	Ac	0.01	0.06	0.15	0.37	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	1.02	Ac	0.04	0.16	0.41	1.02	
	Settling Basins	0.08	*Ac*	0.00	0.01	0.03	0.08	
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	0.00	0.00	0.00	0.00	
	Wetland Restoration	55.13	Ac	2.21	8.82	22.05	55.13	

Planning Unit ID	BMP	Amount	Unit	2-Year Goal	5-Year Goal	10-Year Goal	25-Year Goal	Sediment Reduction Achieved (tons/yr) by Year 25
	Streambank Stabilization	4473.20	LF	178.93	715.71	1,789.28	4,473.20	
Subwatershed Total								704
PCSB (3698 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	35.88	Ac	1.44	5.74	14.35	35.88	
	Infiltration Trench	0.00	Ac	0.00	0.00	0.00	0.00	
	Oil/Grit Separators	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention as Bioswale @ ~ $15/ft²	11.71	Ac	0.47	1.87	4.69	11.71	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	0.00	0.00	0.00	0.00	
	Porous Pavement @ ~ $8/ft²	8.73	Ac	0.35	1.40	3.49	8.73	
	Weekly Street Sweeping	87.29	Ac	3.49	13.97	34.92	87.29	
	Water Quality Inlets (does not include maintenance)	87.29	Ea	3.49	13.97	34.92	87.29	
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	0.00	0.00	0.00	0.00	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	1.17	Ac	0.05	0.19	0.47	1.17	
	Settling Basins	0.07	*Ac*	0.00	0.01	0.03	0.07	
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	0.00	0.00	0.00	0.00	
	Wetland Restoration	181.28	Ac	7.25	29.00	72.51	181.28	
	Streambank Stabilization	6678.00	LF	267.12	1,068.48	2,671.20	6,678.00	
Subwatershed Total								42
PCSC (2082 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	19.63	Ac	0.79	3.14	7.85	19.63	
	Infiltration Trench	0.00	Ac	0.00	0.00	0.00	0.00	
	Oil/Grit Separators	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention as Bioswale @ ~ $15/ft²	7.68	Ac	0.31	1.23	3.07	7.68	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	0.00	0.00	0.00	0.00	
	Porous Pavement @ ~ $8/ft²	13.93	Ac	0.56	2.23	5.57	13.93	
	Weekly Street Sweeping	139.29	Ac	5.57	22.29	55.72	139.29	
	Water Quality Inlets (does not include maintenance)	139.29	Ea	5.57	22.29	55.72	139.29	
	Detention Basin Retrofit - native planting in dry bottom pond	0.23	Ac	0.01	0.04	0.09	0.23	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	0.42	Ac	0.02	0.07	0.17	0.42	
	Settling Basins	0.04	*Ac*	0.00	0.01	0.02	0.04	
	Vegetated Filter Strips @ ~ $3/ft²	0.00	*Ac*	0.00	0.00	0.00	0.00	
	Wetland Restoration	242.52	Ac	9.70	38.80	97.01	242.52	
	Streambank Stabilization	6121.60	LF	244.86	979.46	2,448.64	6,121.60	
Subwatershed Total								45
PCTA (833 acres)	*Bioretention (Rain Gardens / Planter Boxes / Landscaped Medians) @ ~ $4/ft2*	1.41	Ac	0.06	0.23	0.56	1.41	
	Infiltration Trench	0.00	Ac	0.00	0.00	0.00	0.00	

Planning Unit ID	BMP	Amount	Unit	2-Year Goal	5-Year Goal	10-Year Goal	25-Year Goal	Sediment Reduction Achieved (tons/yr) by Year 25
	Oil/Grit Separators	0.00	Ac	0.00	0.00	0.00	0.00	
	Bioretention as Bioswale @ ~ $15/ft²	1.41	Ac	0.06	0.23	0.56	1.41	
	Bioretention (Green Roof) @ ~ $30ft2	0.00	Ac	0.00	0.00	0.00	0.00	
	Cistern (10,000 Gal Tank/ 0.37 Ac)	0.00	Ea	0.00	0.00	0.00	0.00	
	Porous Pavement @ ~ $8/ft²	0.70	Ac	0.03	0.11	0.28	0.70	
	Weekly Street Sweeping	7.01	Ac	0.28	1.12	2.81	7.01	
	Water Quality Inlets (does not include maintenance)	7.01	Ea	0.28	1.12	2.81	7.01	
	Detention Basin Retrofit - native planting in dry bottom pond	0.00	Ac	0.00	0.00	0.00	0.00	
	Detention Basin Retrofit - wet bottom pond restoration and bank enhancement	0.75	Ac	0.03	0.12	0.30	0.75	
	Settling Basins	0.04	*Ac*	0.00	0.01	0.02	0.04	
	Vegetated Filter Strips @ ~ $3/ft²	66.89	*Ac*	2.68	10.70	26.75	66.89	
	Wetland Restoration	104.61	Ac	4.18	16.74	41.84	104.61	
	Streambank Stabilization	2561.60	LF	102.46	409.86	1,024.64	2,561.60	
Subwatershed Total								94

Table 7.1-1 Measurable Milestones for 2-, 5-, 10-, and 25-year Goals – Poplar Creek Planning Area

7.2 MEASURING PROGRESS AND MONITORING EFFECTIVNESS

7.2.1 Tracking Plan Implementation

Reflecting discussions with MWRD and other watershed stakeholders, this plan identifies two primary mechanisms to track plan implementation over time:

(1) Many of the capital/BMP projects envisioned in this plan will need to be permitted under the MWRD WMO. MWRD has a database of permit actions. The database includes information such as BMP type and size and location as a function of the WMO requirements with respect to volume control and detention for new and redevelopment. A principal means of tracking plan implementation will be to periodically pull reports for permitted projects in the Poplar Creek watershed. This will capture the majority of stormwater BMP projects and allow for a check to see to what extent the milestones in table 7.1-1 are being met. In this way MWRD can be aware of all the projects in the watershed.

(2) MWRD will include an agenda item in each Poplar Creek and Upper Salt Creek Watershed Planning Council meeting to discuss project ideas and capture projects in process or completed. Watershed communities and other stakeholders can report on their projects, some of which may be small or otherwise be of a nature that a WMO permit was not required. This will allow for projects to be tracked even if the project is not in the WMO permit database.

The cumulative expanse of projects completed can be compared to the table of milestones to determine if implementation is proceeding generally on schedule.

Communities that are MS4 communities and are subject to the State-wide MS4 general permit will also be tracking implementation of stormwater-related projects. This will include structural/on-the-ground projects as well as non-structural practices such as street sweeping. This is also a requirement of the State-wide MS4 general permit where an annual report outlining milestones for BMP implementation is required.

Participation in watershed protection events, trainings, workshops, and other outreach activities can be measured by event organizers. The effects of outreach activities will be selectively evaluated through surveys or other means. This includes encouragement of municipalities to allocate funding toward improving water quality.

7.3 CURRENT WATER QUALITY MONITORING EFFORTS AND FUTURE EFFORTS

The ultimate indicator of the effects of plan implementation will be changes in water quality. Recognizing that changes will occur slowly over time, and water quality data will be affected by a number of other factors, monitoring is nevertheless critical to understand conditions and identify changes. State-conducted monitoring has been very important to characterizing water quality in the Poplar Creek watershed, including monitoring that has been carried out in the development of the 303(d) list of impaired waters. It will be valuable for the State to carry out monitoring in the watershed on a periodic basis, to the extent resources allow, to keep 303(d) listings up-to-date. If a segment(s) can be de-listed that will be a direct indicator that water quality has improved.

Biological monitoring would be a valuable complement to monitoring of chemical water quality. The Illinois DNR conducts monitoring at strategic locations to check for the presence of invasive species. It may be possible to draw out information about biological abundance and diversity from this sampling, if full biological surveys or the mainstem or tributaries are not practicable.

As noted in Chapter 3, MWRD monitored water quality constituents as part of its Ambient Water Quality Monitoring in the planning area between 2001 through 2012. It would be valuable for the District to resume these monitoring efforts if feasible. The data on TSS, nutrients, DO, bacteria, and chlorides will be indicative of overall water quality and may reveal material results from BMP implementation.

There is a good amount data generated nationally on the effectiveness of BMPs. However, few studies have been done in the Poplar Creek watershed. Studies of the performance of typical individual BMPs will be useful to determine locally the extent to which BMPs are performing as expected. Monitoring and observation of BMPs will also be valuable to assess if maintenance is occurring and if BMP performance is continuing over time.

CHAPTER 8 CONCLUSION

This watershed-based plan for the Poplar Creek planning area is a comprehensive overview of the water quality conditions in the watershed and measures that need to be implemented to restore and protect water quality.

The analysis of water quality conditions and pollutant loadings reveal that stormwater discharges are the primary source of loadings of key pollutants. This is not surprising -- the planning area is approximately 71% developed excluding the forest preserves and open space. As would be expected, much of the developed land area is covered with impervious surfaces. Some portions of the development in the watershed occurred prior to 1970's and stormwater control measures were not integrated into the areas. The overall change from pervious to impervious surfaces result in high volumes of stormwater runoff and increases in pollutant loadings.

Reflecting the identified sources of pollutant loadings, the plan recommends BMPs to better manage urban runoff and stormwater. Many of the recommended BMPs will have the function of intercepting and treating runoff, including green infrastructure practices. Green infrastructure practices including rain gardens, bioswales, permeable pavements and green roofs, capture and treat runoff, resulting in reduced stormwater volumes and reduced pollutant loads. The plan also notes the importance of non-structural controls, including but not limited to measures that communities will carry out in conformance with MS4 permit provisions. Enhanced de-icing practices will be critically important for reducing chloride loadings.

An aggressive level of BMP implementation will be needed to achieve substantial pollutant load reductions. The plan proposes a target degree of BMP implementation. Specifically the plan recommends that 20% of the land areas with the different land uses/land covers in the watershed will have BMPs applied. This is the degree of implementation expected to be practicable, given public vs. private land ownership, budgets, community-buy-in, and other factors. The watershed planning units contributing the greatest loadings are identified in the plan; these should be areas of focus for BMP implementation.

The plan identifies recommended BMPs to address the different land covers and sources of pollution from runoff within the watershed. The plan identifies *types* of BMPs that would address the sources of loadings, but does not list or *prescribe* specific BMPs in specific places. The sizes and designs of BMPs and the optimal places for BMPs will need to be determined by communities and other stakeholders taking into account where benefits will be the greatest but also numerous factors including land ownership, budgets, community buy-in, and how maintenance will be assured. Also, new concepts or designs for BMPs may be developed during the plan implementation period. The plan intends there be flexibility to incorporate new BMP concepts if they cost-effectively reduce pollutant loadings from urban runoff and stormwater discharges.

The plan models and quantifies the effects (i.e., the loading reductions) that would be achieved with a typical and suitable mix of BMPs within the watershed planning units, and the associated costs. Because of the size of the watershed and the amount of developed area, the 20% target implementation level represents a very substantial scale of BMP implementation. The costs will be significant. This can be considered a *stretch goal*, that is an ambitious goal that will need to be pursued incrementally. However, with creative thinking and strong resolve on the part of watershed decision-makers, businesses, and residents, significant progress can be made toward a healthy watershed that can be appreciated and enjoyed by all.

CHAPTER 9 REFERENCES

Beaulieu, K.M., Bell, A.H., & Coles, J.F., (2012), *Variability in Stream Chemistry in Relation to Urban Development and Biological Condition in Seven Metropolitan Areas of the United States, 1999–2004*: U.S. Geological Survey Scientific Investigations Report 2012–5170, Page 27.

Bitting, Jennifer & Kloss, Christopher, (2008), *Managing Wet Weather with Green Infrastructure Municipal Handbook: Green Infrastructure Retrofit Policies*, U.S. Environmental Protection Agency, 23 Pages.

Brabec, Elizabeth, Schulte, Stacey & Richards, Paul L., (May 1, 2002) *Impervious Surfaces and Water Quality: A Review of Current Literature and Its Implications for Watershed Planning,* Sage Journal of Planning Research Article, Volume 16, Issue 4, Pages 499-514.

Brezonik, Patrick L. & Stadelmann, Teresa H., (April, 2002), *Analysis and predictive models of stormwater runoff volumes, loads, and pollutant concentrations from watersheds in the Twin Cities metropolitan area, Minnesota, USA,* Water Research, Volume 36, Issue 7, Pages 1743-1757

Brian Miller, Associate Director and Outreach Coordinator, (n.d.) *Illinois-Indiana Sea Grant College Program*, Purdue Extension publication ID-260-W.

Brown, Robert C., Pierce, Richard H., & Rice, Stanley A., (June 1985), *Hydrocarbon contamination in sediments from urban stormwater runoff*, Elsevier Marine Pollution Bulletin, Volume 16, Issue 6, Pages 236-240.

Boyer, Jennifer, (2007), *DuPage County Water Quality Best Management Practices Technical Guidance for Inclusion into Appendix E: Technical Guidance for the DuPage Countywide Stormwater and Flood Plain Ordinance*, Engineering Resource Associates, Inc., 121 Pages.

Clary, Jane, & Jones, Jonathan with Wright Water Engineers, Inc., & Leisenring, Marc, Hobson, Paul and Strecker, Eric with Geosyntec Consultants (2017), *International Stormwater BMP Database: 2016 Summary Statistics*, Water Environment & Reuse Foundation.

Corsi, Steven R., De Cicco, Laura A., Lutz, Michelle A., & Hirsch, Robert M., (March 2015), *River chloride trends in snow-affected urban watersheds: increasing concentrations outpace urban growth rate and are common among all seasons*, Elsevier Science of the Total Environment, Volume 508, Pages 488-497.

Erickson, Andrew J., Weiss, Peter T., & Gulliver, John S., (March 14, 2013), *Optimizing Stormwater Treatment Practices: A Handbook of Assessment and Maintenance*, Springer Science & Business Media, Volume XII, 337 Pages.

Fischer, Richard A., & Fischenich, J. Craig, (April 2000), *Design Recommendations for Riparian Corridors and Vegetated Buffer Strips*, Environmental Laboratory (U.S.) Engineer Research and Development Center (U.S.), ERDC TN-EMRRP-SR-24.

Herrmann, Reimer, (November 1981), *Transport of polycyclic aromatic hydrocarbons through a partly urbanized river basin*, Water, Air, and Soil Pollution, Volume 16, Issue 4, Pages 445-467.

Hwang, Hyun-Min, (April 2006), *Characterization of polycyclic aromatic hydrocarbons in urban stormwater runoff flowing into the tidal Anacostia River, Washington, DC, USA*, Elsevier Environmental Pollution, Volume 140, Issue 3, Pages 416-426.

Kauffman, J.B., Beschta, R.L., Otting, N., & Lytjen, D., (1997), *An Ecological Perspective of Riparian and Stream Restoration in the Western United States*, Fisheries, Volume 22, Number 5, Pages 12-24.

Kaushal, Sujay S., Goffman, Peter M., Likens, Gene E., Belt, Kenneth T., Stack, William P., Kelly, Victoria R., Band, Lawrence, E., & Fisher, Gary T., (September 20, 2005), *Increased Salinization of fresh water in the northeastern United States*, Proc Natl Acad Science USA, Volume 102, No. 38, Pages 13517-13520.

Li, Dongya, Wan, Jinquan, Ma, Yongwen, Wang, Yan, Huang, Mingzhi & Chen, Yangmei, (March 16, 2015), *Stormwater Runoff Pollutant Loading Distributions and Their Correlation with Rainfall and Catchment Characteristics in a Rapidly Industrialized City*, Plus One.

LID Urban Design Tools - Tree Box Filters - Low Impact Development, October 21, 2017; www.lid-stormwater.net/treeboxfilter_home.htm.

Mahl, Ursula H., Jennifer L. Tank, Sarah S. Roley, and Robert T. Davis, 2015. Two-Stage Ditch Floodplains Enhance N-Removal Capacity and Reduce Turbidity and Dissolved P in Agricultural Streams. Journal of the American Water Resources Association (JAWRA) 1-18. DOI: 10.1111/1752-1688.12340

Meals, Donald W., Dressing, Steven A., & Davenport, Thomas E., (2009), *Lag Time in Water Quality Response to Best Management Practices: A Review.*, J. Environ Qual., Volume 39, Number 1, Pages 85-96.

NOAA Habitat Conservation National Marine Fisheries Services, Streams & Rivers Restoration.

"Reforestation." US Forest Service, United States Department of Agriculture.

Schueler, Tom, Hirschman, David, Novotney, Michael, & Zielinski, Jennifer, (2007), *Urban Subwatershed Restoration Manual No. 3: Urban Stormwater Retrofit Practices, Version 1.0.*, Environmental Protection Agency Office of Water Programs.

Stein, Eric D., Tiefenthaler, Liesl L., &Schiff, Kenneth, (February, 2006), *Watershed-based sources of polycyclic aromatic hydrocarbons in urban storm water*, Environmental Toxicology and Chemistry, Volume 25, Issue 2, Pages 373-385.

(November 1995), *Ecological Restoration: A Tool To Manage Stream Quality*, United States Environmental Protection Agency, Office of Water.

(April 2011), *Stormwater Retrofit Techniques for Restoring Urban Drainages in Massachusetts and New Hampshire*, *USEPA Small MS4 Permit Technical Support Document*, United States Environmental Protection Agency, Pages 1-4.

(May 2013), *Chesapeake Bay Field Office: Coastal Program Stream Habitat Assessment and Restoration Implementation Projects*, U.S. Fish & Wildlife Service.

APPENDIX 1 BMPS APPLIED WITHIN EACH WATERSHED PLANNING UNIT

	Planning Unit Area	Implementation Area (20% of PU Area Area)	Rain Gardens 0.06 acres per acre (*Bioretention*)	Bioswale (5' wide per linear foot of roadway - *Bioretention*)	Planter Boxes (*Bioretention*)	*Infiltration Trench* (d/s of planter boxes)	*Oil/Grit Separators* (1 per 10 acres)	Green Roof (15% of all buildings - *Bioretention*)	*Cistern* (10,000 Gal Tank/ 0.37 Ac)	*Porous Pavement* (10% of Roadway Max)	*Weekly Street Sweeping* (Total Area of Roadway)	*WQ Inlets* (Contributing Area = Total Roadway Area)	Native Planting in Bottom of Dry Pond (*Ext. Wet Detention*)	Wet Bottom Pond Restoration (*Ext. Wet Detention*)	*Settling Basin* (2 per pond)	*Vegetated Filter Strips* (5' around perimeter - 50% of Area)	Wetland Restoration (*Wetland Detention*)
Subarea PC1																	
Residential (39%)	677.33	135.47	8.13							1.09	54.49	54.49					
ROW	139.72	27.94		2.59													
Forest (47%)	816.15	163.23								7.67	76.72	76.72				1.22	
Wetland - Residential	246.37	49.27															49.27
Wetland - Cropland	27.47	5.49															5.49
Wetland - Open Space	188.75	37.75															37.75
Wetland - Non-Parcel Areas	70.20	14.04															14.04
Wet Detention - Residential	2.94	0.59												0.59	0.04		
Streambank Length	33012.00	6602.40															
Subarea PC2																	
ROW	219.42	43.88		4.06													
Residential 68%	1466.72	293.34	17.60							2.98	29.84	29.84					
TRANS/COMM/UTIL/WASTE (11 %)	247.35	49.47								0.48	4.83	4.83					
Wetland - Residential	1382.38	276.48															246.37
Wetland - Commercial	0.65	0.13															0.13
Wetland - Institutional	29.25	5.85															5.85
Wetland - Trans/Comm/Util/Waste	6.94	1.39															1.39
Wetland - Cropland	8.51	1.70															1.70
Wetland - Open Space	13.39	2.68															2.68
Wetland - Non-Parcel Areas	30.93	6.19															6.19
Wet Detention - Residential	9.89	1.98												1.98	0.12		
Wet Detention - Commercial	0.91	0.18												0.18	0.01		
Wet Detention - Institutional	0.20	0.04												0.04	0.00		
Streambank Length	32364.00	6472.80															
Subarea PC3																	
ROW	511.08	102.22		9.46													
Residential 18%	1089.92	217.98	13.08							6.95	69.51	69.51					
Forest 66%	3932.04	786.41								6.75	67.46	67.46				4.45	
Wetland - Residential	185.28	37.06															37.06
Wetland - Commercial	4.40	0.88															0.88
Wetland - Institutional	23.85	4.77															4.77
Wetland - Trans/Comm/Util/Waste	0.31	0.06															0.06
Wetland - Cropland	0.76	0.15															0.15
Wetland - Open Space	405.44	81.09															81.09
Wetland - Vacant	0.00	0.00															0.00
Wetland - Water	9.93	1.99															1.99
Wetland - Non-Parcel Areas	105.74	21.15															21.15
Dry Detention - Residential	0.83	0.17											0.17		0.01		
Wet Detention - Residential	1.53	0.31												0.31	0.02		
Wet Detention - Commercial	0.59	0.12												0.12	0.01		
Streambank Length	79018.00	15803.60															
Subarea PC4																	
Industrial 24%	913.61	182.72			2.15	143.37	18.27	13.70	91.36	1.99	19.94	19.94					
ROW	415.34	83.07		7.69													
Residential 28%	1067.84	213.57	12.81							2.33	23.26	23.26					
Wetland - Residential	162.04	32.41															32.41
Wetland - Commercial	21.82	4.36															4.36
Wetland - Institutional	123.02	24.60															24.60
Wetland - Industrial	226.47	45.29															45.29
Wetland - Trans/Comm/Util/Waste	102.82	20.56															20.56
Wetland - Cropland	0.89	0.18															0.18
Wetland - Open Space	214.79	42.96															42.96
Wetland - Vacant	36.52	7.30															7.30
Wetland - Water	44.87	8.97															8.97
Wetland - Non-Parcel Areas	90.66	18.13															18.13
Wet Detention - Residential	5.62	1.12												1.12	0.07		
Wet Detention - Commercial	0.20	0.04												0.04	0.00		
Wet Detention - Industrial	6.61	1.32												1.32	0.08		
Streambank Length	49896.00	9979.20															
Subarea PCEB																	
ROW	429.61	85.92		7.96													
Residential 26%	865.61	173.12	10.39							2.23	22.34	22.34					
Forest 32%	1031.13	206.23								2.75	27.50	27.50				3.74	
Wetland - Residential	171.88	34.38															34.38
Wetland - Commercial	49.17	9.83															9.83
Wetland - Institutional	14.41	2.88															2.88
Wetland - Industrial	24.71	4.94															4.94
Wetland - Trans/Comm/Util/Waste	14.22	2.84															2.84
Wetland - Cropland	6.85	1.37															1.37
Wetland - Open Space	241.29	48.26															48.26
Wetland - Vacant	12.45	2.49															2.49
Wetland - Water	11.17	2.23															2.23
Wetland - Forest	0.00	0.00															0.00
Wetland - Non-Parcel Areas	46.73	9.35															9.35
Wet Detention - Residential	0.59	0.12												0.12	0.01		
Wet Detention - Commercial	7.58	1.52												1.52	0.09		
Streambank Length	53278.00	10655.60															
Subarea PCLT																	

	Planning Unit Area	Implementation Area (20% of PU Area Area)	Rain Gardens 0.06 acres per acre (*Bioretention*)	Bioswale (5' wide per linear foot of roadway - *Bioretention*)	Planter Boxes (*Bioretention*)	*Infiltration Trench* (d/s of planter boxes)	*Oil/Grit Separators* (1 per 10 acres)	Green Roof (15% of all buildings - *Bioretention*)	*Cistern* (10,000 Gal Tank/ 0.37 Ac)	*Porous Pavement* (10% of Roadway Max)	*Weekly Street Sweeping* (Total Area of Roadway)	*WQ Inlets* (Contributing Area = Total Roadway Area)	Native Planting in Bottom of Dry Pond (*Ext. Wet Detention*)	Wet Bottom Pond Restoration (*Ext. Wet Detention*)	*Settling Basin* (2 per pond)	*Vegetated Filter Strips* (5' around perimeter - 50% of Area)	Wetland Restoration (*Wetland Detention*)
ROW	502.31	100.46		9.30													
Residential 56%	1594.94	318.99	19.14							5.63	56.26	56.26					
TRANS/COMM/UTIL/WASTE 21%	611.89	122.38								2.11	21.10	21.10					
Wetland - Residential	445.91	89.18															89.18
Wetland - Commercial	22.40	4.48															4.48
Wetland - Institutional	10.36	2.07															2.07
Wetland - Industrial	18.43	3.69															3.69
Wetland - Trans/Comm/Util/Waste	3.81	0.76															0.76
Wetland - Open Space	113.60	22.72															22.72
Wetland - Vacant	12.68	2.54															2.54
Wetland - Water	12.29	2.46															2.46
Wetland - Non-Parcel Areas	90.09	18.02															18.02
Wet Detention - Residential	4.07	0.81												0.81	0.05		
Wet Detention - Commercial	0.39	0.08												0.08	0.00		
Wet Detention - Institutional	0.93	0.19												0.19	0.01		
Wet Detention - Trans/Comm/Util/Waste	0.07	0.01												0.01	0.00		
Wet Detention - Open Space	0.85	0.17												0.17	0.01		
Streambank Length	18192.00	3638.40															
Subarea PCRR																	
Commercial 26%	460.05	92.01			1.53	101.74	9.20	6.90	46.00	1.32	13.19	13.19					
ROW	253.61	50.72		4.70													
Residential 30%	535.50	107.10	6.43							1.52	15.22	15.22					
Wetland - Residential	45.72	9.14															9.14
Wetland - Commercial	5.82	1.16															1.16
Wetland - Institutional	1.39	0.28															0.28
Wetland - Trans/Comm/Util/Waste	59.27	11.85															11.85
Wetland - Cropland	4.71	0.94															0.94
Wetland - Open Space	71.72	14.34															14.34
Wetland - Vacant	0.62	0.12															0.12
Wetland - Non-Parcel Areas	86.39	17.28															17.28
Dry Detention - Trans/Comm/Util/Waste	1.87	0.37											0.37		0.02		
Wet Detention - Residential	1.01	0.20												0.20	0.01		
Wet Detention - Commercial	0.48	0.10												0.10	0.01		
Wet Detention - Institutional	0.16	0.03												0.03	0.00		
Wet Detention - Industrial	3.04	0.61												0.61	0.04		
Wet Detention - Trans/Comm/Util/Waste	0.41	0.08												0.08	0.00		
Streambank Length	22366.00	4473.20															
Subarea PCSB																	
ROW	632.56	126.51		11.71													
Residential 54%	2013.74	402.75	24.16							6.83	68.32	68.32					
TRANS/COMM/UTIL/WASTE 18%	675.01	135.00								1.90	18.98	18.98					
Wetland - Residential	447.01	89.40															89.40
Wetland - Commercial	79.13	15.83															15.83
Wetland - Institutional	28.93	5.79															5.79
Wetland - Industrial	21.73	4.35															4.35
Wetland - Trans/Comm/Util/Waste	4.73	0.95															0.95
Wetland - Cropland	0.11	0.02															0.02
Wetland - Open Space	188.69	37.74															37.74
Wetland - Vacant	15.00	3.00															3.00
Wetland - Non-Parcel Areas	121.05	24.21															24.21
Wet Detention - Residential	5.03	1.01												1.01	0.06		
Wet Detention - Institutional	0.83	0.17												0.17	0.01		
Streambank Length	33390.00	6678.00															
Subarea PCSC																	
ROW	414.56	82.91		7.68						8.29	82.91	82.91					
Residential 48%	996.43	199.29	11.96							3.98	39.80	39.80					
TRANS/COMM/UTIL/WASTE 20%	416.50	83.30								1.66	16.58	16.58					
Wetland - Residential	614.18	122.84															122.84
Wetland - Commercial	2.97	0.59															0.59
Wetland - Institutional	1.51	0.30															0.30
Wetland - Open Space	306.34	61.27															61.27
Wetland - Water	37.47	7.49															7.49
Wetland - Non-Parcel Areas	250.15	50.03															50.03
Dry Detention - Residential	1.16	0.23											0.23		0.01		
Wet Detention - Residential	1.28	0.26												0.26	0.02		
Wet Detention - Commercial	0.76	0.15												0.15	0.01		
Wet Detention - Open Space	0.08	0.02												0.02	0.00		
Streambank Length	30608.00	6121.60															
Subarea PCTA																	
Cropland 24%	198.84	39.77								0.37	3.66	3.66				66.89	
ROW	76.23	15.25		1.41													
TRANS/COMM/UTIL/WASTE 22%	182.32	36.46								0.34	3.35	3.35					
Wetland - Residential	86.83	17.37															17.37
Wetland - Commercial	122.60	24.52															24.52
Wetland - Institutional	65.93	13.19															13.19
Wetland - Industrial	4.54	0.91															0.91
Wetland - Trans/Comm/Util/Waste	122.40	24.48															24.48
Wetland - Cropland	71.63	14.33															14.33
Wetland - Open Space	6.38	1.28															1.28
Wetland - Vacant	16.63	3.33															3.33

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Wetland - Non-Parcel Areas	26.10	5.22															5.22
Wet Detention - Residential	0.75	0.15												0.15	0.01		
Wet Detention - Commercial	2.39	0.48												0.48	0.03		
Wet Detention - Institutional	0.60	0.12												0.12	0.01		
Streambank Length	12808.00	2561.60															