



DUPAGE COUNTY



Sawmill Creek Watershed-Based Plan

July 2017 (DRAFT)



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1. Introduction

Since the late 1980s, watershed organizations, tribes and federal, state and local agencies have been using a watershed approach to managing water quality in water bodies such as streams, rivers, lakes, wetlands and oceans. A watershed approach is a flexible framework for managing water resource quality and quantity within specified drainage areas, also known as watersheds. This approach includes stakeholder involvement and management actions supported by sound science and appropriate technology. The watershed planning process works within this framework by using a series of cooperative, iterative steps to characterize existing conditions, identify and prioritize problems, define management objectives, develop protection or remediation strategies and implement and adapt selected actions, as necessary. The outcomes of this process are documented or referenced in a watershed plan.

A watershed plan is a strategy that provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants and resources related to developing and providing a timeframe for implementing the plan. The development of watershed plans requires a certain level of technical expertise and the participation of a variety of people with diverse skills and knowledge.

DuPage County Stormwater Management received a Section 319 grant from the Illinois Environmental Protection Agency (IEPA) to fund the development of five sub-watershed plans, including Sawmill Creek, Winfield Creek, Klein Creek, Kress Creek, and St. Joseph Creek, which is the focus of this document (Figure 1 Sawmill Cree). The purpose of the Sawmill Creek Watershed Plan is to develop recommendations to improve the quality of Sawmill Creek and its surrounding areas. Stakeholders input, long-term monitoring and regional, statewide and federal water quality goals drive both the development and eventual implementation of the plan.



Figure 1 Sawmill Creek

2. Sawmill Creek Watershed Planning Area

2.1 Planning Area

Sawmill Creek (IL_GJ-01) is a portion of HUC# 071200040704 flowing generally north to south through the southeast quadrant of DuPage County, Illinois (Figure 2). Wards Creek is a subwatershed of Sawmill Creek and is geographically separated from the rest of the watershed by Interstate 55, however, it is hydrologically connected via a storm sewer that runs beneath I-55. Sawmill Creek is tributary to the Des Plaines River (ILG-03). The headwaters of the Des Plaines River begin in southern Wisconsin before flowing through northern Illinois east of the DuPage County line and west of Lake Michigan. The Des Plaines River eventually converges with the DuPage and Kankakee Rivers in Channahon, IL to form the Illinois River.

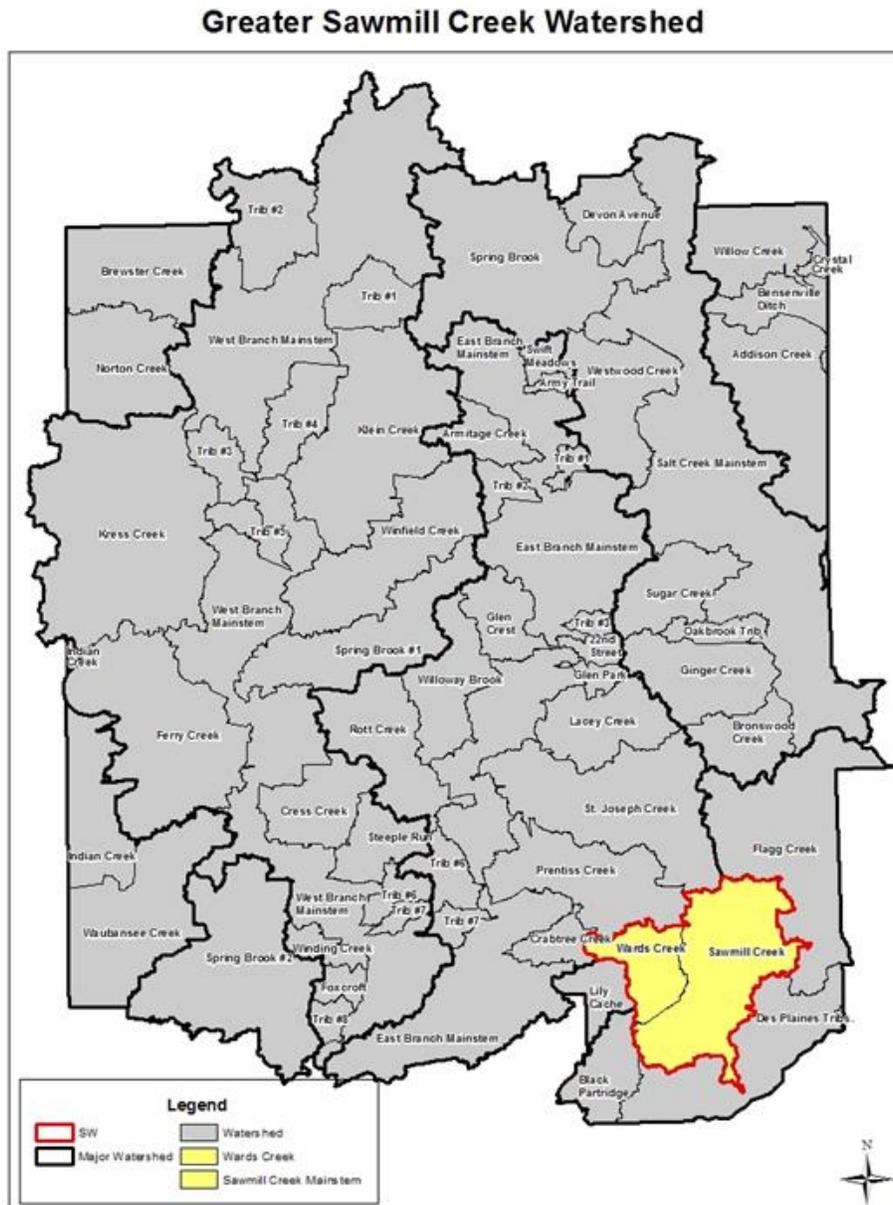


Figure 2 Sawmill Creek Watershed's location within the West Branch DuPage River Watershed.

As shown in Figure 3 Municipal boundaries within the Sawmill Creek Watershed. The Sawmill watershed drains approximately 12.5 square miles and encompasses the towns of Darien, Burr Ridge, Woodridge, Downers Grove, Willowbrook, Lemont, unincorporated DuPage County, and the federally owned land, Argonne National Laboratory (ANL).

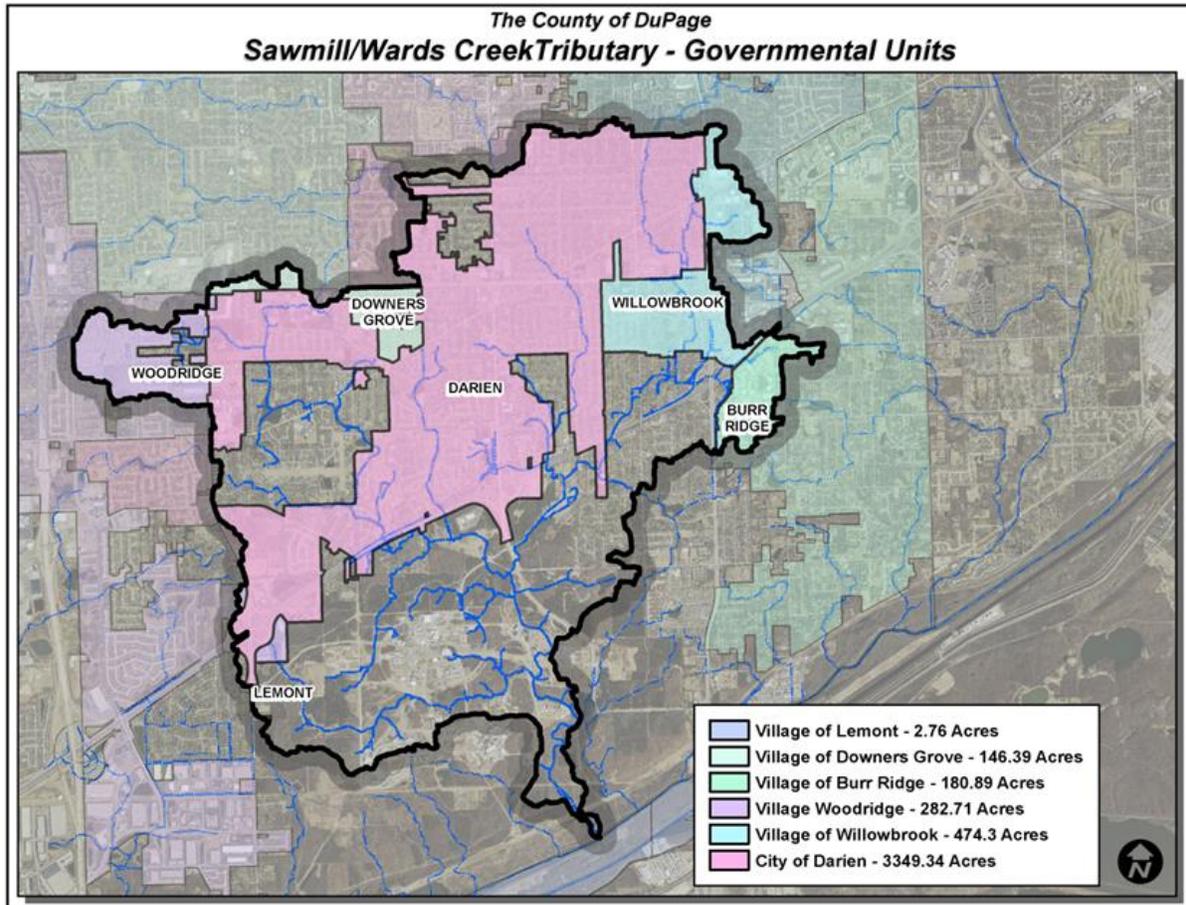


Figure 3 Municipal boundaries within the Sawmill Creek Watershed.

Sawmill Creek begins as several tributaries all flowing in a north to south direction as shown in Figure 4. The landscape of the Sawmill Creek watershed is typical of a suburban area. It is largely single family residential with scattered multifamily complexes. Commercial land and some industrial are distributed throughout. There is a significant amount of open space within the watershed, due to the Argonne National Laboratory as well as the DuPage County Forest Preserve District of DuPage County (FPDDPC) owned open space.

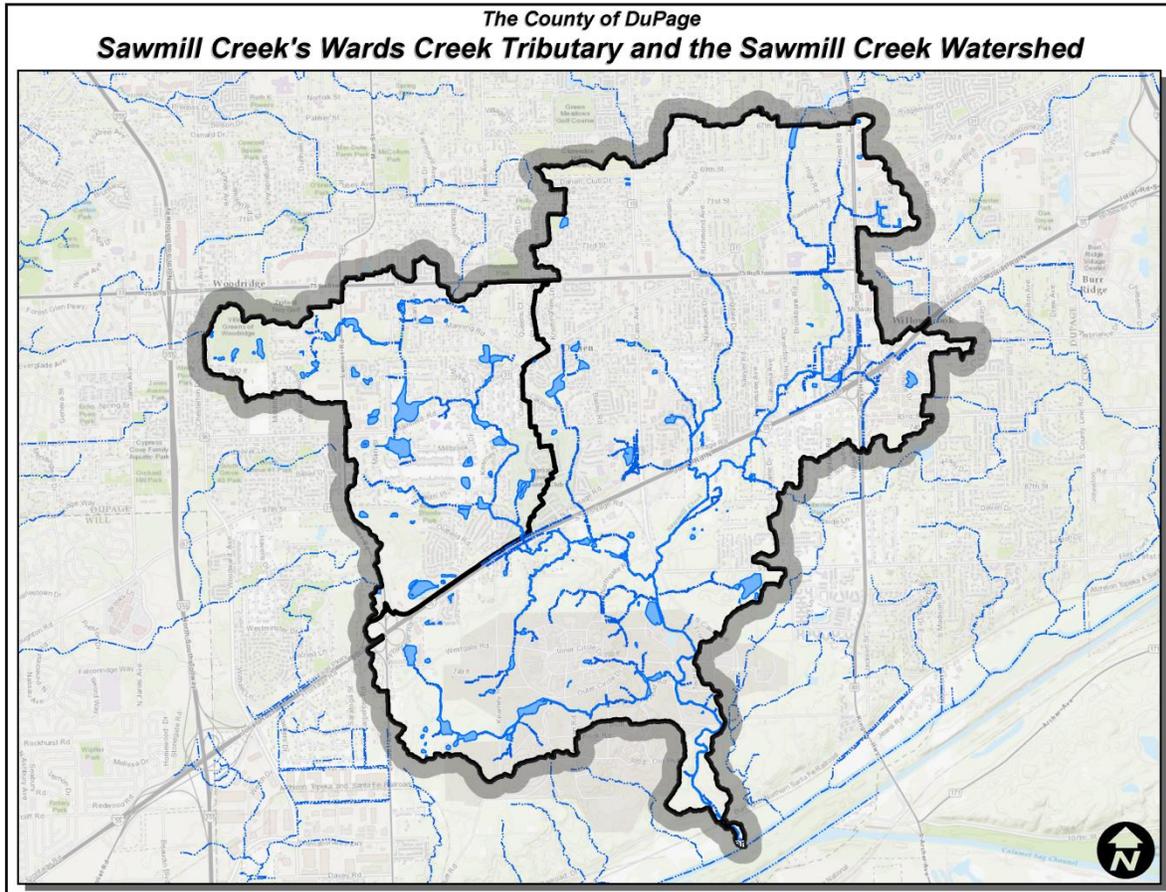


Figure 4 Sawmill Creek Streams and Ponds

As shown in Figure 5, the Sawmill Creek watershed has been separated into 4 subwatersheds for the purposes of this study. Subwatershed #1 encompasses the southeast and south central part of the watershed mainly south of Interstate 55. Subwatershed #1 is about 2434 acres in size, which is comprised mainly of Argonne National Laboratory and Forest Preserve land. There are also a few blocks within the limits of the City of Darien that fall within subwatershed #1. Subwatershed #1 makes up about 30% of the Sawmill Creek watershed. Subwatershed #2 is on the far eastern side of the Sawmill Creek watershed. The towns of Willowbrook, Darien, and Burr Ridge are partially located in subwatershed #2 as well as some unincorporated areas of DuPage County. IL Route 83 and Clarendon Hills Road run north and south through subwatershed #2. Residential and commercial developments make up a majority of the land area although there is some light industrial use around IL 83. At about 1701 acres, subwatershed #2 comprises about 21% of the Sawmill Creek watershed. Subwatershed #3 is located in the north central part of the Sawmill Creek watershed. The City of Darien and unincorporated

DuPage County are located in subwatershed #3. Most of subwatershed #3 is north of Interstate 55 with the exception of a small area around the intersection of I-55 and Cass Avenue. Cass Avenue runs north and south through the middle of subwatershed #3. Subwatershed # 3 is mainly residential land use with some commercial areas throughout. Subwatershed #3 is 1927 acres in size, making up about 24% of the Sawmill/Wards Creek watershed. Subwatershed #4 is on the northwest side of the Sawmill Creek watershed. Subwatershed #4 is made up of the named Sawmill tributary of Wards Creek. This subwatershed lies entirely north of Interstate 55. Subwatershed #4 consists of portions of the towns of Downers Grove, Darien, Woodridge, and unincorporated DuPage County. The land use in subwatershed #4 is mainly residential with scattered commercial use, golf courses, and light industrial areas. A notable component of the watershed is the Brookeridge subdivision, which is located southeast of the intersection of Lemont and Plainfield Roads. Brookeridge is a residential subdivision that was built around a runway to accommodate residents who own and operate small planes. Residents of Brookeridge regularly take off and land planes here as well as store them in onsite hangars which are attached to the residences. At 1963 acres, subwatershed #4 makes up 100% of the Wards Creek watershed, and about 24% of the overall Sawmill Creek watershed.

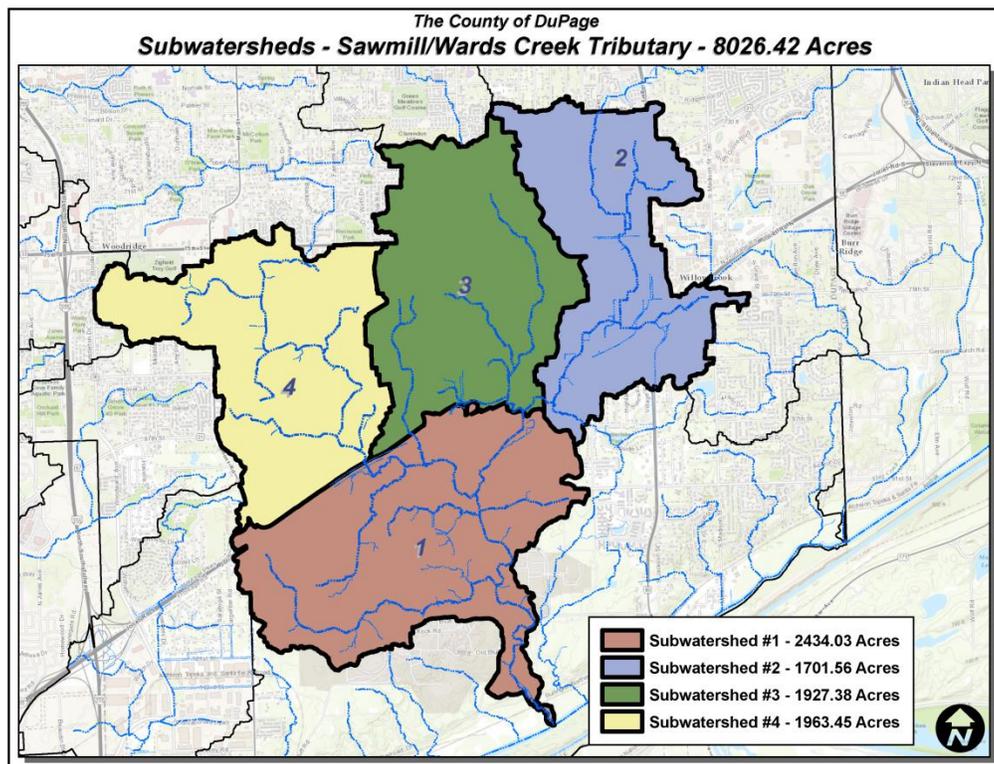


Figure 5 Sub-watersheds in Sawmill Watershed

2.2 Local Stakeholders

To understand the Sawmill Creek Watershed better, DuPage County engaged in extensive community outreach. Input collected from local public agencies, non-profits, businesses and residents was integral in developing a detailed and holistic Plan highlighting existing needs and opportunities within the watershed. Further, the engagement during the development of the Plan will lay the groundwork for the later implementation of the Plan.

DuPage County took a multi-tiered approach to outreach, ranging from stakeholder involvement at the technical input through general residential engagement. An intergovernmental, Sawmill Creek Watershed Steering Committee led the Plan development process and contributed a large amount of technical details within the Plan. Leading the general outreach was DuPage County Stormwater Management's Communications Supervisor, in partnership with several local organizations.

2.2.1 Sawmill Creek Watershed Steering Committee

Early in the Plan development, DuPage County convened a Sawmill Creek Watershed Steering Committee. The group consisted of regional organizations, including several County departments, the Forest Preserve District of DuPage County (FPDDC), The Conservation Foundation (TCF), ComEd, and the Illinois Department of Transportation (IDOT), as well as municipalities, park districts, school districts, townships and sanitary districts within the watershed. The Steering Committee first assembled on September 18, 2015 to assist with basin assessments and other data required for the water quality assessments, then, later, on a regular basis to provide input on the content of the Plan. This Committee, partially featured in Figure 6, was instrumental in forming the Plan and will be the guiding agencies in implementing projects, programs and policies recommended within the Plan.



Figure 6 Sawmill Creek Watershed Workshop members learn about local projects.

2.2.3 Local Community Outreach

Although prominent agencies and environmentally minded individuals may be the easiest targets when developing watershed plans, local residents, business owners and others are the key to identifying both localized water quality issues and solutions. DuPage County has a long-standing history of engaging local communities in the development and, as importantly, implementation of watershed plans and the Sawmill Creek Plan was no exception. DuPage County made an effort to engage with the broad watershed, as well as residents near the creek, using an interactive and

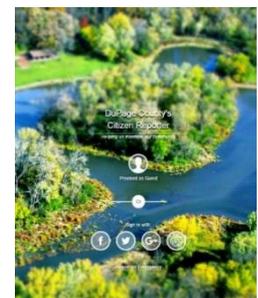


Figure 7 DuPage County water quality planning app.

socially driven web application to identify areas of the watershed in need of improvement, as well as potential spots for projects. Figure 7 shows a screenshot of this app.

DuPage County mailed 354 letters with an overview of the Plan, contact information and instructions on using the web application to all single family homes within the 100-year. Further, staff distributed several hundred targeted brochures to local libraries, park districts, government buildings, non-profits and businesses with community boards within the watershed. The “Back to Basics” brochures provided basic – hence the name – information on watersheds, non-point source pollution and best management practices, in addition to a panel detailing the Sawmill Creek Watershed Plan and web application. Staff used the feedback from both direct interaction and the web application within the Plan. Further, DuPage County’s commitment to long-term sustainability within the Watershed will provide an opportunity for additional consultation and consideration of input from all community members.



Figure 8 DuPage County staff works community events to elicit input during the planning process.

2.3 Mission

Throughout the stakeholder engagement process, DuPage County was able to craft the mission of the Plan. This mission statement, defined below, then shaped the recommendations found in the Plan.

Mission Statement: To improve the quality of Sawmill Creek and the surrounding watershed to meet federal, statewide and regional water quality initiatives. Specifically, proposed recommendations found in the Plan will improve stream depth and velocity patterns, flow regime alterations as well as biological oxygen demand (BOD), total phosphorous (TP), total nitrogen (TN) and total suspended solids (TSS) as well as strive to reduce chemical pollutants such as PCBs and methoxychlor.

1. Watershed Resource Inventory

3.1 Demographics

For this study, DuPage County staff evaluated the population density, population growth rate, median age, median income and unemployment for Sawmill Creek Watershed. Demographic attributes that were evaluated for this study were median age, median income, unemployment, population density, and population growth rate. Evaluating the age of the population can help to determine what kinds of projects to include in a watershed plan. For instance, residents of a neighborhood with an older population may value pedestrian trails around a naturalized stormwater facility rather than a playground with permeable surfaces.

The median age in the Sawmill Creek watershed ranges from 27-36 to 44-53 years (Figure 9). The pockets of relatively younger median populations occur in the north central part of the watershed west of Cass Avenue, southwest of the intersection of Plainfield Road and Clarendon Hills Road, and southeast of the intersection of 91st St and Cass Avenue.

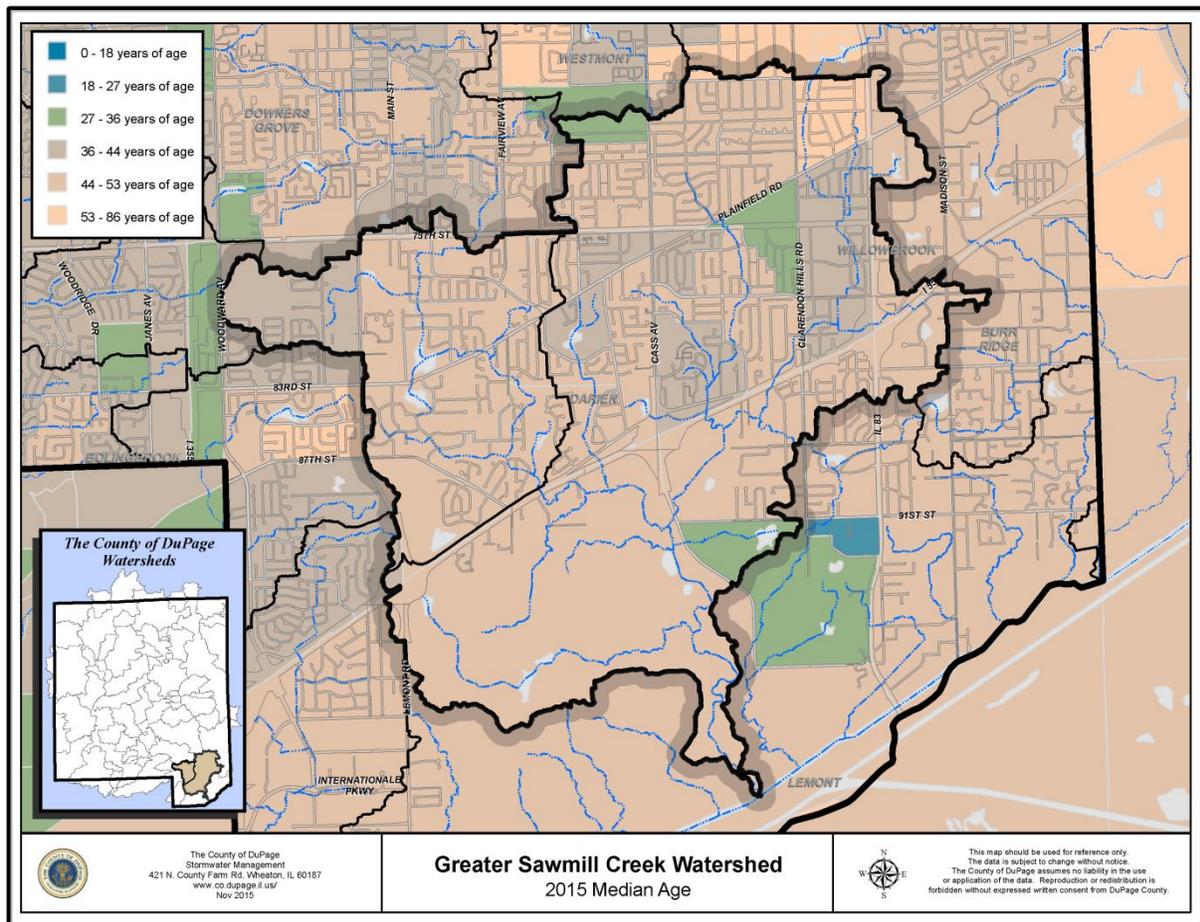


Figure 9 Median Age

Population density and growth rates are always important statistics to consider for planning purposes. Projects or developments in a high density may require buying out properties or planning for minimally

designed features in order to fit within existing developments. Population growth rates can indicate how crowded (or open) a region may be in the future. An area with decreasing populations may not require a large public project for future use. When planning for an area with an increasing population, the design should be able to accommodate a larger than current population. In terms of stormwater quality, increasing populations can tell you that the water quality problems existing now will only be exacerbated by more people in the area.

The population of the Sawmill Creek watershed ranges from 0-1,000 people per square mile around the Argonne National Laboratory to 4,000- 22,000 people per square mile in the north and central portion of the watershed in the City of Darien and some unincorporated areas (Figure 10). The rest of the watershed has a population of 1,000- 4,000 people per square mile. These areas generally have many single family residential subdivisions as well as forest preserve, golf courses, commercial areas, or other non-residential uses that may lower the overall population density.

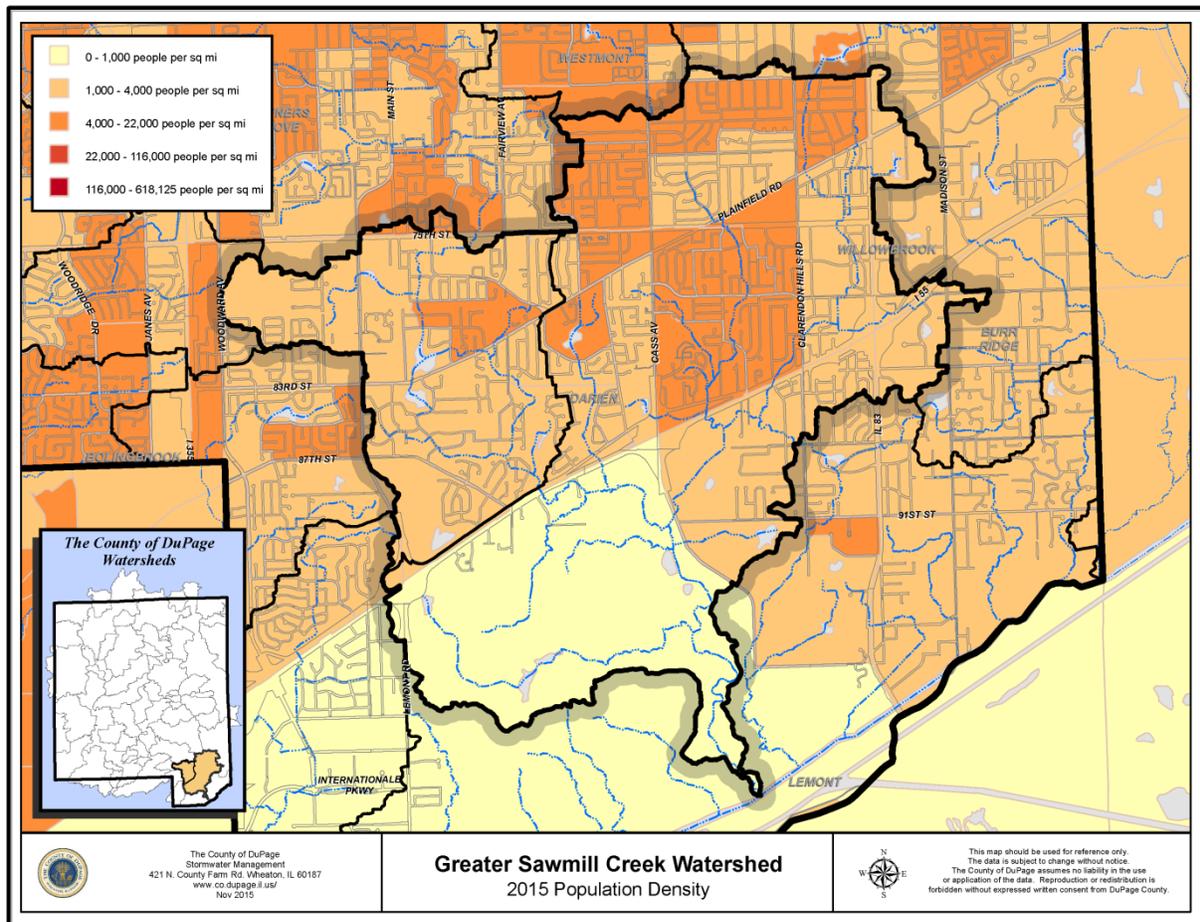


Figure 10 Population Density

Population growth is relatively static in the Sawmill Creek watershed (Figure 11). Most of the watershed area has population growth rates between 0% and 1.25%. The area of highest population growth is northeast of the intersection of Plainfield Road and Clarendon Hills Road within the City of Darien. Population growth rate here is between 1.25% and 1.9% which is still rather low. There are areas of

slight population decline (-1.25% to 0%) within the watershed. These are scattered throughout the northern half of the watershed. Overall the population is not changing significantly.

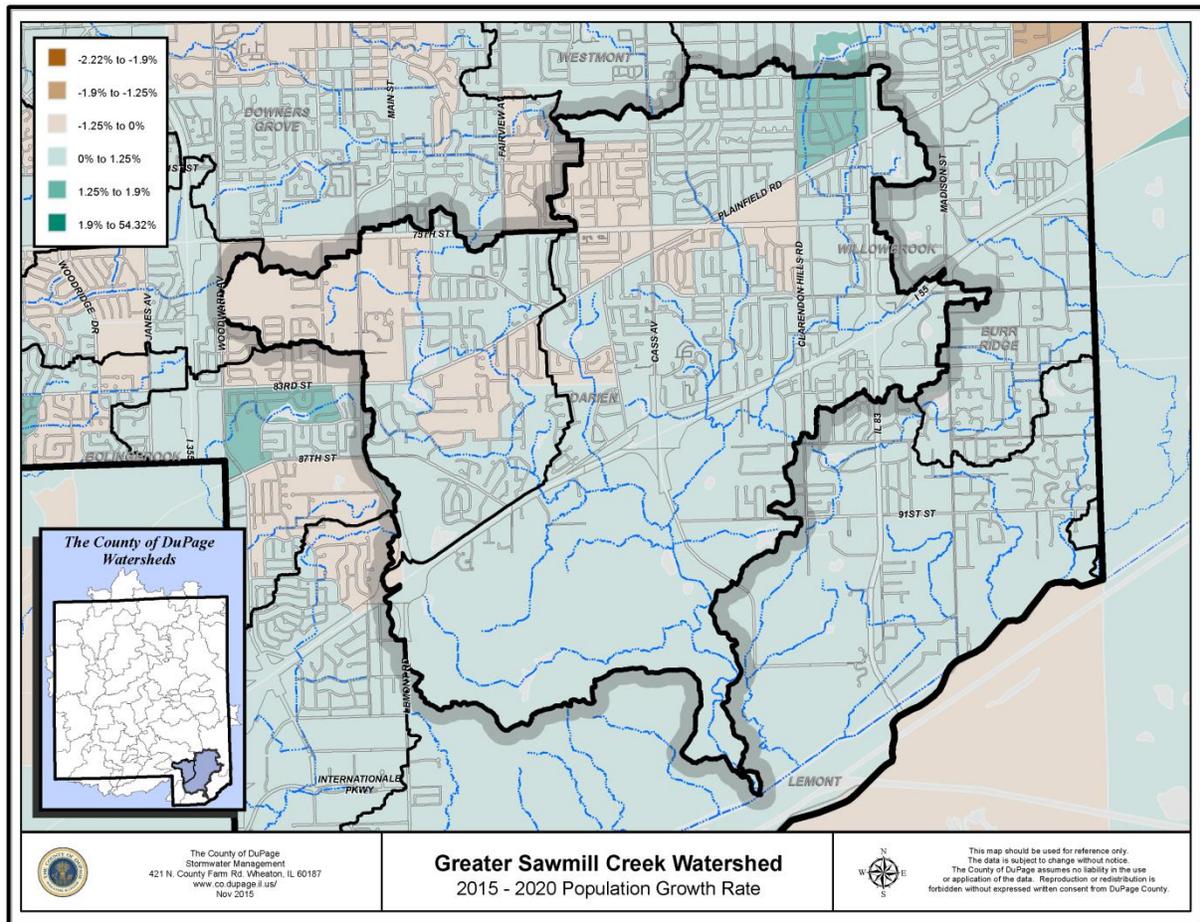


Figure 11 Population Growth

Median income and unemployment rate provide a snapshot of the economic condition of a region (Figures 12 and 13). Although DuPage County in general has a high median income as compared to the rest of the country, there are parts of the County with lower than average incomes. According to the U. S. Census, the median income in Illinois (2010-2014) was \$57,166. In comparison, the median income of residents of the Sawmill /Wards Creek watershed ranges from considerably higher than the statewide median to significantly lower. There is a pocket in the southeast portion of the watershed with a median income of \$12,000 to \$43,000. A large part in the northeast side of the watershed has a median income of \$43,000 - \$73,000 which is around the statewide median. The rest of the watershed has higher median incomes than the rest of the state. The majority of the watershed has a median income of \$73,000 - \$104,000. Parts of Daren, Burr Ridge, and unincorporated DuPage County have the highest median income at \$104,000 - \$200,001.

The unemployment rate in Illinois is currently 6% according to the Bureau of Labor Statistics. In comparison, the unemployment rate in the Sawmill Creek watershed ranges from 0% – 17.6%. A neighborhood in the northeast corner of the watershed has an unemployment rate of 11%-17.6% which is higher than the statewide rate. Several other areas throughout the watershed have an unemployment

rate of 4.4% - 11%. The statewide average of 6% falls within this range. There is a significant portion of the watershed that has an unemployment rate between 0% and 4.4%, which is lower than the statewide average.

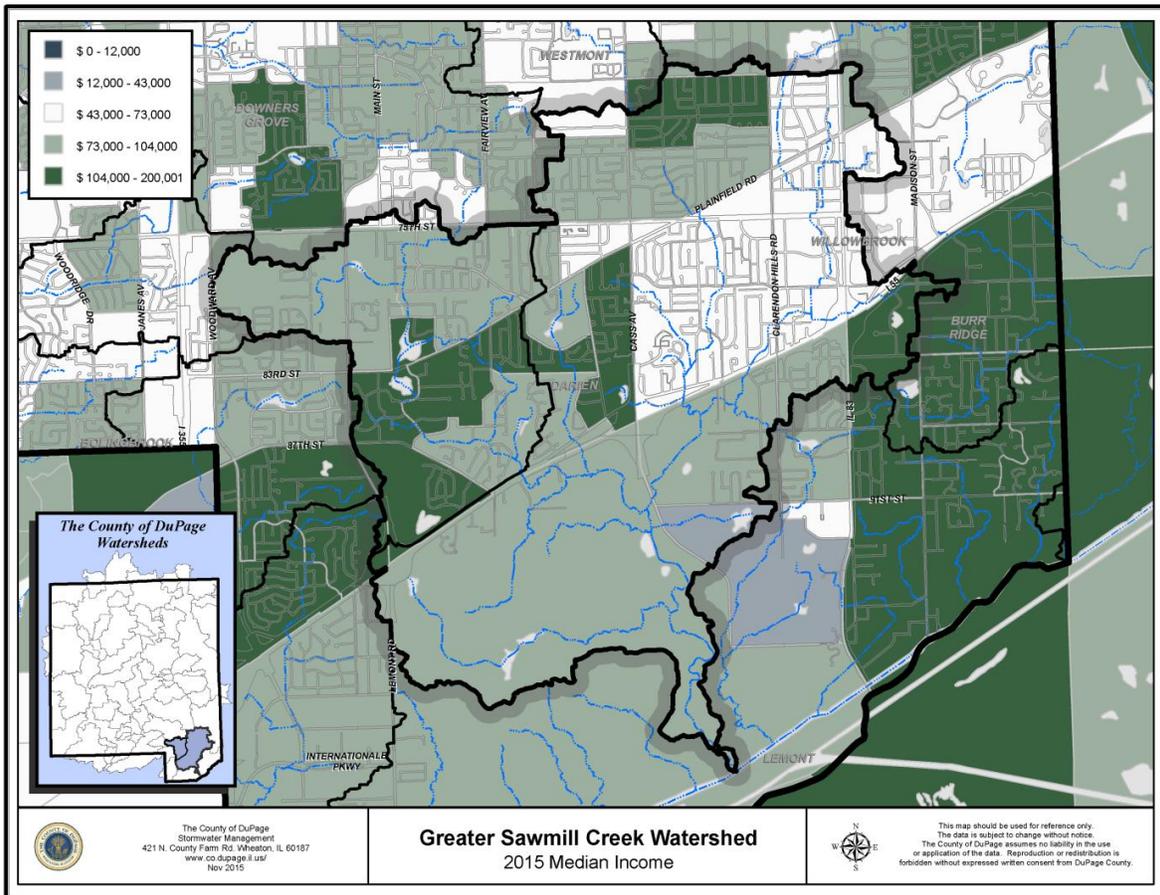


Figure 12 Median Income

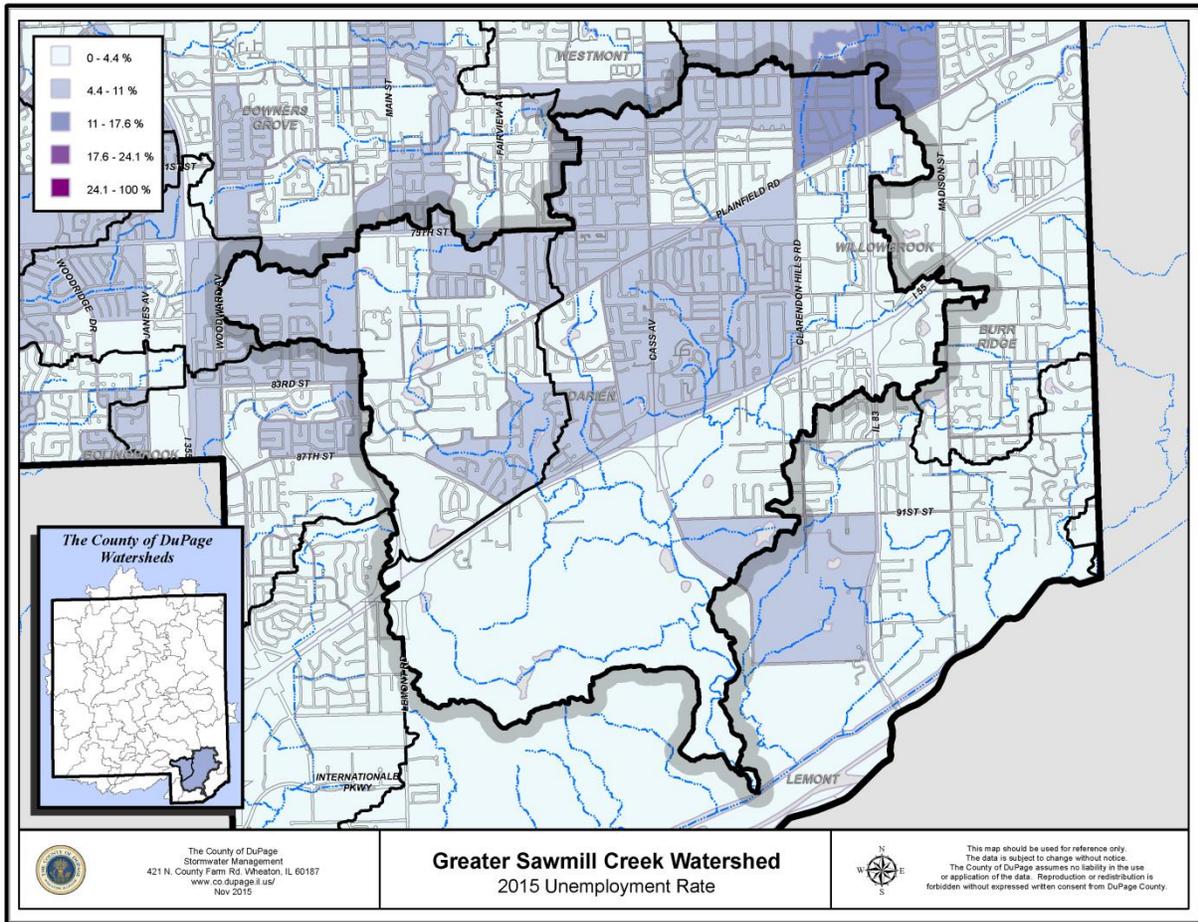


Figure 13 Unemployment Rate

3.2 Local Jurisdictions

The Sawmill Creek watershed lies entirely within the limits of Downers Grove Township in DuPage County. The watershed contains six municipalities including Burr Ridge, Darien, Downers Grove, Lemont, Willowbrook and Woodridge as well as unincorporated portions of DuPage County (Table 1). In addition, the northern half of the Argonne National Laboratory property is within the Sawmill Creek watershed. A majority of the land area is within the City of Darien and unincorporated DuPage County.

Municipalities	Acreage	Percent of Watershed
Burr Ridge	181	2.26%
Darien	3349	41.73%
Downers Grove	146	1.82%
Lemont	3	0.04%
Unincorporated	3590	44.73%
Willowbrook	474	5.91%
Woodridge	283	3.53%
Townships	Acreage	Percent of Watershed
Downers Grove	8026	100.00%

County	Acreage	Percent of Watershed
DuPage	8040	100.00%
Federal Land	Acreage	Percent of Watershed
Argonne National Lab	936	11.66%

Table 1 Sawmill Creek Governmental Units

In addition to the jurisdictional boundaries, the Watershed flows through property owned by the State of Illinois, Forest Preserve District of DuPage County (FPDDC), and school and park districts. This requires multi-jurisdictional collaboration to resolve issues within the Watershed, specifically:

- For unincorporated areas within the Watershed, **DuPage County** oversees all zoning, drainage, permitting and the Countywide Stormwater Management and Flood Plain Ordinance (Ordinance) enforcement. In addition, DuPage County is responsible for certain roadways within the watershed, as well as stream maintenance.
- **Municipalities** are responsible for managing local zoning, drainage, permitting, drinking water, sewer service and Ordinance enforcement. Local municipalities are also responsible for local roadways, which includes road maintenance, snow removal, salt dispersal, litter removal, traffic flow, hydrological conveyance systems and ensuring overall road safety. Each municipality as well as DuPage County and Argonne Laboratory hold their own permits with the IEPA (Table 2).
- The **Illinois Department of Transportation** (IDOT) and local **Township Authorities** also oversee some areas of roadway and the associated right of way within the Watershed. Like municipalities, they are responsible for upkeep of roadways under their jurisdiction.
- The **DuPage County Health Department** (DCHD) has countywide jurisdiction of private drinking wells and septic systems within unincorporated areas of DuPage County.
- The **Forest Preserve District of DuPage County** is responsible for the inspection and maintenance of all drainage ways, including streams and rivers, within their forest preserves.

Permittee	Permit Number
Argonne National Labs	IL0034592
Burr Ridge, Village of	ILR400304
Darien, City of	ILR400180
Downers Grove, Village of	ILR400183
DuPage County	ILR400502
Willowbrook, Village of	ILR400255
Woodridge, Village of	ILR400480

Table 2 NPDES Permit holders within Sawmill Creek Watershed

3.3 Physical & Natural Features

3.3.1 Climate

The climate of the Sawmill Creek is typical for northern Illinois. It is characterized by warm summers and cold winters with moderate precipitation year round. The average annual temperature is 49.9 degrees Fahrenheit in the nearest National Oceanic and Atmospheric Administration (NOAA) precipitation recording station¹. In summer, the average temperature is 71.9 degrees F with an average high temperature of 82.9 degrees F. During the winter, the average temperature is 26.1 degrees F with an average low temperature of 18 degrees Fahrenheit (Table 3). The growing season in this area lasts from mid-April to mid-October lasting about 165 to 170 days in a normal year.

¹ NOAA. West Chicago Airport Station, IL US

Average annual precipitation according to NOAA ² is 36.62 inches (Table 4). Summer is the wettest season, with an average rainfall of 12.90 inches in the summer months. The least amount of precipitation occurs in the winter months, with an average total of 6.54 average inches for winter.

SEASON	● PRECIP (IN)	● MIN TMP (°F)	● AVG TMP (°F)	● MAX TMP (°F)
Annual	36.91	39.8	49.9	60.1
Winter	4.45	18.0	26.1	34.2
Summer	12.61	60.9	71.9	82.9
Spring	10.29	37.9	49.0	60.0
Autumn	9.56	42.0	52.3	62.6

Table 3 Climate Data for Sawmill Creek, courtesy of NOAA

SEASON	● PRECIP (IN)
Annual	39.62
Winter	6.54
Summer	12.90
Spring	10.33
Autumn	9.85

Table 4 Precipitation data for Sawmill Creek, courtesy of NOAA

3.3.2 Topography

The topography of the Sawmill Creek runs generally from north to south. The highest elevations are around the northwest boundary of the watershed (Figure 14). The highest point is about 775 feet above sea level. Elevations decrease gradually towards a low point of 650 feet above sea level at the confluence of Sawmill Creek and the Des Plaines River in the south central tip of the watershed. The most dramatic changes in elevation occur in the southern part of the watershed along Sawmill Creek itself where the creek creates a system of bluffs and ravines through Argonne Lab and Forest Preserve property.

² NOAA. Little Red Schoolhouse Station, IL US

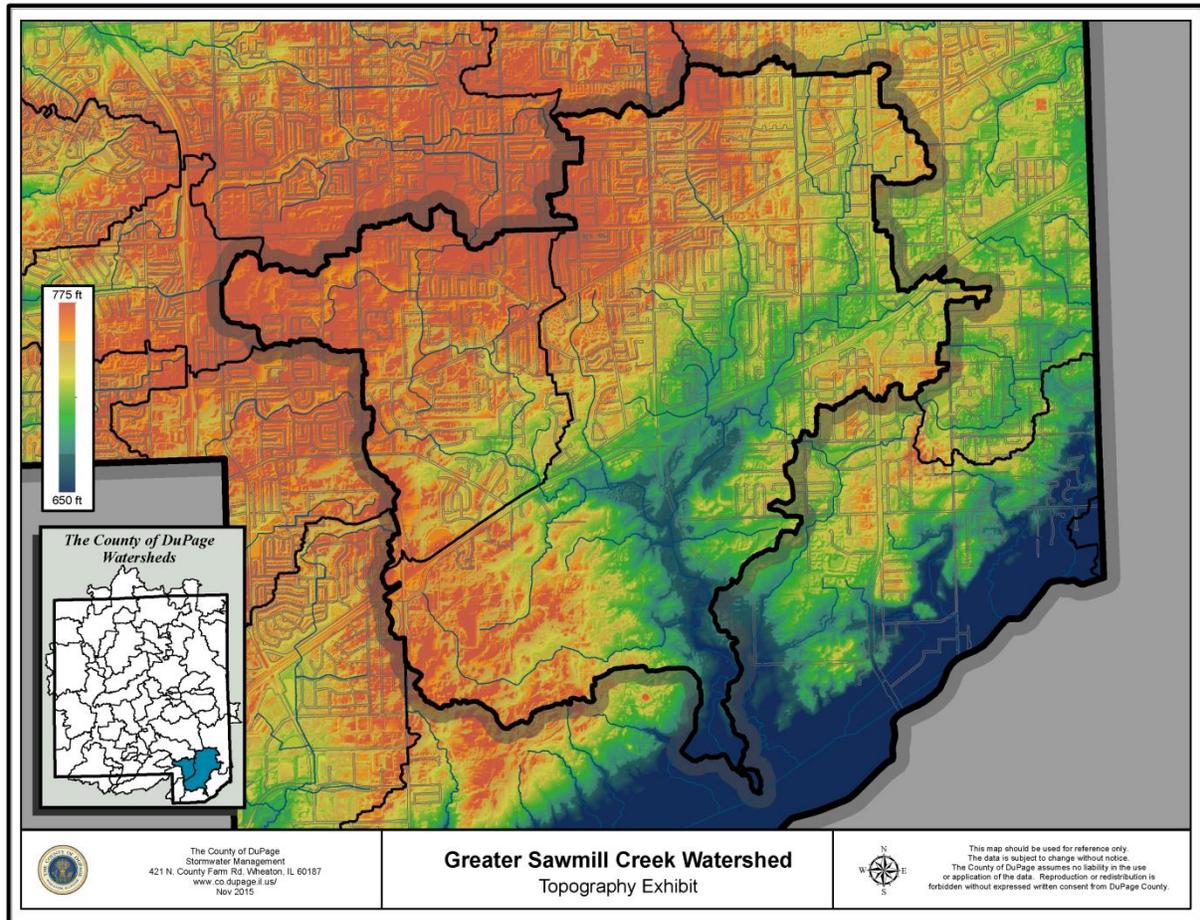


Figure 14 Sawmill Creek Watershed topography

3.3.3 Geology

The geology of the Sawmill Creek watershed was heavily influenced by the Wisconsin glacialiation as was the rest of DuPage County. As a result, the land surface area is covered by less than 25 inches of loess (windblown silt) as shown in Figure 15. Loess coverage is very shallow compared to the rest of the state, which can have up to 300 inches of loess or more. The loess deposits are the parent material for the fertile topsoil that developed over thousands of years by the tallgrass prairies.

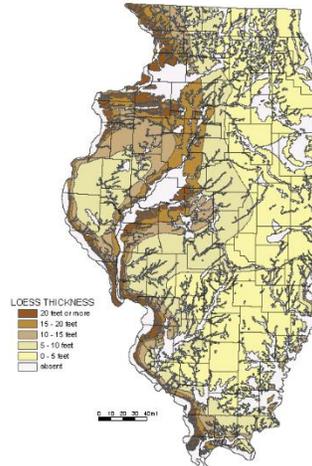


Figure 15 Loess thickness in Illinois, courtesy of the Illinois State Geologic Survey (ISGS)

The loess, or wind-blown silt, accumulated over till which was deposited during the advancing glacial activity. This also caused the formation of moraines which cover the area.³ This till is high in clay and causes much of the poor drainage that occurs throughout the region⁴.

3.3.4 Soils

An evaluation of soils is essential when creating a water quality-based watershed plan. The ability of soils to retain water, support vegetation and provide active exchange sites for absorption of pollutants varies. Information regarding soil thickness, horizon depth, texture, structure, drainage characteristics, erosion potential and the location of the seasonally high water table should all be considered when planning projects that will impact stormwater. Soils support vegetation, infiltrate stormwater, serve as a base for construction, support wildlife and serve as stream and lakebeds in addition to many other purposes. When identifying potential locations for best management practices (BMPs), such as rain gardens or infiltration trenches, it is important to evaluate soil type to determine if and how well the practice will infiltrate stormwater.⁵

³ Illinois State Geologic Survey, Bulletin 104. Plate 1

⁴ United States Department of Agriculture, Soil Conservation Service, Soil Survey of DuPage County and Parts of Cook County, 1979

⁵ Calsyn, 2001. Soil Survey of

Du Page County, Illinois. United States Department of Agriculture, Natural Resource Conservation Service. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/illinois/.../Du_Page_IL.pdf

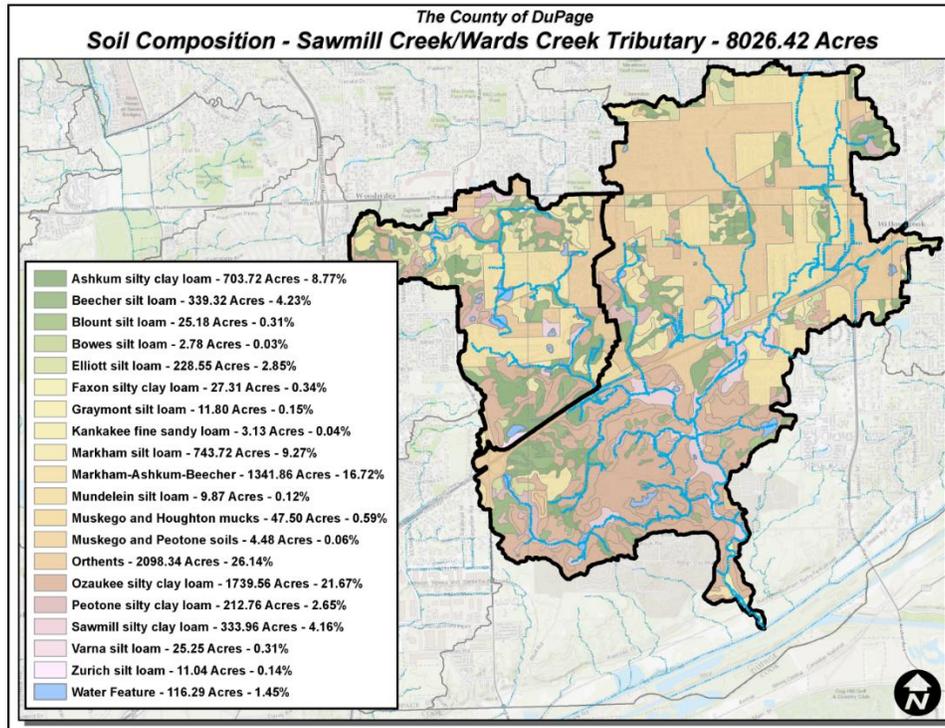


Figure 16 Soil series mapped in the Sawmill Creek Watershed. Data obtained from the National Resource Conservation Service (NRCS) Soil Survey

Soils formation occurs when a parent material deposited by earth forming geological processes is impacted by climate, organisms over time⁶. In this region, the parent material is glacial till and loess. Which was deposited during the Wisconsin glaciation.

Most of the soils in the Sawmill Creek watershed are silty clay loams or silt loams. About 26% of the Sawmill Creek watershed consists of orthents, or disturbed urban soils (Table 5). Orthents are created when development and disturbance occurs to a point where the original soil no longer displays its characteristic properties. A majority of the orthents in Sawmill Creek watershed are in the highly developed areas in the north half of the watershed. The second most abundant soil type within the Sawmill Creek watershed is Ozaukee series. Ozaukee is a moderately well drained soil.

Series Name	Acres	% of watershed	Texture
Ashkum	703.72 Acres	8.77%	silty clay loam
Beecher	339.32 Acres	4.23%	silt loam
Blount	25.18 Acres	0.31%	silt loam
Bowes	2.78 Acres	0.03%	silt loam
Elliott	228.55 Acres	2.85%	silt loam
Faxon	27.31 Acres	0.34%	silty clay loam
Graymont	11.80 Acres	0.15%	silt loam
Kankakee	3.13 Acres	0.04%	fine sandy loam
Markham	743.72 Acres	9.27%	silt loam

⁶ Soil Survey of DuPage County and parts of Cook County, USDS, SCS, 1979

Markham-Ashkum-Beecher	1341.86 Acres	16.72%	
Mundelein	9.87 Acres	0.12%	silt loam
Muskego and Houghton	47.50 Acres	0.59%	mucks
Muskego and Peotone	4.48 Acres	0.06%	mucks
Orthents	2098.34 Acres	26.14%	
Ozaukee	1739.56 Acres	21.67%	silty clay loam
Peotone	212.76 Acres	2.65%	silty clay loam
Sawmill	333.96 Acres	4.16%	silty clay loam
Varna	25.25 Acres	0.31%	silt loam
Zurich	11.04 Acres	0.14%	silt loam
Water Feature	116.29 Acres	1.45%	

Table 5 Sawmill Creek Watershed soil properties

3.3.4.1 Hydric Soils

According to the NRCS definition, hydric soils are defined as soils formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soils are also an indicator of present or historic wetlands. Therefore, we can look at hydric soil maps (Figure 17) to give an indication of the extent of wetlands before human alteration of the landscape. Also, hydric soils may not be suitable for infiltration practices as seasonally high water table is too close to the soil surface to allow for proper filtration of pollutants.

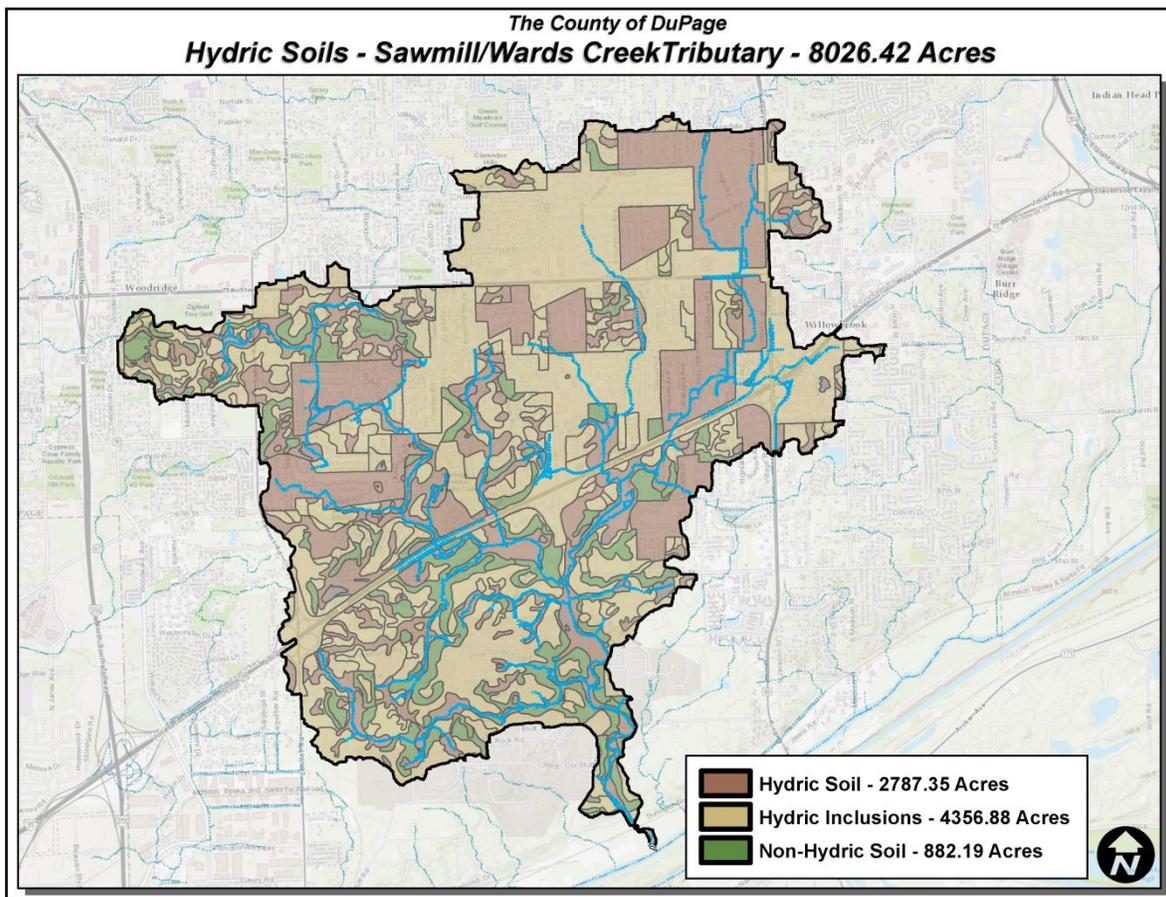


Figure 17 Hydric Soils in Sawmill Creek Watershed

3.3.3.3 Soil Drainage Class

Hydrologic soil groups refer to the runoff potential of a soil.⁷ This is determined by depth to the seasonal high water table (SHWT), infiltration rate, permeability after prolonged wetting and depth to a very slowly permeable layer. Determination of hydrologic soil group does not consider the slope of a soil surface. The hydrologic soil groups are based on unfrozen soils without vegetation, and properties, such as soil texture and soil structure, affect the group. Hydrologic soil groups in Sawmill Creek Watershed are shown in Figure 18. There are four hydrologic soil groups: A, B, C and D.

- **Hydrologic Soil Group A** consists of soils with low runoff potential when thoroughly wet. Water moves freely through the soil. The texture of these soils is sandy or gravelly with less than 10% clay and more than 90% sand.⁸ Some finer textured soils may be included if they are well aggregated, of low bulk density, or have more than 35% rock fragment.⁹
- **Hydrologic Soil Group B** consists of soils with a moderately low runoff potential when thoroughly wet. The texture of these soils is usually loamy sand or sandy loam with between 10% to 20% percent clay and less than 50% to 90% sand. Some finer textured soils may be included if they are well aggregated, of low bulk density, or have more than 35% rock fragment.
- **Hydrologic Soil Group C** consists of soils with a moderately high runoff potential when thoroughly wet. The texture of these soils is typically loam, silt loam, sandy clay loam, clay loam and silty clay loam with between 20% to 40% clay and less than 50% sand. Some finer textured soils may be included if they are well aggregated, of low bulk density, or have more than 35% rock fragment.
- **Hydrologic Soil Group D** consists of soils with a high runoff potential when thoroughly wet. The texture of these soils is clayey with greater than 40% clay and less than 50% sand.

Determining the hydrologic soil group is essential in order to design BMPs and other infiltration practices or projects. For example, soils that are compacted, high in clay or fall in hydrologic soil group C or D may not infiltrate quickly enough to allow the BMP to be functional. On the other hand, soils in hydrologic soil group A or soil with high amounts of sand may infiltrate too quickly for BMPs to be effective. Infiltration that occurs too rapidly may not allow for filtering of pollutants by plant roots and soil before reaching the groundwater, which can lead to a potential contamination of groundwater. Table 5 shows the soil properties for the Sawmill Creek Watershed.

Hydrologic soil group classifications may not be accurate in regards to orthents. The disturbance caused by development alters the soil profile from its original state. Therefore, the classification is no longer accurate for the disturbed soil. An onsite investigation by a soil scientist should be conducted in areas mapped as orthents to determine if soil is appropriate for infiltration practices or projects.

⁷ USDA, NRCS Soil Survey of DuPage County (2001).

⁸ U.S. Department of Agriculture, Natural Resources Conservation Service. 2007. Part 630 Hydrology National Engineering Handbook. Chapter 7 Hydrologic Soil Groups.

<https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>

⁹ National Engineering Handbook

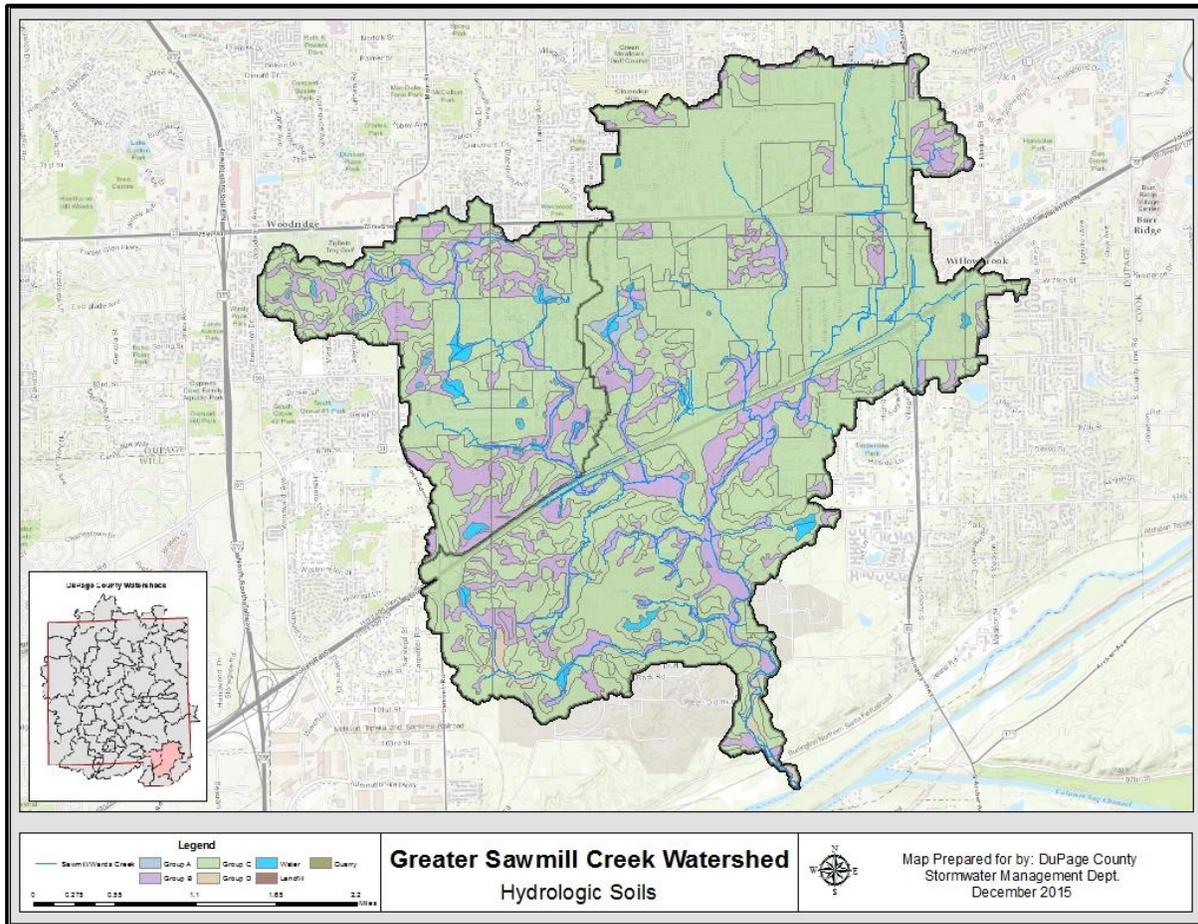


Figure 18 Hydrologic Soil Groups of Sawmill Creek Watershed

Series Name	Hydric	Drainage Class	Hydrologic Soil Group	Runoff Potential	Infiltration Rate	Transmission Rate
Ashkum	Y	Poorly Drained	B	Moderate	Moderate	Moderate
Beecher	N	Somewhat Poorly Drained	C	Moderate	Slow	Slow
Blount	N	Somewhat Poorly Drained	C	Moderate	Slow	Slow
Bowes	N	Well Drained	B	Moderate	Moderate	Moderate
Elliott	N	Somewhat Poorly Drained	C	Moderate	Slow	Slow
Faxon	Y	Poorly Drained	D	High	Very Slow	Very Slow
Graymont	N	Moderately Well Drained	B	Moderate	Moderate	Moderate
Kankakee	N	Well Drained	B	Moderate	Moderate	Moderate
Markham	N	Moderately Well Drained	C	Moderate	Slow	Slow
Markham-Ashkum-Beecher	N		B/C	Moderate	Moderate/Slow	Moderate/Slow
Mundelein	N	Somewhat Poorly Drained	B	Moderate	Moderate	Moderate

Muskego and Houghton	Y	Very Poorly Drained	A	Low	High	High
Muskego and Peotone	Y	Very Poorly Drained	A	Low	High	High
Orthents	N	Moderately Well Drained	C	Moderate	Slow	Slow
Ozaukee	N	Moderately Well Drained	C	Moderate	Slow	Slow
Peotone	Y	Very Poorly Drained	B	Moderate	Moderate	Moderate
Sawmill	Y	Poorly Drained	B	Moderate	Moderate	Moderate
Varna	N	Moderately Well Drained	C	Moderate	Slow	Slow
Zurich	N	Moderately Well Drained	B	Moderate	Moderate	Moderate
Water Feature	-	-	-	-	-	-

Table 6 Soil drainage class and properties

3.3.3.4 Highly Erodible Soils

The soil erodibility factor of a soil (K) is a measure of the susceptibility to erosion. This can occur as sheet erosion, a flat rate of erosion over the entire surface, or as rill erosion, or the concentration of erosive flows to a central low point which creates small runnels through the soil. Several factors contribute to the K factor of a soil. These include infiltration rate, water storage capacity, permeability, cohesiveness, structure, and texture. Soil erodibility is one factor used in determining average annual soil loss (A) using the Revised Universal Soil Loss Equation (RUSLE).¹⁰

Fragment free soil erodibility is the estimated erodibility of the fine earth fraction of a soil. This is for particles less than 2 millimeters in size and does not include coarse fragments. A higher Kf indicates greater susceptibility of a soil to erosion. The fragment free soil erodibility of the Sawmill Creek watershed is shown in Table 7:

Series Name	Soil Erodibility (Kf)
Ashkum	0.43
Beecher	0.49
Blount	0.55
Bowes	0.49
Elliott	0.49
Faxon	0.43
Graymont	0.43
Kankakee	0.37
Markham	0.43

¹⁰ $A=R \times K \times L \times S \times C \times P$

where:

- A= average annual soil loss
- R= Rainfall runoff factor
- K= soil erodibility
- L=slope length factor
- S= slope steepness factor
- C= cover management factor
- P= erosion control practice factor

Markham-Ashkum-Beecher	0.43
Mundelein	0.43
Muskego and Houghton	0.37
Muskego and Peotone	0.37
Orthents	0.32
Ozaukee	0.43
Peotone	0.37
Sawmill	0.43
Varna	0.43
Zurich	0.43
Water Feature	NA

Table 7 Soil Erodibility

3.4 Land Use & Land Cover

Land use percentages for the Sawmill Creek Watershed are shown in Table 8. Land use in the Sawmill Creek watershed varies from mainly residential in the northern half to open space and institutional in the southern half (Figure 19). Scattered open space in the northern part of the watershed is mostly golf courses and small parks. Despite the institutional classification, much of the Argonne National Laboratory property is open space woodlands much like the Forest Preserve. East of IL Route 83, and along the major roadways there is an abundance of commercial land.

Land Use	Acres	% of Watershed
Commercial	377.04	5%
Industrial	157.93	2%
Institutional	1245.48	16%
Multi-Family Residential	189.47	2%
Open Space	1413.18	18%
Residential	2982.41	38%
Transportation	1457.30	18%
Vacant	31.14	0%
Agricultural	89.42	1%
Total	7943.37	100%

Table 8 Land use acreages

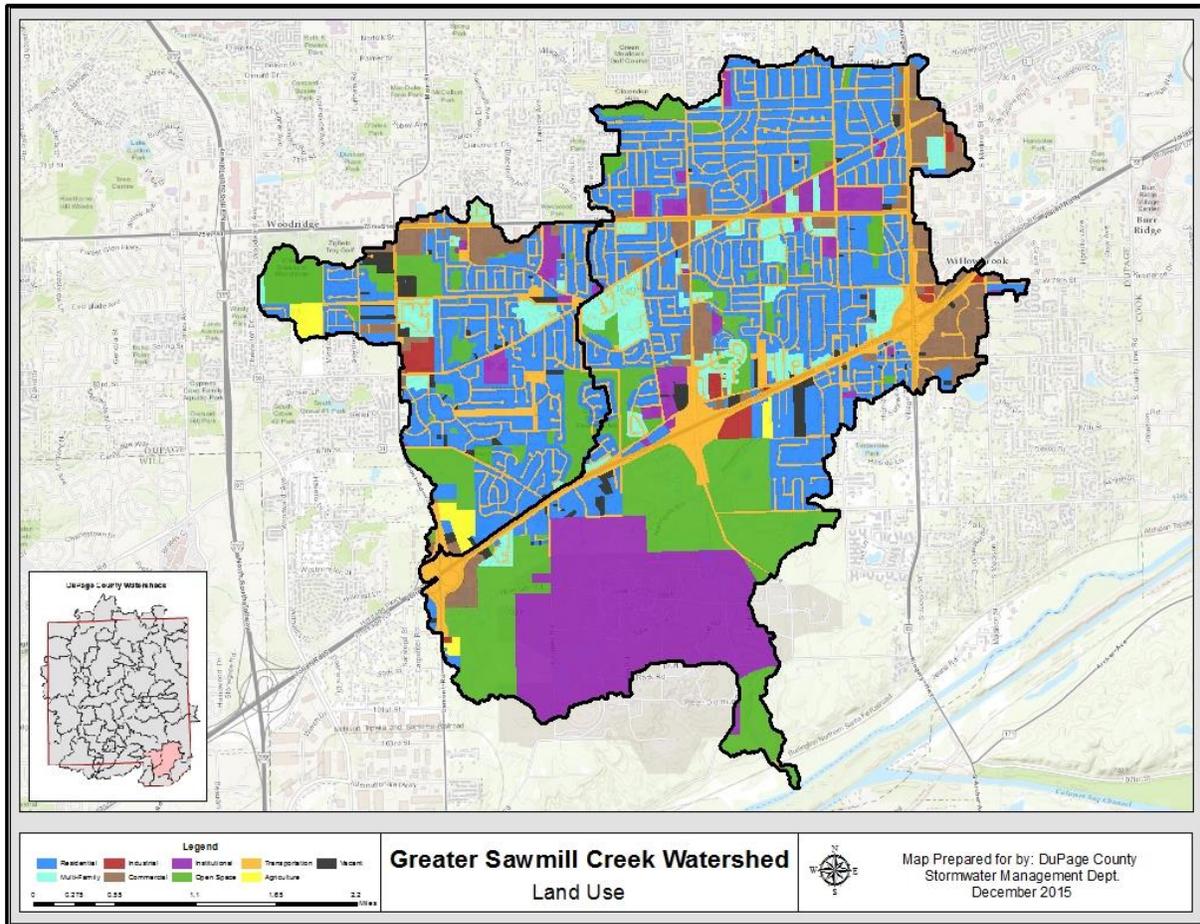


Figure 19 Sawmill Creek land use map

3.4.1 Historical Land Cover

The Sawmill Creek watershed has been significantly altered over the past half century. As shown in Figure 20, the landscape within the Sawmill Creek watershed was mainly rural in 1956. Large expansive of farm fields dominated the landscape. Many wetlands were drained by field tiles, and streams were channelized to accommodate farming. In 1956 problems in the watershed were different then they are today. Conservation farming practices were not as widely used in the middle of the 20th century. Roads were 2 lanes with rural cross sections and stormwater ran through roadside ditches. The main contributors to stream pollution within the Sawmill Creek watershed in 1956 were sediment from agricultural runoff, pesticides, and herbicides.



Figure 20 Sawmill Creek Watershed in 1956

Today, the Sawmill Creek watershed looks much different than it did 60 years ago (Figure 21). The agricultural fields have been converted into residential subdivisions and commercial developments. There are significantly more roadways, which are wider and more heavily used. Most roads are drained by curb and gutter which quickly directs stormwater to streams. Wetlands that were drained to accommodate agriculture for the most part remain drained to this day. Some of the main pollutant sources from the Sawmill Creek watershed today are chlorides from road salt application, nutrients from lawns, and metals from parking lots and buildings.

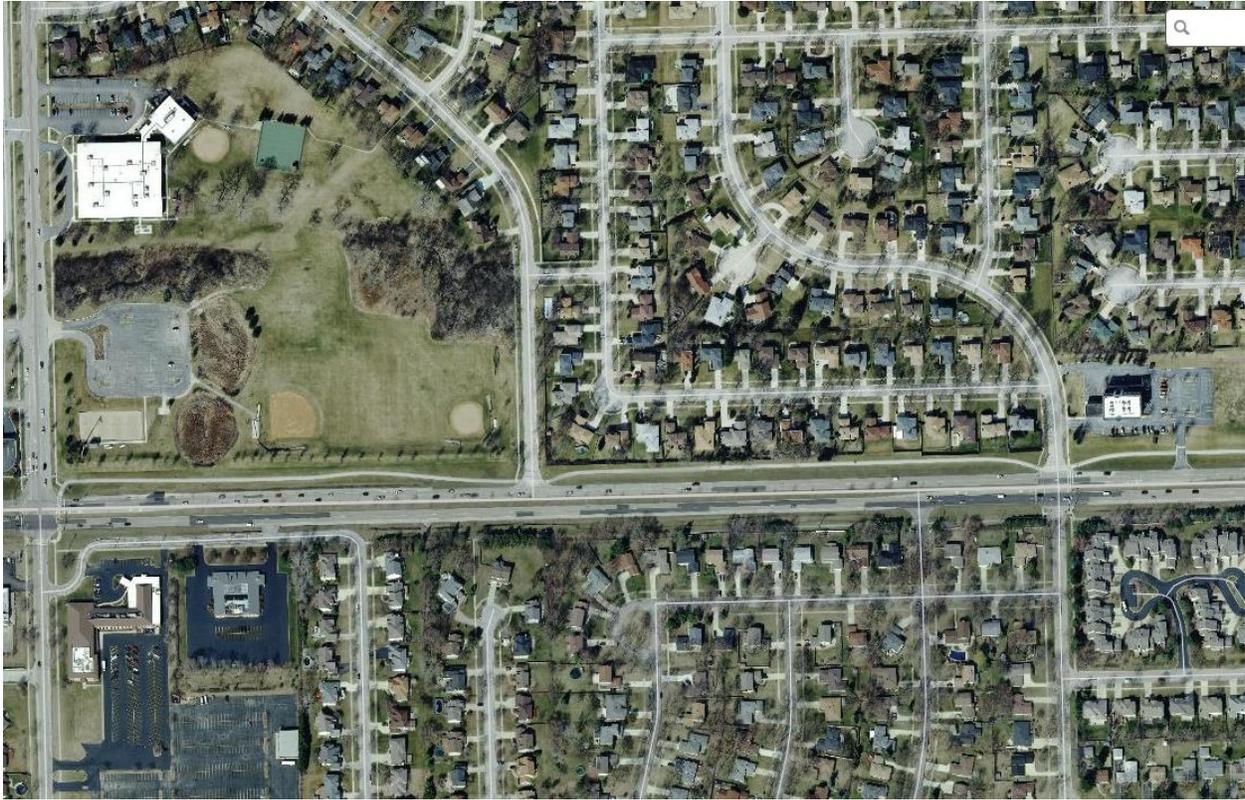


Figure 21 Sawmill Creek Watershed in 2014

While mainly suburban in nature, the Sawmill Creek watershed has a significant amount of natural areas as compared to many other watersheds within DuPage County. Many of these expanses of open space are contained within the Argonne National Laboratory (Figure 22) and the Forest Preserve District of DuPage County. Argonne Lab does contain several buildings and parking lots; however it is buffered by woods on all sides. Argonne Lab is federally owned land and some part of the site are secured areas. DuPage County is partnering with Argonne staff to obtain information the water bodies within these inaccessible portions of Argonne. Argonne will also be a partner in watershed-based planning efforts.



Figure 22 Argonne National Laboratory

The Sawmill Creek watershed encompasses about 8026 acres, or 12.5 square miles. Several stream branches begin in the northern portion of the watershed and converge into four main branches which cross under Interstate 55 in separate locations. North of Interstate 55, these four branches are piped, excavated into ponds, and generally impacted by urban development. At a few locations, these branches begin as or progress through a series of wetlands. However, most the headwaters are highly impacted and begin as storm sewer flow through a residential area. Detention ponds and piped stormwater are a large part of the northern part of the Sawmill Creek watershed.

3.4.2 Impervious Surfaces

With development comes an increase in impervious surfaces, such as roads, driveways, sidewalks and rooftops, and the Sawmill Creek Watershed is no exception. Of the Watershed's approximately 7943 acres, more than 2159 acres – or 27% of the Watershed – has impervious cover (Figure 23). Impervious cover in the Sawmill Creek watershed is fairly dense in the northern half and less dense south of I55. These surfaces cannot effectively absorb rainfall, meaning precipitation that falls on them is drained through engineered collection systems and discharged directly to nearby waterbodies. In addition to contributing to localized flooding by overloading sewer systems, this runoff carries with it non-point source pollutants that degrade receiving waters. In addition, high flows in the receiving waters can lead to erosion and damage to habitat, property and infrastructure.

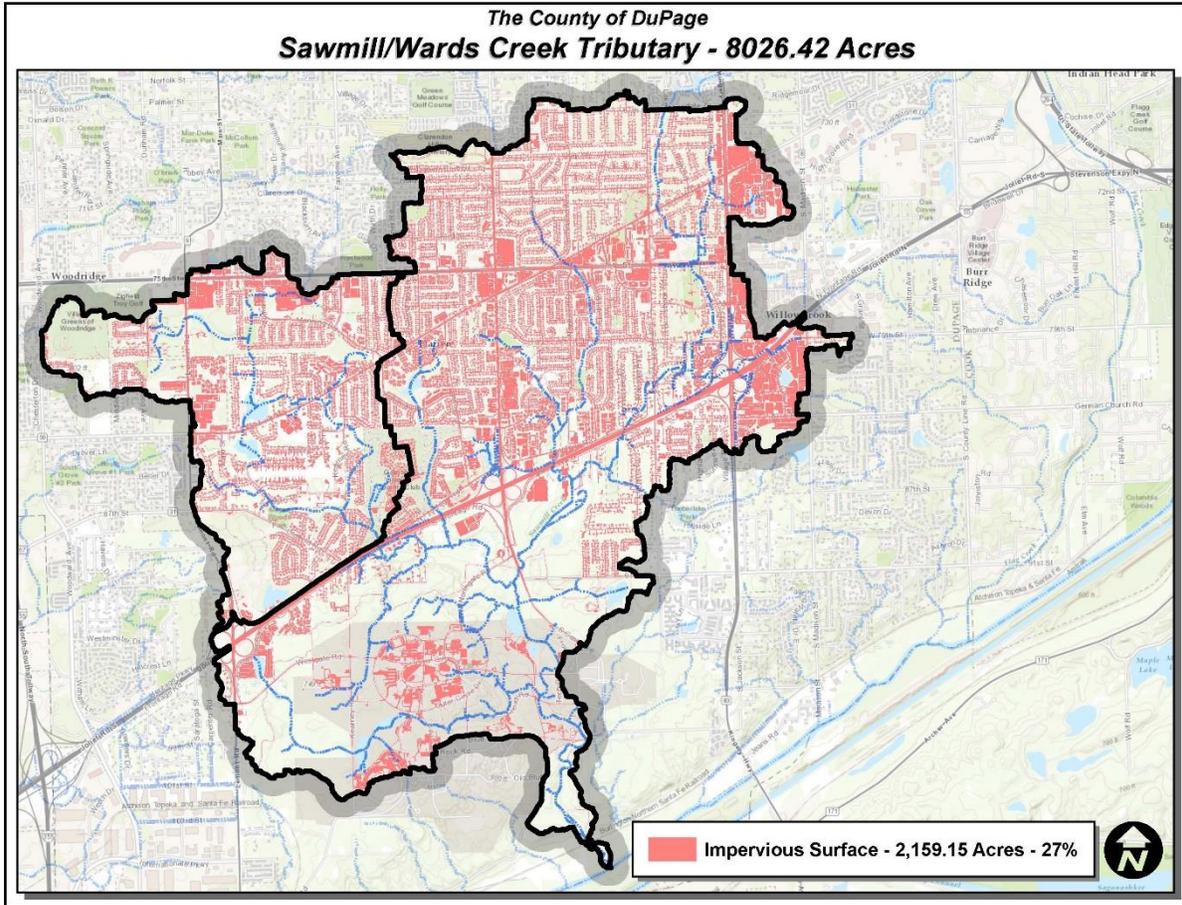


Figure 23 Impervious area

Of particular concern is the amount of impervious road cover in the planning area with public roads occupying 342 lane miles within the Sawmill Creek Watershed. These roadways account for 60% - or 1305 acres – of the Watershed’s total impervious cover (Table 9). A significant amount of polluted stormwater runoff generated in the Watershed is conveyed to Sawmill Creek and its tributaries along these transportation corridors.

<i>Entity</i>	<i>Lane Acreage</i>	<i>Lane Miles</i>
City of Darien	464.96	128.30
DGN Township	164.28	45.18
DGS Township	231.52	71.64
DuPage County DOT	137.61	33.00
Illinois DOT	232.62	43.70
Village of Burr Ridge	17.60	4.84
Village of Downers Grove	25.94	7.13
Village of Willowbrook	30.86	8.49
Total	1305.38	342.27

Table 9 Municipal NPDES permits

Impervious cover can also have an effect on groundwater recharge, stream base flow and water quality. Recent studies have shown that groundwater recharge and water quality decrease as impervious cover increases. Figure 24 illustrates a direct relationship between the intensity of development, as indicated by the amount of impervious surface, and the degree of damage to aquatic life in the watershed. Specifically, the chart on the left shows a decline in where the macroinvertebrate community as watershed imperviousness approaches 10%, and the chart on the right shows fish species are impacted when imperviousness exceeds 15%. In general, stream quality degradation is noticeable when impervious cover in a watershed approaches 10%, and a stream becomes non-supportive of aquatic life when impervious cover is more than 25% (Figure 25).

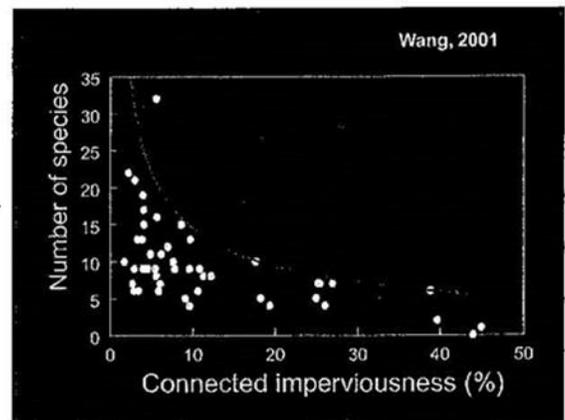
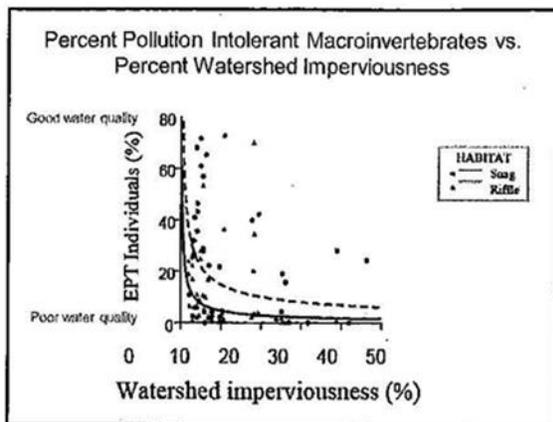


Figure 24 Watershed imperviousness relating to impacts on aquatic species. Images taken from Meeting TMDL, LID and MS4 Stormwater Requirements: Using WinSLAMM to Assess

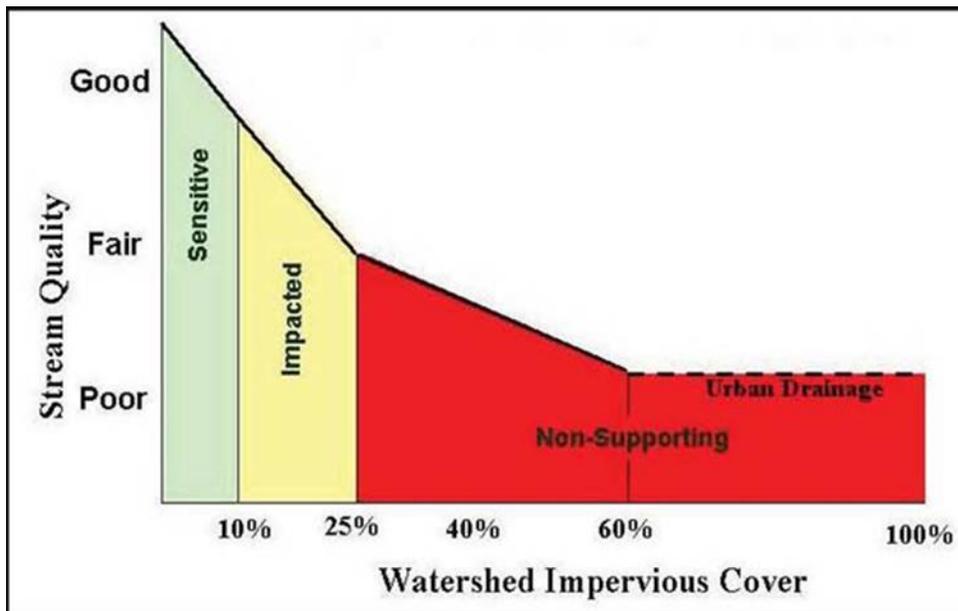


Figure 25 Comparison of stream quality versus impervious cover of a watershed

3.4.3 Wetlands

Wetlands provide numerous benefits to the surrounding ecosystem. Wetlands filter nutrients into the soil and help to filter pollutants out of the water. Wetlands also control flooding by absorbing water runoff from storms. One acre of wetlands has the potential to store 1 to 1 ½ million gallons of floodwater.¹¹ Wetlands also contribute to groundwater supply by filtering stormwater runoff through the system to remove pollutants and returning it to the underground aquifers. Many species of animals and plants depend on wetlands for habitat and nourishment. Wetlands make up only an approximate 5% of land in the continental U.S., but almost 1/3 of plant species can be found in wetlands.¹²

Sawmill Creek watershed contains around 536 acres of wetlands¹³ which are shown in Figure 26. This is about 6% of the land area. In comparison, hydric soils make up 2787 acres, or at least 35% of the land area. It can be assumed that the extent of hydric soils directly relates to historic extent of wetlands. Therefore, over 80%, or 2251 acres of wetland have been lost in the Sawmill Creek Watershed.

¹¹ United States Environmental Protection Agency, 2001. Functions and Values of Wetlands Factsheet. EPA 843-F-01-002c. <https://www.epa.gov/wetlands/wetlands-factsheet-series>

¹² United States Environmental protection Agency, 2006. Economic Benefits of Wetlands Factsheet EPA 843-F-06-004. <https://www.epa.gov/wetlands/wetlands-factsheet-series>

¹³ DuPage County's Wetland Map was created using the National Wetland Inventory (NWI) standards. Therefore, any Waters of the U.S. are mapped as wetlands, regardless of jurisdictional status. Based on the NWI criteria, excavated ponds, impoundments and detention basins are mapped as wetlands despite not serving the same functions for water quality and aquatic habitat as true wetlands.

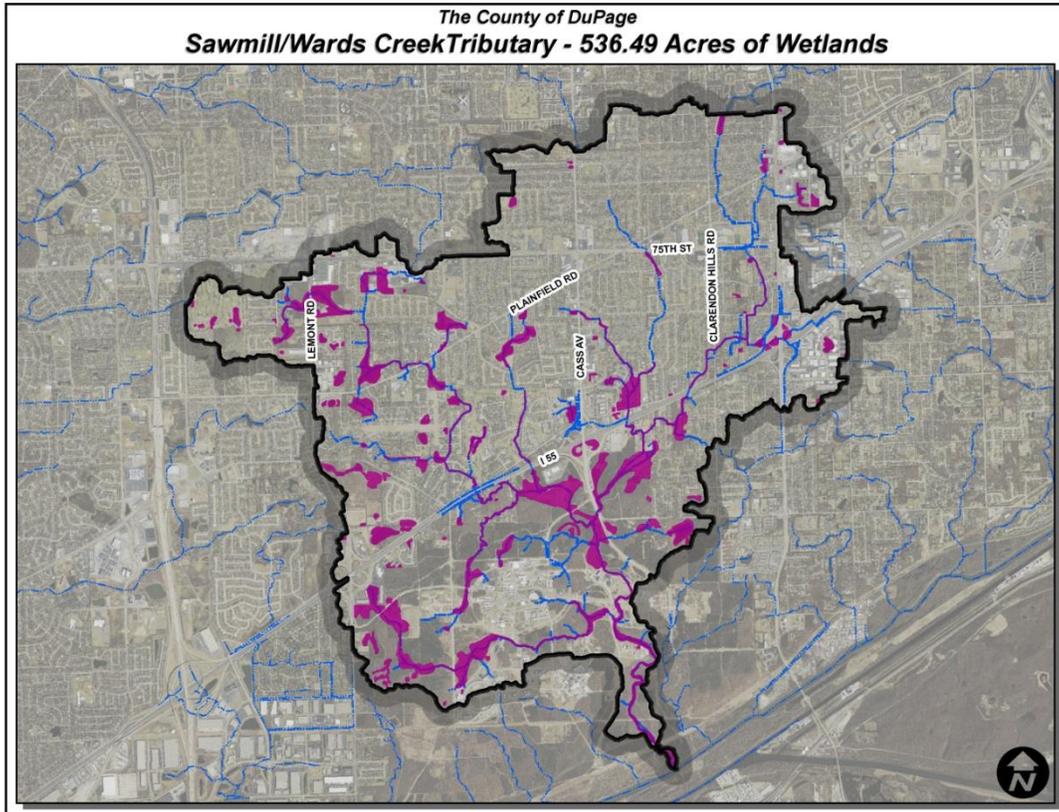


Figure 26 Sawmill Creek Watershed wetlands

Of the wetlands that remain in the planning area, there are some critical wetlands found in Waterfall Glen Forest Preserve, illustrated in Figure 27. Critical wetlands are those that have been identified by DuPage County as having the highest value by virtue of one or more high-ranking characteristics that result in a uniquely valuable environment. Some of the natural wetlands in the forest preserve flow directly into Sawmill Creek, while others are isolated.

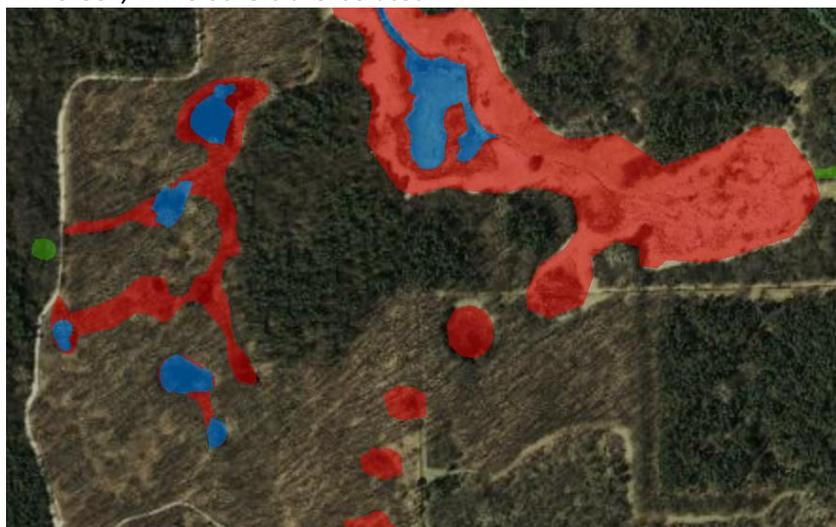


Figure 27 Critical wetlands found in Waterfall Glen Forest Preserve.

3.4.4 Open Space

Another result of the significant development in the Sawmill Creek Watershed is a decrease in open space. The Watershed has just over 1217 acres of open space, which is 15% of the surface area (Figure 28). On the bright side, public agencies own most of the existing open space, which limits future development and opens opportunity for inter-governmental cooperation on potential projects.

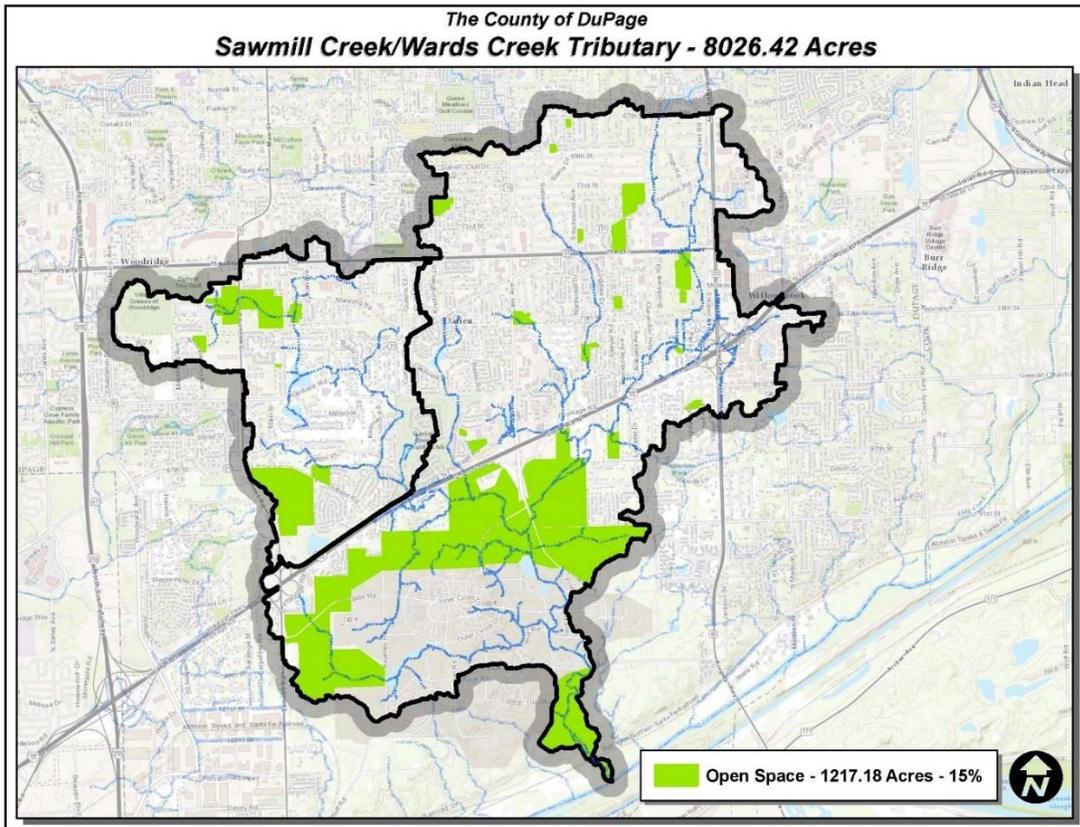


Figure 28 Sawmill Creek Watershed open space

Some of the notable open spaces in the planning area include:

- **Waterfall Glen Forest Preserve:** Located along the outskirts of the Argonne National Laboratory site, within the Sawmill Creek and Des Plaines River main stem Watersheds, Waterfall Glen is a 2492 acre preserve containing prairie, savannas, and oak-maple woodlands. In addition to the extensive natural areas, the site also contains trails, a youth campground, and a model airplane field.¹⁴



Figure 29 Waterfall Glen Forest Preserve. Photo courtesy of FPDDPC

¹⁴ http://www.dupageforest.org/Conservation/Forest_Preserves/Waterfall_Glen.aspx

- **Argonne National Laboratory Natural Areas:** Argonne Laboratory property contains 44 acres of wetlands, 22 acres of prairie, and 506 acres of woodlands. Argonne actively manages onsite natural areas and has developed a Site Sustainability Plan.



Figure 30 Argonne National Laboratory prairie. Photo courtesy of ANL

- **Darien Park District:** Darien is the largest municipal landholder in the Sawmill Creek watershed. The Darien Park District owns much of the open space within the watershed, outside from the Forest Preserve District. Notable parks include Westwood Park and Meyers Woods.



Figure 31 Meyers Woods. Photo courtesy of Darien Park District

- Tony and Florence Borse Memorial Community Park: This 17.17 acre park is the largest in Willowbrook Park District. It contains a half acre pond as well as many sports fields.



Figure 32 Borse Park, Willowbrook Park District

3.5 Water Resource Conditions

3.5.1 Watershed Drainage System

As previously mentioned, the Sawmill Creek Watershed is located in the southeastern part of DuPage County and drains stormwater from two townships and six municipalities. The northern most boundary of the watershed is north of Ogden Ave; the southernmost part of the watershed is between 63rd and 75th St; the furthest point east in the watershed is east of Madison Street; and the furthest point west is Woodward Ave. Sixteen tributaries make up the Sawmill Creek Watershed, including SWSW001 (mainstem), SWSW002, SWSW003, SWSW004, SWSW005, SWSW006, SWSW007, SWSW008, SWSW009, SWSW010, SWSW011, SWSW012, SWSW013, SWSW014, SWSW015, SWSW016. Wards Creek, a tributary to Sawmill Creek, is identified separately as SWWD001 through SWWD006. There are also smaller tributaries that are generally labeled SWSW000.

Sawmill Creek Mainstem (SWSW001) begins north of Plainfield Road and east of Clarendon Hills Road. SWSW001 runs south, meeting up with tributary SWSW010 north of 75th Street. SWSW001 then continues south and then west passing under Clarendon Hills Road, then I-55, where it meets with tributary SWSW013 south of I-55. Traveling south-west SWSW001 then meets up with tributary SWSW006 south-west of the intersection of Cass Avenue and 91st Street. Travelling south the mainstem then meets up with SWSW011, SWSW012, and SWSW009 before connecting to the Des Plaines River. Wards Creek Mainstem (SWWD001) begins north-east of 83rd Street and west of Lemont Road, and travels north until it crosses Lemont Road and turns south-east. SWWD001 connects to SWWD003 east

of Lemont Road and then turns south. SWWD turns east when it connects to SWWD004 north of Plainfield Road. After crossing Plainfield Road it turns south-east and connects with SWWD002, SWWD005 and SWWD006 before connecting to the Sawmill tributary of SWSW006.

Stormwater within the Sawmill Creek watershed flows in a general south direction beginning near between Plainfield Road and 63rd Street. Wards Creek flows in a south-east direction beginning west of Lemont Road until it connects to a Sawmill tributary at I-55. Of the estimated 44 miles of Sawmill Creek, approximately 8.26 – or nearly 19% – of the stream length is piped (Figure 33). Much of the piped segments are within the more developed northern half of the watershed and within roadway culverts. Impoundments such as piped segments of stream, culvert crossings, and dams impact the movement of fish and aquatic life and also decrease dissolved oxygen levels. There is one known low head dam along Sawmill Creek, located within the Waterfall Glen Forest Preserve.

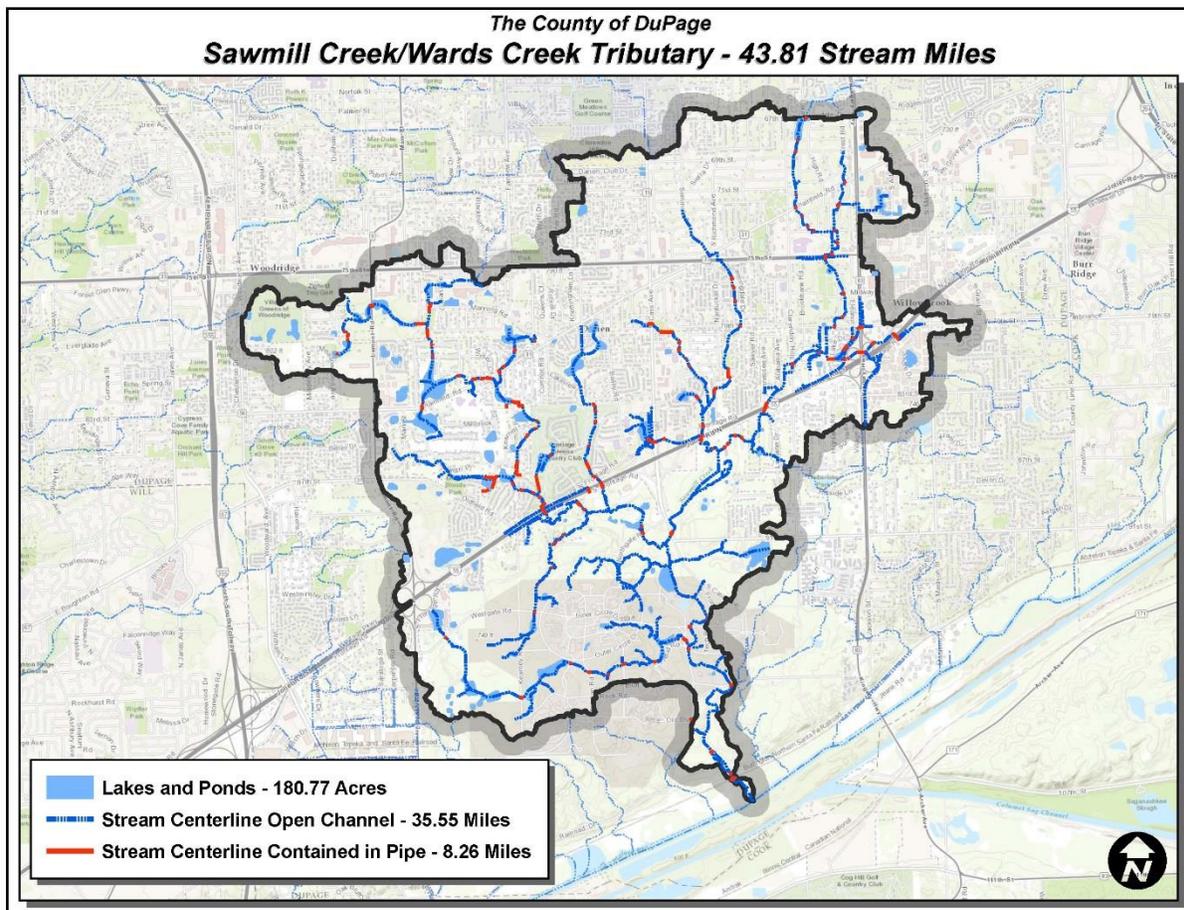


Figure 33 Piped stream segments of Sawmill Creek

3.5.2 Physical Stream Conditions

During the development of the Plan, DuPage County staff performed stream assessments along Sawmill Creek and its tributaries, where possible, to identify sediment accumulation, streambank erosion, channelization and riparian buffer. Figure 34 shows the 45 data collection points and 15 reaches, outlined above.

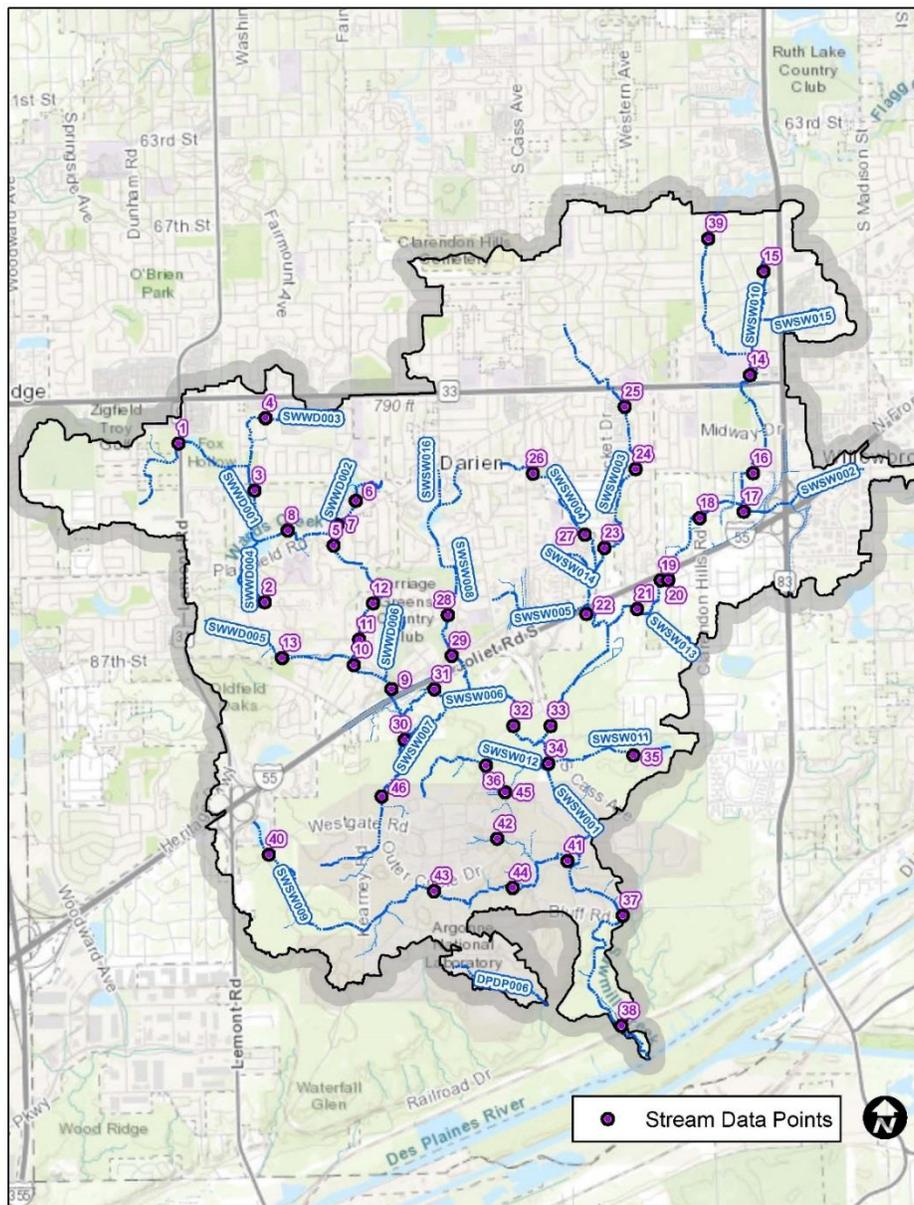


Figure 34 Stream assessment points for Sawmill Creek.

3.5.2.1 Sediment Accumulation

Sediment transport is an important part of stream and river dynamics, but too much accumulation can deteriorate waterways. In the case of an urban stream like Sawmill Creek, streambank erosion that leaves soil exposed carries dislodged sediment downstream. Effects of sediment accumulation on a stream include decreased biodiversity, lowered quality of habitat, increased transfer of pollutants and increased biological oxygen demand.

DuPage County staff identified the degree of sediment accumulation at 45 data points by assessing silt deposits in pools, embedded riffles, mid-channel bars and islands, enlargement of point bars and deposition in areas above the streambank. The quality of these stream sections were then ranked on a

four-point scale, ranging from no sediment accumulation to high sediment accumulation. As demonstrated in Figure 35, sediment accumulation for Sawmill Creek is moderate to high in many points of the stream.

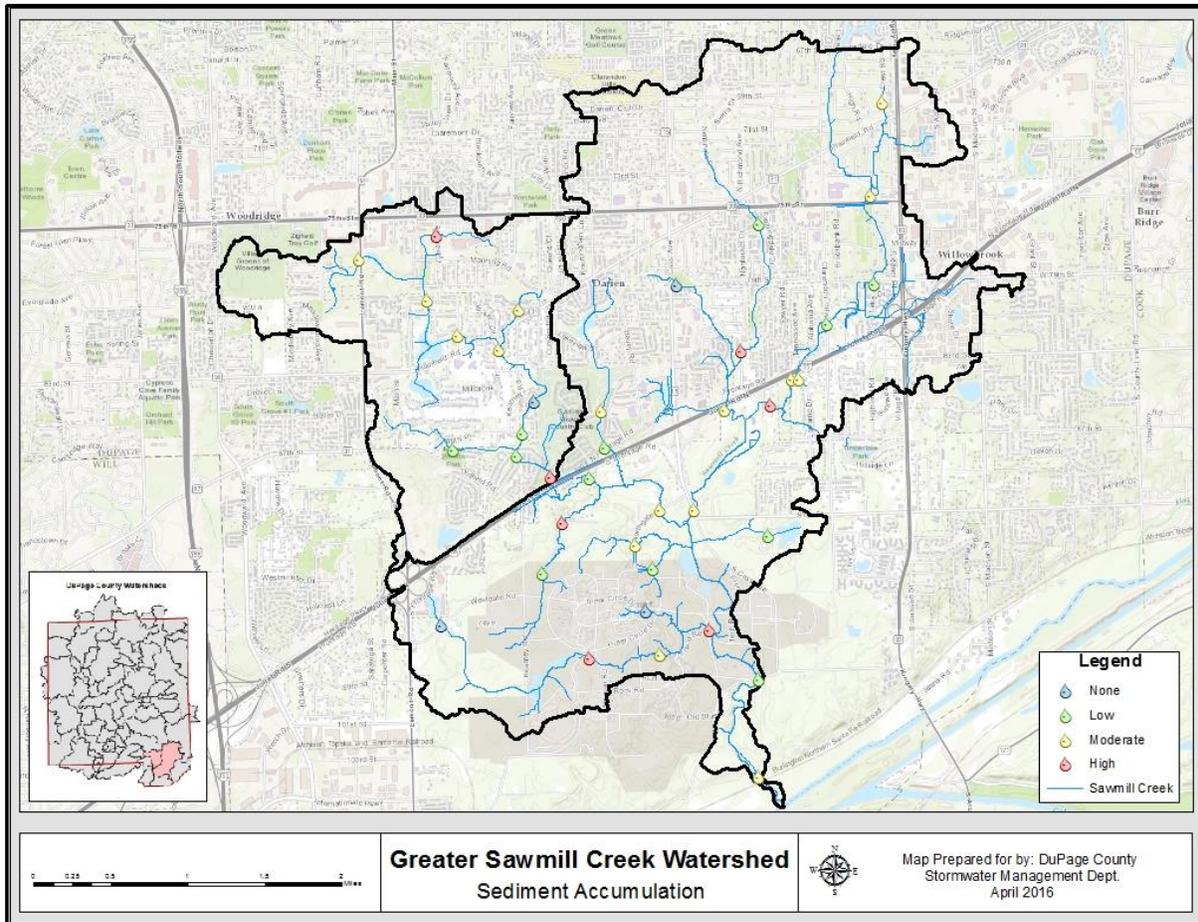


Figure 35 Sediment accumulation

3.5.2.2 Streambank Erosion

Erosion is a natural process allowing for the continued renewal of rivers, streams, and creeks. However human interaction with the stream can cause this natural process to accelerate, and have negative impacts on water quality, flood control, and can inflict property damaged if not managed. A variety of factors impacts the erosion of streambanks including; soil type, slope, precipitation, vegetation cover and management practices.



Figure 36 Streambank erosion along Sawmill Creek

When assessing streambank erosion on Sawmill Creek, both sides of stream were evaluated at each of the 45 data points for erosion. Shown in Table 10, a total of 7065 feet of streambank was reviewed for this study. Data points were assessed on a four-point scale ranging from no or minimal evidence of erosion or bank failure to very severe erosion where the bank is unstable and has evident “raw” areas because of extreme erosion. In total, about 40% of the streambank assessed exhibited none to low erosion, meaning there is little potential for future problems in these areas. Another 25% has moderate erosion, meaning the bank was moderately stable with small areas of erosion. The remaining 35% has high erosion, which leaves the bank relatively unstable and vulnerable for increased erosion. None of the banks assessed had very severe erosion. Figure 37 illustrates where erosion is found. Additional areas of erosion were noted during the watershed planning process by stakeholders, municipal representatives, and by reviewing previous studies and are shown later in this document.

Stream or Tributary Name	Reach Code	Stream Length Assessed (ft)	None or Low Erosion (ft/%)	Moderate Erosion (ft/%)	High Erosion (ft/%)
Sawmill Creek	0	150	0	0	150
Sawmill Creek	1	3930	1500	1050	1380
Sawmill Creek	2	150	0	150	0
Sawmill Creek	3	1230	750	0	480
Sawmill Creek	4	150	0	0	150
Sawmill Creek	5	210	0	0	210
Sawmill Creek	6	150	0	150	0
Sawmill Creek	7	60	0	60	0

3.5.2.3 Channelization

Channelization severely degrades water quality of a river or stream. Stream channelization can cause an increase in water velocity, streambank erosion and pollutant dispersion, while also negatively affecting aquatic habitat and, thus, biodiversity. As demonstrated in Table 11, of the 45 Sawmill Creek sites assessed, more than half had little to no evidence of channelization, meaning there was a natural meander to the stream. The remaining assessed stream banks exhibited moderate channelization, which is characterized by a straight channel with some concrete or armor. None of the points assessed had high channelization, which is a straight channel with concrete streambed and banks. Assessment points and severities are shown in Figure 38.

Stream or Tributary Name	Reach Code	Stream Length Assessed (ft)	None or Low Channelization (ft/%)		Moderate Channelization (ft/%)		High Channelization (ft/%)	
			ft	%	ft	%	ft	%
Sawmill Creek	0	0	0	0%	0	0%	0	0%
Sawmill Creek	1	8,193	3728	45.5%	4465	54.5%	0	0%
Sawmill Creek	2	825	825	100%	0	0%	0	0%
Sawmill Creek	3	0	0	0%	0	0%	0	0%
Sawmill Creek	4	0	0	0%	0	0%	0	0%
Sawmill Creek	5	0	0	0%	0	0%	0	0%
Sawmill Creek	6	0	0	0%	0	0%	0	0%
Sawmill Creek	7	0	0	0%	0	0%	0	0%
Sawmill Creek	8	0	0	0%	0	0%	0	0%
Sawmill Creek	9	585	285	48.7%	300	51.3%	0	0%
Sawmill Creek	10	0	0	0%	0	0%	0	0%
Sawmill Creek	11	100	0	0%	100	100%	0	0%
Sawmill Creek	12	0	0	0%	0	0%	0	0%
Sawmill Creek	13	0	0	0%	0	0%	0	0%
Sawmill Creek	14	0	0	0%	0	0%	0	0%
Sawmill Creek	15	0	0	0%	0	0%	0	0%
Sawmill Creek	16	150	150	100%	0	0%	0	0%
Sawmill Creek	17	0	0	0%	0	0%	0	0%
Sawmill Creek	18	300	300	100%	0	0%	0	0%
Totals		10,153	5,288	52.1%	4,865	47.9%	0	0%

Table 11 Channelization data for Sawmill Creek

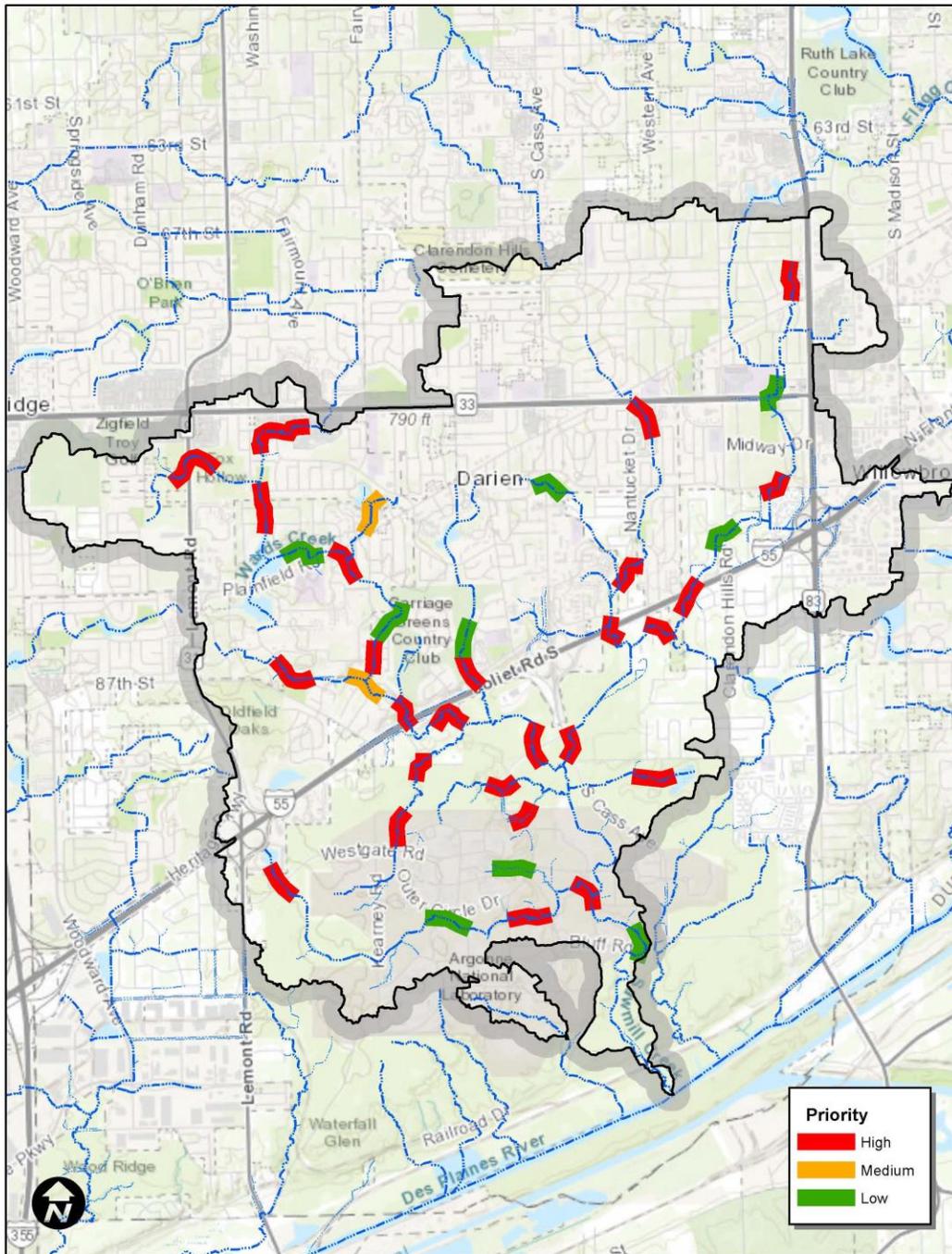


Figure 38 Channelization of Sawmill Creek

3.5.2.4 Riparian Condition

At each stream assessment location, the condition of the riparian buffer was assessed. As shown in Table 12, the condition of the buffer varied throughout the Watershed. Nearly half of the riparian buffers were noted to be in good condition, likely due to the large amount of land area within the Forest Preserve. About 24% of the assessed riparian area was observed to be in fair condition. The remaining 27% was considered to be in poor condition, meaning it had a narrow buffer, consisting of turf, impervious surface and little natural vegetation.

Stream or Tributary Name	Reach Code	Stream Length Assessed (ft)	Good Condition (ft/%)		Fair Condition (ft/%)		Poor Condition (ft/%)	
			ft	%	ft	%	ft	%
Sawmill Creek	0	150	150	100%	0	0%	0	0%
Sawmill Creek	1	3930	1155	29.39%	1200	30.53%	1575	40.08%
Sawmill Creek	2	150	0	0%	0	0%	150	100%
Sawmill Creek	3	1230	1050	85.37%	180	14.63%	0	0%
Sawmill Creek	4	150	0	0%	150	100%	0	0%
Sawmill Creek	5	210	210	100%	0	0%	0	0%
Sawmill Creek	6	150	75	50%	0	0%	75	50%
Sawmill Creek	7	60	0	0%	60	100%	0	0%
Sawmill Creek	8	180	90	50%	90	50%	0	0%
Sawmill Creek	9	600	600	100%	0	0%	0	0%
Sawmill Creek	10	90	90	100%	0	0%	0	0%
Sawmill Creek	11	75	75	100%	0	0%	0	0%
Sawmill Creek	12	90	0	0%	0	0%	90	100%
Totals		7065	3495	49.47%	1680	23.78%	1890	26.75%

Table 12 Riparian buffer condition

3.5.2.5 Overall Stream Condition

DuPage staff rated the overall stream condition of Sawmill Creek using the results of the evaluations for erosion, channelization and riparian buffer condition, summarized in Table 13.

Stream or Tributary Name	Reach Code	Stream Length Assessed (ft)	Good Condition (ft/%)		Fair Condition (ft/%)		Poor Condition (ft/%)	
			ft	%	ft	%	ft	%
Sawmill Creek	0	150	0	0%	150	100%	0	0%
Sawmill Creek	1	3930	1440	37%	5040	128%	450	11%
Sawmill Creek	2	150	0	0%	0	0%	150	100%
Sawmill Creek	3	1230	600	49%	450	37%	180	15%
Sawmill Creek	4	150	0	0%	150	100%	0	0%
Sawmill Creek	5	210	0	0%	210	100%	0	0%
Sawmill Creek	6	150	75	50%	0	0%	75	50%
Sawmill Creek	7	60	0	0%	60	100%	0	0%

Sawmill Creek	8	180	0	0%	90	50%	90	50%
Sawmill Creek	9	600	600	100%	0	0%	0	0%
Sawmill Creek	10	90	90	100%	0	0%	0	0%
Sawmill Creek	11	75	75	100%	0	0%	0	0%
Sawmill Creek	12	90	0	0%	90	100%	0	0%
Totals		7065	2880	40.76%	6240	88.32%	945	13.38%

Table 13 Overall stream condition of Sawmill Creek at the assessment data points

3.5.3 Bruce Lake

Bruce Lake is privately owned by Bruce Lake Home Owners Association (HOA) and is located in unincorporated DuPage County in the northwest portion of Sawmill Creek Watershed. It is almost entirely surrounded by single family homes with the exception of a park that abuts 138 feet of the lake. The park has a small beach area for swimming and launching non-motorized boats. There are inlets from the north and south and Bruce Lake outlets into Wards Creek to the east which is tributary to Sawmill Creek and the Des Plaines River.

3.5.3.1. Lakeshore Buffer Zones

Bruce Lake’s lakeshore buffer zone was qualitatively assessed by County staff by canoe on June 13, 2017. The buffer zone area considered was from the shoreline to a depth of 25 feet. This depth is based on current literature indicating that a 25-foot vegetated buffer is the minimum depth for shoreline habitat maintenance¹⁵. Each parcel abutting the lake was assessed individually and given a score of good, fair, or poor based on a scale of land cover categories that range from beneficial to detrimental to water quality (Table 14). These criteria were provided by the Chicago Metropolitan Agency for Planning’s Boone-Dutch Creek Watershed-based Plan¹⁶.

Good	Unmowed grasses & forbs + Tree trunks + Shrubs	≥ 70%
	AND Impervious surface	≤ 5%
Fair	Unmowed grasses & forbs + Tree trunks + Shrubs	≥ 50% and < 70%
	AND Impervious surface	≤ 10%
Poor	Unmowed grasses & forbs + Tree trunks + Shrubs	< 50%
	AND Turfgrass lawn + Flower beds + Beach + Impervious surface	≥ 50%

Table 14 Criteria for assessing lakeshore buffer zone

¹⁵ http://dec.vermont.gov/sites/dec/files/wsm/lakes/Lakewise/docs/lp_shorelandbufferwidths.pdf

¹⁶ http://www.cmap.illinois.gov/documents/10180/12317/BooneDutchCrkWatshdPlan-ExecSumm_FINAL_CMAP-Mrch2016.pdf/7ec35a0f-5fa4-4543-b949-03d745140bf9

The total assessed shoreline length for Bruce Lake totaled 3950 feet. Condition of shoreline buffer around Bruce Lake is displayed in Figure 39. A majority of the shorelines around the lake were considered to be in poor condition due to the residential yards that extend to the edge of water. Several properties were also observed to have created “beaches” along the lake by placing sand at the water’s edge. As shown in Table 15, 77% of the shoreline was in poor condition. Only one parcel, comprising 2% of the shoreline was considered to have a buffer zone in good condition.

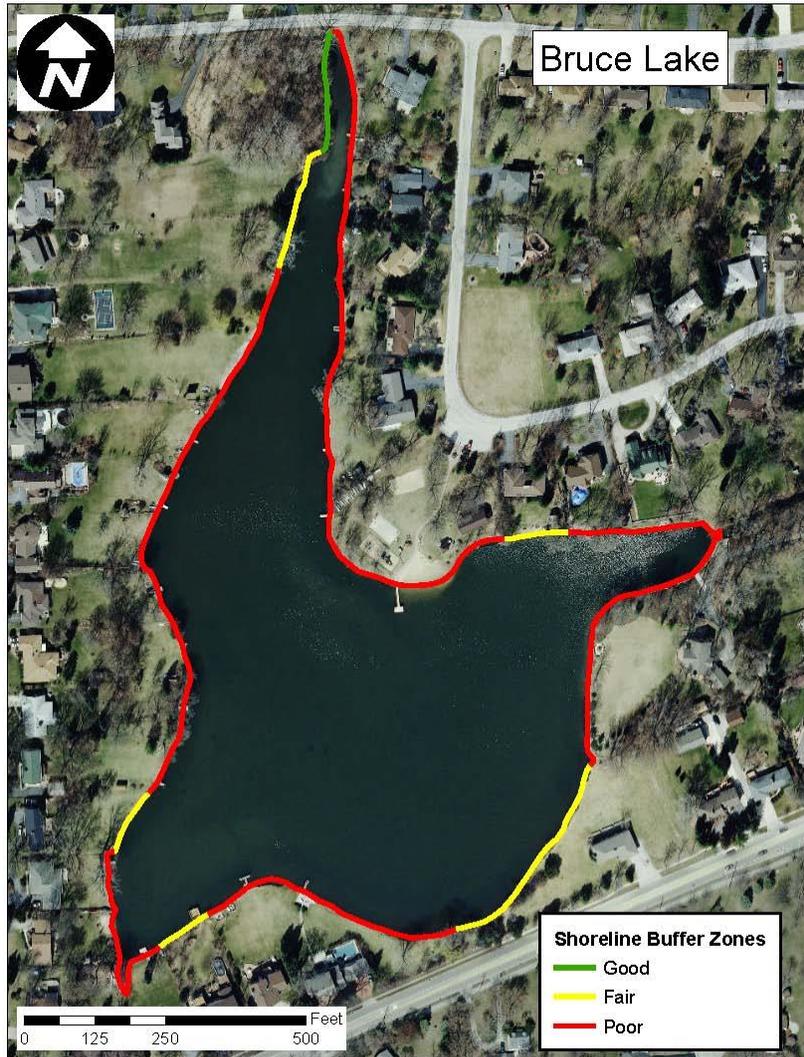


Figure 39 Bruce Lake shoreline buffer condition

Good Condition (ft/%)		Fair Condition (ft/%)		Poor Condition (ft/%)	
70	2%	948	24%	3,389	77%

Table 15 Shoreline buffer zone condition

3.5.3.2. Shoreline Erosion

Bruce Lake’s shoreline erosion assessment was done at the same time the buffer zone assessment was conducted using the same parcel-based process. Table 16 shows the criterion for the erosion assessment.

Erosion Level	
None or Low Erosion	Typically stone or concrete seawall or minor erosion with some bare soil areas but with stable banks
Moderate Erosion	Approximately 3-12" eroded bank heights
High Erosion	Approximately 12-24" eroded bank heights

Table 16 Criteria for assessing shoreline erosion

Erosion levels around the shoreline of Bruce Lake are shown in Figure 40. The severity of shoreline erosion varied around Bruce Lake. Table 16 shows a summary of assessed shoreline erosion levels. Minor erosion (none, minimal, or slight) was found over 80% of the lake indicating a relatively stable shoreline (Table 17). Many of the properties had shorelines stabilized with rock to reduce wave action and minimize erosion.



Figure 40 Bruce Lake shoreline erosion levels

No Erosion (ft/%)		Minimal Erosion (ft/%)		Slight Erosion (ft/%)		Moderate Erosion (ft/%)		High Erosion (ft/%)	
756	19%	1,788	45%	650	16%	315	8%	441	11%

Table 17 Shoreline erosion severities

3.5.4 Stormwater Detention Basins

In an attempt to create a comprehensive inventory of detention basins throughout the Sawmill Creek Watershed, DuPage County staff and partner municipalities identified basins throughout the study area using GIS data, aerial maps and field visits. Following basin identification, DuPage County staff physically assessed each of them, compiling the data into an ArcGIS Collector Application. The basin assessments included type, buffer and erosion. Staff then assessed the overall water quality benefit of each of the 136 basins (Figure 41), rating each good, fair or poor.

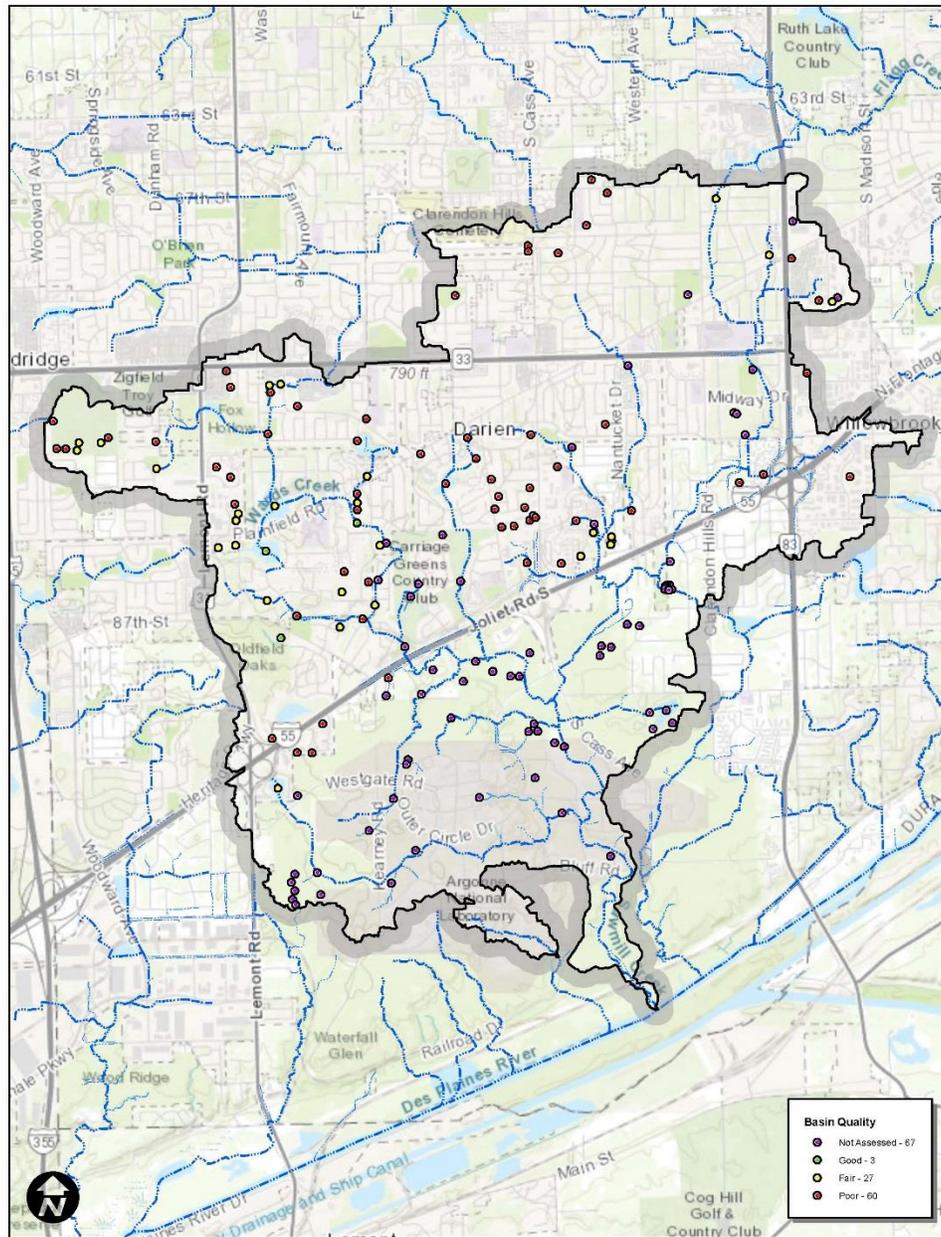


Figure 41 Types of detention basins in Sawmill Creek Watershed.

The types of basins found in the watershed included dry naturalized, dry turf, wet, wet with extended dry and constructed wetland. When in good condition, these basins play an important role in water quality by retaining stormwater runoff and filtering pollutants before slowly releasing the runoff back into the stream. The indicators DuPage staff used to determine the water quality benefit of the basins included:

- Side slope cover
- Side slope angle
- Native plant buffer
- Waters' edge cover
- Basin bottom cover

- Shoreline erosion
- Safety shelf
- Sediment forebay
- Short circuit
- Inlet/outlet stilling basins
- Connection to other basins
- Basin uses and maintenance
- Retrofit opportunities

In total, staff categorized 94 basins within the watershed as poor, as shown in Table 18. Those basins were then compared to critical areas within the watershed to prioritize opportunities for retrofits.

Political Jurisdiction	# of Basins	Detention Basin Type					Water Quality Benefit		
		Wet	Dry Turf	Dry Naturalized	Wet w/ Extended Dry	Constructed Wetland	Good	Fair	Poor
Burr Ridge	1	1	0	0	0	0	0	0	1
Darien	94	46	31	4	8	5	2	26	66
Downers Grove	11	0	11	0	0	0	0	0	11
Unincorporated Cook	1	0	0	0	0	1	0	1	0
Unincorporated DuPage	7	3	0	0	0	4	0	4	3
Willowbrook	9	9	0	0	0	0	0	3	6
Woodridge	13	12	0	0	1	0	0	6	7
Total	136	71	42	4	9	10	2	40	94

Table 18 Detention basin assessments in the Sawmill Creek Watershed.

3.5.4 Groundwater Evaluation

Groundwater is a valuable natural resource. Although much of DuPage County receives drinking water from Lake Michigan, a total of 1281 properties in the Sawmill Creek Watershed, particularly in unincorporated areas within the Sawmill Creek Watershed, receive drinking water from private groundwater wells¹⁷. Contamination of this groundwater is serious because of the risk to human health and the environment, but also because cleanup of groundwater is very difficult, if not impossible. Even if the source is eliminated, contamination in the groundwater can persist for long periods. According to the Illinois Groundwater Protection Act (IGPA), the ongoing contamination of Illinois' groundwater will adversely affect the health and welfare of its citizens, as well as the economic viability of the state.¹⁸ Properties that receive water from private or public wells within Sawmill Creek are shown in Figure 42.

¹⁷ Well data courtesy of the DuPage County Health Department

¹⁸ <http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1595&>

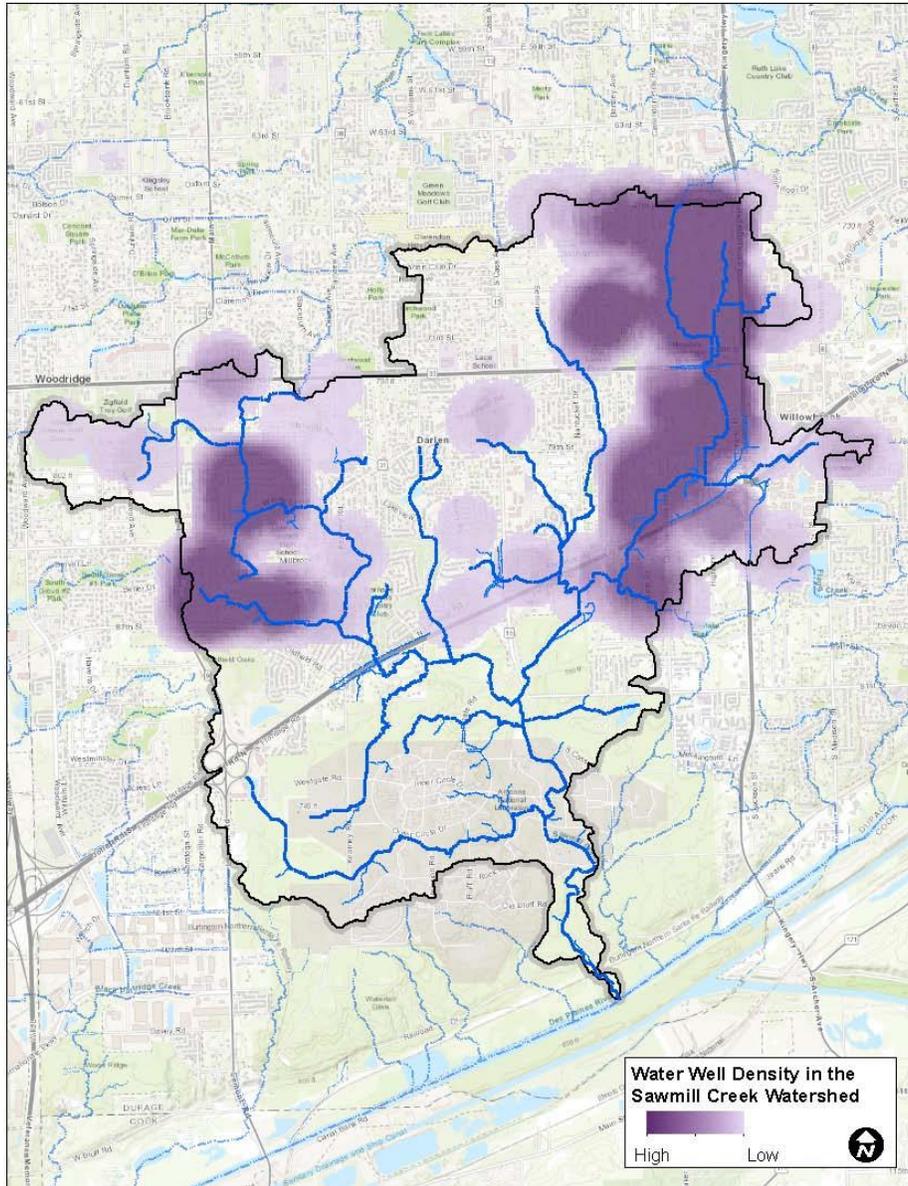


Figure 42 Density of well water sources in Sawmill Creek Watershed

Groundwater also feeds many of the County’s natural resources, including wetlands, streams, springs, ponds and a few lakes. As such, DuPage County is located in one of four priority groundwater protection planning regions.¹⁹ The IEPA established the priority areas by reviewing recharge area mapping, groundwater pumping data, population affected, water supply characteristics and solid waste planning efforts, among other factors. For this reason, recharge of aquifers is necessary.

As shown in Figure 43, the principle aquifer under DuPage County is the Silurian-Devonian aquifer. However, many people interact with surficial aquifer systems found in sand and gravel found at or near the surface and alluvium along streams and rivers.²⁰

¹⁹ Illinois Groundwater Protection Program, established under Section 17.2 of the IGPA

²⁰ <https://pubs.usgs.gov/ha/730k/report.pdf>

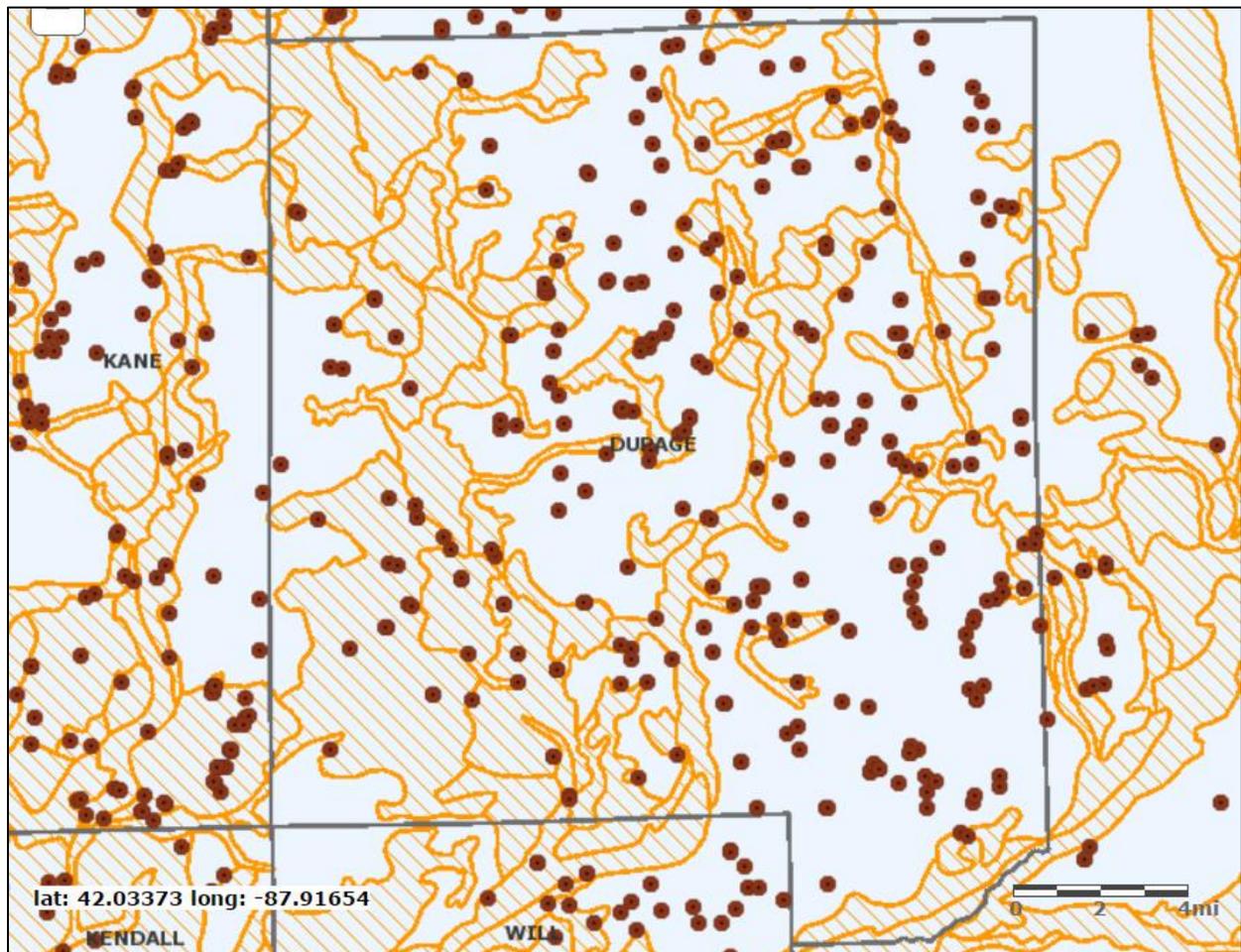


Figure 43 Potential aquifers and community wells in DuPage County.²¹

Under the DuPage County Stormwater Ordinance, development that triggers the need for volume control is also required to treat runoff for pollutants. Infiltration is a commonly used practice as it can provide both volume and pollutant control in one practice. However, the Ordinance recognizes that certain soils may not have pollutant removal capabilities due to high permeability. In order to protect groundwater from inadvertent contamination, the following are prohibited from installing infiltration practices onsite:

- Fueling and maintenance areas
- Areas within 400 feet of a public well
- Sites containing contaminants of concern as identified by the EPA or IEPA
- Development sites with soils in hydrologic soil group A
- Areas with a seasonally high water table within 2 feet of the surface

²¹ Less than 50 feet deep. <http://www.rmms.illinois.edu/RMMS-JSAPI/>

3.5.5 Surface Water Quality

3.5.5.1 Designated Uses, Assessment & Impairment Status

Every two years, in accordance with Sections 305(b) and 303(d) of the federal Clean Water Act, the Illinois Environmental Protection Agency (IEPA) must report to the U.S. Environmental Protection Agency on the quality of Illinois surface water (e.g., lakes, streams, Lake Michigan, wetlands) and groundwater resources (Section 305(b)) and provide a list of those waters where their designated uses are deemed ‘impaired’ (Section 303(d)).

Sawmill Creek was first added to Illinois’ §303(d) list in 2010 as assessment unit IL_GJ-01, which extends approximately 6.62 miles from the bridge crossing at 69th Street downstream until the confluence with the Des Plaines River. However, the stream is confined a network of underground storm sewer pipes until about 450 feet upstream of the 75th Street bridge crossing. Currently, Sawmill Creek is listed as not supporting the aquatic life use. Figure 44 identifies the waterbodies that IEPA has listed as impaired in accordance with Section 303(d) of the Federal Clean Water Act (CWA).

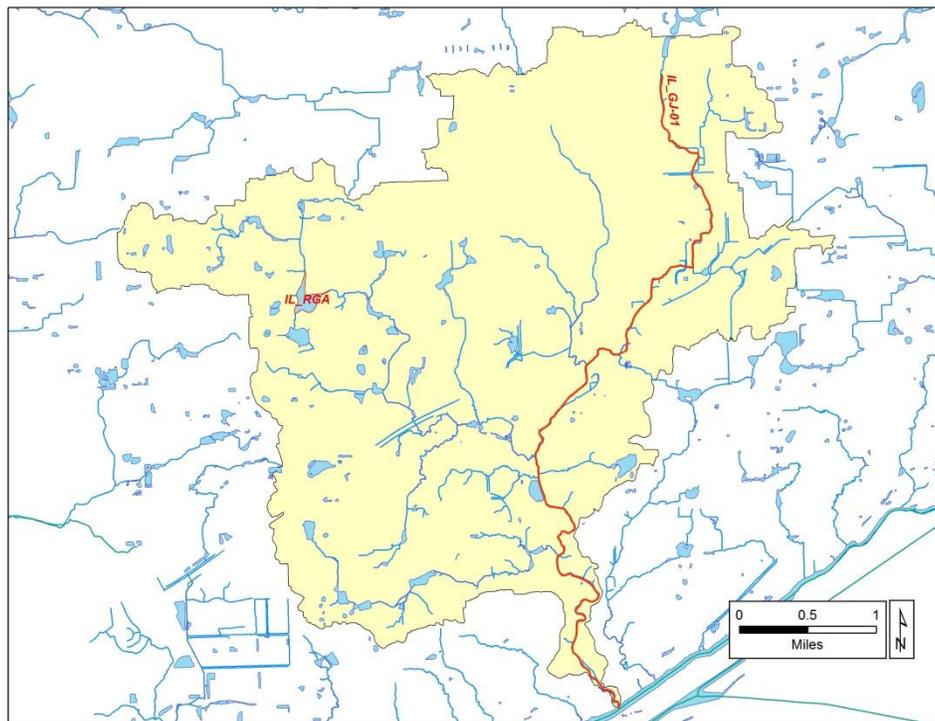


Figure 44 Impaired waterbodies in Sawmill Creek Watershed

Of the five designated uses of Sawmill Creek, the IEPA’s 2016 Illinois Integrated Water Quality Report and Section 303(d) List only evaluated it for aquatic life, assessing it as not supporting (Table 19). Changes in stream depth and velocity patterns, other flow regime alterations, methoxychlor, and polychlorinated biphenyls are recognized as causes of the aquatic life impairment. Contaminated sediments and the presence of a dam or other impoundments are suspected sources of the noted causes. (Table 20).²² Assessment information for Bruce Lake is shown in Table 21. The listed cause for this impairment is total

²² as identified in the [303\(d\) list \(Appendix A-2\)](#) of the 2016 Integrated Report

phosphorus; with onsite treatment systems (septics), agriculture, urban runoff/ storm sewers, and runoff from forest/grassland/parkland listed as sources.

Designated Use	Use ID	Assessed in 2016	Use Attainment
Aquatic Life	582	Yes	Not Supporting
Fish Consumption	583	No	N/A
Primary Contact	585	No	N/A
Secondary Contact	586	No	N/A
Aesthetic Quality	590	No	N/A

Table 19 IEPA's Sawmill Creek Assessment information

Year	Assessment Unit	Use	Cause	First Listed	Source(s)
2016	IL_GJ-01	Aquatic Life	Methoxychlor	2010	Contaminated sediments and dam or impoundment
			Polychlorinated biphenyls	2010	
			Changes in stream depth and velocity patterns	2010	
			Other flow regime alterations	2010	

Table 20 Assessment information for Sawmill Creek

Waterbody	Assessment Unit ID	Size	Causes of Impairment	Sources of Impairment
Bruce Lake	IL_RGA	14.6 acres	Phosphorus (Total)	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
				Agriculture
				Urban Runoff/ Storm Sewers
				Runoff from Forest/Grassland/Parkland

Table 21 Assessment information for Bruce Lake

Additional information for the contaminated sediments are listed in Table 22. At the time of the IEPA assessment (2008), the levels of methoxychlor and PCBs exceeded IEPA, threshold effect concentration (TEC), and probable effect concentrations (PEC) guidelines.

Station	Date	Parameter	Concentration (ug/kg)	Guidelines (ug/kg)		
				IEPA ²³	TEC ²⁴	PEC ²⁵
GJ-01	7/31/2008	Methoxychlor	14	5.0		
		Polychlorinated biphenyls	220	180	59.8	676

Table 22 IEPA assessment data for Sawmill Creek

IEPA assesses aquatic life designated uses with four separate categories – streams, freshwater lakes, Lake Michigan and indigenous aquatic life. These categories are labeled “Fully Supporting” or “Not Supporting” when the assessment is completed by using biological, water chemistry and habitat data. The “Fully Supporting” label means the category is in good condition whereas the “Not Supporting” label means the category is in fair or poor condition.

To assess aquatic life uses in streams, the three biological indices used are the fish Index of Biotic Integrity (fIBI), the macroinvertebrate Index of Biotic Integrity (mIBI), and the Macroinvertebrate Biotic Index (MBI). These indices are compiled into decision matrices with water quality data and physical habitat information compiled from the Intensive Basin Survey, Ambient Water Quality Monitoring Network or Facility-Related Stream Survey programs. Once all the available information is included in the decision matrices, IEPA determines if the stream is impaired for aquatic life use and if impaired, to what degree.

²³ Non-standards based numeric criteria for substances in water were based on 85th-percentile values determined from a statewide set of observations from IEPA’s Ambient Water Quality Monitoring Network, for water years 1978-1996. Criteria for substances in sediment represent the minimum threshold of “highly elevated” levels (Short 1997). These non-standards based cause guidelines are no longer used by IEPA as potential causes of impairment.

²⁴ Threshold Effect Concentrations, or the concentration below which harmful effects are unlikely to be observed, were taken from *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems* (MacDonald et al. 2000).

²⁵ Probable Effect Concentrations, or the concentration above which harmful effects are likely to be observed, were taken from *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems* (MacDonald et al. 2000).

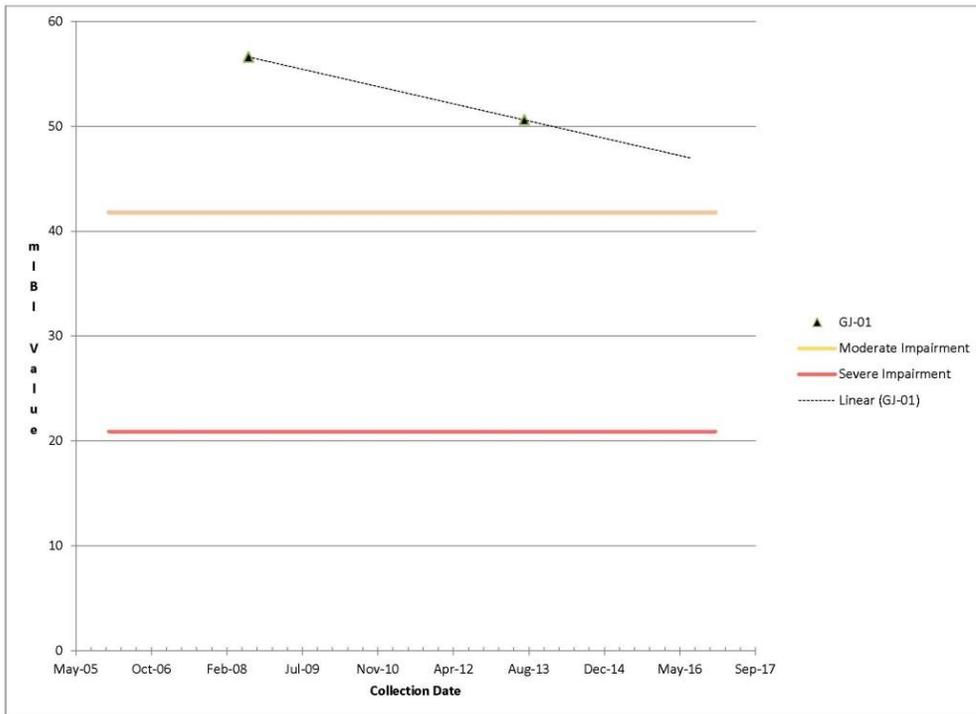


Figure 45 mIBI for Sawmill Creek

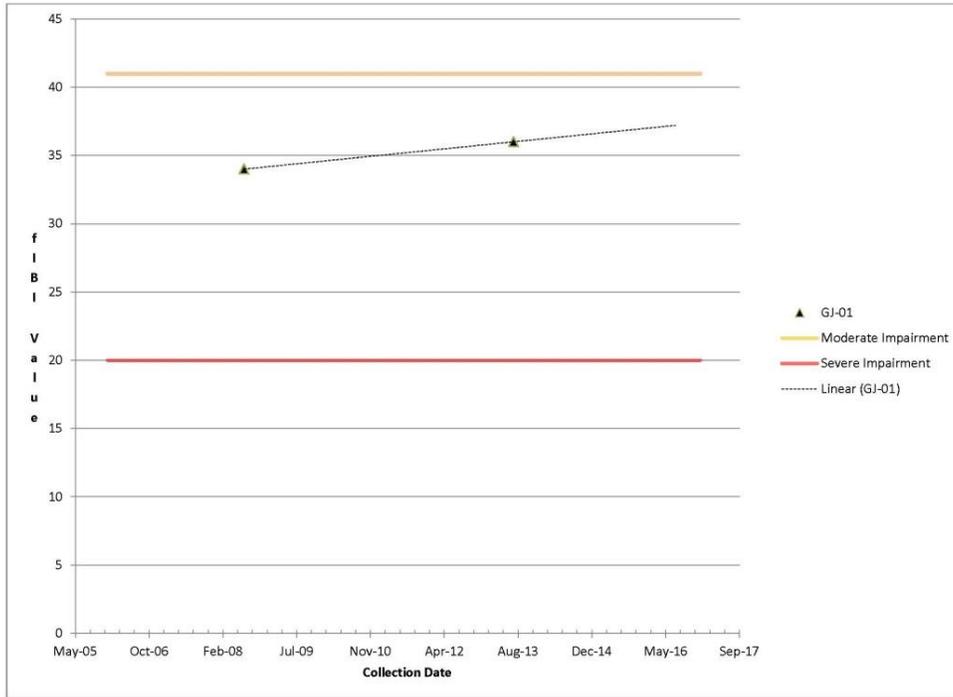


Figure 46 fBIVaIuIe for Sawmill Creek

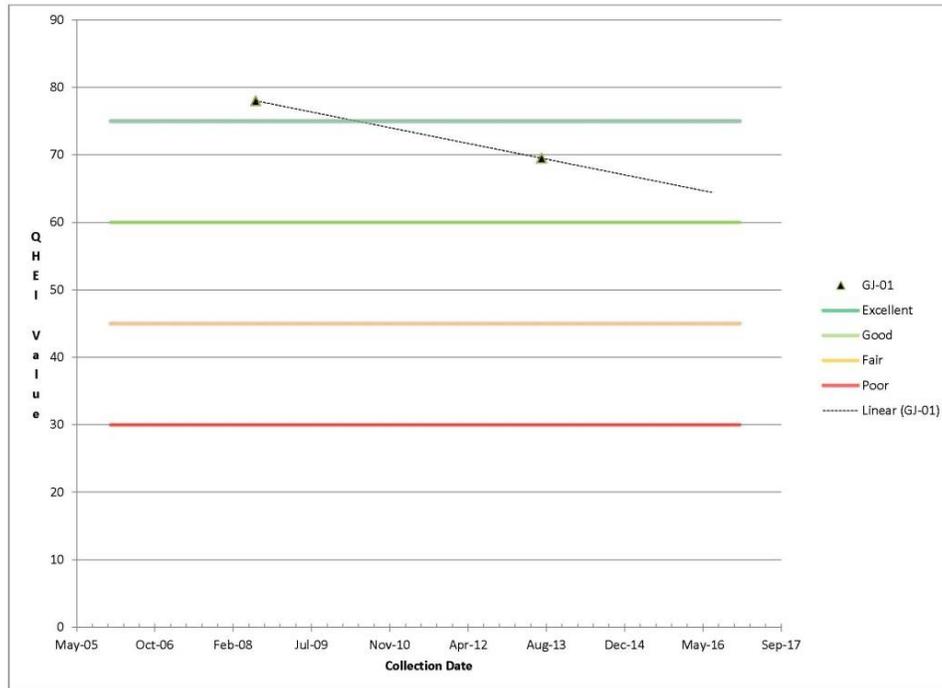


Figure 47 QHEI for Sawmill Creek

3.5.6 Citizen Reporter Web Application

The DuPage County Citizen Reporter App was launched in May 2016.²⁶ The intent of this web-based GIS application is to collect observations from DuPage County citizens on water quality impairments or concerns. These observations can then be used for the purpose of identifying water quality practices or projects for watershed planning efforts. The public can view the observations and “vote” if they agree with the report. Photos and comments can also be attached to these reports.

In an effort to engage the citizens of the Sawmill Creek Watershed, an informational flyer was sent to each resident or property owner within the floodplain of the Sawmill Creek Watershed. Mailings were sent to properties within the Sawmill Creek floodplain encouraging residents to use the app or contact us by email or phone to share observations on Sawmill Creek. A total of 8 responses were received. As detailed in Table 23, observations include stream erosion, blockages, and other water quality concerns.

Type of Impairment	Number of Reports
Stream Blockage	2
Sediment	
Streambank Erosion	4

²⁶ <http://gis.dupageco.org/CitizenReporter/>

Water Quality Issues	
Illegal Dumping	
Garbage	
Other	2
Total	8

Table 23 Citizen Reports from DuPage County's reporter web application.

The highest number of reports were related to streambank erosion. These have been included in the plan as potential streambank stabilization project locations. Stream blockages were another issue reported by residents. Some blockages included fallen trees and debris, which could be addressed by County or municipal maintenance staff right away. Additional comments reported under the “Other” section were related to drainage or flooding concerns and not included in this plan.

3.6 Pollutant Sources

3.6.1 Nonpoint Sources

The primary goal of this watershed plan is to prompt a reduction of designated-use impairments in Sawmill Creek. Table 24 lists the causes of impairment as determined in the 303(d) list, along with a list of sources of these impairments. Recommendations to reduce the primary nonpoint source pollutants and, thus, improve the quality are described in the next section.

<i>Cause of Impairment 303(d) Aquatic Life Impairment</i>	<i>Source of Impairment 303(d) Aquatic Life Impairment</i>
Methoxychlor	Impoundments (Culvert Crossings/Dams)
Polychlorinated biphenyls	Contaminated Sediments
Changes in stream depth and velocity patterns	
Other flow regime alterations	
<i>Cause of Impairment (Perceived)</i>	<i>Source of Impairment (Perceived)</i>
Fecal Coliform	Atmospheric Deposition
Mercury	Urban runoff/ storm sewers
PCBs	Habitat Modification
Phosphorus	Highway/Road/Bridge Runoff (Non-Construction Related)
Nitrogen	Loss of Wetlands, Drainage & filling
Sedimentation/Siltation	Industrial Point Source Discharge
Loss of Instream Cover	Municipal (Urbanized High Density Area)
pH	Herbicide Application
Chloride	Pesticide Application
Temperature	Roadway Deicing
Nitrogen	Streambank modifications/destabilization
Debris/Floatables/Trash	Changes in stream flow due to hydraulic and hydrologic alteration from surrounding development
Petroleum Hydrocarbons	Streambank erosion

Oil & grease	Channelization
Dissolved Oxygen	Loss of Riparian Habitat
Total Suspended Solids	Municipal point source discharges
Aquatic Algae	Site clearance (land development or redevelopment)
Alteration in stream-side or littoral vegetative covers	Source unknown

Table 24 Causes and sources of degraded water quality in the Sawmill Creek Watershed

3.6.1.1 Nonpoint Source Pollutant Load Modeling

The IEPA assessments do not indicate Biological Oxygen Demand, Total Suspended Solids, or Total Nitrogen as pollutants of concern within Sawmill Creek or Bruce Lake. However, in order to develop a successful plan for improving waterways, it is necessary to evaluate the entire watershed to determine the nonpoint sources that are contributing to these issues. Pollutant load modeling will give a fuller picture of pollutants entering the stream from urban runoff.

The EPA developed a pollutant load estimation model that has been used widely throughout this region for obtaining pollution loads at a watershed scale. This model, the Spreadsheet Tool to Estimate Pollutant Loads (STEPL), estimates background or pollutant loads from existing land uses. STEPL can also determine potential reductions to these pollutant loads through implementation of water quality projects and practices. For the Sawmill Creek watershed, STEPL was used to generate background nonpoint source loads for TN, TP, TSS and BOD.

STEPL estimates pollutant loads based on land use information entered into the model. Each sub-watershed is evaluated individually, and then this information can be broadened into the entire watershed. DuPage County land use data – clipped to sub-watershed boundaries – serves as the baseline information for this evaluation. STEPL contains pre-determined pollutant loads determined for specific land uses, and it can be used for agricultural, forest or urban land. As the Sawmill Creek watershed is in a developed “suburban” area, only urban land uses were used. Figures 48 through 51 map the background pollutant loads of TN, TP, TSS and BOD for existing land use in the Sawmill Creek Watershed.

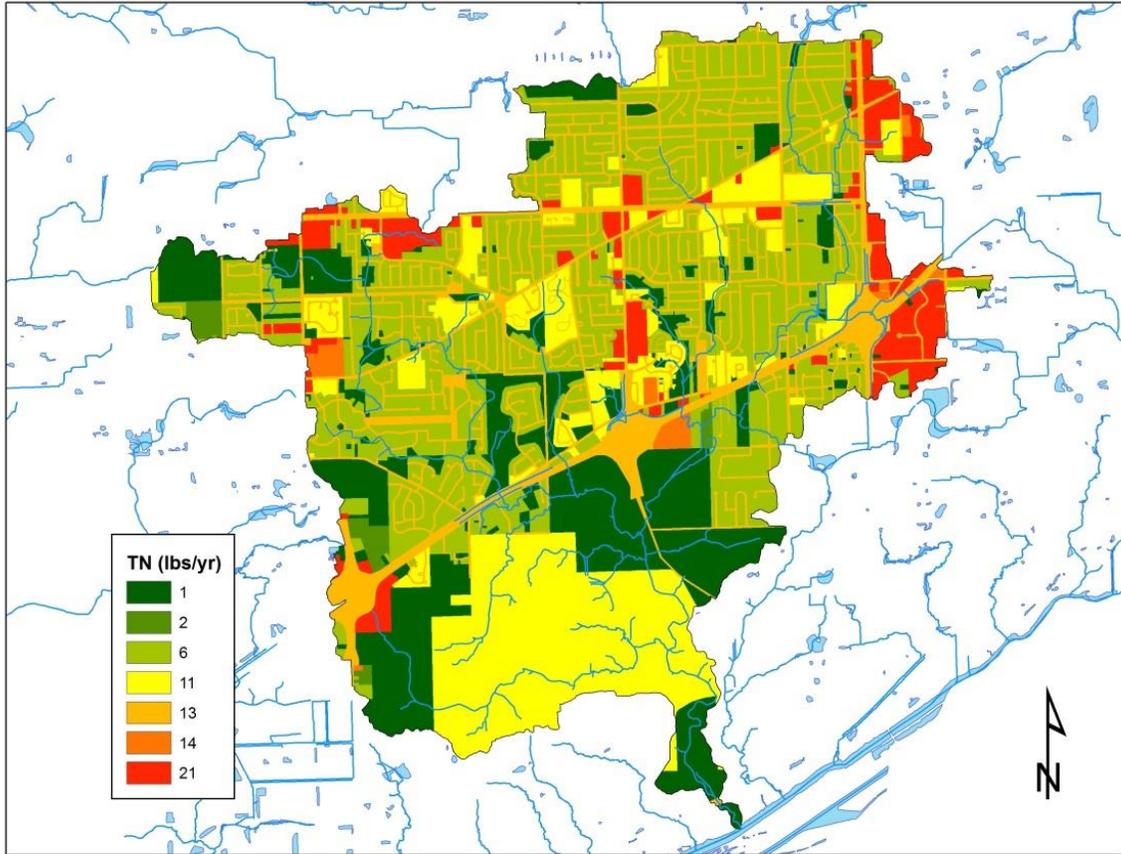


Figure 48 TN concentrations, based on land use, for the Sawmill Creek Watershed.

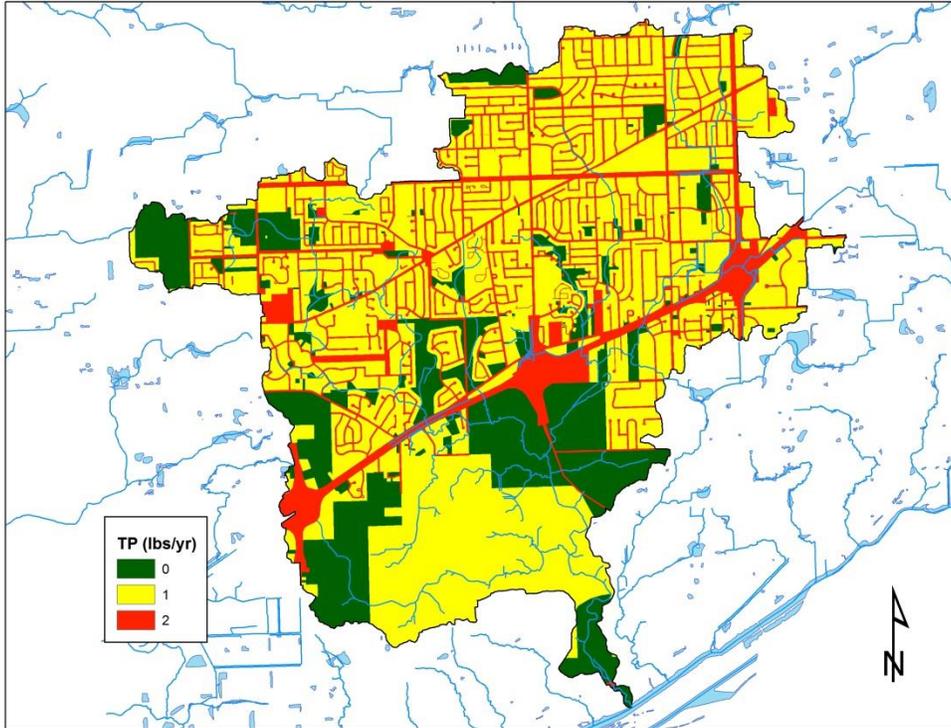


Figure 49 TP concentrations, based on land use, for the Sawmill Creek Watershed.

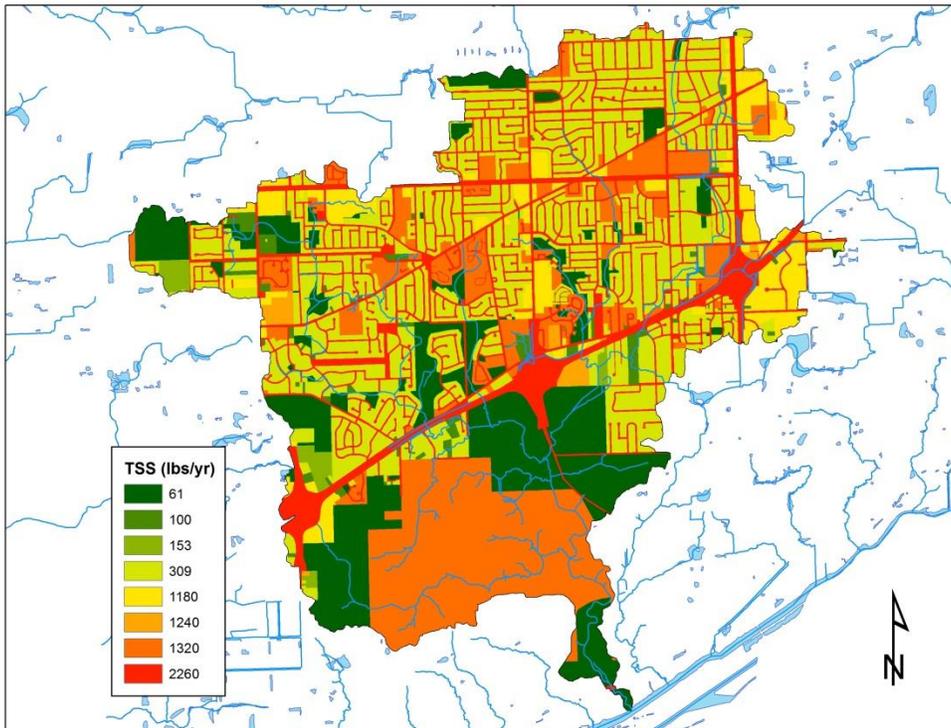


Figure 50 TSS concentrations, based on land use, for the Sawmill Creek Watershed.

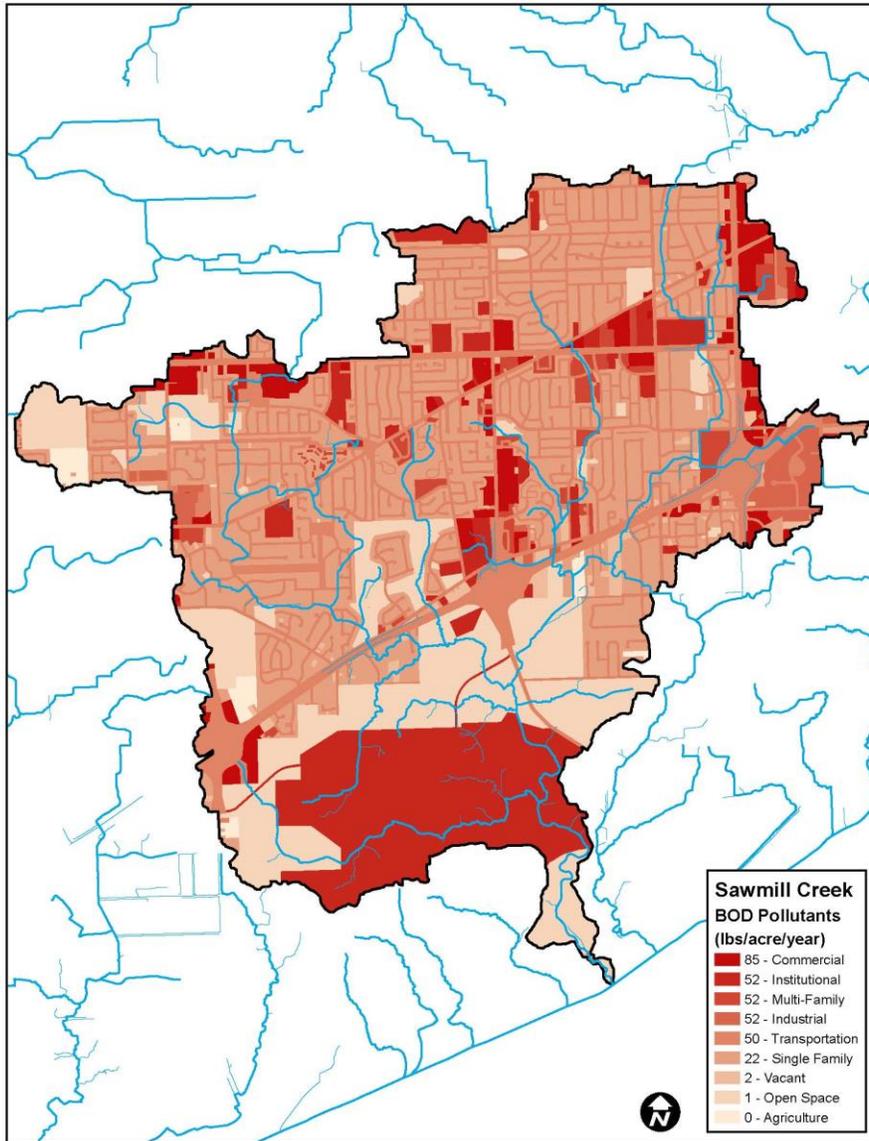


Figure 51 BOD based on land use in Sawmill Creek Watershed

As highlighted in tables 25-28, pollutant load estimates show that the most pollutants per acre are originating in sub-watershed #1, which encompasses the southern portion of the watershed, Argonne National Laboratory, and the confluence with the Des Plaines River. Additionally, commercial areas around major thoroughfares are also identified as higher pollutant load sources.

Sub-Watershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space	Total
1	179	0	4,551	43	4,602	600	683	103	26	10,787

2	1,010	768	338	1,063	210	2,074	1,297	173	0	6,933
3	715	62	685	1,630	463	2,753	1,291	48	21	7,668
4	622	197	280	5,982	106	2,626	201	53	1,111	11,178
Totals	2,526	1,027	5,854	8,718	5,381	8,053	3,472	377	1,158	36,566

Table 25 TN loads by land use (lbs/yr) for each of Sawmill Creek's sub-watersheds.

Sub-Watershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space	Total
1	35	0	775	7	845	111	114	9	3	1,899
2	197	118	57	176	39	384	216	16	0	1,203
3	139	9	117	270	85	510	215	4	1	1,350
4	121	30	48	991	19	486	33	5	67	1,800
Totals	492	157	997	1,444	988	1,491	578	34	71	6,252

Table 26 TP loads by land use (lbs/yr) for each of Sawmill Creek's sub-watersheds

Sub-Watershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space	Total
1	3	0	97	1	94	22	23	3	0	243
2	15	24	7	26	4	77	43	5	0	201
3	11	2	15	40	9	102	43	1	0	223
4	9	9	6	147	2	97	7	2	0	279
Totals	38	35	125	214	109	298	116	11	0	946

Table 27 TSS loads by land use (t/yr) for each of Sawmill Creek's sub-watersheds

Sub-Watershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space	Total
1	827	0	19,657	134	20,664	2,711	1,435	274	69	45,771
2	4,674	2,764	1,458	3,293	943	9,372	2,723	461	0	25,688
3	3,309	222	2,960	5,049	2,078	12,439	2,711	128	28	28,924
4	2,878	710	1,208	18,533	476	11,863	422	142	1,447	37,679

Totals	11,688	3,696	25,283	27,009	24,161	36,385	7,291	1,005	1,544	138,062
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Table 28 BOD loads by land use (lbs/yr) for each of Sawmill Creek's sub-watersheds

3.6.1.2 Streambank Erosion Pollutant Load Estimates

DuPage County staff estimated pollutant loads from eroding streambanks by using STEPL. The stream assessment field data (section 3.e.2) was used in the model to calculate pollutant volumes contributed by bank erosion.

	TN (lbs/yr)	TP (lbs/yr)	BOD (lbs/yr)	Sediment (t/yr)
Background Runoff Rates	48790	7858	178169	1131
Streambank Erosion Caused Pollutant Loads	6	2	12	4
Total Background Loads	48796	7860	178181	1135

Table 29 Streambank erosion pollutant load estimates

3.6.1.3 Nonpoint Source Pollutants of Concern

As previously noted, the recommendations found in the Sawmill Creek Watershed will surround reducing TN, TP, TSS and BOD loads as well as stabilizing and restoring degraded stream segments. A description of each of these pollutants of concern follows.

3.6.1.3.1 Total Nitrogen (TN)

Phosphorus and nitrogen are primary nutrients that have the ability to pollute waterways even though they are naturally present in aquatic ecosystems in addition to their presence from anthropogenic sources. Nitrogen compounds are vital for water resources, the atmosphere and in the life processes of all plants and animals. The three forms of N found in water are ammonia (NH₃), nitrites (NO₂) and nitrates (NO₃). Typically, N enters waterways as ammonia from industrial and municipal sewage effluent, septic systems, animal waste and from fertilizers. A common example of ammonia introduction to streams is from an over application of fertilizers; plants and crops only use the amount of N they need and any extra that is applied is wasted and flows into streams after rain events, which is called runoff. In the United States, 89% of TN inputs into the Mississippi River come from agricultural runoff and drainage.²⁷ These TN loadings contribute to the Gulf of Mexico's "dead zone," which occurs annually due to eutrophication. Eutrophication is an excessive amount of nutrients in a body of water that can cause excessive plant growth, which, in turn, limits the amount of available oxygen for aquatic animals and macroinvertebrates (hypoxia).

Nutrients in stormwater can cause nitrate contamination in groundwater aquifers as well. Nitrates in drinking water are a health concern because excess levels can cause methemoglobinemia, known as "blue baby" disease and may also serve as an indicator for other contaminants. While most of DuPage County's potable water originates from Lake Michigan and/or municipal deep aquifer wells, which are largely immune to nitrate contamination by DuPage County land-use practices, significant residential areas of the County still rely on the shallow aquifer for potable water. Historically, with proper fertilizer application practices, serious nitrate contamination of the shallow aquifer has not been an issue in DuPage.

²⁷ U.S. Environmental Protection Agency (2007) Hypoxia in the Northern Gulf of Mexico: an update by the EPA Science Advisory Board. EPA-SAB-08-003. Washington (D.C.): U.S. Environmental Protection Agency

3.6.1.3.2 Total Phosphorous (TP)

Phosphorus is critical for plant and algal growth, but in excessive amounts, it contributes to increased algae growth that significantly impacts DO and impairs aquatic communities. Phosphorus sources include sewage treatment plants, some industrial discharges, fertilizers from lawns or agricultural fields, waterfowl feces, septic systems and atmospheric deposition. Runoff from urban lawns includes phosphorus, some of which is infiltrated and adsorbed to the surface of sediments that is carried by storm sewers and overland flow into waterways.

Streams are less sensitive than ponds to phosphorus loading because of the continuous movement of the water. The rate at which the water moves and the rate at which organic forms (bacteria, fungi, algae and aquatic plants) can absorb nutrients determines the expressed productivity. In areas where there are dams, water is backed up behind spillways, excessive nutrients can accumulate and nuisance conditions can be created. Excessive algal growth can also reduce the available supply of oxygen on the upstream side of the dam. In aquatic systems, like streams, other factors such as temperature and available light can also influence expressed productivity.

Phosphorus is the nutrient in short supply (limiting nutrient) in most fresh waters, so even slight increases in phosphorus can have a negative cascading effect on water quality like accelerated plant growth, algae blooms, low DO and fish and invertebrate die offs.

Illinois does not currently have a numeric standard for phosphorus in streams; however, the State of Illinois does have a narrative standard that mandates that aquatic communities “shall be free from unnatural algal growth.”

3.6.1.3.3 Total Suspended Solids (TSS)

TSS is measured in mg/L as the dry weight after water is filtered and can consist of solids like soil particles, plant matter, sewage, industrial waste and other fine particulate matter. These particles can pose problems for water quality with physical-chemical effects and their effects on aquatic biota (USEPA, 1977; USEPA, 2003). Concentrations of TSS scatter light in the water column (known as turbidity) which may inhibit aquatic organisms from finding food, affect gill function, affect spawning beds, and may even bury aquatic invertebrates and fish larvae. Suspended solids absorb heat from sunlight, which increases water temperature and subsequently decreases levels of DO (warmer water holds less oxygen than cooler water). Photosynthesis also decreases, since less light penetrates the water. As plants and algae produce less oxygen, there is a further drop in DO levels. Organic and inorganic pollutants readily adsorb to soils and other suspended solids and easily transport throughout aquatic systems. This transportation of pollutants increases exposure rates to aquatic organisms.

TSS is used as a water quality indicator and if measurements of 116 mg/L or greater are found in an Illinois stream, that stream is potentially impaired. There are an estimated 1,004 miles of impaired Illinois streams and 117,388 acres of Illinois lakes potentially impaired by TSS.²⁸

3.6.1.3.4 Biological Oxygen Demand (BOD)

BOD is measured to determine the amount of dissolved oxygen used in an aquatic ecosystem by microorganisms. Byproducts of plant and animal wastes and domestic and industrial wastewaters are

²⁸ IEPA. 2016. Illinois Integrated Water Quality Report and Section 303(d) List. Water Resource Assessment Information and List of Impaired Waters. Illinois Environmental Protection Agency.

typical sources of compounds that have high levels of BOD. Elements of these wastewaters that contain BOD are feces, urine, detergents, fats, oils and grease, etc. Waters with high levels of BOD may see water quality problems like low levels of dissolved oxygen and fish die-offs.

Prolonged exposure to low dissolved oxygen levels may not directly kill aquatic life but may significantly increase their susceptibility to other environmental stressors and diseases. Dissolved oxygen concentrations affect growth rates, swimming ability, susceptibility to disease and the relative ability to endure other environmental stressors and pollutants. The most critical conditions related to dissolved oxygen deficiency in natural waters occur during summer months when temperatures are high and the solubility of oxygen is at a minimum; however, additional protection is generally provided through criteria for dissolved oxygen in the spring months that correspond to the spawning and nursery season for select aquatic life.

Algae plays a significant role in dissolved oxygen levels in waterbodies. Where both nitrogen and phosphorus are plentiful, algal growth is encouraged causing blooms to occur. When the algae die, the degradation of their biomass consumes oxygen lowering the dissolved oxygen levels in the water column and impacting the health of aquatic life.

3.6.1.3.5 Methoxychlor & PCBs- Legacy Pollutants

Polychlorinated Biphenyls (PCBs) are chemicals that were widely used in electrical devices and building materials. They were developed in the 1940's and used through the 1970's. In 1976, Congress banned PCBs, and by 1979 they were no longer in use. However, PCBs remain in buildings and devices that were manufactured during from the 1950's through the 1970s. Items that may contain PCBs include florescent light ballasts, caulking, transformers, and capacitors and other building materials. Although they are no longer in production, many of these materials have now reached the end of their useful life. Therefore, proper disposal of materials containing PCBs is required to prevent their release into the environment.

As PCBs are concentrated through bioaccumulation, fish consumption is the main source of exposure. Electronic devices can release PCBs into the air when heated, so breathing PCB contaminated vapors can be another source. Exposure through contaminated soils or drinking water can also occur to a lesser extent.^{29, 30}

Methoxychlor is a powdered insecticide effective against flies, mosquitoes, cockroaches, chiggers, and other insects. It was widely used on food crops, farm animals, pets, homes, gardens, trees, lakes, and marshes. Use was suspended in 2000 and it is no longer in production in the United States. Human exposure to methoxychlor is most likely through inhalation or dermal contact, mainly in concentrated forms, such as during production, handling, and application of the chemical.^{31, 32}

²⁹ Polychlorinated Biphenyls (PCBs) Research Overview. US EPA, OSWER, Office of Resource Conservation and Recovery. https://epa.gov/sites/production/files/2015-08/documents/pcbs_comprehensiv_ovrview.pdf

³⁰ Polychlorinated Biphenyls (PCBs) Fact Sheet | US EPA ARCHIVE DOCUMENT. US EPA, OSWER, Office of Resource Conservation and Recovery. <https://www.epa.gov/sites/production/files/2013-09/documents/pcbinspectmanual.pdf>

³¹ Methoxychlor Fact Sheet | US EPA ARCHIVE DOCUMENT. US EPA, OSWER, Office of Resource Conservation and Recovery. <https://archive.epa.gov/epawaste/hazard/wastemin/web/pdf/methoxch.pdf>

³² <https://www.epa.gov/sites/production/files/2016-09/documents/methoxychlor.pdf>

3.6.2 Point Sources

Under the Water Quality Act of 1987, the EPA established the NPDES program to limit point source pollution to waterways. In Illinois, the IEPA enforces the NPDES program, which was rolled out in two phases. Published in 1990, Phase 1 regulates discharges from industrial activities, medium and large MS4 communities and construction sites 5 acres or larger. Medium MS4s have a population of 100,000 to 249,999. Large MS4s have a population of 250,000 or greater. In the Sawmill Creek Watershed, only the DGSD holds an NPDES Phase 1 permit, meaning they must limit discharge of specific pollutants, including BOD, TSS, ammonia nitrogen, fecal coliform and phosphorous.

Phase 2, which was published in 1999 and went into effect March 2003, expanded the regulations to include discharges from small MS4s and construction sites 1 to 5 acres in size. Small MS4s are those with populations under 100,000, not covered under Phase 1. NPDES Phase 2 requires all small MS4s obtain NPDES permits and implement the six minimum control measures, which are:

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

All but one DuPage County municipality, as well as all townships and unincorporated areas, are considered small MS4s under NPDES. Currently, each MS4 in the Sawmills Creek Watershed holds its own NPDES Permit No. ILR40 with the IEPA, and, therefore, is required to define best management practices (BMPs) and goals for each of the minimum control measures, to be reported annually. DuPage County assists other permit holders by providing several of the six minimum control measures on a regional scale.

In addition to the NPDES program, the DuPage County Stormwater Management Plan provides the foundation for future watershed planning efforts, the Ordinance and water quality improvements throughout the County. It was established in recognition of the critical need to limit the reoccurrences of extensive flood damages within the County. Development has historically caused increases in flood risk, flood damage and environmental degradation. The DuPage County Stormwater Management Planning Committee implemented the plan to reverse that trend. It responds to the opportunity inherent in State of Illinois P.A. 85-905, which authorizes regional stormwater management in northeastern Illinois counties. It also recognizes the integrated nature of the watershed system and the need to consider stormwater management planning on a watershed basis. The plan consolidates the stormwater management framework throughout DuPage County into a united, countywide structure; sets minimum countywide standards for floodplain and stormwater management; and provides for countywide coordination for the management of stormwater runoff in both natural and manmade drainage ways and storage.

3.7 Land Management Practices

3.7.1 Conservation Easement Programs

Throughout DuPage County, The Conservation Foundation runs the Natural Areas Assurance Program for Developments, which provides assurance to municipalities, regulators, future occupants and communities that natural areas and open space within a development is protected from further development and those natural resources and functions will be maintained forever.

The Conservation Foundation works with the developer and the regulatory agency to execute a two-step process. The first step is to protect the natural areas and open space within the development with a conservation easement. This restriction is recorded on the deed and takes away the development rights on that portion of the land. The second part of the process is to put in place financial mechanisms to provide adequate funding for the long-term ecological management of the natural areas and open space in accordance to an approved management plan. This funding is often accomplished through annual assessments of property owners with a backup special service area tax in place if necessary. The Natural Areas Assurance Program has resulted in healthy and aesthetically pleasing natural areas that are an amenity to the community and help maintain or even increase property values in both residential and commercial developments.

3.7.2 Local Ordinances

As previously mentioned, DuPage County developed a comprehensive Ordinance to regulate stormwater management activities countywide. Adopted in 1991 and last revised in 2013, the principal purpose of the Ordinance is to promote effective, equitable, acceptable and legal stormwater management measures.

The Ordinance establishes a minimum level of regulatory compliance that a municipality or unincorporated portion of the County must meet. The Ordinance not only outlines countywide stormwater regulations, but also establishes a process that allows communities within DuPage County to enforce these regulations individually while following the same provisions. Pursuant to the authority established in 55 ILCS 5/5-1062, the provisions of the Ordinance may be enforced by a community once they have adopted a stormwater management ordinance consistent with, and at least as stringent as, the County's Ordinance or when they have duly adopted the provisions of the countywide Ordinance.

Several communities have waived their legal authority to enforce the Ordinance, either partially or wholly, within their jurisdiction. In these communities, the County conducts either some (partial waiver communities) or all (non-waiver communities) aspects of the permitting process for development sites subject to the Ordinance requirements. Table 30 shows the waiver status of municipalities within the Sawmill Creek Watershed. DuPage County staff offers numerous services for the communities, including permit submittal review and post-construction inspections at sites containing wetland, buffer, riparian enhancement and wetland mitigation. As the Ordinance has been adopted into DuPage County's County Code, it serves as the regulatory mechanism for enforcement of these requirements. Development securities can be drawn upon in the event of non-compliance, and legal action through the State's Attorney's Office may also be applied.

Community	Stormwater Ordinance Waiver Status
Burr Ridge	Partial Waiver

Darien	Partial Waiver
Downers Grove	Full Waiver
Lemont	Non Waiver
Unincorporated	Non Waiver
Willowbrook	Full Waiver
Woodridge	Full Waiver

Table 30 Ordinance waiver status of Sawmill Creek Watershed communities

3.7.3 Local Planning Documents

Regionally, the Sawmill Creek Watershed is included within Chicago Wilderness’ Green Infrastructure Vision, which guides open space and sustainable development throughout the greater Chicagoland region. The Chicago Metropolitan Agency for Planning (CMAP) is in the process of developing their On To 2050 plan – a follow up to their Go To 2040 plan – that outlines regional initiatives, notably stormwater management, open space and environmental.

In DuPage County, the Sawmill Creek study area falls under the regional jurisdiction of DuPage County’s Stormwater Management Plan and Ordinance, both of which guide local development, projects and flood control management within the floodplain. This area is also subject to an ongoing U.S. Army Corps of Engineers (USACOE) study of the entire DuPage River Watershed to identify flood control improvements within it.

Many of the municipalities within the Sawmill Creek Watershed have developed comprehensive plans. However, as new comprehensive plans can be developed every few years, each municipality should be contacted for the most recent planning information.

Argonne National Laboratory has also developed planning documents, including the Site Sustainability Plan, developed in 2017. The Site Sustainability Plan includes green infrastructure practices on new development such as rain gardens and bioswales to infiltrate stormwater. As with municipalities, Argonne should be consulted for the most recent sustainability and planning documents.³³

4. Watershed Protection Measures

4.1 Best Management Practices & Programs

Used watershed-wide, with a particular focus in critical areas, the following BMPs are recommendations to reduce the key nonpoint source pollutants stressing Sawmill Creek. Some of these solutions may be implemented at a localized level, such as green retrofits on private property, while others may require DuPage County’s involvement, such as a dam removal.

4.1.1 BMP Projects

4.1.1.1 Green Infrastructure

According to the EPA, green infrastructure “reduces and treats stormwater at its source while delivering environmental, social, and economic benefits.” Green infrastructure refers to using the existing vegetation and soils on a site to manage water rather than focusing on transporting the water offsite as

³³ <http://www.anl.gov/downloads/fy-2017-argonne-site-sustainability-plan>

is common in traditional “gray infrastructure.” Examples of green infrastructure generally fall under one of the following three categories, infiltration practices, impervious surface reduction and rainwater harvesting.³⁴

4.1.1.1.1 Infiltration Practices

Infiltration practices are designs that enhance the absorption of runoff through a soil matrix. These practices slow and retain stormwater runoff to facilitate pollutant removal. Increasing the time it takes for water to reach a nearby water body in smaller storm events also results in lower storm elevations and overland runoff that can cause localized flooding. Slowing runoff causes excess sediment and debris to drop out and to allow water to seep into the soil. Slowing runoff and allowing for infiltration reduces peak flows thereby reducing streambank erosion to improve water quality. Infiltration practices recommended throughout the Sawmill Creek Watershed include:

- **Bioswales** are vegetated channels that slow and filter pollutants from runoff. Pollutant removal ability increases when swales are planted with native vegetation as opposed to mowed turf grass. Rock check dams can be added to slow the flows through the swale further increasing removal rates. They are commonly found along streets as existing roadside ditches can easily be converted to bioswales.
- **Rain gardens** and **bioretention facilities** are excavated or natural depressions that collect runoff from surrounding impervious areas and allow it to infiltrate. They are often constructed in residential yards or adjacent to commercial buildings.
- **Infiltration trenches** are excavated trenches filled with rock. Stormwater runoff is directed to these trenches where it is retained within the void space and slowly infiltrates through the soil. One benefit of an infiltration trench is that it is completely underground and can be covered with turf grass, making it blend in with surrounding lawn areas.
- **Green roofs** refer to vegetation being planted on the roof of a building. The roof is covered with a waterproof membrane and growing medium which allow for the establishment of vegetation. The system then allows stormwater to be captured, infiltrated, and eventually evapotranspired back into the atmosphere, thereby reducing runoff and the pollutants that are carried with it.
- **Tree wells or planter boxes** are ideal for infiltration in urban landscapes where space is limited. They consist of depressed planting beds that capture and infiltrate runoff from surrounding roads, sidewalks, and parking lots.

Pollutant removal rates of infiltration practices can vary, but overall they are among the most efficient at removing pollutants due to the fact the all of the stormwater in smaller events is captured and infiltrated into the soil, eliminating runoff. This plan proposes utilizing infiltration practices over 6-7% of the watershed.

4.1.1.1.2 Impervious Surface Reduction

Converting impervious surface to a surface of permeable soil and vegetation is an excellent way to reduce runoff volume and velocity, as well as treat it. Permeable pavement is a paved surfaces that infiltrates, treats and/or stores rainwater where it falls. Permeable pavement may be constructed from pervious concrete, porous asphalt, interlocking grid pavers or other materials. These pavements are particularly cost effective where land values are high and where flooding or icing is a problem. Permeable pavements reduce runoff and capture TSS, metals and oils. This plan proposes converting 1-1.5% of pavement areas to permeable.

³⁴ <https://www.epa.gov/green-infrastructure/what-green-infrastructure>

When converting all impervious surfaces is not an option, finding ways to disconnect impervious surfaces from one another can go a long way. Examples include disconnecting gutters from storm sewers, separating sidewalks from streets with parkways and using flat or concave instead of mounded landscape features in between walkways and parking spaces.

4.1.1.1.3 Rainwater Harvesting

The use of rain barrels and cisterns are encouraged in Sawmill Creek watershed to reduce runoff at the source. Rain barrels are storage containers that are located above ground. They capture runoff from the gutters of a structure and store water so it can be later used to water landscaping and gardens. Cisterns function in the same way as rain barrels, but are usually larger, placed underground and evacuated by pump. Cisterns and rain barrels should be emptied prior to rainfall to reduce runoff volume.

4.1.1.2 Detention Basin Retrofits

Many of the detention basins in Sawmill Creek Watershed are typical of construction from the last century and do a poor job of removing pollutants from the water before releasing them. Some of the basins may even degrade water quality further. Modifying a detention pond for improved water quality involves many variables and takes a site-specific design approach. The following basin retrofits can offer big improvements to water quality in the pond and downstream.

- **Wetland shelf.** Doubling as a safety feature, wetland shelves are made from soil and extend into the permanent pool from the traditional bank of a wet detention pond. They are usually constructed no more than 6 inches below the normal water level and planted with wetland vegetation. Wetlands in a detention basin absorb nutrients and protect the shoreline from eroding by buffering wind, waves and ice. Native vegetation can also deter goose populations that prefer turf and water edges.
- **Forebay.** A forebay is a smaller, closed basin at the ponds inlet. A forebay acts as a sediment basin and helps to prevent sediment in the detention pond from being re-suspended by high flows. Forebays also extend the life of the pond and makes sediment control easier.
- **Native vegetation on the slopes.** Native vegetation includes species native to northeastern Illinois. Once established, native vegetation can reduce erosion, eliminate the need for fertilizers, deter geese and filter pollutants from overland flow.
- **Wetland bottom.** This retrofit involves building up the bottom of a wet detention basin with soil to just below the water surface. The bottom is then planted with native wetland vegetation. These pond retrofits often feature a meandering low flow channel to handle flows, but allow water to inundate the wetland as needed. Wetland bottom ponds offer one of the highest levels of pollutant control, as well as the elimination of erosion, excessive algae growth and goose populations.
- **Constructed wetland detention.** Constructed wetland detention basins pull together the use of native slopes, forebay and wetland bottom into the most effective basin design for filtering pollutants. Mimicking the pollutant removal mechanisms of natural wetlands, these carefully engineered facilities feature varying depths of wetland, permanent pools and vegetation.

Detention basin retrofits are proposed for 2-3% of the drainage area of subwatershed #1 and 5% of subwatersheds #2, 3, and 4. A wetland detention pond can remove up to 20% of nitrogen, 44% of phosphorus, 77% of BOD and 63% of TSS. Retrofitting a dry detention pond with native vegetation

can more than double its removal efficiency of phosphorus and TSS, while nitrogen and BOD removals are increased by more than 50%.³⁵

4.1.1.3 Riparian Buffer Enhancement

As mentioned earlier, 27% of riparian buffers assessed in the Sawmill Creek Watershed were in poor condition. A water quality benefit could be achieved by having buffer zones increased and improved watershed-wide. In addition, areas with minimal riparian zones represent potential buffer restoration sites. Riparian and wetland buffer environments should be protected, restored, increased and managed to optimize their benefits to waterways.

Acreage and quality of riparian buffers can be increased by replacing traditional landscapes and impervious surfaces with well-managed native ecosystems. Riparian areas are vital to the health of the stream ecosystem by providing a natural filter for nonpoint source pollutants. Wide floodplains also reduce flood damage by allowing waterways to expand and shift away from buildings and infrastructure. Unlike maintained turf grass, native vegetation is resilient to large flood events and can tolerate periods of high flows and high water, holding in the soil even after a storm event.

Healthy streams need healthy riparian ecosystems to provide the many different types of food for organisms, shade to moderate temperatures and provide opportunities for evapotranspiration and infiltration. Overhanging vegetation and leaves from trees shade waterways and create habitat variety both on the bank and in the water. As the vegetation breaks down, it becomes a part of the water column and food chain.

4.1.1.4 Wetland Restoration

Wetlands and their buffers play an important role in supporting the health and resilience of a watershed. Wetlands act as enormous rain gardens that treat pollutants, reduce runoff and moderate water temperature, among many other benefits. Unlike an open water pond, wetlands store more water in soils and plants release water into the air as vapor, as such, they are said to have more stormwater storage capacity than a traditional basin of equal size. Wetlands and their buffers provide the substrate for a complex web of organic and inorganic processes. The products of these ecosystems, which then flow downstream, are crucial resources for a properly functioning riverine ecosystem and riparian environment. By performing these functions, wetlands improve water quality and biological health of streams and lakes located downstream while helping to protect public safety.

With a goal to improve the current inventory and quality of wetlands and wetland buffers in the Sawmill Creek Watershed, recommendations include increasing the acreage of new wetland and improving the quality of existing wetland and wetland buffer. Wetlands have an enormous capacity to store excess water from a storm event, enhanced by evapotranspiration and storage in soils. The stored water is slowly released over time through smaller surface outlets or down through the soils to become groundwater, which results in replenished groundwater and cooler in-stream water temperature.

³⁵ <http://www.stormwaterok.net/CWP%20Documents/CWP-07%20Nat%20Pollutant%20Removal%20Perform%20Database.pdf>
<http://www.epa.state.il.us/green-infrastructure/docs/draft-final-report.pdf>
http://www.cmap.illinois.gov/documents/10180/12317/BooneDutchCrkWatshdPlan-ExecSumm_FINAL_CMAP-March2016.pdf/7ec35a0f-5fa4-4543-b949-03d745140bf9
<http://it.tetrattech-ffx.com/steplweb/default.htm>

Wetlands also filter sediments and nutrients in runoff, provide necessary wildlife habitat and help maintain stable water, temperature and chemistry levels in streams.

4.1.1.5 Hydrodynamic Separators

Hydrodynamic separators – commonly known as oil and grit separators – are manufactured structures designed to reduce the amount of oil, grease, and sediment reaching waterways. They are placed within the storm sewer system, typically within a catch basin, and rely on gravity to capture the pollutants that will settle and float. Pollutant removal effectiveness varies widely among these proprietary devices. Particle size distribution is an important factor to consider when choosing a device. Many pollutants attach to fine particles such as silts, clays and colloids, and these finer particles contribute much of the sediment in DuPage County. Hydrodynamic separators are most effective when they are designed to target and treat runoff from small, frequent rain events. They should be designed to treat a specific storm runoff volume and to prevent resuspension of pollutants in higher events. Devices must be maintained regularly in order to be continuously effective.

Five-year goals for the watershed include installation of oil and grit separators along roadways to treat 1% of the watershed. Oil and grease separators are designed specifically to treat roadway runoff for oil, grease, floatables and sediment. Manufacturer specifications vary, but a typical oil and grit separator can remove more than 97% of oil from the first flush runoff from roadways. Installation of these practices over even 1% of the watershed can have a measurable impact to Sawmill Creek, particularly when located along major thoroughfares and high traffic areas.

4.1.1.6 In-Stream Restoration

Stream restoration projects focus on improving channel sinuosity, installing natural features such as riffles and pools, and replacing mud substrates with cobbles. Water quality benefits of stream restoration projects include reducing streambank erosion, trapping suspended sediment, and re-oxygenating the water column. In-channel restoration also provides habitat that supports the propagation of fish and macroinvertebrates.

Streambank stabilization involves using vegetation, soil or materials such as riprap or woody debris to stabilize stream, river or ditch banks in order to protect them from erosion or sloughing. Stream stabilization has numerous benefits including:

- Stabilizes banks and shores, preventing further erosion and degradation;
- Improves water quality by reducing sediment loads in surface waters;
- Helps maintain the capacity of waterways to handle floodwaters, preventing flood damage to utilities, roads, buildings and other facilities;
- Reduces expenses for dredging accumulated sediment from lakes and drainage ditches;
- Enhances habitat for fish and other aquatic species by improving water quality and moderating water temperature; and
- Creates riparian habitat for terrestrial wildlife.

The Stream Assessments conducted by DuPage County staff found a lack of pool and riffle sequences throughout Sawmill Creek. Future stabilization projects should include stream structure additions, such as pool and riffle sequences, for improved habitat.

4.1.1.7 Dam Modification

Dam modifications or removals are gaining popularity for their cost-effective benefits to streams and rivers. They inherently return the waterway and its ecosystem to its natural flow. The Sawmill Creek Watershed has one small, low head dam that could potentially be modified to improve stream conditions. The dam creates a barrier that inhibits fish passage. The dam modification should involve removing or altering the dam, creating in-stream habitat, such as pools and riffles, in place of the dam and installing native vegetation where practical.

4.1.1.8 Streambank Stabilization

Unstable streambanks cause multiple problems for property owners, the health of the creek itself and other waterbodies downstream. Streambank erosion can cause an unstable streambank, leading to lost property or danger to structures and infrastructure. Eroding streambanks is a direct source of pollutants, dumping excess sediment and other pollutants, into the water. Streambank erosion often causes degradation of the stream channel and disconnection of the creek to its floodplain. When the creek becomes low in the landscape, it must contain flows of more volume and velocity within its banks, usually causing further streambank damage and deteriorating conditions.

With cooperation from the property owners, creek banks will be stabilized where needed using bio-engineered practices wherever possible to provide to a more gradual slope to Sawmill Creek. Vegetation in the floodplain will be converted to native species where practical. Projects to reduce streambank erosion stressors include increasing healthy native wetland, wetland buffer and riparian environments, modification of the channel to support stable banks and a healthy base flow and the reduction of stormwater runoff in the watershed. Replacing invasive species identified along Sawmill Creek with deep-rooted native vegetation will contribute to the bank stabilization effort. Educational materials will be made available to the property owners as part of a targeted educational campaign to encourage public understanding of the importance of a healthy stream and riparian corridor.

4.1.1.9 Daylighting

Sections of Sawmill Creek and its tributaries are enclosed in pipes. When a stream is restored to a bed and bank channel, open to the air and sunlight, it is referred to as “daylighting” the stream. In urban areas, it is most common to see the headwaters of streams enclosed in pipe, usually because narrow channels and a smaller tributary make it easier to do so. Although there is no erosion in the pipe to worry about, pipes often cause more problems for water quality and stream health than they solve in convenience.

Headwater streams are an important part of the stream system.³⁶ Aside from providing nutrient, sediment and flood control, they also support a stable base flow and produce essential food sources for downstream reaches. Enclosing a stream often removes floodplain storage, increases velocity and (indirectly) erosion downstream and eliminates habitat along with many biological processes. Daylighting projects will restore natural streams from piped reaches, allowing headwater streams to re-access the floodplain.

4.1.2 BMP Programs

³⁶ Ohio EPA epa.ohio.gov/dsw/wqs/headwaters/index

4.1.3.1 Street Sweeping

Routine street sweeping and catch basin cleaning are particularly important maintenance activities that remove pollutants that accumulate on public roads and in the stormwater conveyance systems before reaching nearby surface waters.

The need for sweeping can vary depending on the volume of traffic, presence of parkway trees and proximity to pedestrian traffic, homes and businesses. Based on data from the Center for Watershed Protection, pollutant removal rates from street sweeping can be improved by implementing vacuum style sweepers rather than mechanical sweepers.³⁷ Additional information should be obtained from municipalities in regards to street sweeper types, volume of traffic per roadway, as well as proximity to trees and public spaces. Improvement to scheduling and frequency are proposed for 5% of roadways.

Catch basin cleanout is another important roadway maintenance activity for improving water quality. Pollutant removal rates can be improved by increasing the frequency of cleanouts throughout the watershed as well as by identifying and prioritizing cleanouts in catch basins that have the highest sediment accumulation rates. In addition, agencies can consider sharing services, including street sweepers and catch basin cleanout trucks, to increase sweeping and catch basin cleanout schedules.

4.1.3.2 Stream Maintenance

In DuPage County’s Citizen Reporter App, residents reported several areas where debris would inhibit the flow of Sawmill Creek, ultimately contributing to overbank flooding and erosion. In particular, one location under Janet Avenue and another beneath Midway Drive in Darien are both repeatedly blocked by debris filing in after storm events.

Stream maintenance programs can occur on several levels ranging DuPage County on-call contracts to remove large obstructions to the annual DuPage River Sweep where volunteers remove trash and debris from waterways countywide.

4.1.3 Watershed-Wide BMP Projects & Programs

Table 31 includes the projects and programs described above on a watershed-wide scale. The next section discusses site-specific projects, but, for the purpose of the Sawmill Creek Watershed Plan, stakeholders will have discretion of where some of the BMP projects may be installed in the watershed.

Sub-watershed	BMP	Treated Area	Nitrogen Reduction (lbs/yr)	Phosphorus Reduction (lbs/yr)	BOD Reduction (lbs/yr)	Sediment Reduction (t/yr)	Estimated Cost
1	Bioretention/ Rain Gardens	3.0%	239.31	46.728	NA	NA	\$7,425,896
	Bioswale	2.0%	126.62	25.311	NA	4.99	\$2,604,481
	Infiltration Trench	2.0%	139.28	23.364	NA	4.155	\$3,717,305

³⁷ CWP 2008

	Oil & Grit Separators	1.0%	12.662	0.9735	NA	0.42	\$189,417
	Permeable Pavers	1.5%	170.94	26.2845	NA	3.74	\$2,692,086
	Weekly Street Sweeping	5.0%	NA	5.841	139.197	2.216	\$322,245
	Detention Basin Retrofit	5.0%	126.62	42.834	1461.57	10.80	\$4,617,035
	Filter Strip	2.5%	126.62	22.02544	585.7874	5.05525	\$6,188,247
Total			942	193	2187	31	\$21,568,465
2	Bioretention/ Rain Gardens	2.0%	147.28	30.32	NA	NA	\$5,688,427
	Bioswale	2.0%	116.89	24.635	NA	5.02	\$2,992,649
	Infiltration Trench	2.0%	128.58	22.74	NA	4.185	\$4,271,326
	Oil & Grit Separators	1.0%	11.689	0.9475	NA	0.42	\$217,647
	Permeable Pavers	1.0%	105.2	17.055	NA	2.51	\$2,062,207
	Weekly Street Sweeping	5.0%	NA	5.685	125.817	2.232	\$370,272
	Detention Basin Retrofit	2.0%	46.76	16.676	528.43	4.35	\$2,122,060
	Filter Strip	1.0%	46.756	8.574875	211.792	2.0367	\$2,844,214
Total			603	127	866	21	\$20,568,803
3	Bioretention/ Rain Gardens	2.0%	172.23	36.288	NA	NA	\$4,387,921
	Bioswale	2.0%	136.69	29.484	NA	5.76	\$2,308,460
	Infiltration Trench	2.0%	150.36	27.216	NA	4.8	\$3,294,802
	Oil & Grit Separators	1.0%	13.669	1.134	NA	0.48	\$167,888
	Permeable Pavers	1.0%	123.02	20.412	NA	2.88	\$1,590,739
	Weekly Street Sweeping	5.0%	NA	6.804	154.35	2.56	\$285,619
	Detention Basin Retrofit	2.0%	54.68	19.9584	648.27	4.99	\$1,636,908
	Filter Strip	1.0%	54.676	10.2627	259.8225	2.336	\$2,193,960
Total			705	152	1062	24	\$15,866,297
4	Bioretention/ Rain Gardens	2.0%	135.78	28.016	NA	NA	\$4,387,921
	Bioswale	2.0%	107.76	22.763	NA	4.68	\$2,308,460

Infiltration Trench	2.0%	118.54	21.012	NA	3.9	\$3,294,802
Oil & Grit Separators	1.0%	10.776	0.8755	NA	0.39	\$167,888
Permeable Pavers	1.0%	96.984	15.759	NA	2.34	\$1,590,739
Weekly Street Sweeping	5.0%	NA	5.253	115.182	2.08	\$285,619
Detention Basin Retrofit	2.0%	43.10	15.4088	483.76	4.06	\$1,636,908
Filter Strip	1.0%	43.104	7.923275	193.8897	1.898	\$2,193,960
Total		556	117	793	19	\$15,866,297
Grand Total		2807	589	4908	95	\$73,869,863

Table 31 Watershed-wide BMP projects

4.1.4 Site-Specific BMP Projects

Although each of the BMP projects described above can help to improve levels of TN, TP, TSS and BOD in Sawmill Creek, some are more critical than others in certain portions of the watershed. Based on land use, sub-watershed #1 is the most critical because of the large area of institutional land use (Argonne Lab) and interstate I-55 which runs along the northern boundary. Subwatersheds 2, 3, and 4 are not as critical, but do have commercial areas along major thoroughfares as well single family and multi family residential land uses.

In addition to proximity to critical areas, DuPage staff assessed BMPs based on their benefit – or how much they may reduce a pollutant of concern – and feasibility. With any government planning effort, public land will not only be the most feasible for projects, but it is generally the largest amount of land in an area. Therefore, for the purpose of this study, projects are recommended in each of the sub-watersheds using this prioritization process of need, benefit and feasibility.

Using this prioritization process and to achieve the goal pollutant load reductions, BMP projects were recommended at both watershed-wide and site-specific levels. Watershed-wide projects are recommended throughout the sub-watersheds with the site at the discretion of the property owner, planner or other implementing entity. Site-specific projects are generally those of highest priority where they are in a polluted catchment area, are on public land and would generate a great benefit. The following sections outline each of these site-specific projects by sub-watershed. Appendices A and B list each project along with estimate load reductions.

4.1.2.1 Sub-Watershed #1

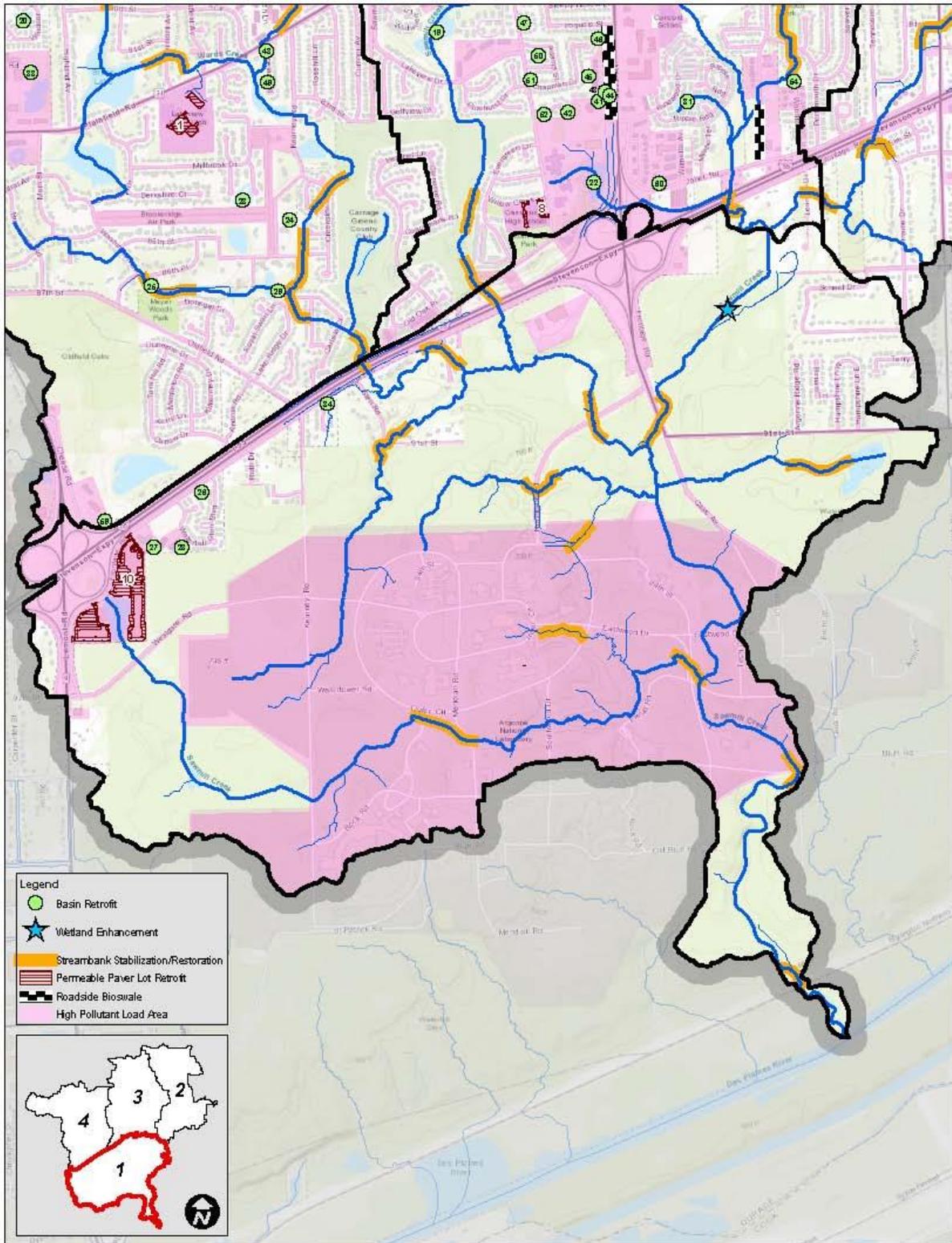


Figure 52 Site-specific BMP projects in Sawmill Creek sub-watershed #1.

4.1.2.2 Sub-Watershed #2

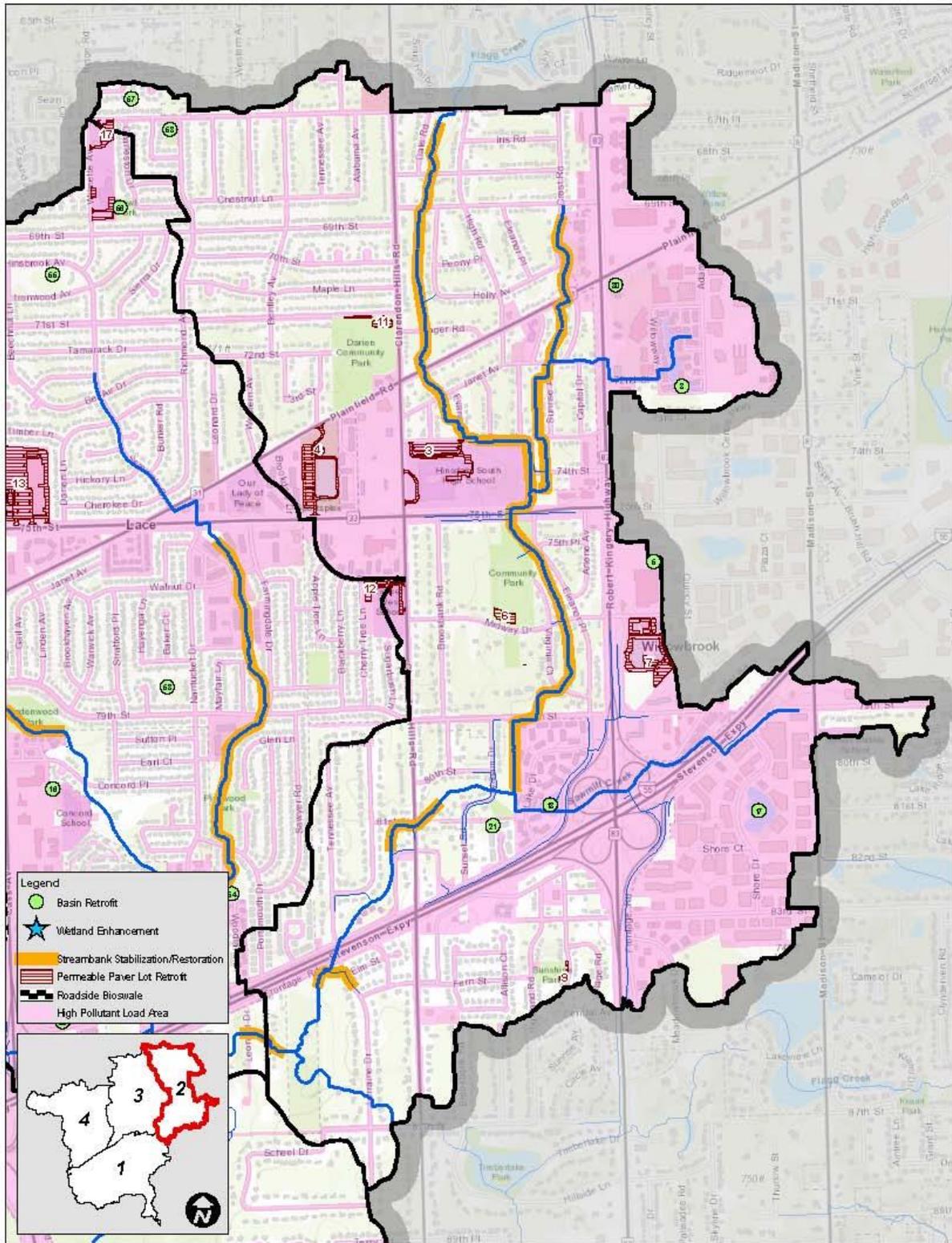


Figure 53 Site-specific BMP projects in Sawmill Creek sub-watershed #2

4.1.2.3 Sub-Watershed #3

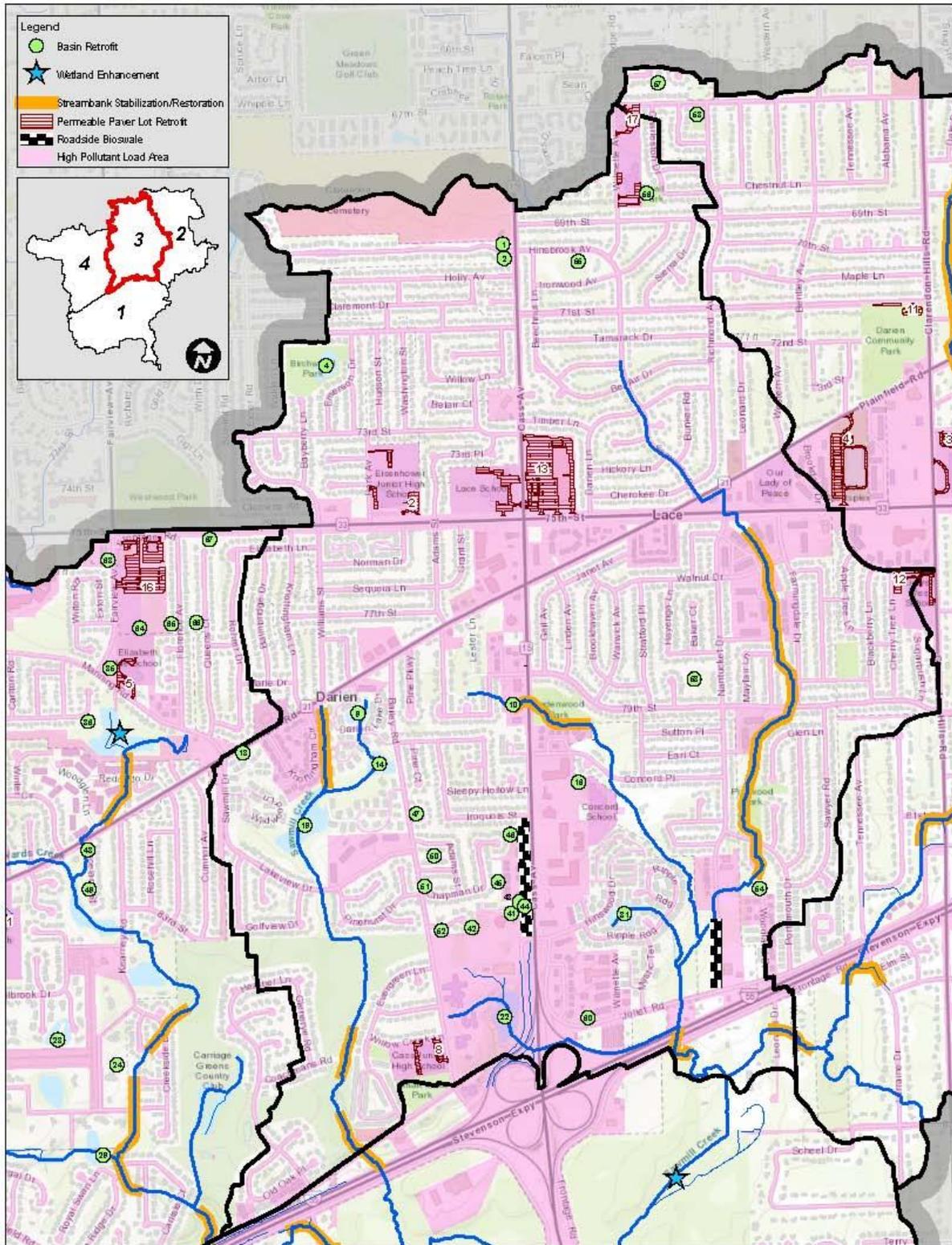


Figure 54 Site-specific projects in Sawmill Creek sub-watershed #3

4.1.2.4 Sub-Watershed #4

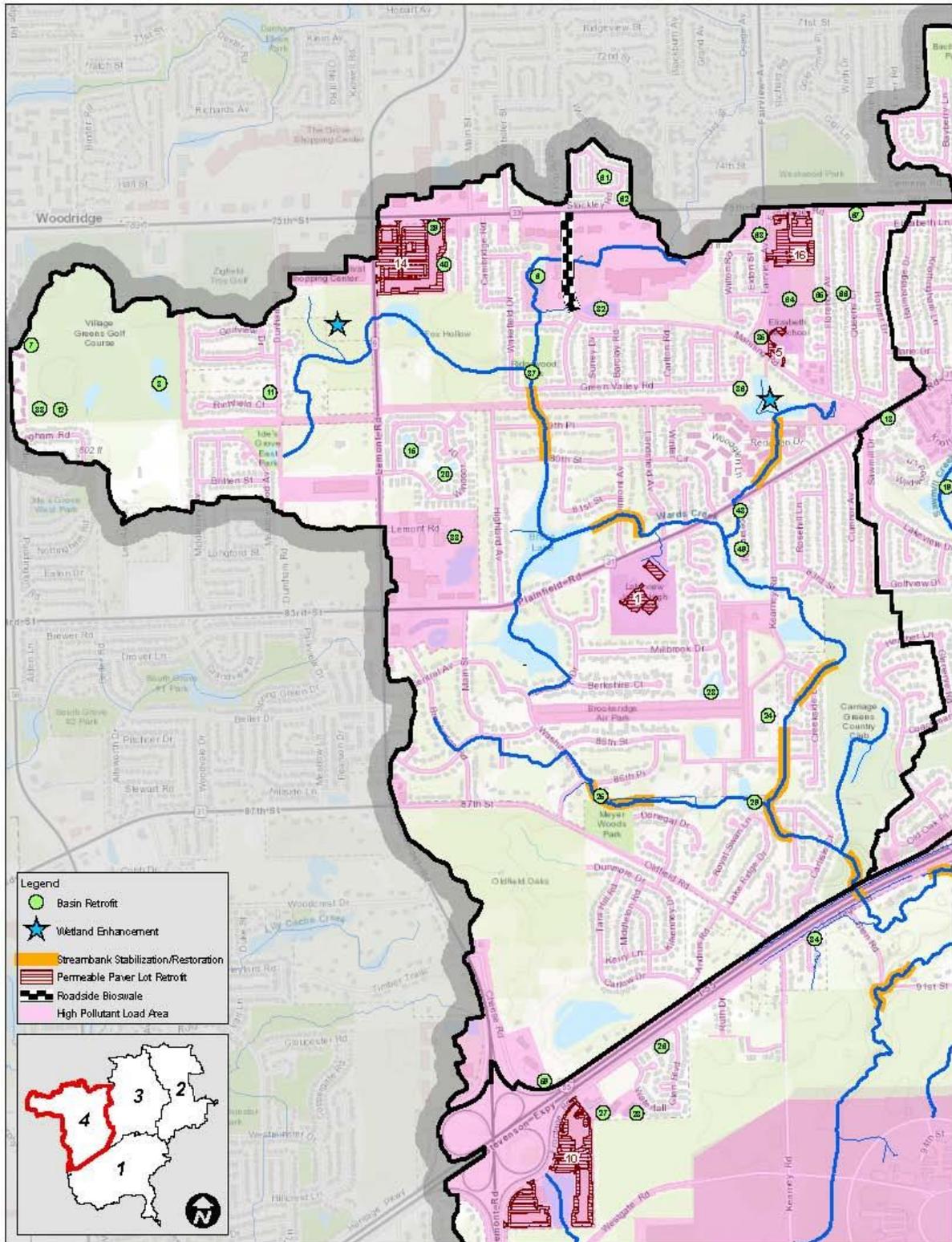


Figure 55 Site-specific projects in Sawmill Creek sub-watershed #4

4.2 Planning, Policy & Programming

4.2.1 Open Space Protection

Protecting open spaces and sensitive natural areas within and adjacent to cities can mitigate the water quality and flooding impacts of urban stormwater while providing recreational opportunities for city residents. Natural areas that are particularly important in addressing water quality and flooding include riparian areas, wetlands and steep hillsides.

4.2.2 Align Ordinances with Best Practices

Oftentimes, municipal, homeowner association and other ordinances or codes do not account for green infrastructure projects. For example, many “weedy plant” ordinances restrict the height of plants a homeowner may have on the property, which may inhibit the use of native vegetation or rain gardens.

Working with Geosyntec, DuPage County has already developed a guidance document and checklist for municipalities to self-audit their ordinances.³⁸ In addition, CMAP offers technical assistance programs that may be of use for communities who wish to audit their ordinances, as it is often a time-consuming endeavor.

4.2.3 Watershed Planning

Continued watershed planning efforts, on both a local and regional level, to identify localized projects, programs and practices to improve the quality of Sawmill Creek are recommended. To date, DuPage County has studied nearly 60% of the County for flood control improvements, and a long-term goal is to integrate water quality components into each of the plans. Clear, concise and goal-oriented planning ensures long-term viability of projects despite changing political climate, staff turnover and other issues that deter initiatives.

4.3 Public Information, Education & Outreach

To carry out the recommendations within the Plan successfully, DuPage County will need to build on the stakeholder engagement garnered during the Plan development, which staff may accomplish, at least, partially using existing networks and resources. Throughout the years, DuPage County has developed a robust and comprehensive water quality outreach program, from which the Sawmill Creek Watershed can and does benefit. The County hosts or sponsors 13 annual water quality programs ranging from an Adopt-a-Stream program to technical education for government staff. The County also developed 27 pieces of outreach, primarily targeted at residents, including brochures, public service announcements and a monthly e-newsletter. If not already in use, stakeholders should be using these existing outreach pieces throughout the watershed.

In addition, DuPage County has an array of local partner organizations focused on preserving and enhancing local watersheds. Several of these partners have existing ties within the Sawmill Creek Watershed, specifically The Conservation Foundation and SCARCE, a local youth education non-profit. The Conservation Foundation has a “Conservation in Our Community” program that targets five communities annually to encourage residents and businesses to use sustainable practices, including native landscaping, water conservation and reducing source of non-point source pollution.

SCARCE is a DuPage County partner in educating teachers, students and local organizations about watersheds. DuPage County also developed a Water Quality Flag in partnership with SCARCE that

³⁸ www.dupageco.org/swm

awards institutions for engaging in a series of educational trainings and hands-on activities, as well as installing green infrastructure on site. To date, one school within the Sawmill Creek Watershed have earned flags with several more anticipated.

Throughout outreach in local communities, residents become more aware of water quality concerns within their watershed. While DuPage County and many stakeholder organizations are active in reaching out to the residents and businesses within the Sawmill Creek Watershed, additional targeted efforts could be made in the following areas:

- Inform residents, particularly those with property located within in the Sawmill Creek floodplain, on the techniques to assess and maintain septic systems;
- Educate property owners and landscaping businesses on topics pertaining to lawn care, including fertilizer practices, composting and yard waste disposal;
- Facilitate water conservation and reuse efforts through the education and amendment of municipal codes that would otherwise make such efforts prohibited;
- Establish or expand waste collection events, particularly for household chemical waste and automobile fluids; and
- Develop campaigns to eliminate the discharge of chemicals into the storm sewer system, including oils, paints and waters recently treated with aquatic pesticides.

Table 32 includes recommendation on how to reach target audiences within the Sawmill Creek Watershed.

Print	Electronic	Workshops
Newsletters	Websites	Presentations
News Releases	Emails	Events
Brochures	Twitter	Field Trips
Fact Sheets	Facebook	Meetings
Direct Mail	PSAs	Conferences
Surveys	Surveys	Open House
		Surveys

Table 32 Tools and mediums for reach target audiences within the Sawmill Creek Watershed

4.4 Summary of BMP Projects & Programs

Table 33 provides a comprehensive overview of the BMP projects described previously in this section. Again, these are all measures any stakeholder within the Sawmill Creek Watershed may utilize to improve the quality of the creek, depending on funding, expertise and other factors.

BMP Type	scenario	Est. Qty.	Units	N Red. (lb/yr)	P Red. (lb/yr)	BOD Red. (lb/yr)	Sed. Red. (T/yr)	Estimated Cost (\$)
Bioretention / Rain Gardens	WW	20.94	ac	694.6	141.35	na	na	\$21,890,165
Detention Basin Retrofits	WW	25.67	ac	271.16	95	3122	24	\$10,012,911
Detention Basin Retrofits	SS	52.63	ac	4077	1042	27,539	228	\$22,428,200

Education & Outreach	WW	4	#	na	na	na	na	\$20,000
Bioswale	WW	18.57	ac	487.96	102.193	na	20.448	\$10,214,050
Bioswale	SS	0.4	ac	12.16	2.55	na	0.51	\$220,000
Filter Strip	WW	12.84	ac	271.16	48.79	1251.29	11.33	\$13,420,381
Infiltration Trench	WW	18.57	ac	537	94.73	na	17.04	\$14,578,235
Oil & Grit Separator	WW	92.86	#	48.8	3.93	na	1.7	\$742,840
Permeable & Porous Pavements	SS	30.58	ac	952	153	na	22	\$24,005,300
Permeable & Porous Pavements	WW	10.47	ac	496	79.51	na	11.47	\$7,935,771
Streambank Stabilization	WW	42,940	ft	na	na	na	na	\$9,274,973
Streambank Stabilization	SS	153	na	6	2	12	4	\$33,048
Weekly Street Sweeping	WW	464.28	ac	na	23.58	na	9.09	\$1,263,757
Totals				7,854	1,789	31,924	350	\$136,039,631

Table 33 Summary of projects with pollutant load reductions and cost.³⁹

4.5 Summary of Pollutant Loads & Potential BMP Pollutant Load Reductions

Table 34 provides potential pollutant load reductions for each of the BMP projects described above. Although all of these projects are recommended for attaining the measure able goals outlined in section 5.3, the totality of these projects exceed the goals.

BMP	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	BOD Reduction (lbs/yr)	Sediment Reduction (ton/yr)
Site-Specific				
Streambank Stabilization	6	2	12	4
Detention Basin Retrofits	3768	967	25,623	212
Bioswale	12.16	2.55	na	0.51
Permeable/ Porous Pavement	952	153	na	22
Watershed-Wide				
Bioretention	694.6	141.35	na	na

³⁹ ac = acre
SS = site specific
WW = watershed-wide
N/A = not applicable
ft = feet

Bioswale	487.96	102.193	na	20.45
Infiltration Trench	537	94.73	na	17.04
Oil & Grit	48.8	3.93	na	1.7
Permeable Pavers	496.14	79.51	na	11.47
Filter Strip	271.16	48.79	1251.29	11.33
Weekly Street Sweeping	na	23.58	na	9.09
Detention Retrofit	271.16	95	3122	24
Background Rates	48,790	7,858	178,169	1,131
Total Reduction	7,544.74	1713.51	30,008	333.79
Percent Reduction	15%	22%	17%	30%

Table 34 Watershed-wide and site-specific projects and pollutant load reductions (5-year estimate)

4.6 Funding Opportunities

The projects, programs and other measures recommended in the Sawmill Creek Watershed Plan are largely dependent on the availability of funding for design, construction and implementation of the recommendations. Although nearly any entity within the watershed could be eligible for funding, much of the financial burden will fall on public entities, such as DuPage County, local municipalities and the FPDDC, as they have the technical expertise to carry out the preferred alternatives, or suite of recommended projects and programs to improve Sawmill Creek. For others, regional groups, such as CMAP, offer technical assistance grants to assist with plan implementation. Table 35 includes a complete list of funding and technical resources.

Program	Funding Agency	Funding Amount	Eligibility	Activities Funded	Website
Clean Water State Revolving Fund (CWSRF)	U.S. EPA	Loan	Corporations, partnerships, governmental entities, tribal governments, or state infrastructure financing authority	Flood & storm damage reduction, environmental restoration, feasibility analysis, environmental review, permitting, development and design work, construction, etc.	https://www.epa.gov/cwsrf
Section 319(h) Grant Program	IEPA	Up to 60% of project cost	State and local government, watershed organizations, citizen and environmental groups, land conservancies or trusts, public and private profit and non-profit organizations, universities and colleges	Nonpoint source (NPS) pollution control projects; ie., Development of a Watershed Based Plan, Total Maximum Daily Load (TMDL) or Load Reduction Strategy (LRS), Best Management Practice (BMP) implementation, etc.	http://www.epa.illinois.gov/topics/water-quality/watershed-management/nonpoint-sources/grants/index

Local Technical Assistance Program	CMAP	N/A	Chicago-area governments, non-profits, and intergovernmental organizations	Planning activities that coincide with CMAP's "GO TO 2040" initiative	http://www.cmap.illinois.gov/programs-and-resources/lt_a
Water Quality Improvement Program Grant	DuPage County	Up to 25% reimbursement to project aspects with a water quality benefit	Open to all DuPage County entities	Projects providing a regional water quality benefit, ie., stream bank stabilization, habitat improvements, riparian buffer rehabilitation, etc.	https://www.dupageco.org/EDP/Stormwater_Management/Water_Quality/1312/
Wetland Program Development Grants	U.S. EPA	N/A	States, tribes, local governments, interstate associations, and intertribal consortia	Projects that promote the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys and studies relating to water pollution	https://www.epa.gov/wetlands/wetland-program-development-grants#past-grants
5 Star Wetland and Urban Waters Restoration Grants	U.S. EPA	\$10,000 - \$40,000	Non-profit 501(c) organizations, state government agencies, local and municipal governments, Indian tribes and educational institutions	Environmental education and training for students, conservation corps, youth groups, citizen groups, corporations, landowners and government agencies through projects that restore wetlands and streams	https://www.epa.gov/wetlands/5-star-wetland-and-urban-waters-restoration-grants#Applying
Streambank Cleanup and Lakeshore Enhancement (SCALE)	IEPA	Up to \$3,500	Groups with established and recurring stream or lakeshore cleanups	Implementation of streambank or lakeshore cleanup events	http://www.epa.illinois.gov/topics/water-quality/surface-water/scale/index
Pre-Disaster Mitigation Grant	FEMA	N/A	States, U.S. territories, tribes, and local governments	Implementation of a sustained pre-disaster natural hazard mitigation program	https://www.fema.gov/pre-disaster-mitigation-

Program (PDM)					grant-program
Emergency Watershed Protection Program (EWP)	USDA	Up to 75% of project cost	Public and private landowners sponsored by a legal subdivision of the State, e.g.; city, county, general improvement district, conservatoin district, or tribal organization	Debris removal, reshaping and protection of eroded banks, correcting drainage facilities, preventing erosion, repairing conservation practices	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/landscape/ewpp/?cid=nrcs143_008258
North American Wetlands Conservation Act (Small Grants)	U.S. FWS	Up to \$100,000 with at least matching funds from partner	Tribal, State, or local unit of government, non-governmental organization, or an individual	Long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats for the benefits of all wetlands-associated migratory birds	https://www.fws.gov/birds/grants/north-american-wetland-conservation-act/small-grants.php
North American Wetlands Conservation Act (Standard Grants)	U.S. FWS	\$100,001-\$1,000,000+ with partners matching at a rate of at least two-to-one	Tribal, State, or local unit of government, non-governmental organization, or an individual	Long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats for the benefits of all wetlands-associated migratory birds	https://www.fws.gov/birds/grants/north-american-wetland-conservation-act/standard-grants.php
National Conservation Innovation Grants	USDA - NRCS	Up to \$2,000,000	Tribal, State, or local unit of government, non-governmental organization, or an individual	Conservation measures and water management technologies on a watershed-based, regional, multi-state, or nationwide scale	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/cig/
State Conservation Innovation Grants	USDA - NRCS	N/A	Tribal, State, or local unit of government, non-governmental organization, or an individual	Conservation measures and water management technologies in Illinois	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/cig/

Illinois Green Infrastructure Grant for Stormwater Management (IGIG)	IEPA	N/A	Applicable entrants within a MS4 community	Implementation of green infrastructure BMPs to improve stormwater water quality and remove pollutants	http://www.epa.illinois.gov/topics/grants-loans/water-financial-assistance/igig/index
Environmental Quality and Incentives Program (EQIP)	USDA - NRCS	Up to \$450,000	Landowners with eligible land-types	Implementation and planning of conservation practices that improve natural resources on agricultural land and non-industrial private forestland	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/
Healthy Forests Reserve Program	USDA - NRCS	N/A	Landowner (private or Indian tribes) or landowner approval	Restore, enhance, and protect forestland resources through multi-year easements	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/forests/
Open Space Lands Acquisition and Development Grant / Land and Water Conservation Fund Grant	Illinois DNR	Up to \$750,000 for acquisition projects; up to \$400,000 for development & renovation	Illinois government agencies	Land acquisition for parks, water frontage, nature study and natural resource preservation	https://www.dnr.illinois.gov/AEG/Pages/OpenSpaceLandsAcquisitionDevelopment-Grant.aspx
Sustainable Agricultural Grant Program	Illinois Department of Agriculture	Up to \$10,000 for individuals; up to \$20,000 for all others	Government, organization, institution, non-profit, or individuals with an understanding of sustainable agricultural practices	Research, education, and on-farm projects that address a part of the Sustainable Agriculture Act	https://www.agr.state.il.us/C2000/common/SAGuidelines.pdf

Table 35 Water quality funding opportunities.

5. Implementation of Watershed Plan

The purpose of a watershed plan is to provide recommendations in the form of policy, programs and projects that may improve the health of the Sawmill Creek Watershed. In order to elicit a noticeable improvement in the stream, DuPage County will need cooperation of its local partners in implementing the initiatives identified in the plan. Stakeholders include local public agencies, residents, businesses, non-profits, schools and other organizations.

5.1 Implementation Schedule

Table 36 provides general guidance on implementing initiatives found in the Sawmill Creek Watershed Plan, for both DuPage County and its partners. The implementation schedule follows DuPage County Stormwater Management’s process for implementing flood control projects found in watershed plans.

Task	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Engage stakeholders about the Sawmill Creek Watershed Plan, notably projects and funding opportunities.	X									
Identify preferred alternatives among the recommended implementations, considering cost and benefit.		X								
Identify appropriate funding opportunities for preferred alternatives.			X	X	X	X	X	X		
Submit grant applications for preferred alternatives.			X	X	X	X	X	X		
Implement preferred alternatives.					X	X	X	X	X	X
Monitor the progress and success of the preferred alternatives, particularly with respect to pollutant load reductions.				X	X	X	X	X	X	X
Evaluate successes and failures, and communicate those to stakeholders.								X	X	X
Update water quality-based watershed plan for new conditions.										X

Table 36 Sawmill Creek Watershed Plan 10-year implementation schedule

5.2 Interim Measurable Milestones

Milestones are specific, measurable, achievable, relevant and time-sensitive subtasks needed to achieve an overall goal; in this case, implement a BMP. As outlined in Table 37, these milestones are categorized as short-term (1 to 5 years) or long-term (5 to 10 years). Stakeholders may adjust these milestones to document progress – or lack thereof – to identify progress or areas in need of improvement.

Acres	Indicator	Two-Year Milestone	Five-Year Milestone	Ten-Year Milestone
<i>Improve and protect the ecological integrity of the surface water resources.</i>	Acres of impervious surface reduction	-	10	20
	No. of green infrastructure practices	10	15	20
	No. of detention basin retrofits	5	15	25
	No. of hydrodynamic separators	5	10	15
<i>Build on partnerships with local stakeholders to foster sustainable programs, policy and re-development.</i>	No. of ordinance updates	-	1	2
	No. of plans created and/or updated	2	5	10
	No. of partners carrying out BMP projects	2	4	8
	No. of meetings with stakeholders	6	15	30
	No. of organizations in Steering Committee	4	6	8
<i>Reduce bank erosion and increase daylighting, where possible, to improve and protect in-stream water quality.</i>	Linear feet of daylighting	-	-	100
	Acres of new riparian buffer	2	5	10
	Acres of restored riparian buffer	5	10	15
	Acres of in-stream restoration	2	5	10
	Linear feet streambank stabilization	1,000	2,000	3,000
<i>Raise public awareness on the impacts of land management practices on water quality to prompt behavioral change.</i>	No. of events and presentations	10	20	50
	No. of conservation@home/work properties	5	10	20
	No. of outreach materials distributed	500	1,000	2,000
	No. of Adopt-a-Stream groups	2	4	8
	No. of River Sweep participants	100	200	500
<i>Preserve and connect open space, particularly near waterbodies.</i>	Acres of open space created (i.e. buyouts)	-	5	10
	Acres of floodplain restored and/or protected	-	2	5
	Acres added to conservation easement	-	1	3

	No. of communities who adopt open space plan	-	1	2
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Table 37 Milestones for determining success in carrying out Sawmill Creek Watershed Plan.

5.3 Criteria for Determining Progress

The primary criterion by which progress will be measured within the Sawmill Creek Watershed Plan is through measuring pollutant load reductions, specifically TN, TP, TSS and BOD. Table 30 summarizes the goal reductions for each of the pollutants of concern, as well as oil and grease over 5 years and 10 years. Ultimately, this pollutant load reduction will result in attainment of aquatic life and other designated uses.

Criteria	Current Load, Score or Rating	Five-Year Target	Ten-Year Target
Nitrogen (Total) Load Reduction	48,790 lb/yr	5% Load Reduction = 488 lb/yr (2,440 lb total)	15% Load Reduction = 732 lb/yr (7319 lb total)
Phosphorus (Total) Load Reduction	7858 lb/yr	10% Load Reduction = 157 lb/yr (786 lb total)	20% Load Reduction = 157 lb/yr (1,572 lb total)
Sediment Load Reduction (TSS)	1131 ton/yr	10% Load Reduction = 23 tons/yr (113 ton total)	25% Load Reduction = 28 tons/yr (282 ton total)
BOD Load Reduction	178,169 lb/yr	5% Load Reduction = 3,563 lb/yr (17,817 lb total)	15% Load Reduction = 2673 lb/yr (26,725 lb total)
fIBI Scores	GJ01 - 36	GJ01 > 40	GJ01 > 45
mIBI Scores	GJ01 - 51	GJ01 > 53	GJ01 > 55
QHEI Scores	GJ01 - 70	GJ01 \geq 70	GJ01 \geq 70

Table 38 Sawmill Creek Watershed Plan criteria for determining progress.⁴⁰

5.4 Monitoring to Evaluate Effectiveness

In alignment with the previously mentioned criterion, water quality monitoring is the primary tool used to evaluate the effectiveness of Sawmill Creek Watershed Plan implementation efforts. To ensure accuracy, this requires all BMPS are also tracked throughout the Watershed. Long-term monitoring of

⁴⁰ Percent reduction is consistent with Illinois Nutrient Reduction Strategy year 2025 goal.

these BMPs will be necessary to determine whether Sawmill Creek is both attaining designated uses and meeting water quality standards. In addition, monitoring provides vital information to update remedial actions as necessary. Several agencies offer various levels of water quality monitoring in the Sawmill Creek Watershed, including:

- **DuPage County:** The County is responsible for implementing a monitoring and assessment program as part of the NPDES permit. In the upcoming permit cycles, DuPage County will be modeling effectiveness of BMPs countywide.
- **IEPA:** The Surface Water Section of the IEPA monitors the quality of surface waters in Illinois, including Sawmill Creek. Monitoring efforts include water and sediment chemistry, physical characteristics and stream structure, clarity, macroinvertebrate and fish populations and habitat quality. Surface water monitoring is funded through the USEPA as part of the Clean Water Act to work toward achieving the goal of fishable and swimmable waters throughout the nation.
- **FPDDC:** The Forest Preserve District of DuPage County conducts stream monitoring as part of the Office of Natural Resources Aquatics Monitoring & Research Program. This bio-assessment monitoring includes fish, macroinvertebrate and mussel surveys as well as water chemistry analysis using Sondes and surveys of physical stream characteristics such as cross section, pebble counts and longitudinal profiles.
- **Volunteer Programs:** The DuPage County Adopt-A-Stream program allows for local businesses, schools, churches, student groups, organizations, watershed associations and volunteer groups to do their part in restoring and maintaining local streams. DuPage County asks groups who wish to Adopt-A-Stream to commit to that section of stream for two years and engage in two stream cleanups each year. Groups may choose to go beyond the minimum requirements by regularly monitoring water quality, recording illicit discharge or engaging in streambank enhancement projects.

Although monitoring during implementation of the Sawmill Creek Watershed Plan is vital to its success, monitoring of the BMPs will ensure long-term success to the vitality of Sawmill Creek. In particular, habitat restoration that provides a desirable environment for macroinvertebrates and other stream biota is critical to improving aquatic life and meeting water quality standards. Monitoring both during and after construction will be required for all in-stream and bank stabilization projects. This is critical in assessing whether projects are functioning, as well as determining if future habitat restoration plans need to be adjusted. All such projects will need to be monitored for evidence of erosion and scour and native vegetation success and stabilization for up to 3 to 5 years after implementation.

List of Acronyms

BMP(s): Best Management Practice(s)

BOD: Biological Oxygen Demand

CMAP: Chicago Metropolitan Association of Planning, <http://www.cmap.illinois.gov/>

DCSM: DuPage County Stormwater Management, <http://www.dupageco.org/swm/>

DCHD: DuPage County Health Department: <http://www.dupagehealth.org/>

DCSM Plan: DuPage County Stormwater Management Plan,
http://www.dupageco.org/EDP/Stormwater_Management/1163/

DCSMPC: DuPage County Stormwater Management Planning Committee

DRSCW: DuPage River/Salt Creek Workgroup, <http://www.drscw.org/>

DuDOT: DuPage County Division of Transportation

FPDDC: Forest Preserve District of DuPage County, <http://www.dupageforest.org/>

GIS: Geographic Information System

GIV: Chicago Wilderness' Green Infrastructure Vision,
<http://www.cmap.illinois.gov/livability/sustainability/open-space/green-infrastructure-vision>

HOA: Homeowners Association

IDNR: Illinois Department of Natural Resources

IDOT: Illinois Department of Transportation, <http://www.idot.illinois.gov/>

IEPA: Illinois Environmental Protection Agency, <http://www.epa.illinois.gov/index>

Integrated Report: Illinois Integrated Water Quality Report and Section 303(d) List

ISTHA: Illinois State Toll Highway Authority

MRWQ: Mean Rated Wildlife Quality

MS4(s): Municipal Separate Storm Sewer System(s)

NWI: National Wetland Inventory

NPDES: National Pollutant Discharge Elimination System

NRCS: Natural Resources Conservation Service, <http://www.nrcs.usda.gov>

Ordinance: DuPage County Countywide Stormwater and Flood Plain Ordinance,
http://www.dupageco.org/EDP/Stormwater_Management/Regulatory_Services/1420/

PAH(s): Polycyclic aromatic hydrocarbon(s)

POTW: Publically Owned Treatment Works

TCF: The Conservation Foundation, <http://theconservationfoundation.org/>

TKN: Total Kjeldahl Nitrogen

TMDL: Total Maximum Daily Load

TN: Total Nitrogen

TP: Total Phosphorous

TSS: Total Suspended Solids

USACOE: United States Army Corps of Engineers, <http://www.usace.army.mil/>

USEPA: United States Environmental Protection Agency, <http://www.epa.gov/>

USGS: United States Geological Survey, <http://www.usgs.gov/>

APPENDIX A

Sawmill Creek Watershed							
Total Watershed Area		8026					
Existing N Loading		48796					
Existing P Loading		7860					
Existing BOD Loading		178181					
Existing TSS Loading		1134					
				Pollutant Load Removals			
Pond ID	Current Condition	Drainage Area (ac)	Proposed Condition	N (lb/yr)	P (lb/yr)	BOD (lb/yr)	TSS (t/yr)
1	wet bottom	26	wetland detention				
2	wet bottom	online	wetland detention				
3	wet bottom	60	wetland detention	73	26	839	7
4	wet bottom	23	wetland detention	28	10	322	3
5	wet bottom	12	wetland detention	15	5	168	1
6	wet bottom	37	wetland detention	45	16	517	4
7	wet bottom	8	wetland detention	10	3	112	1
8	wet bottom	90	wetland detention	109	39	1259	10
9	wet bottom	online	wetland detention	na	na	na	na
10	wet bottom	117	wetland detention	142	50	1636	13
11	wet bottom	online	wetland detention	na	na	na	na
12	wet bottom	13	wetland detention	16	6	182	1
13	wet bottom	online	wetland detention	na	na	na	na
15	wet bottom	online	wetland detention	na	na	na	na
16	wet bottom	8	wetland detention	10	3	112	1
17	wet bottom	100	shoreline stabilization	122	43	1399	11
18	wet bottom	310	wetland detention	377	134	4336	34
19	wet bottom	185	wetland detention	225	80	2587	20
20	wet bottom	online	wetland detention	na	na	na	na
21	wet bottom	online	wetland detention	na	na	na	na
22	wet bottom	60	wetland detention	73	26	839	7
23	wet bottom	online	wetland detention	na	na	na	na
24	wet bottom	online	wetland detention	na	na	na	na
25	wet bottom	online	stream and wetland restoration	na	na	na	na
26	wet bottom	online	wetland detention	na	na	na	na
29	wet bottom	online	stream and wetland restoration	na	na	na	na
30	wet bottom	14	wetland detention	17	6	196	2
31	wet bottom	44	wetland detention				
32	wet bottom	58	wetland detention	71	25	811	6
33	wet bottom	2	wetland detention	2	1	28	0
34	dry bottom	online	native basin				
35	dry bottom	12	native basin	40	8	168	2
36	dry bottom	online	native basin	na	na	na	na
37	dry bottom	579	native basin	1936	391	8098	73
41	dry bottom	4	native basin	13	3	56	1
42	dry bottom	2	native basin	7	1	28	0
45	dry bottom	14	native basin				
46	dry bottom	8	native basin	27	5	112	1
47	dry bottom	online	native basin	na	na	na	na
48	roadside swale	online	bioswale				
49	roadside swale	online	bioswale				

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50	dry bottom	online	native basin				
51	dry bottom	6	native basin				
52	dry bottom	online	native basin				
53	dry bottom	38	native basin				
54	dry bottom	online	native basin	na	na	na	na
55	dry bottom	36	native basin	120	24	504	5
56	dry bottom	24	native basin	80	16	336	3
57	dry bottom	online	native basin				
58	dry bottom	13	native basin	43	9	182	2
60	dry bottom	3	native basin	10	2	42	0
61	dry bottom	online	native basin				
62	dry bottom	online	native basin				
63	dry bottom	2	native basin	7	1	28	0
64	dry bottom	16	native basin	54	11	224	2
65	dry bottom	online	native basin	na	na	na	na
66	dry bottom	9	native basin				
27/28	wet bottom	11	wetland detention	13	5	154	1
39/40	dry bottom	23	native basin	77	16	322	3
44/43	dry bottom	2	native basin	7	1	28	0
			Total basin retrofit	3768	967	25623	212
Paver ID	Type	Drainage Area (ac)	Proposed Condition	N (lb/yr)	P (lb/yr)	BOD (lb/yr)	TSS (t/yr)
1	parking lot	10	permeable pavers	55	9	na	1
2	parking lot	12	permeable pavers	66	11	na	2
3	parking lot	22	permeable pavers	120	19	na	3
4	parking lot	18	permeable pavers	98	16	na	2
5	parking lot	6	permeable pavers	33	5	na	1
6	parking lot	4	permeable pavers	22	4	na	1
7	parking lot	9	permeable pavers	49	8	na	1
8	parking lot	4	permeable pavers	22	4	na	1
9	parking lot	1	permeable pavers	5	1	na	0
10	parking lot	18	permeable pavers	98	16	na	2
11	parking lot	2	permeable pavers	11	2	na	0
12	parking lot	5	permeable pavers	27	4	na	1
13	parking lot	26	permeable pavers	142	23	na	3
14	parking lot	20	partial retrofit with permeable pavers	109	18	na	3
16	parking lot	11	partial retrofit with permeable pavers	60	10	na	1
17	parking lot	6	permeable pavers	33	5	na	1
			Total perm. Pavers	952	153	0	22
Bioswale ID	Bioswale Area (ac)	Drainage Area (ac)	Proposed Condition	N (lb/yr)	P (lb/yr)	BOD (lb/yr)	TSS (t/yr)

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1		0.1	bioswale	3.04	0.64	na	0.13
2		0.2	bioswale	6.08	1.27	na	0.25
3		0.1	bioswale	3.04	0.64	na	0.13
			Total bioswale	12.16	2.55	0.00	0.51

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Sawmill Creek Watershed									
Total Watershed Area		8026		ac					
Existing N Loading		48796		lb/yr					
Existing P Loading		7860		lb/yr					
Existing BOD Loading		178181		lb/yr					
Existing TSS Loading		1134		t/yr					
Pollutant Load Removals									
Pond ID	Current Condition	Drainage Area (ac)	Size of Pond (ac)	Ownership	Proposed Condition	N (lb/yr)	P (lb/yr)	BOD (lb/yr)	TSS (t/yr)
1	wet bottom	26	0.2	private	wetland detention				
2	wet bottom	online	0.27	private	wetland detention				
3	wet bottom	60	2.2	private	wetland detention	73	26	839	7
4	wet bottom	23	1.8	public	wetland detention	28	10	322	3
5	wet bottom	12	0.4	private	wetland detention	15	5	168	1
6	wet bottom	37	0.9	public	wetland detention	45	16	517	4
7	wet bottom	8	0.3	public	wetland detention	10	3	112	1
8	wet bottom	90	2.7	public	wetland detention	109	39	1259	10
9	wet bottom	online	1.71	private	wetland detention	na	na	na	na
10	wet bottom	117	0.7	private	wetland detention	142	50	1636	13
11	wet bottom	online	0.28	private	wetland detention	na	na	na	na
12	wet bottom	13	0.4	public	wetland detention	16	6	182	1
13	wet bottom	online	0.12	private	wetland detention	na	na	na	na
15	wet bottom	online	1.66	private	wetland detention	na	na	na	na
16	wet bottom	8	0.4	private	wetland detention	10	3	112	1
17	wet bottom	100	1.3	private	shoreline stabilization	122	43	1399	11
18	wet bottom	310	1.5	private	wetland detention	377	134	4336	34
19	wet bottom	185	6.3	private	wetland detention	225	80	2587	20
20	wet bottom	online	1.35	private	wetland detention	na	na	na	na
21	wet bottom	online	0.45	private	wetland detention	na	na	na	na
22	wet bottom	60	3.8	private	wetland detention	73	26	839	7
23	wet bottom	online	2.15	private	wetland detention	na	na	na	na
24	wet bottom	online	0.56	private	wetland detention	na	na	na	na
25	wet bottom	online	0.16	private	stream and wetland restoration	na	na	na	na
26	wet bottom	online	0.81	private	wetland detention	na	na	na	na
29	wet bottom	online	3	private	stream and wetland restoration	na	na	na	na
30	wet bottom	14	0.1	private	wetland detention	17	6	196	2
31	wet bottom	44	1.8	private	wetland detention				
32	wet bottom	58	1.8	private	wetland detention	71	25	811	6
33	wet bottom	2	0.1	public	wetland detention	2	1	28	0
34	dry bottom	online	0.41	private	native basin				
35	dry bottom	12	1.1	public	native basin	40	8	168	2
36	dry bottom	online	1.42	private	native basin	na	na	na	na
37	dry bottom	579	4.7	public	native basin	1936	391	8098	73
41	dry bottom	4	0.1	private	native basin	13	3	56	1
42	dry bottom	2	0.3	private	native basin	7	1	28	0
45	dry bottom	14	0.7	private	native basin				
46	dry bottom	8	0.6	private	native basin	27	5	112	1
47	dry bottom	online	0.05	private	native basin	na	na	na	na
48	roadside swale	online	0.04	private	bioswale				
49	roadside swale	online	0.04	private	bioswale				
50	dry bottom	online	0.33	private	native basin				
51	dry bottom	6	0.1	private	native basin				
52	dry bottom	online	0.09	public	native basin				
53	dry bottom	38	2.1	private	native basin				
54	dry bottom	online	0.52	private	native basin	na	na	na	na
55	dry bottom	36	1.4	public	native basin	120	24	504	5
56	dry bottom	24	0.8	public	native basin	80	16	336	3
57	dry bottom	online	0.57	private	native basin				
58	dry bottom	13	0.6	public	native basin	43	9	182	2
60	dry bottom	3	0.3	private	native basin	10	2	42	0
61	dry bottom	online	0.29	private	native basin				
62	dry bottom	online	0.5	private	native basin				
63	dry bottom	2	0.1	private	native basin	7	1	28	0
64	dry bottom	16	0.4	private	native basin	54	11	224	2
65	dry bottom	online	0.53	private	native basin	na	na	na	na
66	dry bottom	9	0.5	public	native basin				
27/28	wet bottom	11	0.7	private	wetland detention	13	5	154	1
39/40	dry bottom	23	0.7	private	native basin	77	16	322	3
44/43	dry bottom	2	1.8	private	native basin	7	1	28	0
			52.63		Total basin retrofit	3768	967	25623	212

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Paver ID	Type	Drainage Area (ac)	Paver Area (ac)	Ownership	Proposed Condition	N (lb/yr)	P (lb/yr)	BOD (lb/yr)	TSS (t/yr)
1	parking lot	10	3	public	permeable pavers	55	9	na	1
2	parking lot	12	1	public	permeable pavers	66	11	na	2
3	parking lot	22	3	public	permeable pavers	120	19	na	3
4	parking lot	18	4	public	permeable pavers	98	16	na	2
5	parking lot	6	1	public	permeable pavers	33	5	na	1
6	parking lot	4	1	public	permeable pavers	22	4	na	1
7	parking lot	9	1.35	private	permeable pavers	49	8	na	1
8	parking lot	4	1	public	permeable pavers	22	4	na	1
9	parking lot	1	0.2	public	permeable pavers	5	1	na	0
10	parking lot	18	2	private	permeable pavers	98	16	na	2
11	parking lot	2	1	public	permeable pavers	11	2	na	0
12	parking lot	5	1	public	permeable pavers	27	4	na	1
13	parking lot	26	1.73	public	permeable pavers	142	23	na	3
14	parking lot	20	3	private	partial retrofit with permeable pavers	109	18	na	3
16	parking lot	11	4.3	private	partial retrofit with permeable pavers	60	10	na	1
17	parking lot	6	2	public	permeable pavers	33	5	na	1
			30.58		Total perm. Pavers	952	153	0	22
Bioswale									
Bioswale ID	Bioswale Area (ac)	Drainage Area (ac)	Location	Ownership	Proposed Condition	N (lb/yr)	P (lb/yr)	BOD (lb/yr)	TSS (t/yr)
1		0.1	1	public	bioswale	3.04	0.64	na	0.13
2		0.2	2	public	bioswale	6.08	1.27	na	0.25
3		0.1	1	public	bioswale	3.04	0.64	na	0.13
Total bioswale						12.16	2.55	0.00	0.51