DUPAGE COUNTY

St. Joseph Creek

Watershed-Based Plan

Love Blue. Live Green.

DuPage County Stormwater Management

August 2017

Funding for this plan was provided, in part, by the U.S. Environmental Protection Agency and Illinois Environmental Protection Agency (IEPA) through Section 319 of the Clean Water Act under Financial Assistance Agreement No. 3191503. The findings and recommendations contained in this report are not necessary those of the funding agencies.

Table of Contents

Figures

Tables

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 Winfield Creek, Klein Creek, Sawmill Creek, Kress Creek and St. Joseph Creek, which is the focus of this document (Figure 1). The purpose of the St. Joseph Creek Watershed Plan is to develop recommendations to improve the quality of St. Joseph 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 St. Joseph Creek.

2. St. Joseph Creek Watershed Planning Area

2.1 Planning Area

St. Joseph Creek (IL_GBLB-01) is a portion of HUC# 071200040804 flowing generally east to west through the southeast quadrant of DuPage County, Illinois. St. Joseph Creek is a tributary, or sub-watershed, to the East Branch DuPage River (Figure 2). The headwaters of the East Branch DuPage River begin in northern DuPage County and run north to south through the County before converging with the West Branch DuPage River near Bolingbrook, Illinois in Will County to become the DuPage River. The DuPage River eventually meets with the Des Plaines and Kankakee Rivers in Channahon, Illinois to form the Illinois River.

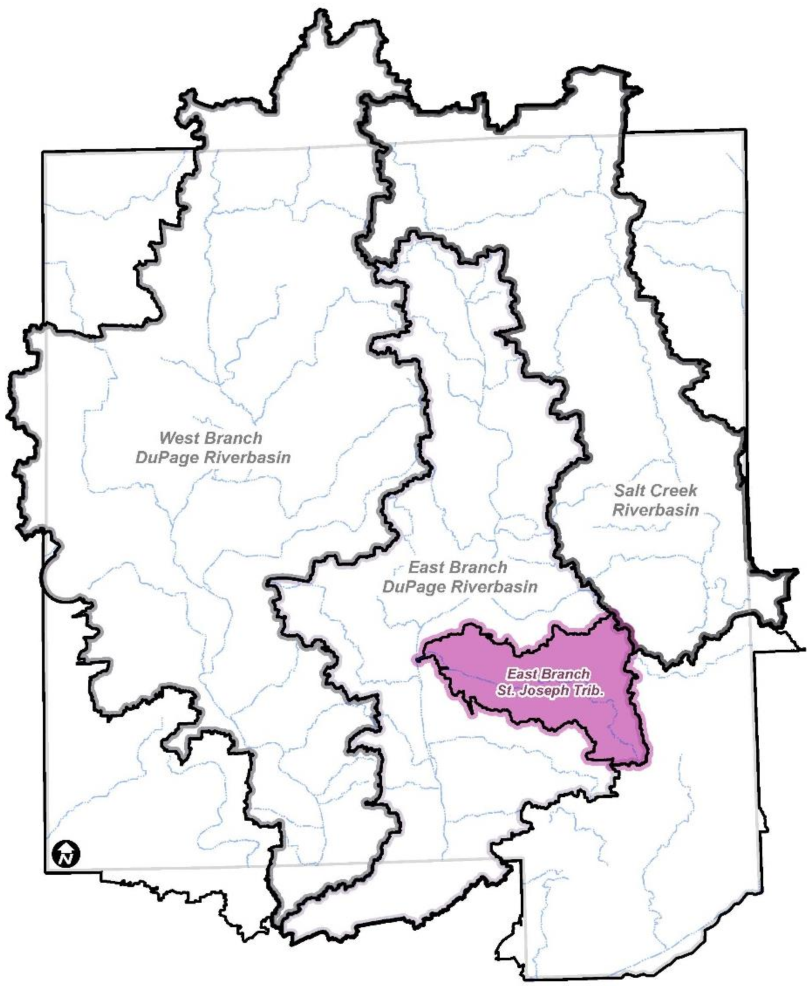

Figure 2 St. Joseph Creek Watershed's location within the East Branch DuPage River Watershed.

St. Joseph Creek Watershed is a typical suburban area that drains a total of approximately 16 square miles in southeastern DuPage County. Shown in Figure 3, the watershed includes portions of the City of Darien, Village of Westmont, Village of Downers Grove, Village of Lisle and unincorporated DuPage County.

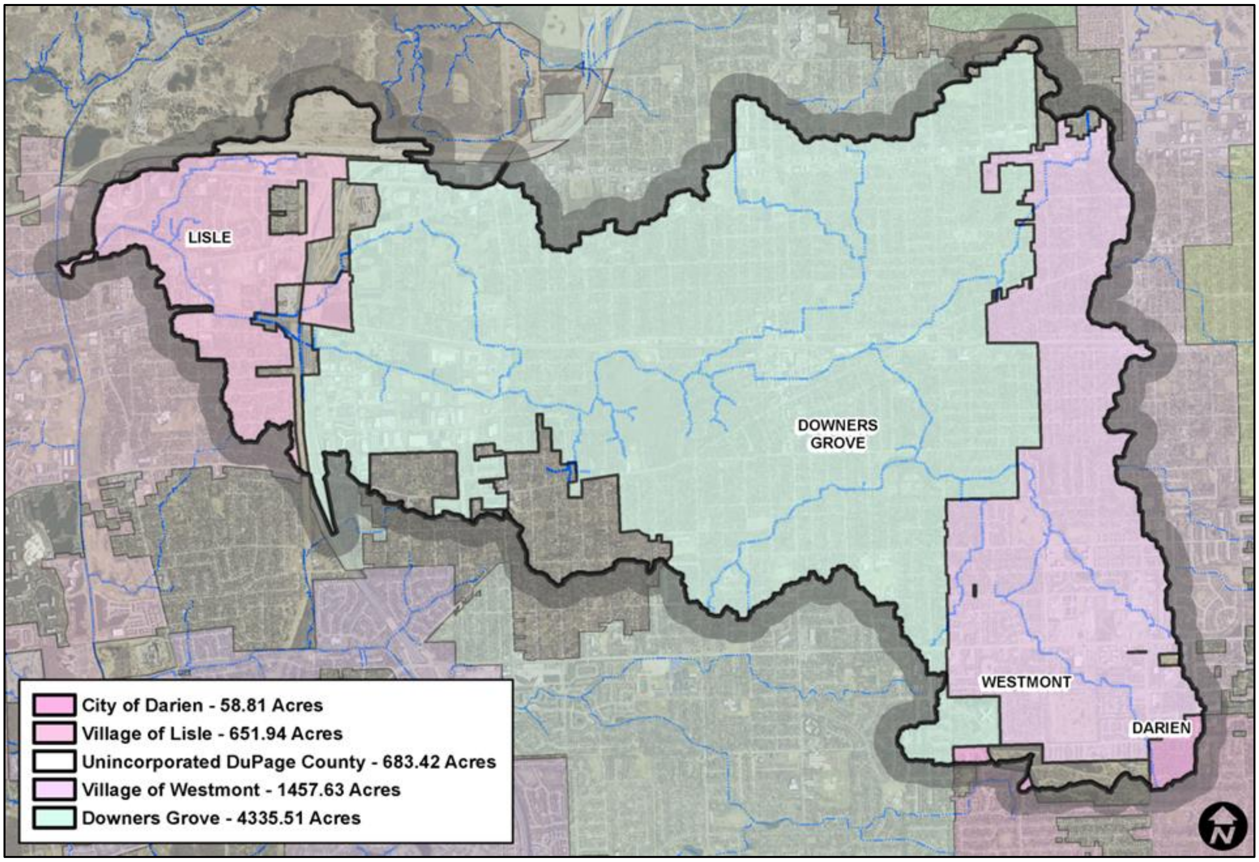

Figure 3 Municipal boundaries within the St. Joseph Creek Watershed.

As shown in Figure 4, St. Joseph Creek begins as several branches in the eastern end of the watershed. The southern tributaries of the St. Joseph Creek Watershed begin in the City of Darien and Village of Westmont. The main watershed use is residential development, but there are also commercial zones, clustered primarily around the major thoroughfares. Other uses include industrial areas, park districts, a forest preserve, golf courses and parks.

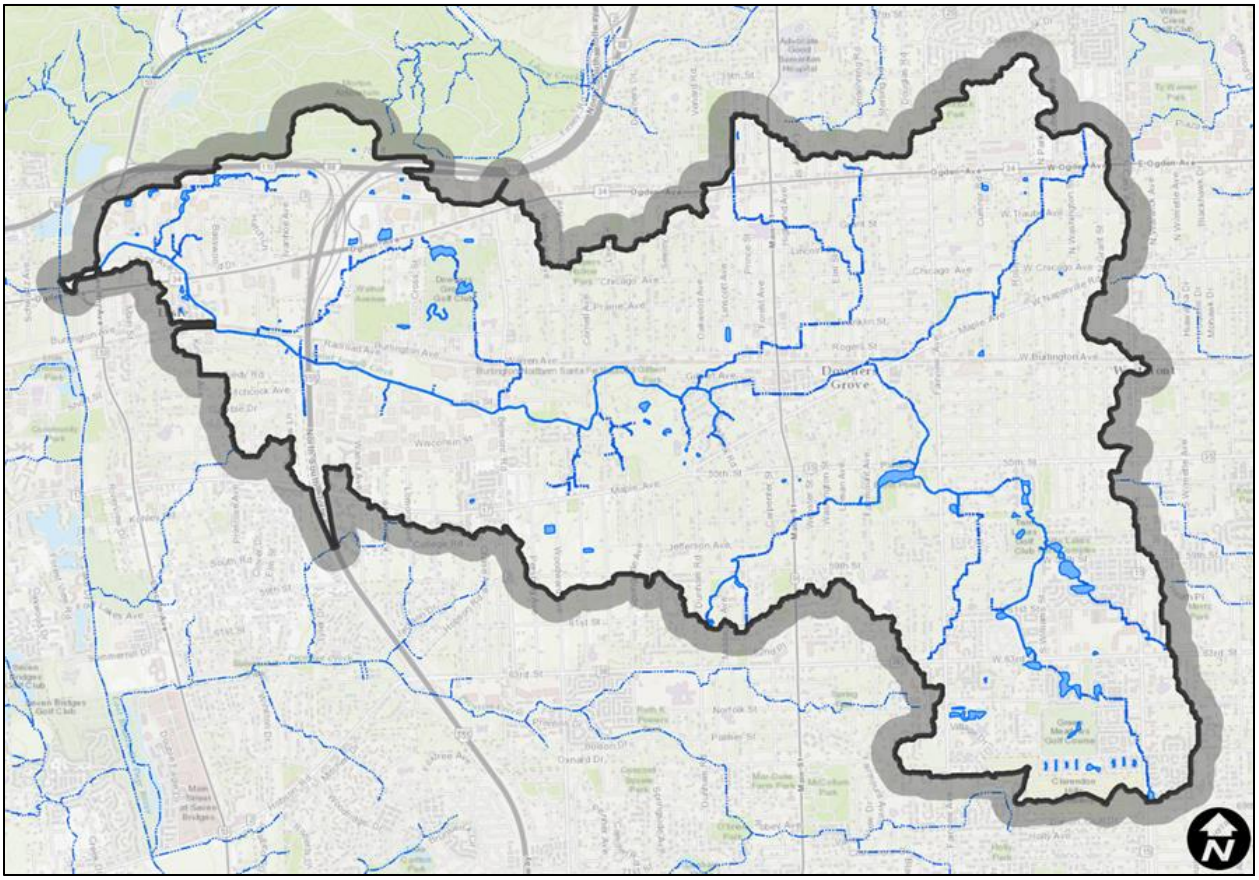

Figure 4 St. Joseph Creek Watershed.

For the purpose of this study, DuPage County staff divided the watershed into three sub-watersheds, shown in Figure 5. Subdividing the planning area allows for a better description of local conditions, as well as future recommendations. Sub-watershed #1 spans from the confluence with the East Branch DuPage River upstream to around Sherman Avenue in Downers Grove. There are two major expressways in this sub-watershed, Interstate 88 and Interstate 355. There is also an industrial area in sub-watershed #1 located within Downers Grove. Sub-watershed #2 consists of the northern branches of the headwaters of St. Joseph Creek. Two stream branches within sub-watershed #2 are completely contained within underground pipes. They do not daylight until crossing the Burlington Northern Santa Fe Railroad. The third branch in sub-watershed #2 is exposed at the headwaters, but is piped further downstream when passing through downtown Downers Grove. However, the largest amount of open space in the St. Joseph Creek Watershed also lies in sub-watershed #2 within the Maple Grove Forest Preserve. Sub-watershed #3 includes the southern branches of the headwaters of St. Joseph Creek.

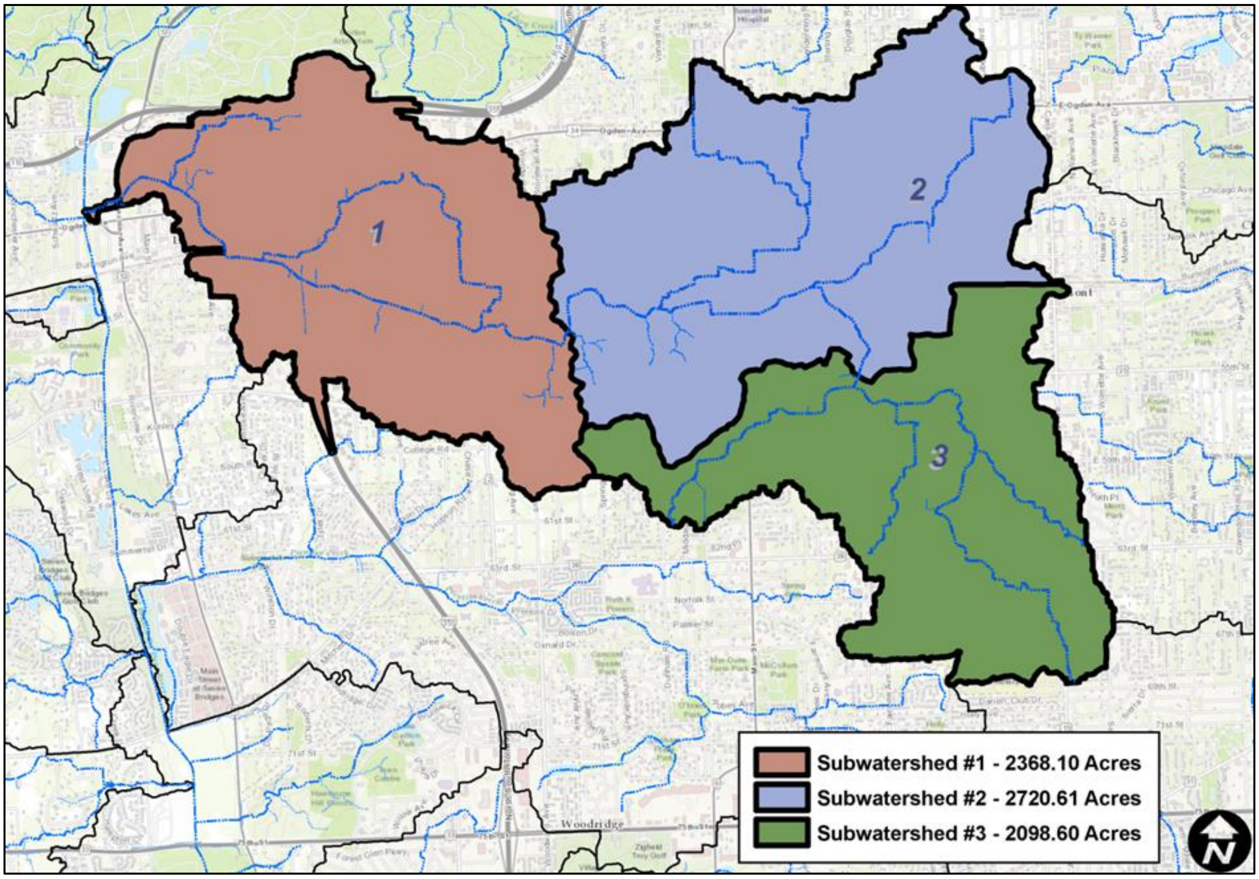

Figure 5 Sub-watersheds in St. Joseph Creek Watershed.

2.2 Local Stakeholders

To understand the St. Joseph 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, multi-disciplinary St. Joseph 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 St. Joseph Creek Watershed Steering Committee

Early in the Plan development, DuPage County convened a St. Joseph 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), the DuPage River Salt Creek Workgroup (DRSCW), ComEd, Illinois Department of Transportation (IDOT) and the Illinois State Toll Highway Authority (ISTHA), 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 monthly basis to provide input on the content of the Plan. This Committee, 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.

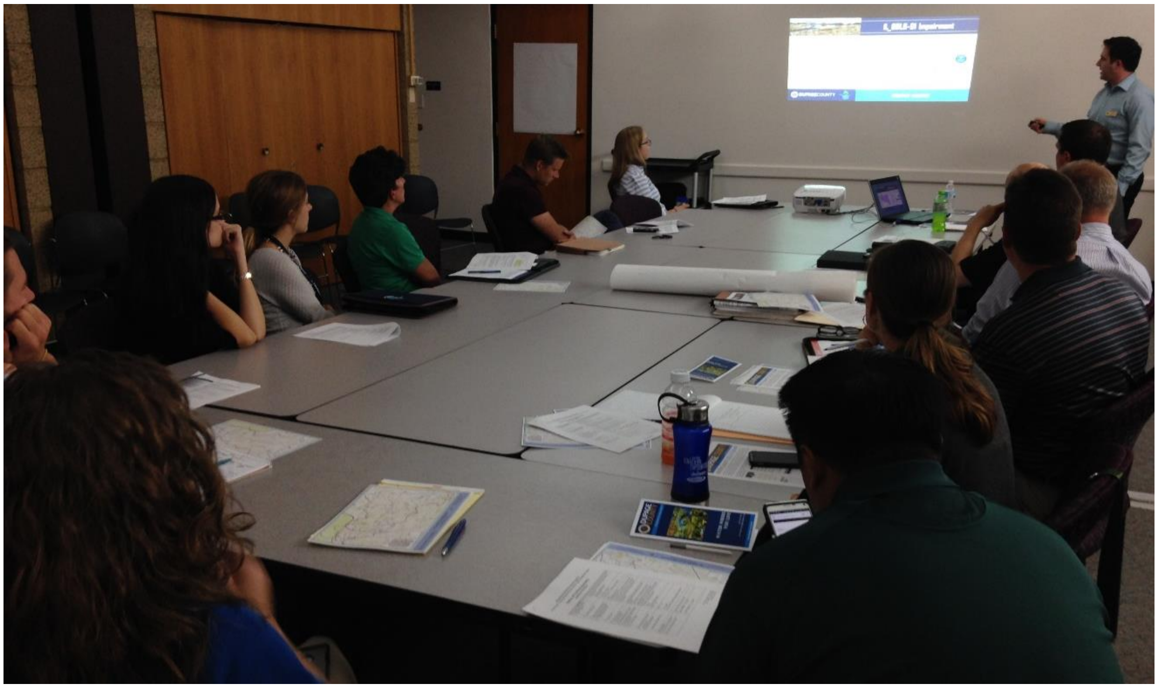

Figure 6 St. Joseph Creek Watershed Steering Committee members meet to discuss the plan.

2.2.2 East Branch Watershed Protection Workgroup

In each of DuPage County's three major watersheds, the Stormwater Management Department, in partnership with The Conservation Foundation, organized groups to improve the health of the watershed. The East Branch Watershed Protection Workgroup consists of local public agencies, organizations, businesses and residents who all have the common goal of improving the East Branch DuPage River by becoming citizen advocates, applying for funding for sustainable projects and maintaining the watershed. Meeting biannually, County staff used the meeting on February 25, 2016 to introduce the St. Joseph Creek Watershed Plan to the group and seek assistance in the water quality assessment. Staff provided subsequent updates via email and during the following April 13, 2016 meeting, both of which were held in Downers Grove. As environmental champions in the local community, this workgroup will be important to future implementation of the Plan.

2.2.3 Local Community Outreach

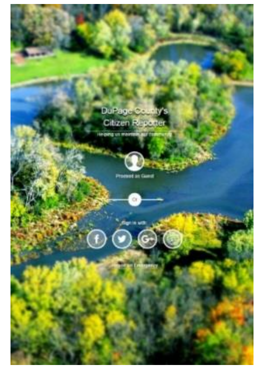

Figure 7 DuPage County water quality planning app.

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. The St. Joseph 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 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 835 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, as well as 20 condominium associations within the floodplain that house another 941 residents. Further, staff distributed several hundred targeted brochures to 34 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 St. Joseph Creek Watershed Plan and web application. Staff also worked community events in Downers Grove on June 25, 2016 (Figure 8) and Westmont on August 11, 2016 to engage directly with residents about the Plan. 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 worked a community event in Downers Grove 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 St. Joseph Creek and the surrounding watershed to meet federal, statewide and regional water quality initiatives. Specifically, proposed recommendations found in the Plan will improve biological oxygen demand (BOD), total phosphorous (TP), total nitrogen (TN) and total suspended solids (TSS), as well as strive to reduce oil and grease.

3. 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 the St. Joseph Creek Watershed. This data was obtained through the U.S. Census Bureau.[1]

Population density in the St. Josephs Creek watershed ranges from a low of zero to 1,000 people per square mile to a high of 4,000 to 22,000 people per square mile (Figure 9). The lowest population density is within the northwestern part of the watershed. Here, two major highways, I-88 and I-355, converge; therefore, a significant amount of area consists of tollway plazas and associated ramps, as well as recreational and commercial properties. Heading south and east, the population density increases to 1,000 to 4,000 people per square mile. Here, there are relatively dense residential areas, but the density is offset by commercial and office districts along Belmont Road, Main Street and Ogden

[1] https://www.census.gov/geo/maps-data/data/tiger.html

Avenue. The Watershed's only forest preserve, Maple Grove, is also within this area. The areas with the highest population density are in the eastern part of the Watershed. Dense residential development, mainly single-family lots but also several multi-family condominiums and apartment complexes, characterize these parts.

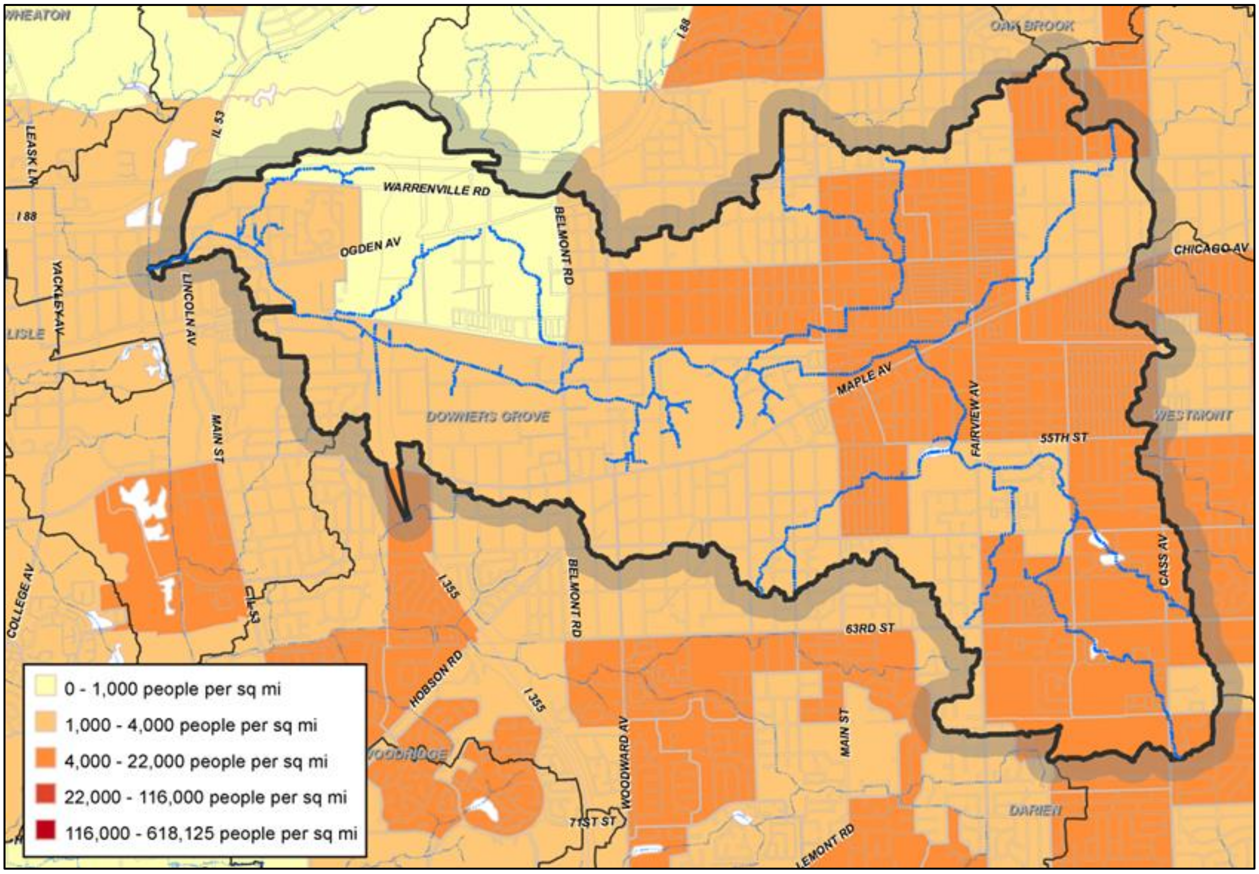

Figure 9 St. Joseph Creek Watershed population density (2015).

Population growth (Figure 10) is relatively static in the St. Joseph Creek Watershed. The highest rate of growth of 1.25% to 1.9% is in the northwest corner of the watershed, as well as a small area in the south. Most of the watershed has a stable to slightly increasing population (0% to 1.25%) or slightly decreasing (-1.25% to 0%).

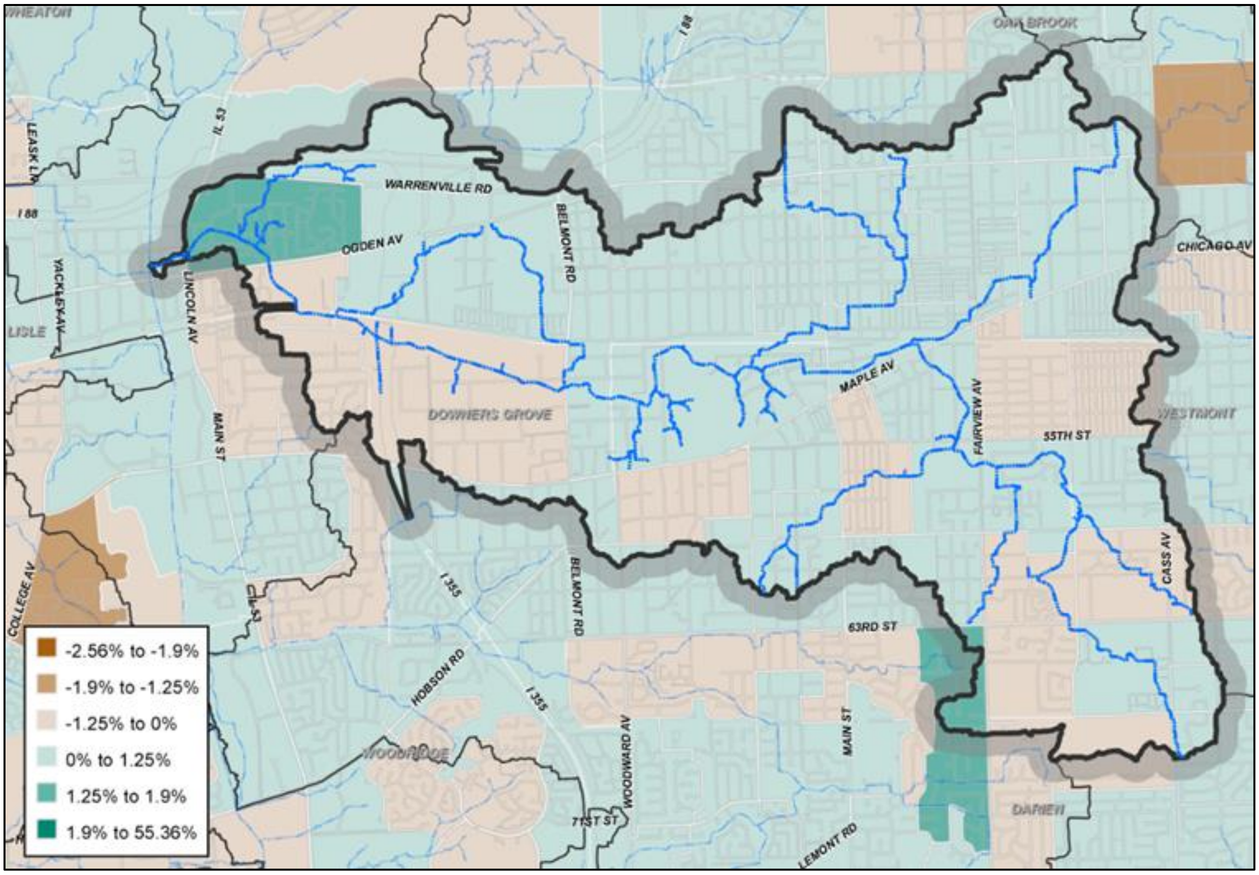

Figure 10 St. Joseph Creek Watershed population growth (2015-2020).

The majority of the St. Joseph Creek Watershed has a median age of 36 to 44 years old (Figure 11). Toward the southern part of the watershed, the median age is 27 to 36 years old. Mainly in the southern half of the watershed, the median age of the population is 44 to 53 years old. A few pockets of the watershed also have a mostly senior population where the median age ranges from 53 to 86 years old.

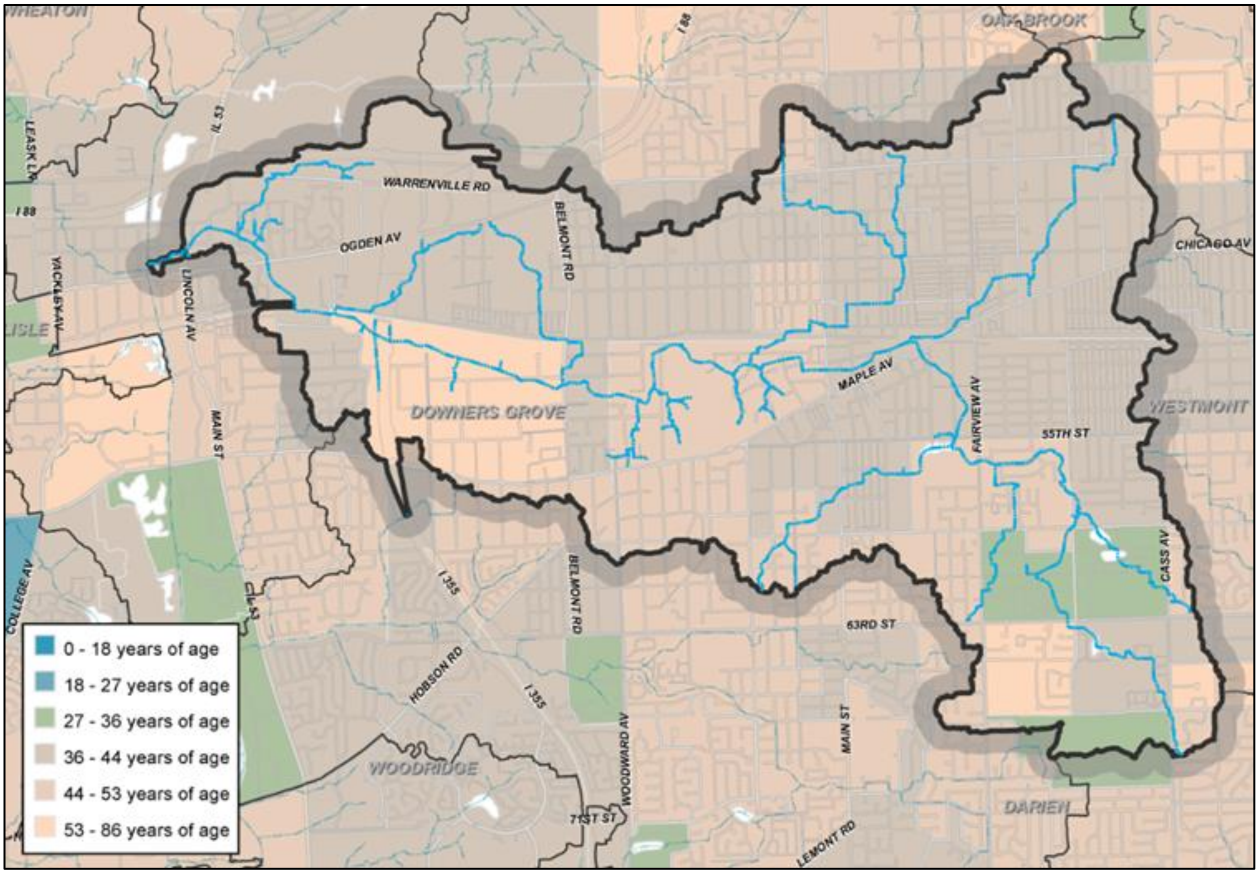

Figure 11 St. Joseph Creek Watershed median age (2015).

Shown in Figure 12, the median income amounts vary significantly throughout the watershed. Generally, the incomes are higher in the central part of the watershed, averaging between $104,000 and $200,000. On the east and west sides of the watershed, the median incomes are lower. The lowest income area of the watershed, ranging from $12,000 to $43,000, is on the southwest side. The remainder of the watershed has a median income of ranging between $43,000 and $104,000.

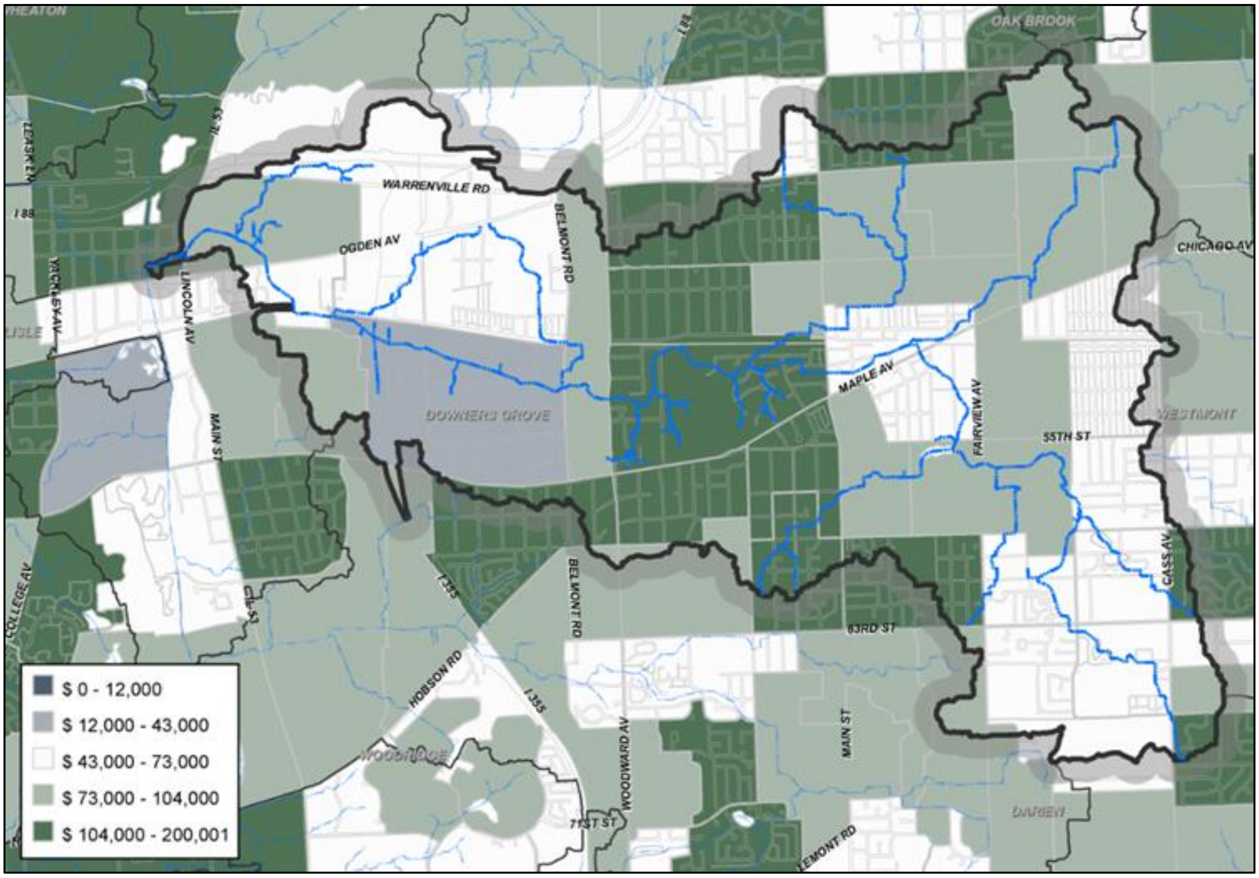

Figure 12 St. Joseph Creek Watershed median income (2015).

As shown in Figure 13, the unemployment rate is on the low end ranging from none to 4.4% for a large portion of the watershed. There are pockets of higher unemployment between 4.4% and 11%, as well as one area with a high unemployment rate in the northeast corner ranging from 17.6% to 24.1%.

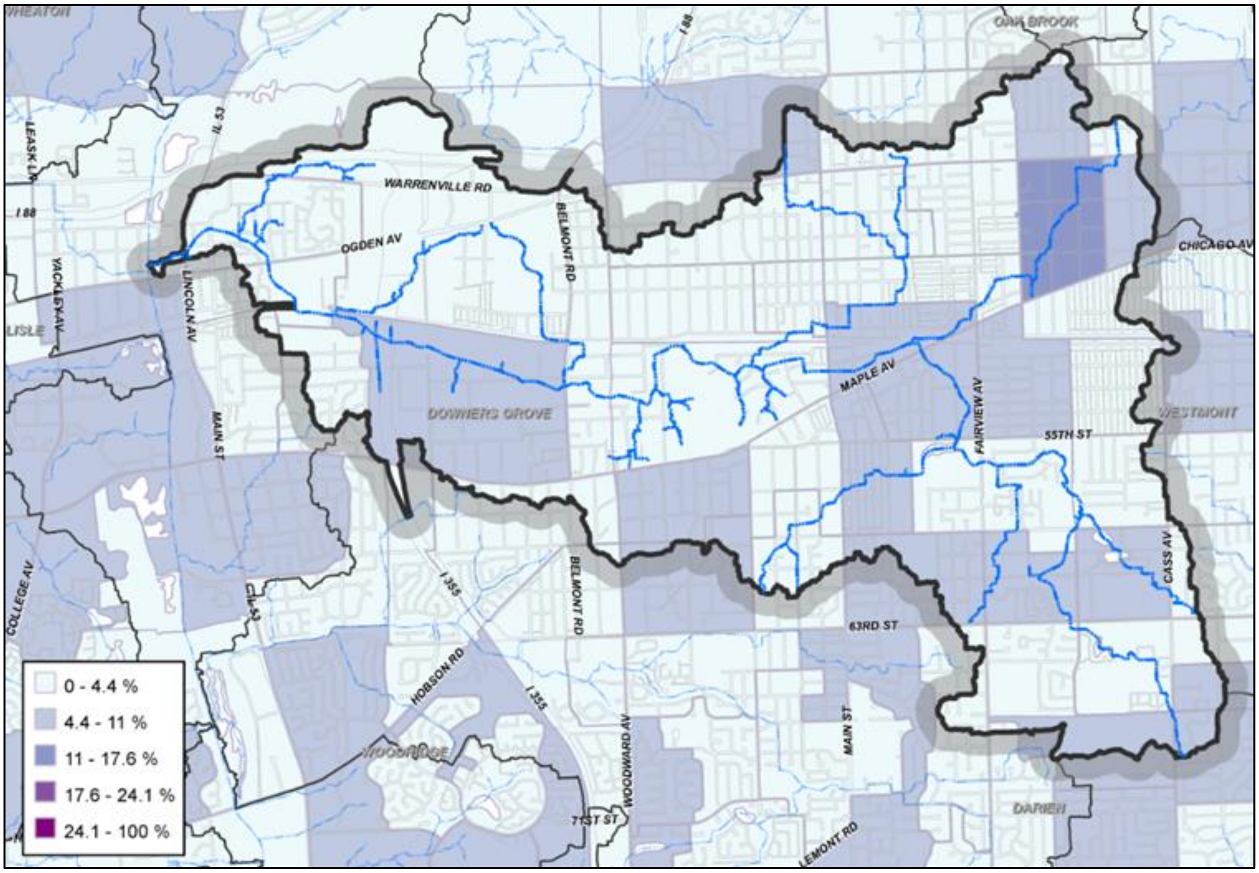

Figure 13 St. Joseph Creek Watershed unemployment rate (2015).

3.2 Local Jurisdictions

The St. Joseph Creek Watershed lies entirely within DuPage County, Illinois. Local jurisdictions consist of the Village of Downers Grove, City of Darien, Village of Lisle, Village of Westmont and unincorporated DuPage County. As outlined in Table 1, the majority of the watershed – 4,335 acres or 60% of the land area – lies within the municipal limits of the Village of Downers Grove. Another 20% is within Westmont. The remaining 20% is split between Darien, Lisle and unincorporated DuPage County. The Watershed also falls within three of DuPage's nine townships: Downers Grove, Lisle and York Townships. All of these municipalities and townships are municipal separate storm sewer systems (MS4s) under the National Pollutant Discharge Elimination System (NPDES).[2]

Agency	Acreage	Percent of Watershed
Municipality		
Darien	59	0.82%
Downers Grove	4335	60.32%
Lisle	652	9.07%

[2] United States Environmental Protection Agency January 2000 (revised December 2005) EPA 833-F-00-002. Stormwater Phase II Final Rule, Small MS4 Stormwater Program Overview. https://www3.epa.gov/npdes/pubs/fact2-0.pdf

Unincorporated	683	9.50%
Westmont	1458	20.29%
Township		
Downers Grove	5034	70.04%
Lisle	2147	29.87%
York	6	0.08%
County		
DuPage		100.00%

Table 1 Municipal acreage within the St. Joseph Creek Watershed.

In addition to the jurisdictional boundaries, the Watershed flows through property owned by the State of Illinois, Forest Preserve District of DuPage County (FPDDC), Downers Grove Sanitary District (DGSD) 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.[3]
- 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.
- 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.
- ***Downers Grove Sanitary District,*** the only wastewater treatment facility in the Watershed, is located along St. Joseph Creek east of its confluence with the East Branch DuPage River. DGSD discharges its effluent directly into St. Joseph Creek via two outfalls. As a Publically-Owned Treatment Works (POTW), they hold their own NPDES permit.

[3] 2013. DuPage County Stormwater Management Planning Committee & Stormwater Management. DuPage County
Countywide Stormwater And Flood Plain Ordinance.
https://www.dupageco.org/EDP/Stormwater_Management/Regulatory_Services/1420/

3.3 Physical & Natural Features

3.3.1 Climate

The climate of the St. Joseph Creek Watershed is characterized by warm summers and cold winters with moderate precipitation year round. The average annual temperature is 49.9 degrees Fahrenheit. In summer, the average temperature is 71.9 degrees Fahrenheit with an average high of 82.9 degrees Fahrenheit. During the winter, the average temperature is 26.1°F with an average low of 18°F.[4] The growing season in this area lasts from mid-April to mid-October or approximately 165 to 170 days in a normal year. Average annual precipitation is 36.91 inches according to the nearest National Oceanic and Atmospheric Administration (NOAA) recording station.[5] Summer is the wettest season with an average rainfall of 12.61 inches in the summer months (Table 2).

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 2 Climate data for the DuPage Airport in West Chicago, IL (courtesy of NOAA). [6]

The abundance of rainfall in the planning area – and greater region – is an anomaly because it is a threat almost year-round. The rainfall then carries non-point source pollution, such as fertilizer in the summer or road salts in the winter, into streams and rivers. Some of these non-point source pollutants have created critical water quality issues within St. Joseph Creek.

3.3.2 Topography

The St. Joseph Creek Watershed is characteristic of Midwestern glacial landforms with gently sloping hills and valleys shaped by glacial advance, retreat and subsequent melt waters. Topography of the St. Joseph Creek Watershed ranges from a high of approximately 775 feet above sea level to a low of approximately 650 feet above sea level. The high points of the watershed are at the drainage divides in the north, east and south borders of the Watershed as shown in Figure 14. The low point is at St. Joseph Creek's confluence with the East Branch DuPage River in the far western point of the Watershed.

---

[4] http://www.ncdc.noaa.gov/cdo-web/datatools/normals

[5] 2003. Illinois State Water Survey, Prairie Research Institute, State Climatologist Office for Illinois. University of Illinois at Urbana- Champaign. Illinois Growing Season. http://www.isws.illinois.edu/atmos/statecli/Frost/growing_season.htm

[6] Climate data recorded at the National Oceanic and Atmospheric Administration (NOAA) recording station at the DuPage Airport in West Chicago, IL.

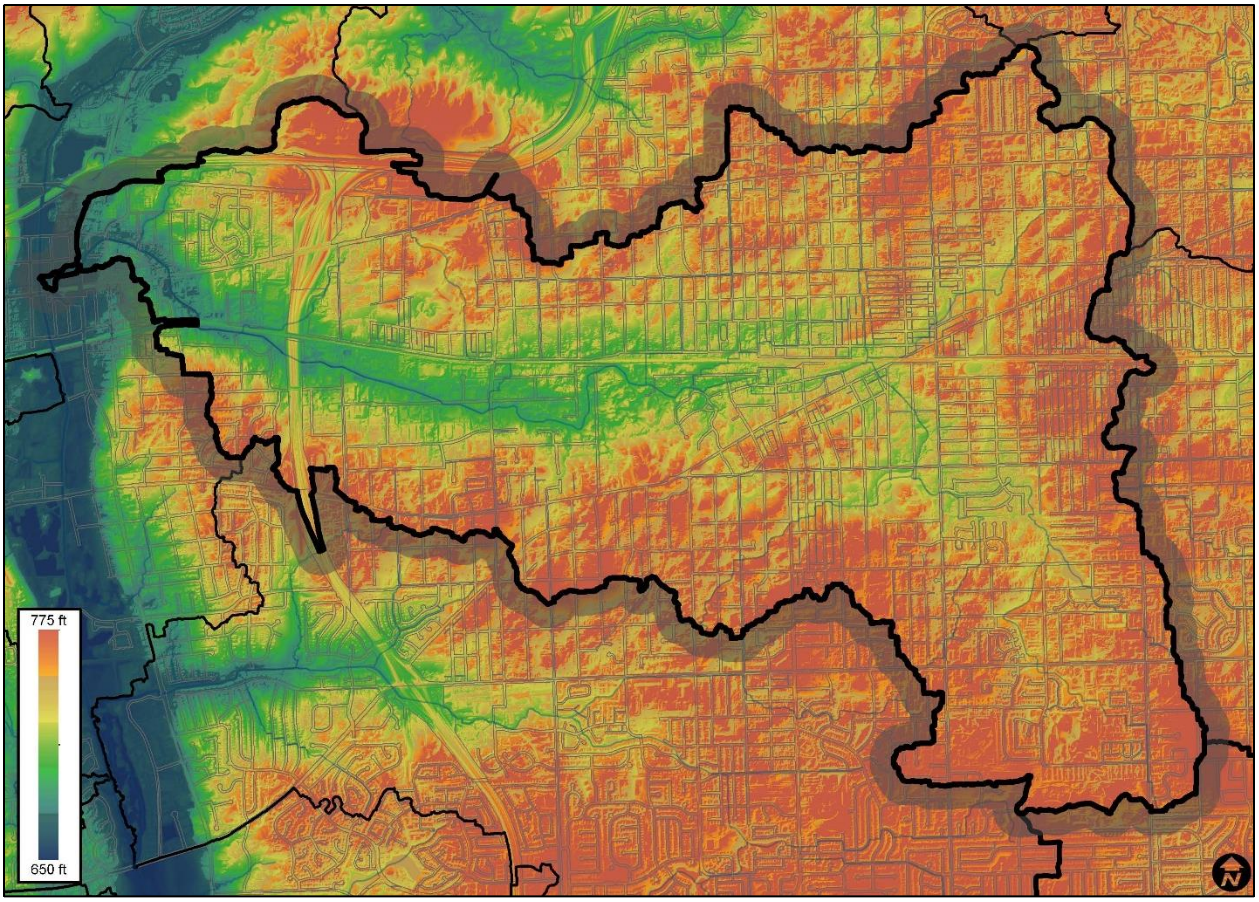

Figure 14 St. Joseph Creek Watershed topography.

3.3.3 Geology

Like the rest of DuPage County, the geology of the St. Joseph Creek Watershed was influenced heavily by the Wisconsin glaciation. As a result, the planning area is covered by less than 25 inches of loess, or windblown silt, as demonstrated in Figure 15**.** Loess coverage in northeastern Illinois is shallow in comparison to the rest of the state, which can have up to 300 inches of loess or more. Following glacial retreat, loess was blown across the landscape and eventually accumulated over glacial till. This till was deposited during the advancing glacial activity, which also caused the formation of moraines that cover the planning area.[7] Till is high in clay, thus causing much of the poor drainage that is characteristic of the region.[8] Loess deposits and the underlying till are the parent material for the fertile topsoil that developed over thousands of years by the tallgrass prairies.[9]

---

[7] Hansel and Johnson, 1996. Wedron and Mason Groups: Lithostratigraphic Reclassification of Deposits of the Wisconsin Episode, Lake Michigan Lobe Area. Department of Natural Resources, Illinois State Geologic Survey Bulletin 104Illinois State Geologic Survey Bulletin 104, plate 1

[8] Mapes, D.R. 1979. Soil survey of Du Page and Part of Cook Counties, Illinois. University, of Illinois Agricultural Experiment Station Soil Report 108.)

[9] Illinois State Geologic Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign. Loess Thickness map http://isgs.illinois.edu/content/loess-thickness-map

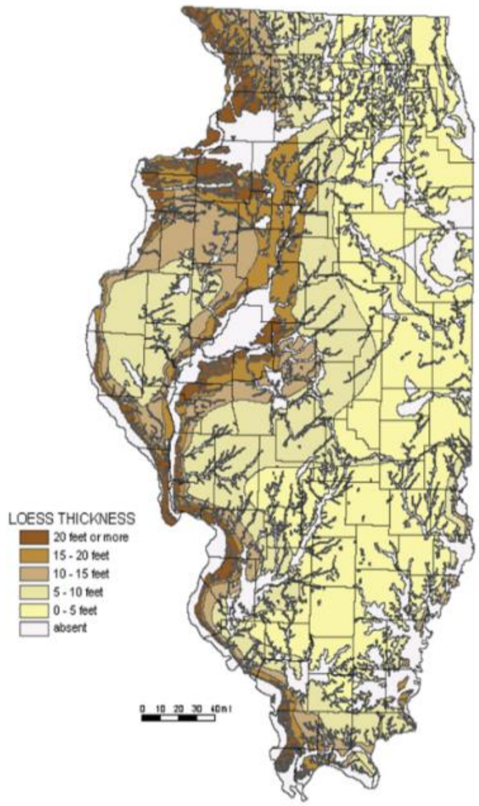

Figure 15 Loess thickness throughout Illinois (courtesy of USGS).

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.[10]

Soil formation occurs when a parent material deposited by earth forming geological processes is impacted by climate and organisms over time across a landscape of varying topography.[11] Mentioned before, the parent material is glacial till and loess in this region.

The soils in the St. Joseph Creek Watershed are mainly silt loam and silty clay loam in texture. As evidenced in Table 3, the soil series that make up the largest percentages of the watershed are the

---

[10] 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

[11] Natural Resources Conservation Service's (NRCS) soil survey of DuPage County (2001).

Markham-Ashkum-Beecher complex and orthents. Orthents, or disturbed urban soils, comprise more than 21% of the land area, as shown in Figure 16. These soils are created when development and disturbance occurs to a point where the original soil no longer displays its characteristic properties. Consequently, the hydrologic soil group classification does not apply to these soils. The disturbance caused by development alters the soil profile from its original state; therefore, the classification is no longer accurate for the disturbed soil. Onsite, evaluations should always be conducted to verify mapped soil type as well as determine characteristics of a disturbed soil.

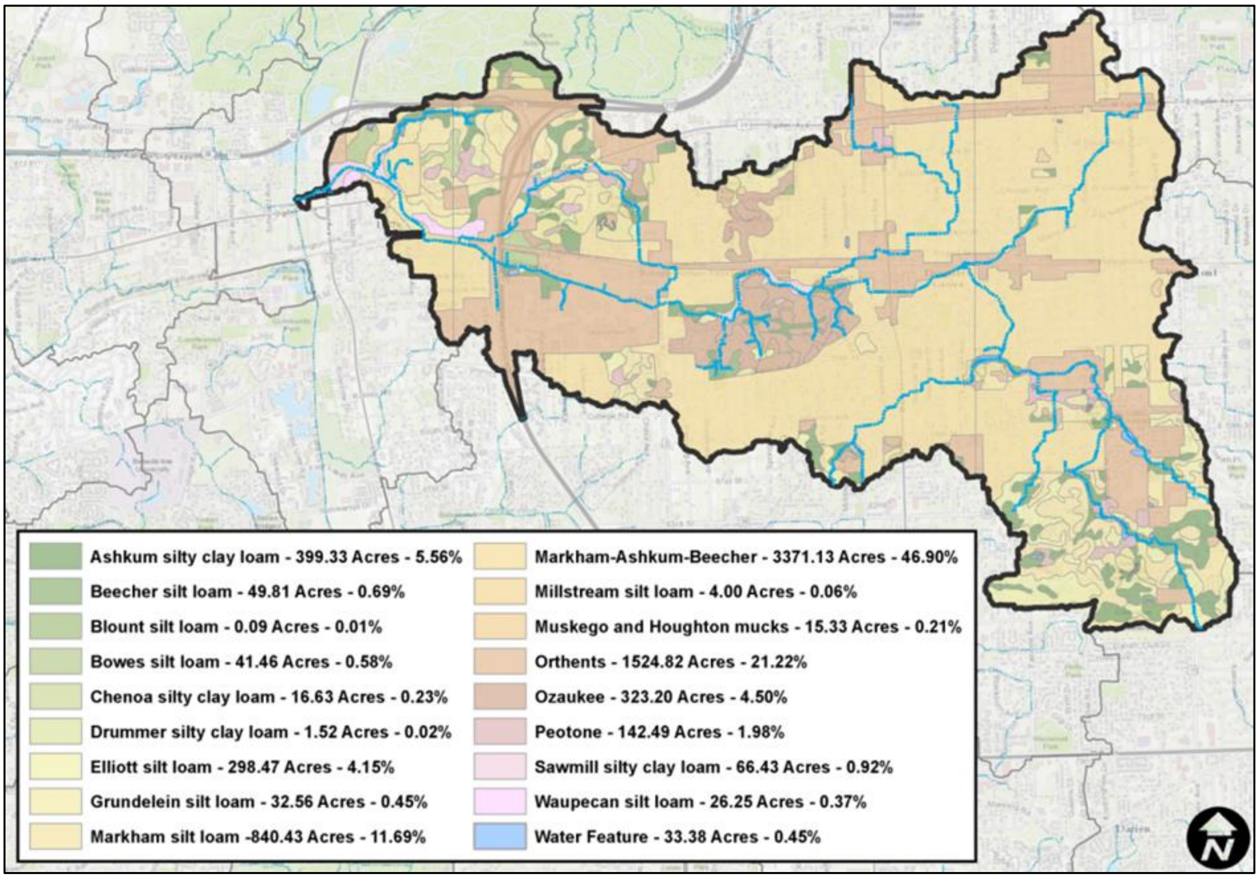

Figure 16 Soil composition of the St. Joseph Creek Watershed.

Series Name	Acres	% of Watershed	Texture
Ashkum	399.33	5.56%	silty clay loam
Beecher	49.81	0.69%	silt loam
Blount	0.009	0.01%	silt loam
Bowes	41.46	0.58%	silt loam
Chenoa	16.63	0.23%	silty clay loam
Drummer	1.52	0.02%	silty clay loam
Elliott	298.47	4.15%	silt loam
Grundelein	32.56	0.45%	silt loam
Markham	840.43	11.69%	silt loam
Markham-Ashkum-Beecher	3371.13	46.90%	

Millstream	4	0.06%	silt loam
Muskego and Houghton	15.33	0.21%	mucks
Orthents	1524.82	21.22%	
Ozaukee	323.2	4.50%	silty clay loam
Peotone	142.49	1.98%	silty clay loam
Sawmill	66.43	0.92%	silty clay loam
Waupecan	26.25	0.37%	silt loam
Water Feature	33.38	0.45%	

Table 3 St. Joseph Creek Watershed soil series data (NRCS).

3.3.3.1 Hydric Soils

According to the NRCS definition, a hydric soil is a soil that 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 an indicator of present or historic wetlands. When comparing the hydric soil map (Figure 17) with DuPage County's current wetland map, it is evident that a large number of wetlands have been drained in the St. Joseph Creek Watershed. As historic aerial photos from 1956 do not show these large wetland complexes, it can be inferred that the wetlands were drained during the installation of agricultural drain tiles nearly 200 years ago. If still in existence, these natural wetlands would have played a significant role in storing and slowly releasing floodwaters, providing essential habitat to wildlife and filtering stormwater before it entered the stream.

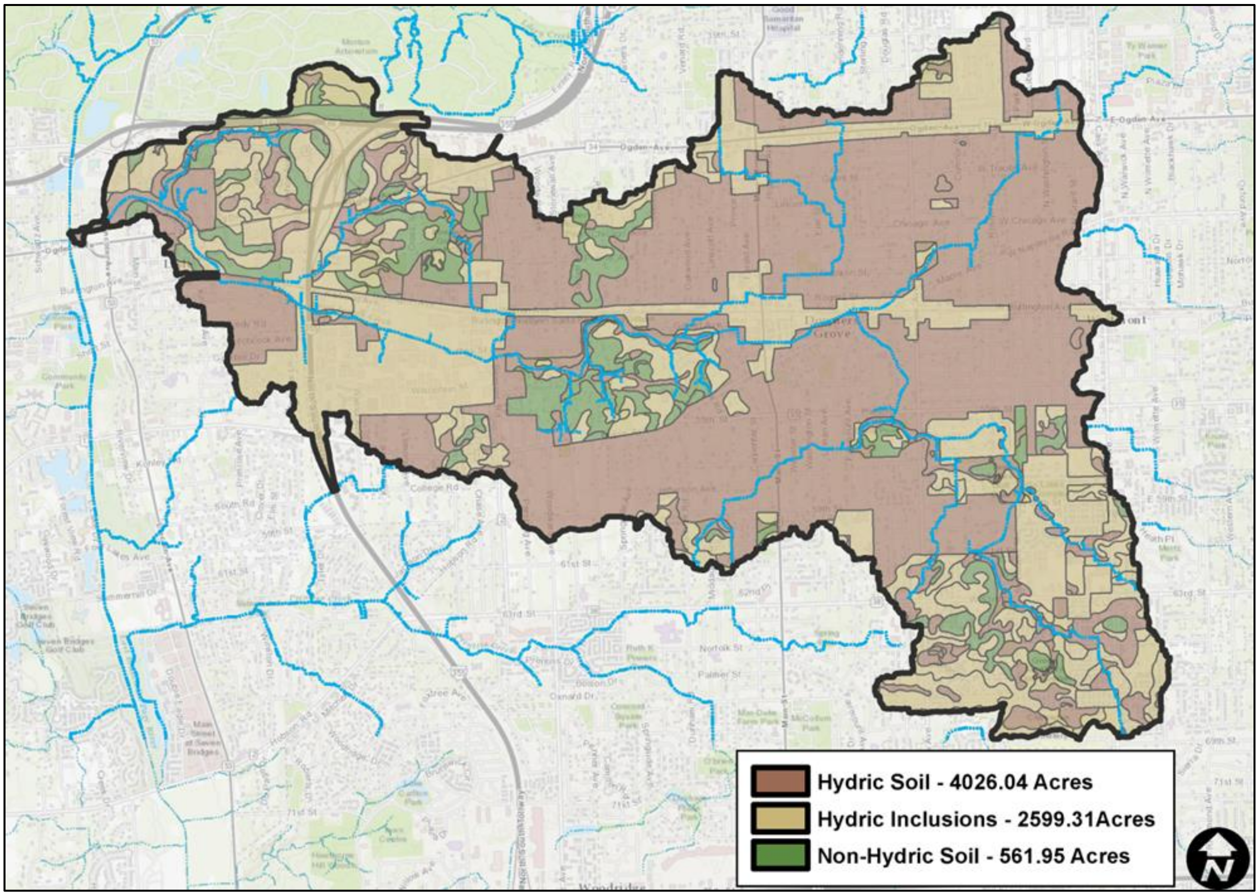

Figure 17 St. Joseph Creek Watershed mapped hydric soils (NRCS data).

3.3.3.2 Hydrologic Soil Groups

Hydrologic soil groups refer to the runoff potential of a soil. 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. 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.[12] Some finer textured soils may be included if they are well aggregated, of low bulk density, or have more than 35% rock fragment.[13]
- ***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.

[12] 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

[13] National Engineering Handbook

- ***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.

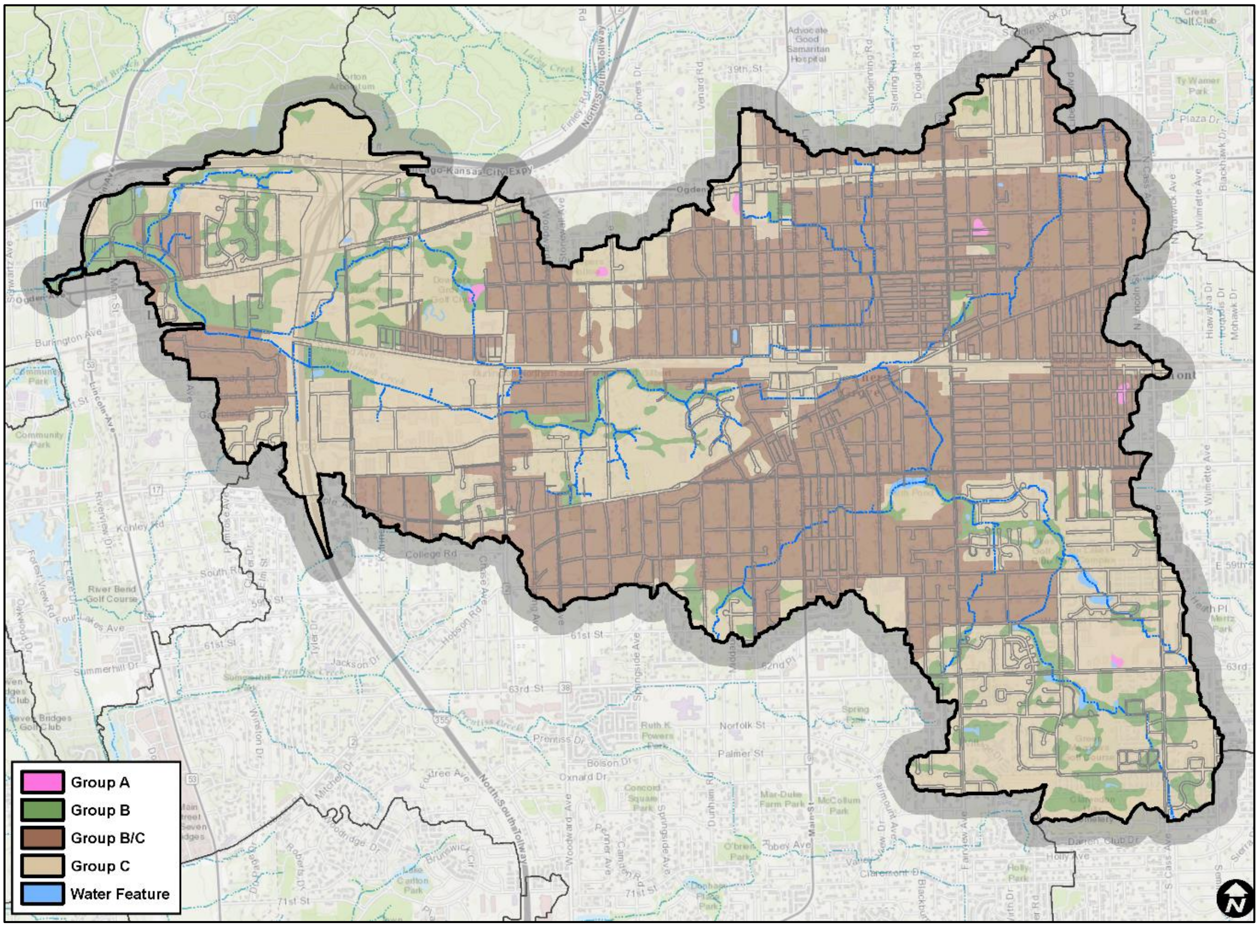

Figure 18 St. Joseph Creek Watershed hydrologic soil groups (NRCS data).

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 4 shows the soil properties for the St. Joseph 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.

3.3.3.3 Soil Drainage Class

Soil drainage class is defined by the NRCS as the frequency and duration of wet periods in conditions similar to those under which the soil formed. Drainage class can vary from excessively drained (water moves through soil very rapidly) to very poorly drained (water moves through soil very slowly).

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
Chenoa	N	Somewhat Poorly Drained	B	Moderate	Moderate	Moderate
Drummer	Y	Poorly Drained	B	Moderate	Moderate	Moderate
Elliott	N	Somewhat Poorly Drained	C	Moderate	Slow	Slow
Grundelein	N	Somewhat Poorly Drained	B	Moderate	Moderate	Moderate
Markham	N	Moderately Well Drained	C	Moderate	Slow	Slow
Markham-Ashkum-Beecher	Y	N/A	B/C	Moderate	Moderate/ Slow	Moderate/ Slow
Millstream	N	Somewhat Poorly Drained	B	Moderate	Moderate	Moderate
Muskego and Houghton	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
Waupecan	N	Well Drained	B	Moderate	Moderate	Moderate
Water Feature	N/A	N/A	N/A	N/A	N/A	N/A

Table 4 St. Joseph Creek Watershed soil properties.

3.3.3.4 Highly Erodible Soils

The erodibility value of a soil (K) is a measure of its susceptibility to erosion. Erosion can occur as sheet erosion, a flat rate of erosion over the entire surface, or rill erosion, the concentration of erosive flows to a central low point that create small runnels through the soil. Several factors contribute to the K factor of a soil, including 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).[14]

Fragment free soil erodibility (Kf) 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 a soil has greater susceptibility to erosion. The fragment free soil erodibility of the St. Joseph Creek Watershed is illustrated in Table 5.

Series Name	Erodibility (Kf)
Ashkum	0.2
Beecher	0.37
Blount	0.37
Bowes	0.32
Chenoa	0.28
Drummer	0.24
Elliott	0.32
Grundelein	0.32
Markham	0.37
Markham-Ashkum-Beecher	0.37
Millstream	0.32
Muskego and Houghton	NA
Orthents	0.32
Ozaukee	0.43
Peotone	0.24
Sawmill	0.24
Waupecan	0.37
Water Feature	N/A

Table 5 St. Joseph Creek Watershed soil erodibility.

3.4 Land Use & Land Cover

Land use in the St. Joseph Creek Watershed is dominated by single-family residential, comprising more than 45% of the land area. Transportation is a disproportionately large segment of the land area using

---

[14] 2016, United States Department of Agriculture- Agricultural Research Service. https://www.ars.usda.gov/southeast-area/oxford-ms/national-sedimentation-laboratory/watershed-physical-processes-research/docs/revised-universal-soil-loss-equation-rusle-welcome-to-rusle-1-and-rusle-2/

RUSLE is calculated as: A=R x K x L x S x C x 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

more than 23%, which is likely due to the two major tollways that intersect within the Watershed. The remaining 32% of the planning area's land use is a combination of commercial, industrial, institutional, multifamily, agricultural and open space.

Evaluating land uses of a watershed is an important step in understanding the watershed conditions and source dynamics. Land use types, together with other physical features such as soils and topography, influence the hydrologic and physical nature of the watershed. In addition, land use distribution is often related to the activities in the watershed and, therefore, pollutant stressors and sources. Sources are often specific to certain land uses, providing a logical basis for identifying or evaluating sources.

3.4.1 Historical Land Cover

Like most Midwestern areas, the St. Joseph Creek Watershed was originally a tallgrass prairie. Following European settlement of North America, the land became agricultural until the 1900s when residential developments became its main occupant, some areas quite dense by the mid-20th century as demonstrated in Figure 19.

By 2014, most of the remaining vacant land in the Watershed was developed to consist of relatively dense homes and small yards, along with clustered commercial buildings and impervious surfaces to support this development, such as roads and parking lots. Any new development today consists of redeveloping already built upon land.

Figure 19 Typical land use in St. Joseph Creek Watershed in 1956 (left) versus 2014 (right).

3.4.2 Impervious Surfaces

With development comes an increase in impervious surfaces, such as roads, driveways, sidewalks and rooftops, and the St. Joseph Creek Watershed is no exception. Of the Watershed's approximately 10,240 acres, more than 2,538 acres – or 35% of the Watershed – has impervious cover (Figure 20). 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.

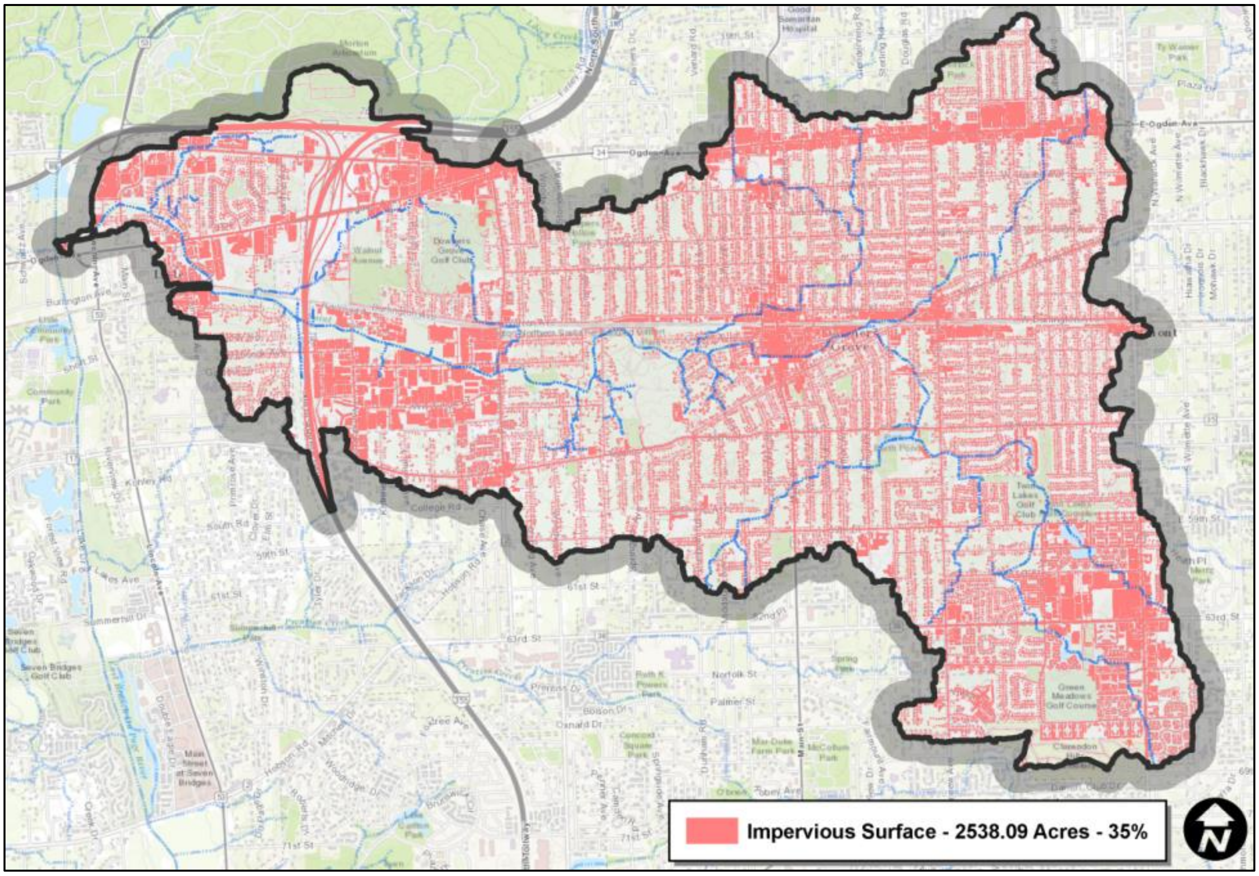

Figure 20 St. Joseph Creek Watershed impervious surface cover.

Of particular concern is the amount of impervious road cover in the planning area with public roads occupying 419 lane miles within the St. Joseph Creek Watershed. These roadways account for 56% - or 1,418 acres – of the Watershed's total impervious cover (Table 6). A significant amount of polluted stormwater runoff generated in the Watershed is conveyed to St. Joseph Creek and its tributaries along these transportation corridors.

Entity	Lane Miles	Lane Acres
DuPage County	49.81	92.55
Village of Darien	3.90	11.68
Village of Downers Grove	185.78	722.17
Village of Lisle	18.11	112.25
Lisle Township	14.27	32.57
Downers Grove North Township	11.88	27.45
York Township	0.31	0.42
Village of Westmont	66.28	247.25
Tollway	54.66	127.19
IDOT	14.10	44.69

Table 6 St. Joseph Creek Watershed lane miles.

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 21 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 22).

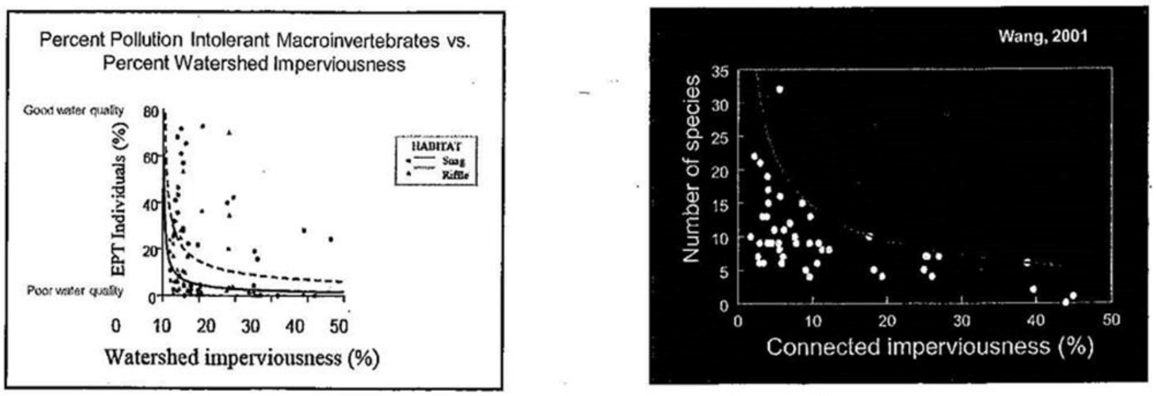

Figure 21 Comparison of impervious cover in a watershed to aquatic species.[15]

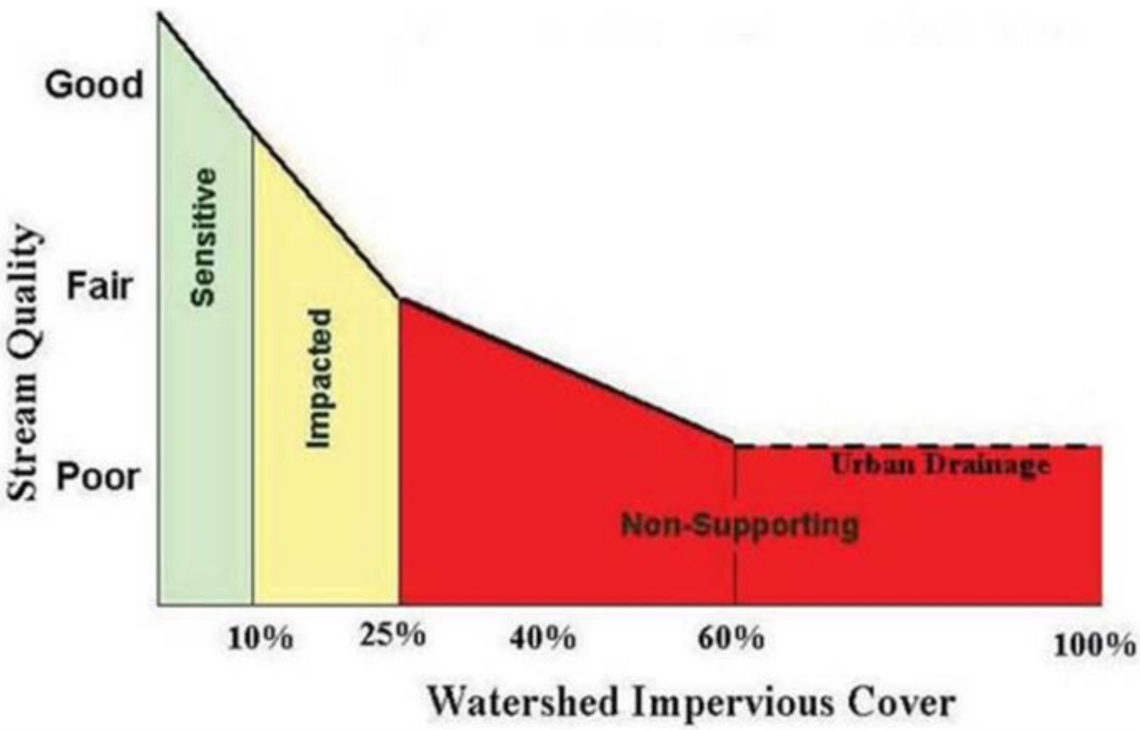

Figure 22 Comparison of stream quality to impervious cover in a watershed.

[15] Images taken from Meeting TMDL, LID and MS4 Stormwater Requirements: Using WinSLAMM to assess.

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.[16] Wetlands also contribute to groundwater supply by filtering stormwater runoff though 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.[17]

In the St. Joseph Creek Watershed, there are currently 144.5 acres of wetlands, which accounts for approximately 2% of the Watershed's surface area (Figure 23). However, hydric soils – an indicator of historic wetlands – are present on more than 4,026 acres of the Watershed, which accounts for 56% of the planning area. As discussed earlier, less than 3% of these historic wetlands remain today because of agricultural uses in the Watershed. More recently, developers buried streams in pipes and dug out wetlands for construction purposes.

---

[16] 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

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

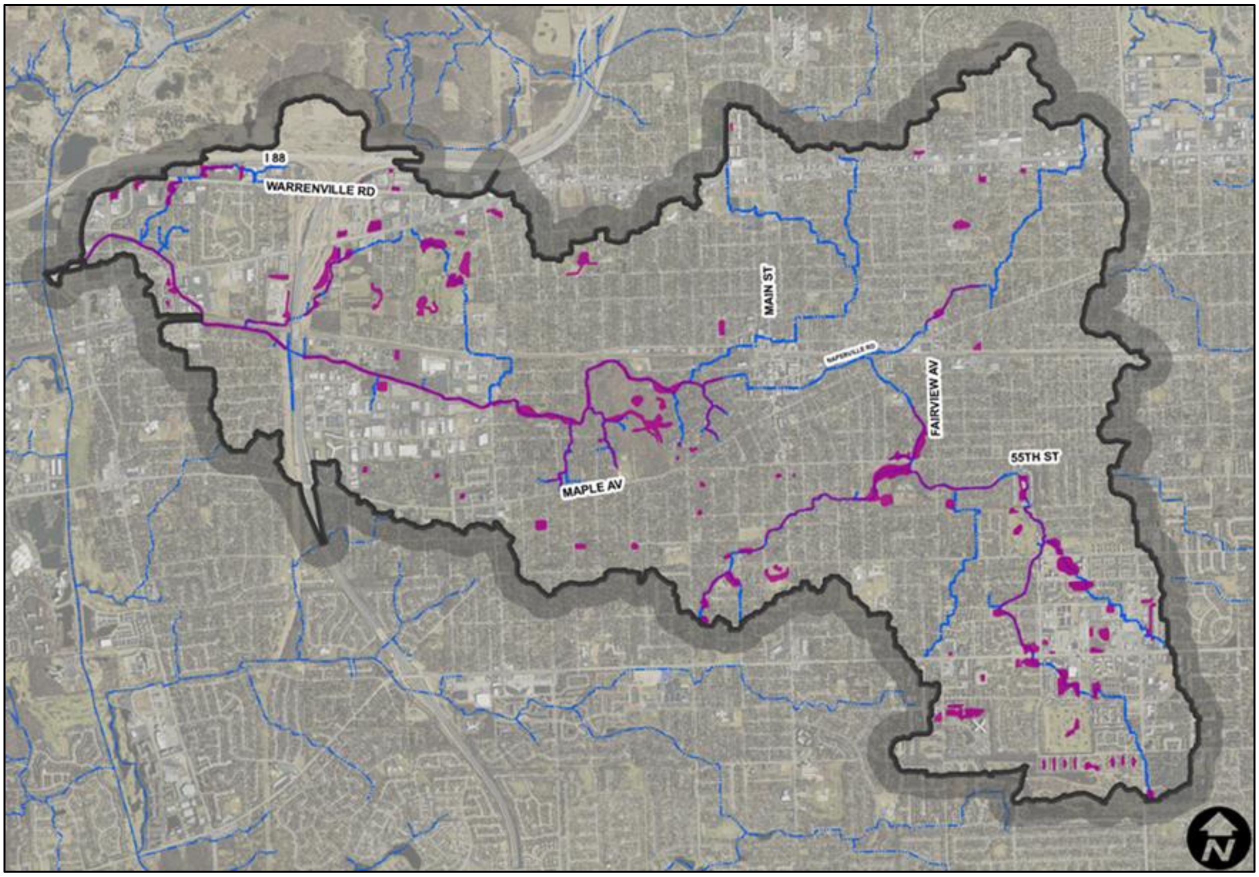

Figure 23 St. Joseph Creek Watershed wetlands.[18]

Of the wetlands that remain in the planning area, there are some critical wetlands found in Maple Grove Forest Preserve, illustrated in Figure 24. 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 St. Joseph Creek, while others are isolated.

[18] 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 24 Critical wetlands found in Maple Grove Forest Preserve.

3.4.4 Open Space

Another result of the significant development in the St. Joseph Creek Watershed is a decrease in open space. The Watershed has just over 460 acres of open space, which is only 6% of the surface area (Figure 27). 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. Some of the notable open spaces in the planning area include:

- ***Barth Pond:*** Also located on DGPD property, Barth Pond is the largest waterbody in the Watershed spanning approximately 6.5 acres. Much of the shoreline is surrounded by limestone outcropping, and Canada geese are frequent visitors.

Figure 25 Barth Pond. Downers Grove Park District.

- ***Belmont Prairie:*** Located in Downers Grove and owned by the Downers Grove Park District (DGPD), Belmont Prairie is a small remnant prairie. It's approximately 10 acres, but is also surrounded by more than 15 acres buffer. Containing both wet and dry communities, the prairie is home to many native plant and animal species. It was dedicated as an Illinois Nature Preserve in 1994.[19]

[19] http://www.dgparks.org/places-to-go/nature-preserves

Figure 26 Belmont Prairie. Downers Grove Park District.

- ***Maple Grove Forest Preserve:*** Owned by the FPDDC, Maple Grove Forest Preserve is located in the central part of the Watershed, north of Maple Avenue, south of the Burlington Northern Railroad line and west of Main Street. This 82-acre preserve is one of the oldest in the County, and its maple forest community is the largest remnant area remaining from the once expansive maple forest that existed in the planning area.[20]

[20] www.dupageforest.com/Conservation/Forest_Preserves/Maple_Grove.aspx

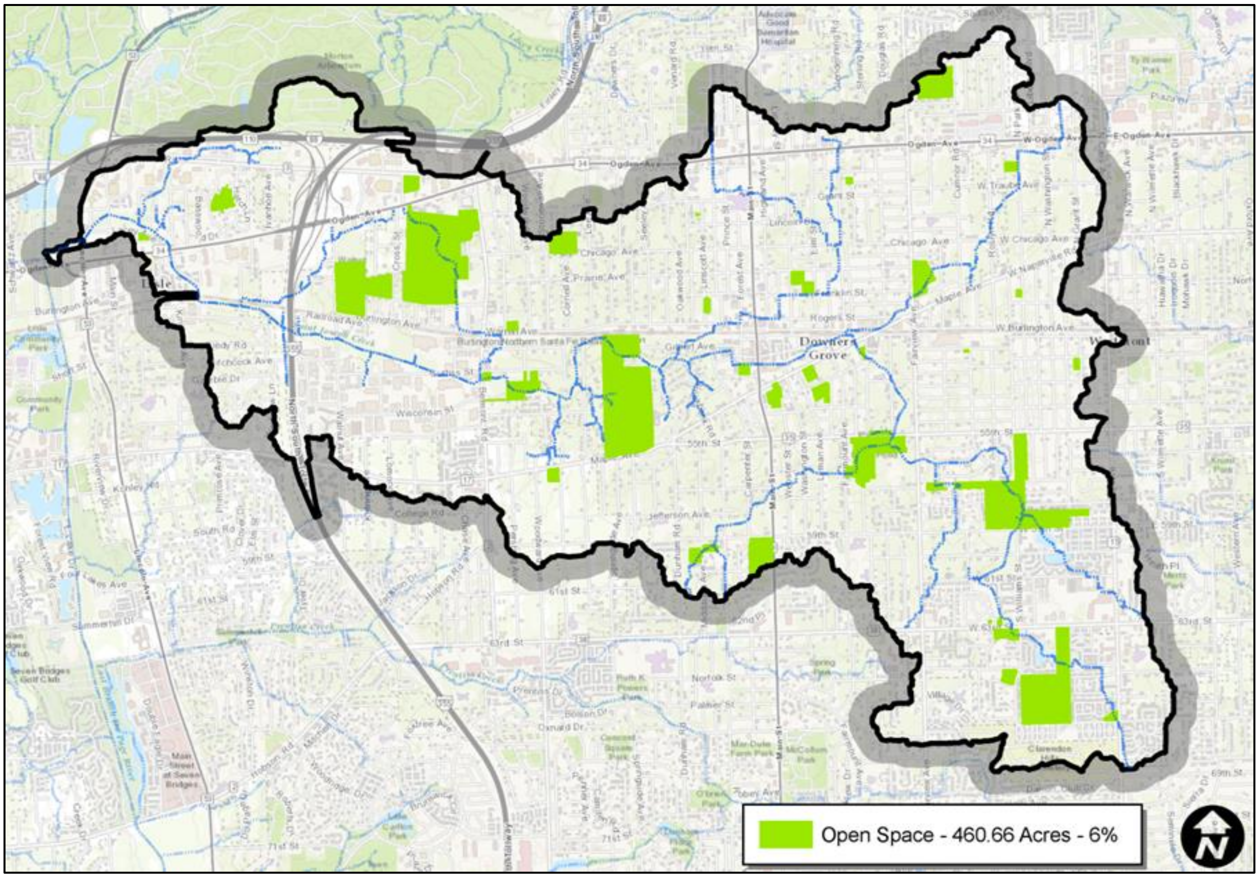

Figure 27 St. Joseph Creek Watershed open space.

3.5 Water Resource Conditions

3.5.1 Watershed Drainage System

As previously mentioned, the St. Joseph Creek Watershed is located in the southeastern part of DuPage County and drains stormwater from three townships and four municipalities. The Watershed boundaries include the northern most part of the watershed is north of Ogden Ave; the southernmost part of the watershed is south of 63rd St. and north of 75th St; the furthest point east in the watershed is east of Cass Ave; and the furthest point west is west of Route-53. Ten different streams run through St. Joseph Creek Watershed, including EBSJ001 (mainstem), EBSJ002, EBSJ003, EBSJ004, EBSJ005, EBSJ006, EBSJ007, EBSJ008, EBSJ009 and EBSJ010. There are also 26 smaller tributaries that are generally labeled EBSJ000. The St. Joseph Creek mainstem (EBSJ001) begins around Cass Avenue south of 63rd Street and travels north crossing under 63rd Street where it meets with tributary EBSJ010 between 56th and 63rd Streets. EBSJ001 then turns north-west and connects with EBSJ009 just east of Fairview Ave. The mainstem then travels northwest to the confluence with EBSJ008 at Barth Pond just south of 55th St and Grand Ave. The stream then flows roughly north before meeting with EBSJ007 and EBSJ006 around the crossing of the Burlington Northern Railroad. After connecting with EBSJ007 and EBSJ006, the mainstem begins traveling west, crossing Main Street before connecting with EBSJ011 just south of Gilbert Avenue. Continuing its western course, the mainstem meets EBSJ005 at Gilbert Park and EBSJ004 at Belmont Road. Proceeding northwest under I-355, EBSJ001 connects with the tributary EBSJ003, crosses north under Ogden Avenue and connects with EBSJ002. Finally the stream reaches its confluence with the East Branch DuPage River west of Route 53 and north of Ogden Avenue.

Stormwater within the St. Joseph Creek Watershed flows in a general north-west direction beginning near Cass Avenue until changing course and flowing west near Maple Avenue. St. Joseph Creek continues to flow in a westerly direction until reaching the East Branch of the DuPage River.

Of the estimated 139,148 linear feet of St. Joseph Creek, approximately 55,235 feet – or 39.6% – of the stream length is piped (Figure 28). Much of the piped segments are within the headwaters and culverts for road crossings.

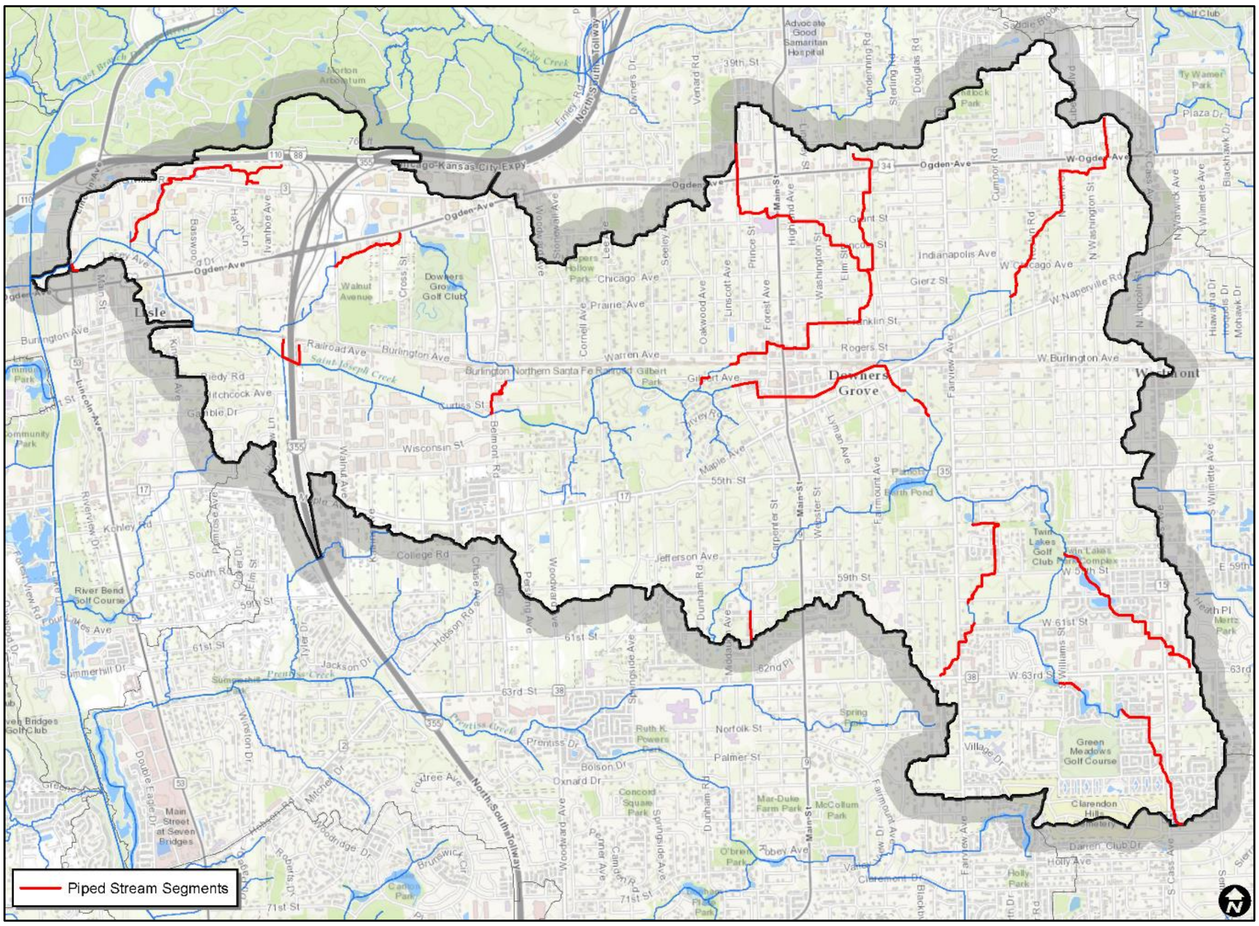

Figure 28 Piped stream segments of St. Joseph Creek.

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. One low head dam was observed within St. Joseph's Creek. This sheet pile dam is located just east of the Belmont Street crossing.

Figure 29 Sheet pile dam east of Belmont St.

3.5.2 Physical Stream Conditions

During the development of the Plan, DuPage County staff performed stream assessments along St. Joseph Creek and its tributaries, where possible, to identify sediment accumulation, streambank erosion, channelization and riparian buffer. Figure 30 shoes the 30 data collection points and 10 reaches, outlined above.

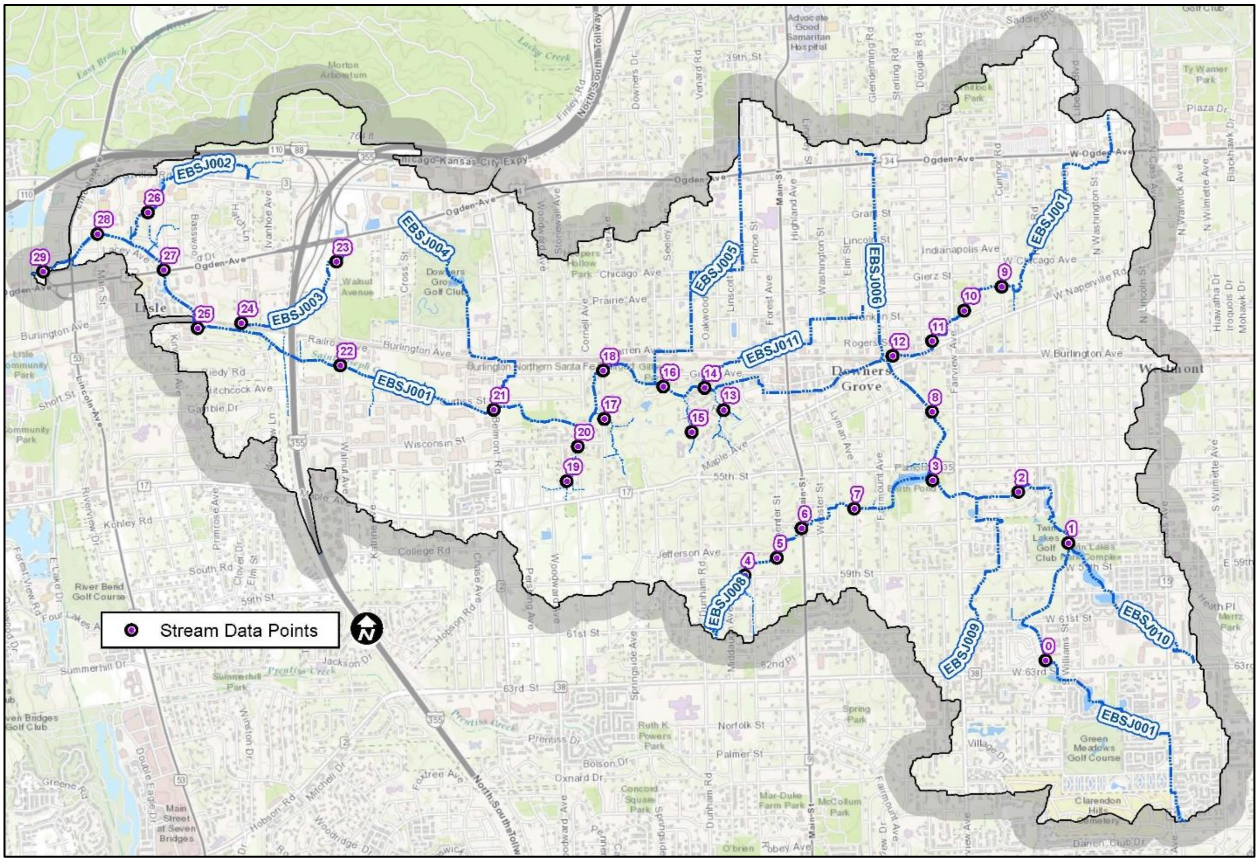

Figure 30 Stream assessment points for St. Joseph Creek.

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 St. Joseph 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 30 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 31, sediment accumulation for St. Joseph Creek is moderate to high in most points of the stream.

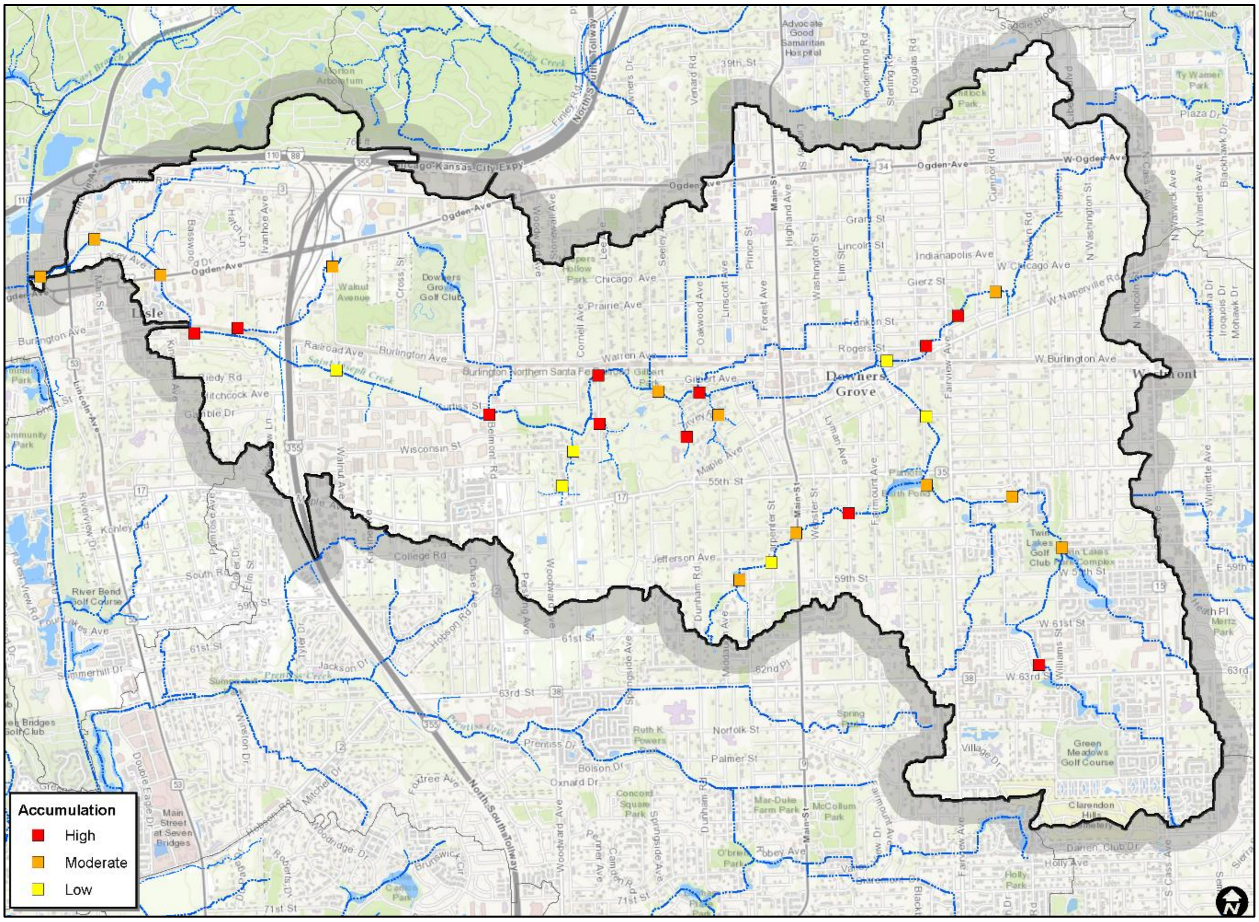

Figure 31 Sediment accumulation along St. Joseph Creek.

3.5.2.2 Streambank Erosion

Erosion is a natural process allowing for the continued renewal of rivers, streams and creeks. However, urbanization in a watershed can cause this natural process to accelerate, which can lead to poor water quality, increased flooding or even damage to surrounding properties. A variety of factors affects erosion of streambanks, including soil type, slope, precipitation, vegetation cover and management practices.

Figure 32 Erosion along St. Joseph Creek in the Village of Downers Grove.

When assessing streambank erosion on St. Joseph Creek, both sides of stream were evaluated at each of the 30 data points for erosion. Shown in Table 7, a total of 3,546 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, 56.9% of the streambank assessed exhibited no erosion, meaning there is little potential for future problems in these areas. Another 29.1% has moderate erosion, meaning the bank was moderately stable with small areas of erosion. However, 13.7% has severe erosion, which leaves the bank relatively unstable and vulnerable for increased erosion. None of the banks assessed had very severe erosion. Figure 33 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 Name	Reach Code	Length Assessed (ft)	No Erosion (ft/%)		Moderate Erosion (ft/%)		Severe Erosion (ft/%)		Very Severe Erosion (ft/%)	
St. Joseph	000	405	121	30	203	50	81	20	0	0
St. Joseph	001	1,785	892	50	571	32	322	18	0	0
St. Joseph	002	60	60	100	0	0	0	0	0	0
St. Joseph	003	165	41	25	42	25	82	50	0	0
St. Joseph	004	0	0	0	0	0	0	0	0	0
St. Joseph	005	0	0	0	0	0	0	0	0	0
St. Joseph	006	0	0	0	0	0	0	0	0	0
St. Joseph	007	900	675	75	225	25	0	0	0	0
St. Joseph	008	231	231	100	0	0	0	0	0	0
St. Joseph	009	0	0	0	0	0	0	0	0	0

St. Joseph	010	0	0	0	0	0	0	0	0	0
Totals		**3,546**	**2,020**	**57%**	**1,041**	**29%**	**485**	**14%**	**0**	**0%**

Table 7 Erosion on St. Joseph Creek.

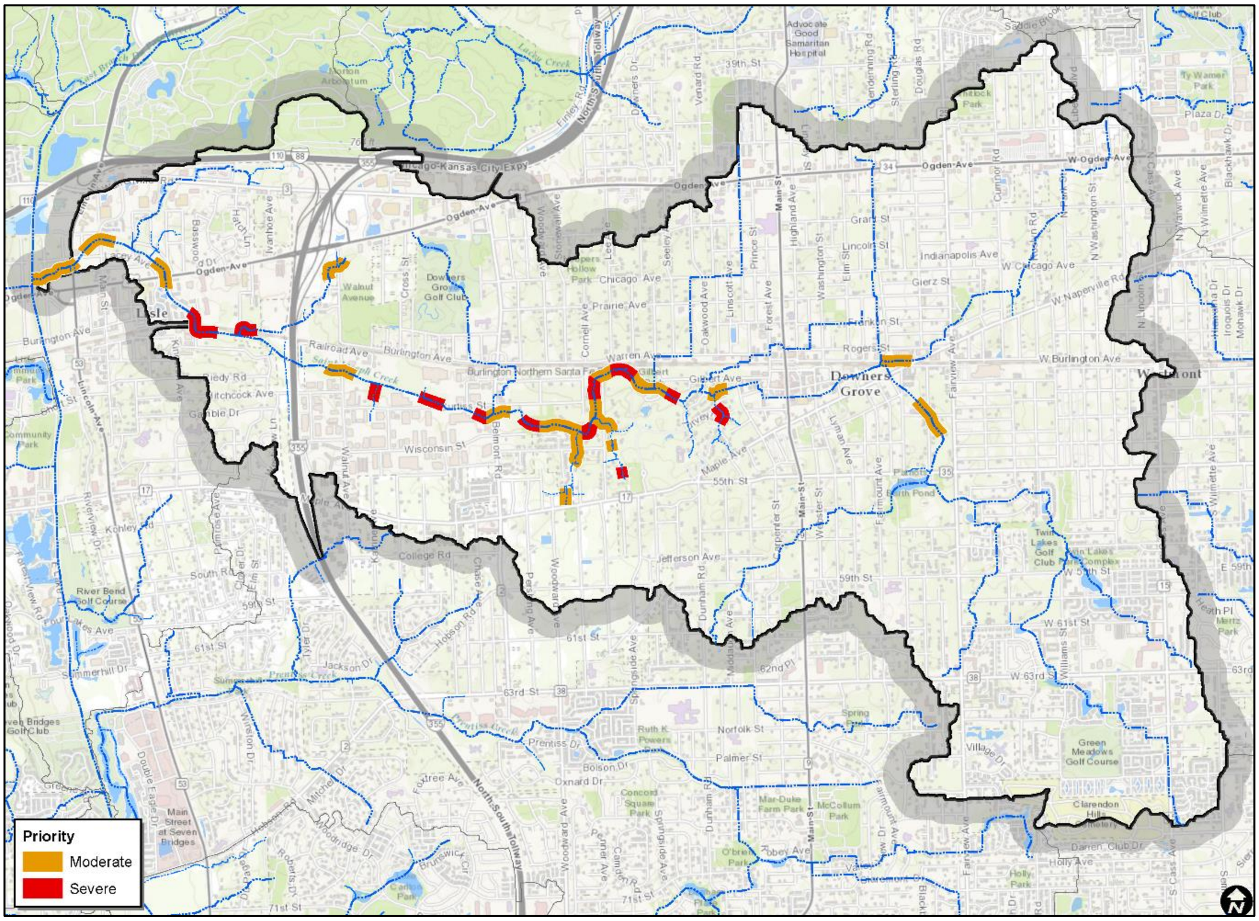

Figure 33 Points of streambank erosion in St. Joseph Creek Watershed.

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 Figure 34, of the 30 St. Joseph Creek sites assessed, 24 had no or very low evidence channelization, meaning there was a natural meander to the stream. Another 6 points exhibited moderate channelization, which is characterized by a straight channel with some concrete or armor, and 2 had high channelization, which is a straight channel with concrete streambed and banks. Shown in Table 8, only 22% of St. Joseph Creek exhibited moderate or high channelization.

It is important to remember in this section that St. Joseph Creek was buried and piped in several areas of the Watershed to allow for development in the mid-1900s (See Figure 19). As previously mentioned, nearly 40% of the stream length is piped, therefore, these areas were not evaluated as part of the stream assessments.

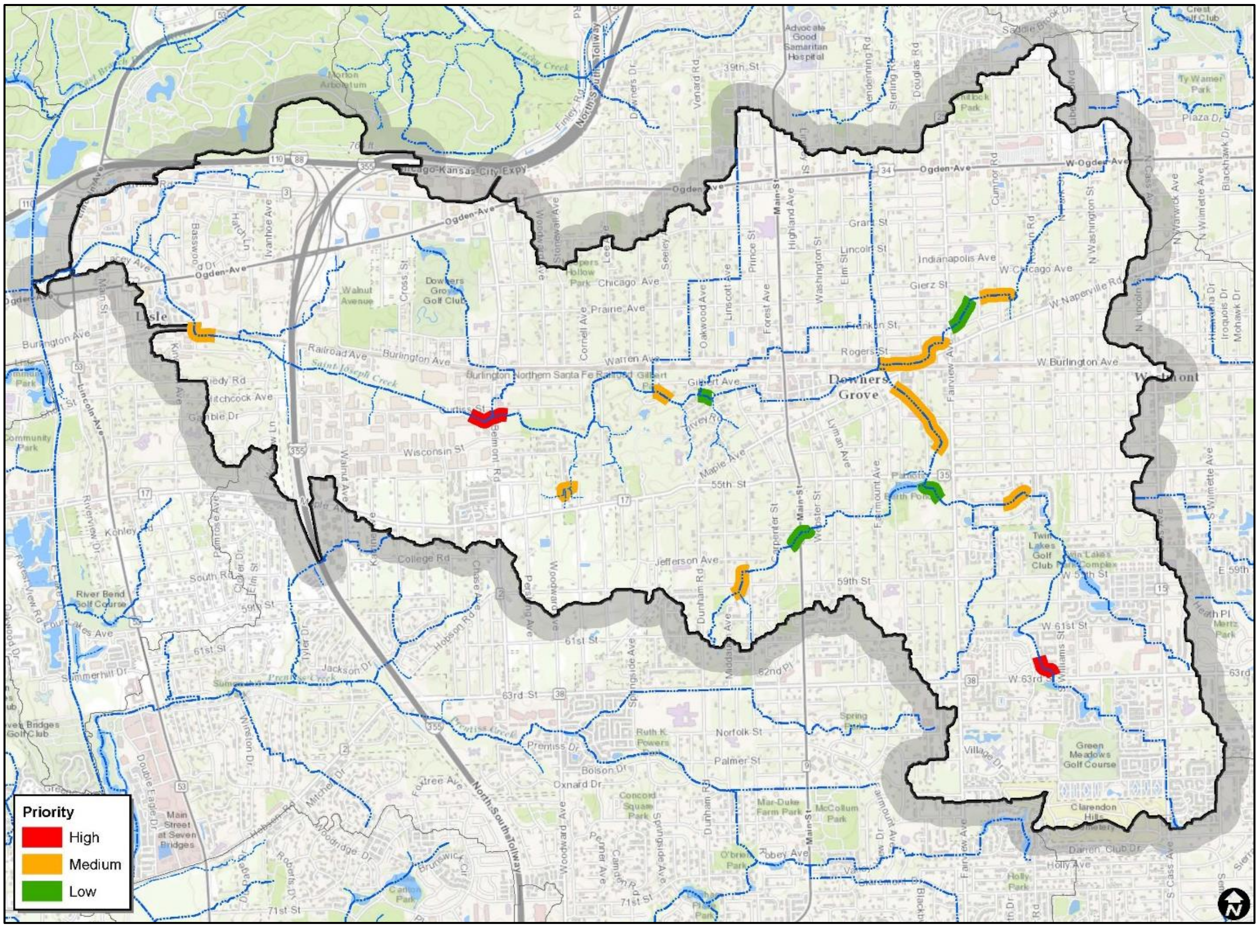

Figure 34 St. Joseph Creek channelization.

Stream Name	Reach Code	Stream Assessed (ft)	None or Low Channelization (ft/%)		Moderate Channelization (ft/%)		High Channelization (ft/%)	
St. Joseph	000	405	405	100	0	0	0	0
St. Joseph	001	1785	1285	72	250	14	250	14
St. Joseph	002	60	60	100	0	0	0	0
St. Joseph	003	165	165	100	0	0	0	0
St. Joseph	004	0	0	0	0	0	0	0
St. Joseph	005	0	0	0	0	0	0	0
St. Joseph	006	0	0	0	0	0	0	0
St. Joseph	007	900	675	75	225	25	0	0
St. Joseph	008	231	173	75	58	25	0	0
St. Joseph	009	0	0	0	0	0	0	0
St. Joseph	010	0	0	0	0	0	0	0
Total		**3546**	**2763**	**78%**	**533**	**15%**	**250**	**7%**

Table 8 Channelization in St. Joseph Creek.

3.5.2.4 Riparian Buffers

At each stream assessment location, the width of the riparian buffer was determined for each of the banks. For the purpose of this study, only naturally vegetated buffers were assessed as the DuPage Ordinance has established that mowed turf buffers provide little or no function to the stream system.[21] In fact, these areas of maintained turf can actually contribute to water quality issues with pesticides, herbicides and grass clippings running into the adjacent stream.

As shown in Figure 35, the width of the buffer varied throughout the Watershed, ranging from a high of more than 60 feet to a low of a zero-foot buffer. In some instances, developed area ran up to the edge of the stream. When considering the Watershed as a whole, the average riparian buffer width is only approximately 15 feet on either side of the stream.

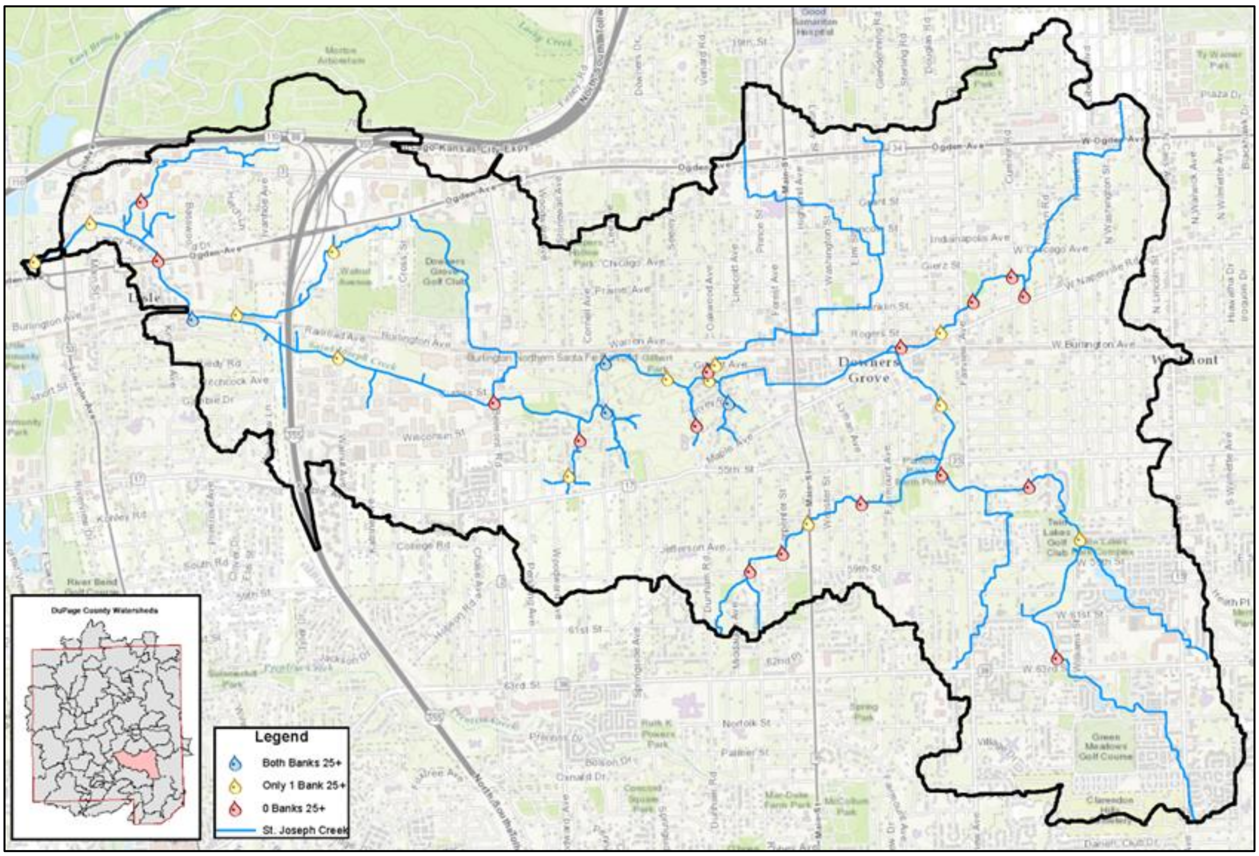

Figure 35 Vegetative Riparian Buffer Widths in St. Joseph Creek.

3.5.2.5 Overall Stream Condition

DuPage staff rated the overall stream condition of St. Joseph Creek using the results of the evaluations for erosion, channelization and sediment accumulation, summarized in Table 9.

ID	Reach	Channelization	Left Bank Erosion	Right Bank Erosion	Sediment Accumulation

[21] Japanese knotweed has been documented along the banks of St. Joseph Creek. This highly aggressive invasive species spreads by underground rhizomes and can quickly overtake streambanks crowding out native species.

1	EBSJ001	High	None	None	High
2	EBSJ001	None	None	None	Moderate
3	EBSJ001	Low	None	None	Moderate
4	EBSJ001	Moderate	None	None	Moderate
5	EBSJ008	Low	None	None	Moderate
6	EBSJ008	None	None	None	Low
7	EBSJ008	Moderate	None	None	Moderate
8	EBSJ008	None	None	None	High
9	EBSJ001	Low	None	Severe	Low
10	EBSJ007	Low	None	None	Moderate
11	EBSJ007	Moderate	None	None	High
12	EBSJ007	Low	None	None	High
13	EBSJ007	Low	Moderate	Moderate	Low
14	EBSJ000	None	Moderate	Moderate	Moderate
15	EBSJ001	Moderate	None	None	High
16	EBSJ000	None	Moderate	None	High
17	EBSJ001	Low	Moderate	Moderate	Moderate
18	EBSJ000	None	Severe	Severe	High
19	EBSJ001	None	Severe	Severe	High
20	EBSJ000	Low	None	None	Low
21	EBSJ000	None	Moderate	Moderate	Low
22	EBSJ001	High	None	None	High
23	EBSJ001	None	None	Moderate	Low
24	EBSJ003	None	None	Moderate	Moderate
25	EBSJ003	None	Severe	Severe	High
26	EBSJ001	Low	Severe	Severe	High
27	EBSJ002	None	None	None	None
28	EBSJ001	None	Moderate	Moderate	Moderate
29	EBSJ001	None	Moderate	Moderate	Moderate
30	EBSJ001	None	Moderate	Moderate	Moderate

Table 9 Stream assessment data for St. Joseph Creel Watershed.

As shown in Table 10, DuPage staff assessed that nearly half of the areas were in fair condition; however, another third of the areas were in poor condition. This data indicates that stream has been highly altered and degraded from its natural state.

Stream Name	Reach Code	Stream Assessed (ft)	Good Condition (ft/%)		Fair Condition (ft/%)		Poor Condition (ft/%)	
St. Joseph	000	405	81	20	243	60	81	20
St. Joseph	001	1,785	375	21	643	36	767	43
St. Joseph	002	60	60	100	0	0	0	0
St. Joseph	003	165	0	0	82	50	83	50

St. Joseph	004	0	0	0	0	0	0	0
St. Joseph	005	0	0	0	0	0	0	0
St. Joseph	006	0	0	0	0	0	0	0
St. Joseph	007	900	0	0	675	75	225	25
St. Joseph	008	231	115	50	116	50	0	0
St. Joseph	009	0	0	0	0	0	0	0
St. Joseph	010	0	0	0	0	0	0	0
Totals		**3,546**	**631**	**17.8%**	**1759**	**49.6%**	**1156**	**32.6%**

Table 10 Overall stream condition of St. Joseph Creek.

3.5.3 Stormwater Detention Basins

In an attempt to create a comprehensive inventory of detention basins throughout the St. Joseph 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 157 basins (Figure 36), rating each good, fair or poor.

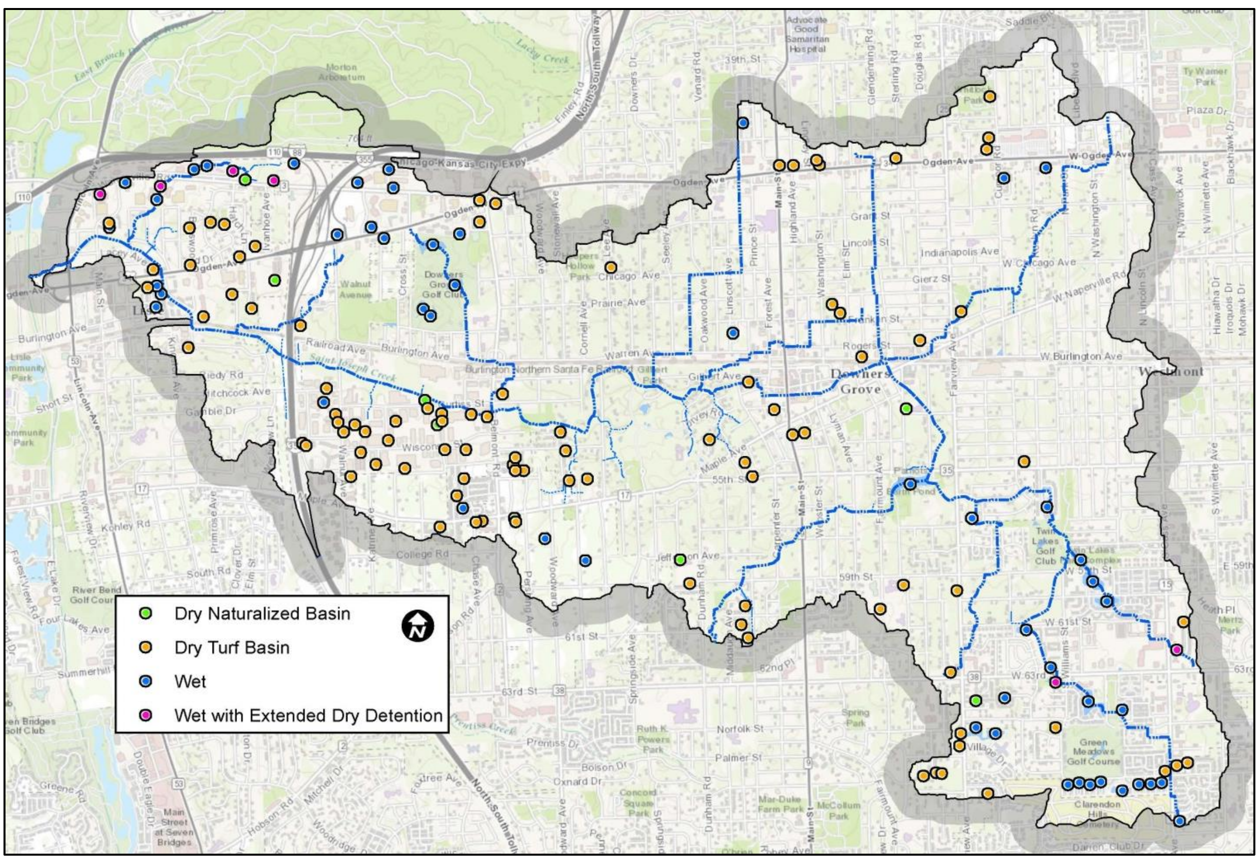

Figure 36 Types of detention basins in St. Joseph Creek Watershed.

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 120 basins within the watershed as poor, as shown in Table 11. 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	Wet w/ extended dry	constructed wetland	Good	Fair	Poor
Darien	3	1	2	0	0	0	0	3
Downers Grove	94	9	85	0	0	5	8	81
Lisle	28	9	15	4	0	2	5	21
Unincorporated DuPage	5	3	2	0	0	1	2	2
Westmont	27	20	5	2	0	1	13	13
Totals	**157**	**42**	**109**	**6**	**0**	**9**	**28**	**120**

Table 11 Detention basin assessments in the St. Joseph Creek Watershed.

3.5.4 Groundwater Evaluation

Groundwater is a valuable natural resource. Although much of DuPage County receives drinking water from Lake Michigan, there are approximately 215 residences within the St. Joseph Creek Watershed that receive drinking water from community or private groundwater wells (Figure 37). 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.[22]

[22] http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1595&

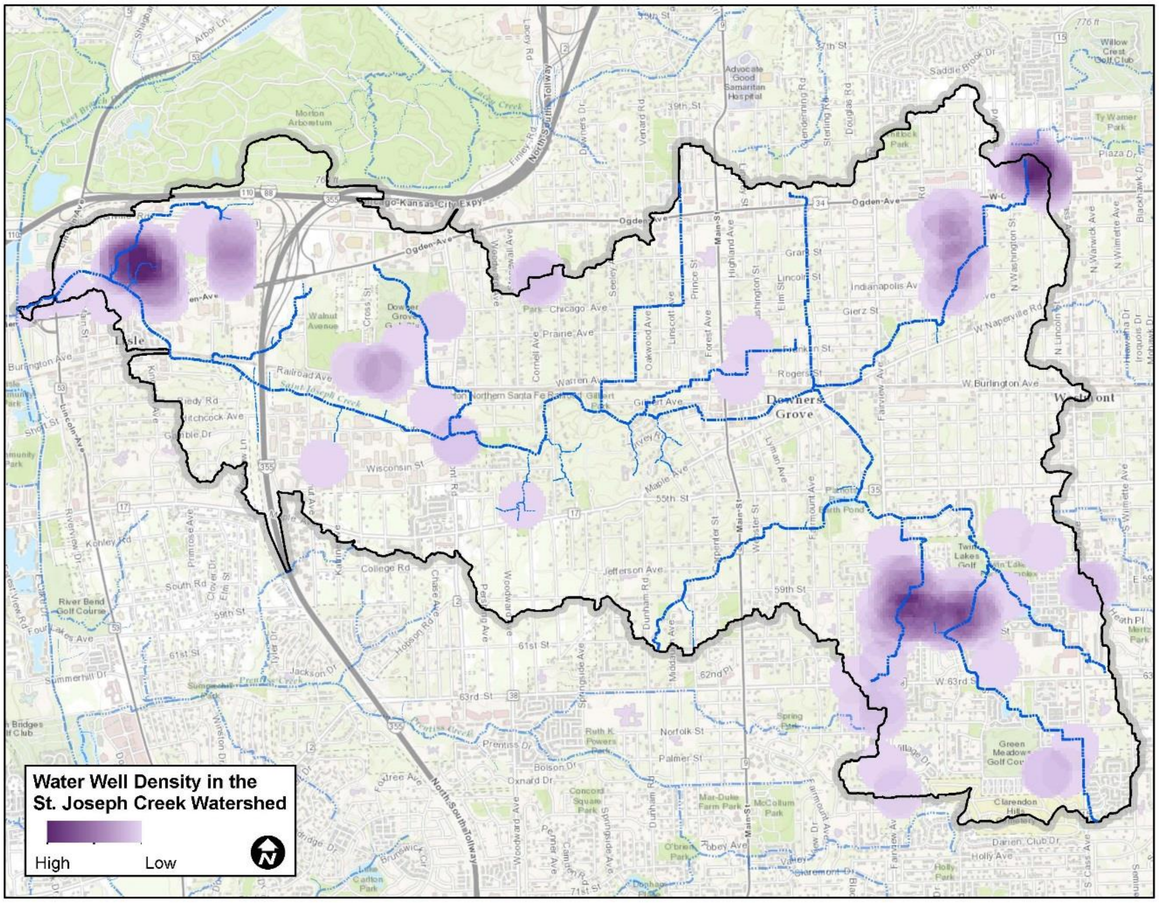

Figure 37 Density of private well water sources in St. Joseph Creek Watershed.[23]

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.[24] 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 38, 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.[25]

[23] http://www.rmms.illinois.edu/RMMS-JSAPI/
[24] Illinois Groundwater Protection Program, established under Section 17.2 of the IGPA
[25] https://pubs.usgs.gov/ha/730k/report.pdf

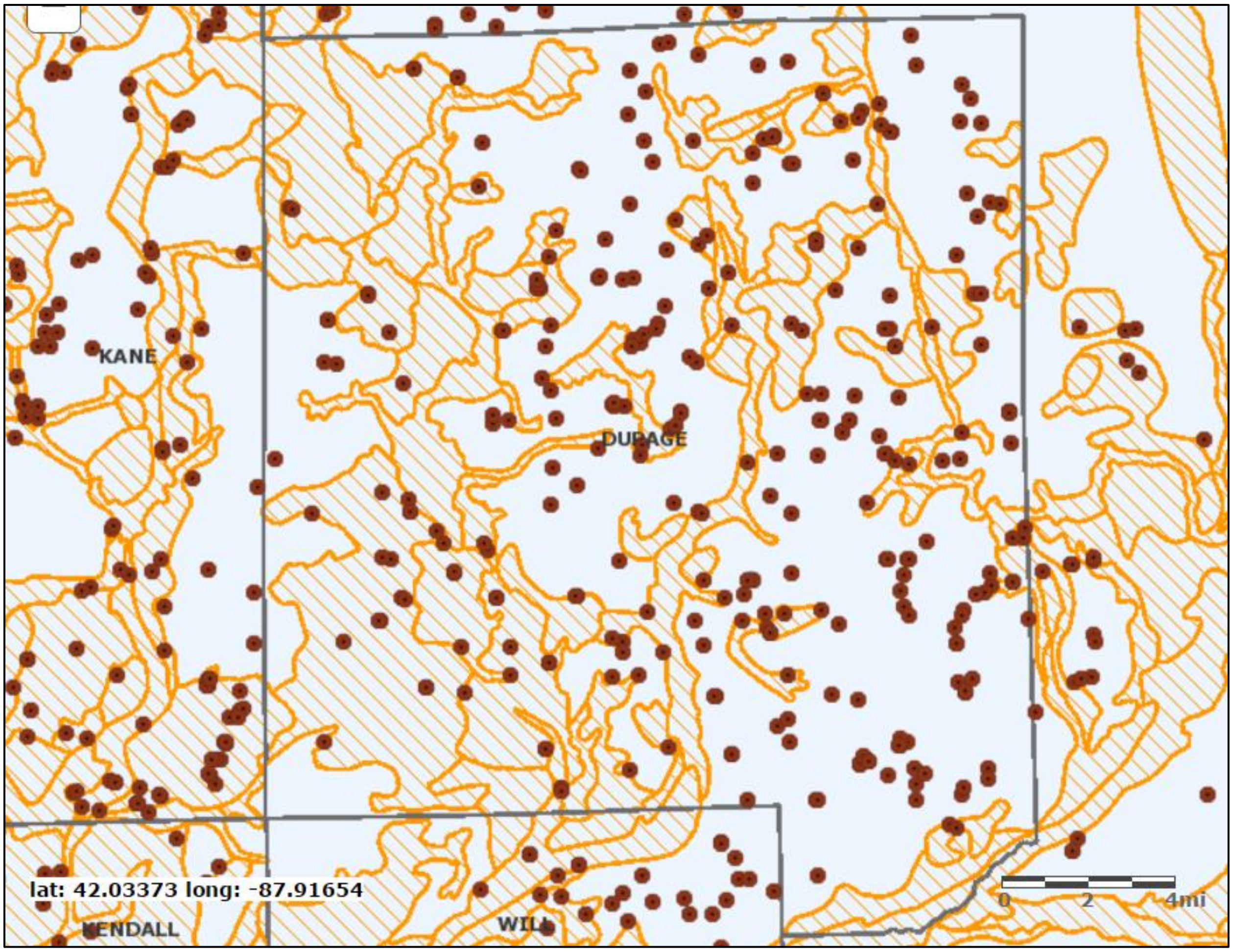

Figure 38 Potential aquifers and community wells in DuPage County.[26]

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

3.5.5 Surface Water Quality

[26] Less than 50 feet deep. http://www.rmms.illinois.edu/RMMS-JSAPI/

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 (CWA), the IEPA reports to the USEPA on the quality of Illinois surface water (i.e. lakes, streams and wetlands) and groundwater resources (Section 305(b)) and provide a list of those waters where their designated uses are deemed ‘impaired’ (Section 303(d)). There are seven designated uses in Illinois; however, only five of those uses apply within the St. Joseph Creek Watershed. These designated uses are aquatic life, fish consumption, primary contact, secondary contact and aesthetic quality.

St. Joseph Creek was first added to Illinois’ §303(d) list in 1998 as assessment unit IL_GBLB-01, which extends 4.29 miles from approximately 100 feet west of the bridge crossing at Carpenter Street downstream until the confluence with East Branch DuPage River. Figure 39 identifies IEPA’s monitoring station that accounts for St. Joseph Creek. Table 12 shows TSS, TP and Dissolved Oxygen (DO) values in the IEPA’s 1997 assessment that prompted GBLB-01’s inclusion on the list.

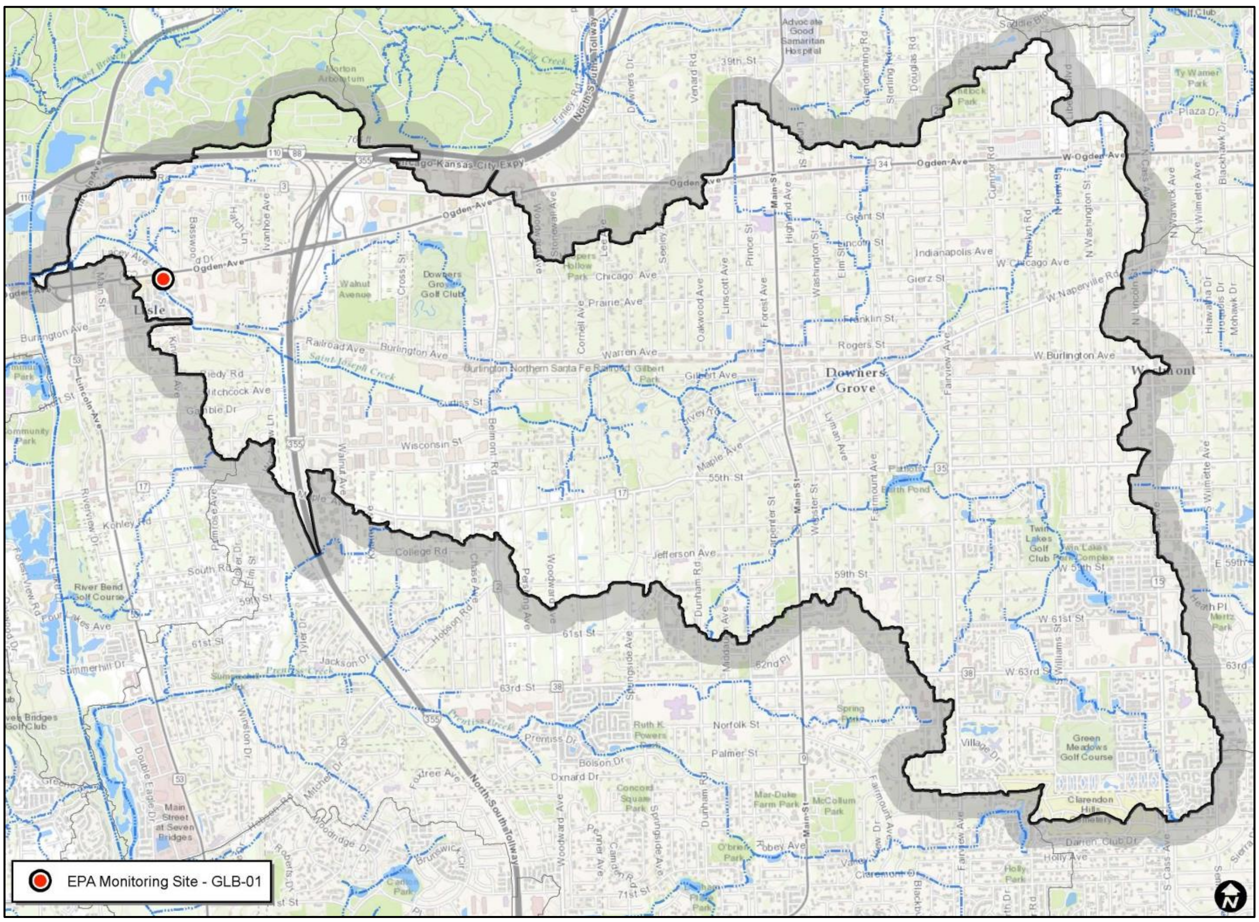

Figure 39 IEPA monitoring site GBLB-01.

Date	Time	Water Temperature (°C)	Total Phosphorus (mg/L)	Dissolved Oxygen (mg/L)	Total Suspended Solids (mg/L)
6/24/1997	6:50 AM	24.01	0.30	2.57	7

6/24/1997	1:45 PM	28.21	0.29	9.09	14
6/24/1997	7:00 PM	27.96	0.27	9.56	14
6/25/1997	2:30 AM	23.84	0.24	4.85	10
9/16/1997	7:30 AM	20.40	0.42	7.20	42
9/16/1997	1:25 PM	23.80	0.29	13.00	76
9/16/1997	7:15 PM	23.66	0.22	11.33	31
9/17/1997	3:45 AM	21.56	0.34	7.25	144

Table 12 IEPA's assessment of TP, DO and TSS at IL_GBLB-01 in 1997.

Of the five designated uses of St. Joseph 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 13). The primary reasons for this classification were due to inadequate levels of dissolved oxygen as well as excessive oil and grease as well as TSS (Tables 14).[27] Table 15 summarizes the causes and sources of these impairments, and the next section discusses them in further detail.[28]

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 13 IEPA's St. Joseph Creek 2016 determination of designated uses.

Waterbody	Assessment Unit ID	Size	Causes of Impairment(s)	Sources of Impairment(s)
St. Joseph Creek	IL_GBLB-01	4.29 miles	Alteration in stream-side or littoral vegetative covers; oil and grease; dissolved oxygen; total suspended solids (TSS); aquatic algae; and other flow regime alterations.	Channelization; loss riparian habitat; site clearance (land development or redevelopment); streambank modifications/destabilization; municipal point source discharges; urban runoff/storm sewers; and source unknown.

Table 14 Assessment Information for waterbodies in the St. Joseph Creek Watershed.

Waterbody	Assessment Unit ID	Size	Impaired Designated Use	Causes of Impairment(s)
St. Joseph Creek	IL_GBLB-01	4.29 miles	Aquatic Life	Oil and Grease
St. Joseph Creek	IL_GBLB-02	4.29 miles	Aquatic Life	Dissolved Oxygen
St. Joseph Creek	IL_GBLB-03	4.29 miles	Aquatic Life	Total Suspended Solids (TSS)

Table 15 303(d) Information for waterbodies in the St. Joseph Creek Watershed.

[27] as identified in the 303(d) list (Appendix A-2) of the 2016 Integrated Report
[28] as identified in Appendix B-2 of the 2016 Integrated Report

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.

3.5.5.2 Other Stream Studies

In October 2009, the IEPA finalized the DuPage River/Salt Creek Watershed TMDL Stage 1 Report, which describes the initial stages in development of a Total Maximum Daily Load (TMDL) for 17 waterbodies throughout those watersheds.[29] A TMDL is an estimation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. It assesses contributing point and nonpoint sources to identify pollution reductions necessary for designated use attainment. Pollutant reductions are then allocated to contributing sources, thus triggering the need for pollution control and increased management responsibilities among sources in the watershed.

In response to concerns about the TMDL that was being developed, a local group of communities, Publically Owned Treatment Works (POTWs) and environmental organizations, organizing under the DRSCW, came together to better determine the stressors to the aquatic systems through a long-term water quality monitoring program, and, ultimately, develop and implement viable remediation projects. The DRSCW began collecting data throughout the East Branch DuPage River watershed in 2007 and established three monitoring stations to collect chemical, biological and habitat information along St. Joseph Creek. As shown in Figure 40, the three monitoring points along St. Joseph Creek are: just west of the intersection of 56th Street and Cumnor Road (EB10); approximately 80 feet downstream of the Jacqueline Drive bridge crossing (EB08); and just upstream of the St. Joseph Creek Road bridge crossing (EB07).

[29] AECOM. 2009. Document No. : 10042-003-501. http://www.epa.illinois.gov/Assets/iepa/water-quality/watershed-management/tmdls/reports/dupage-river-salt-creek/stage1.pdf

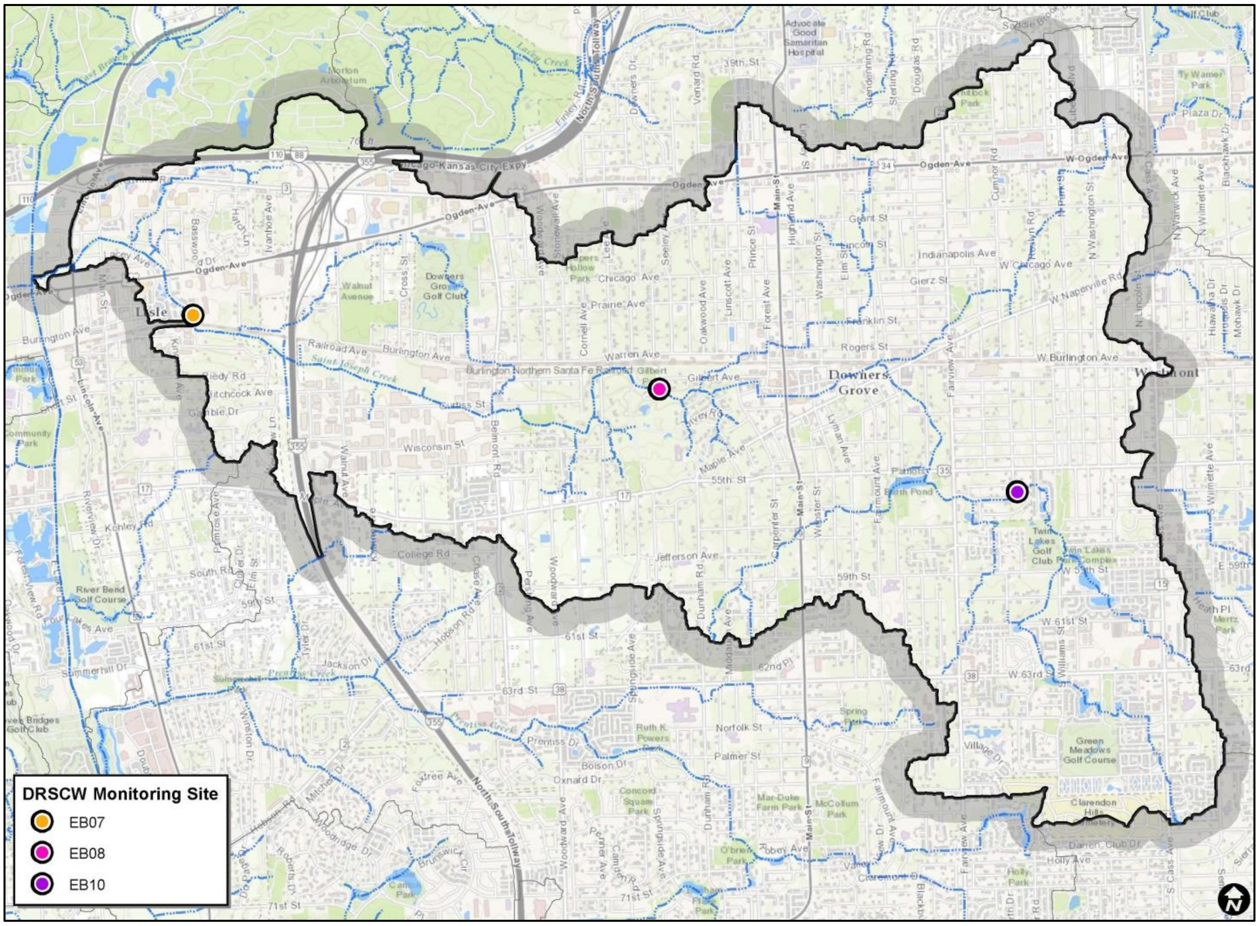

Figure 40 DRSCW monitoring sites along St. Joseph Creek.

At each of these collection points, fIBI (Figure 41), mIBI (Figure 42) and Qualitative Habitat Evaluation Index (QHEI) (Figure 43) data was collected in 2007, 2011 and 2014. Two of the monitoring stations, EB08 and EB10, had both fIBI and mIBI indicating a severe impairment in stream quality. Station EB07 had scores indicating a moderate to severe impairment.

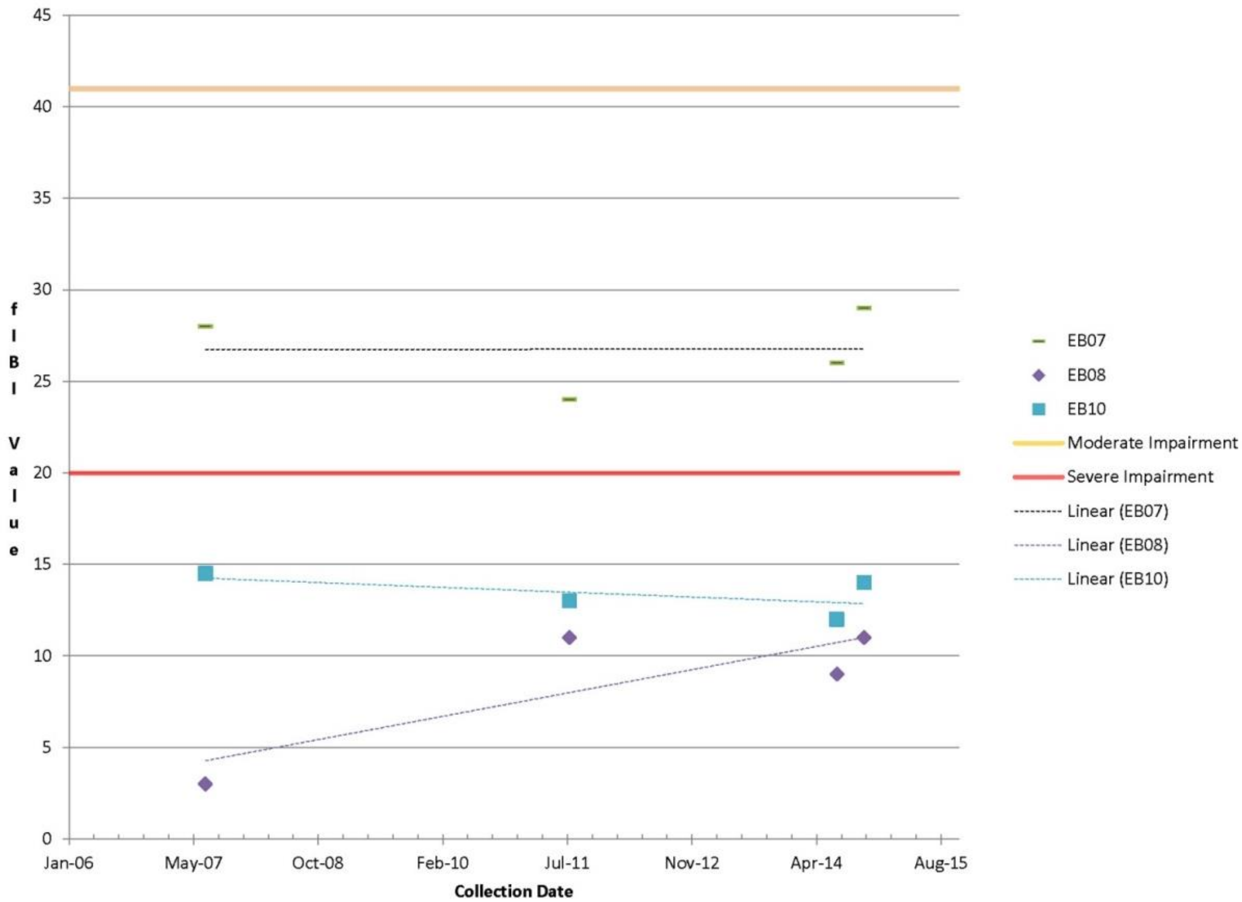

Figure 41 fIBI scores for St. Joseph Creek.

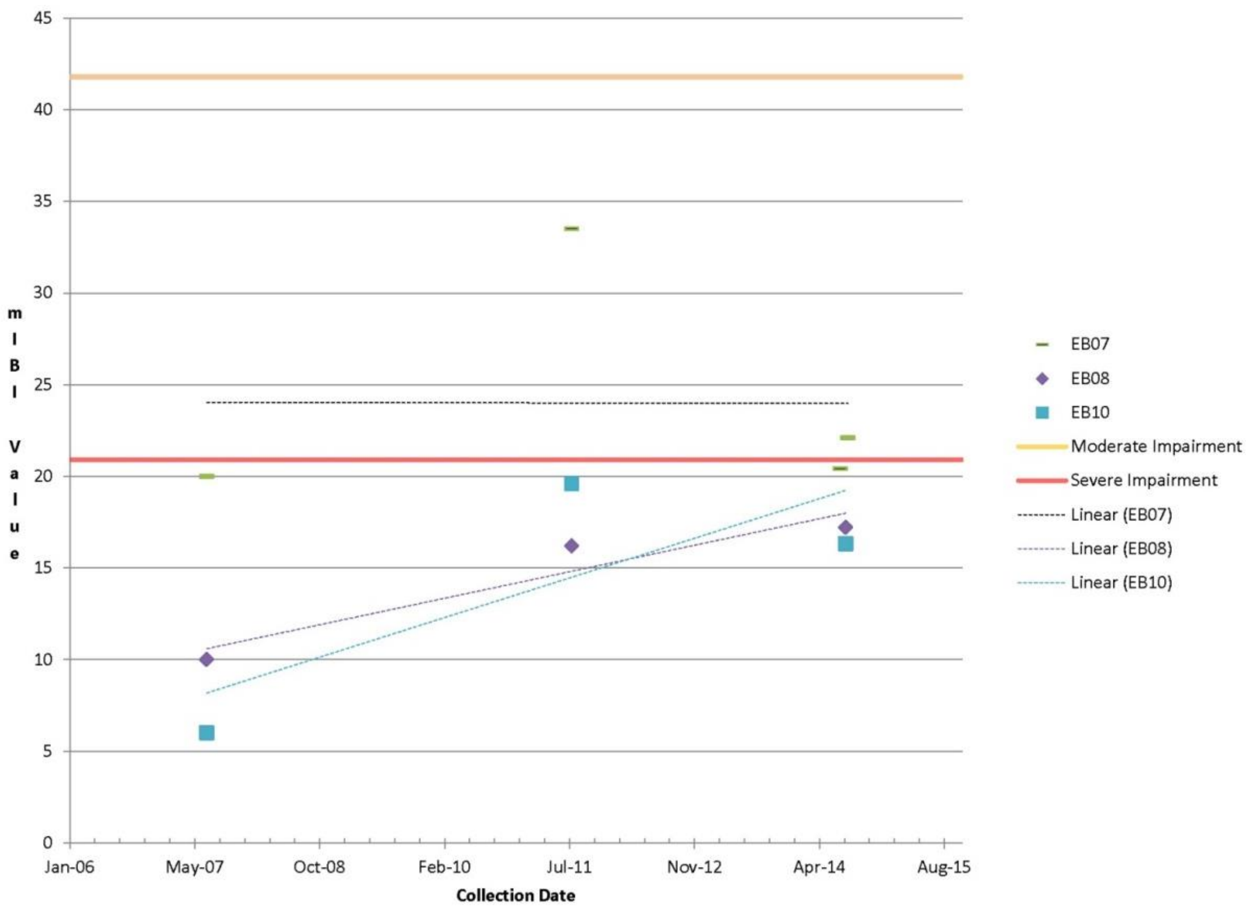

Figure 42 mIBI scores for St. Joseph Creek.

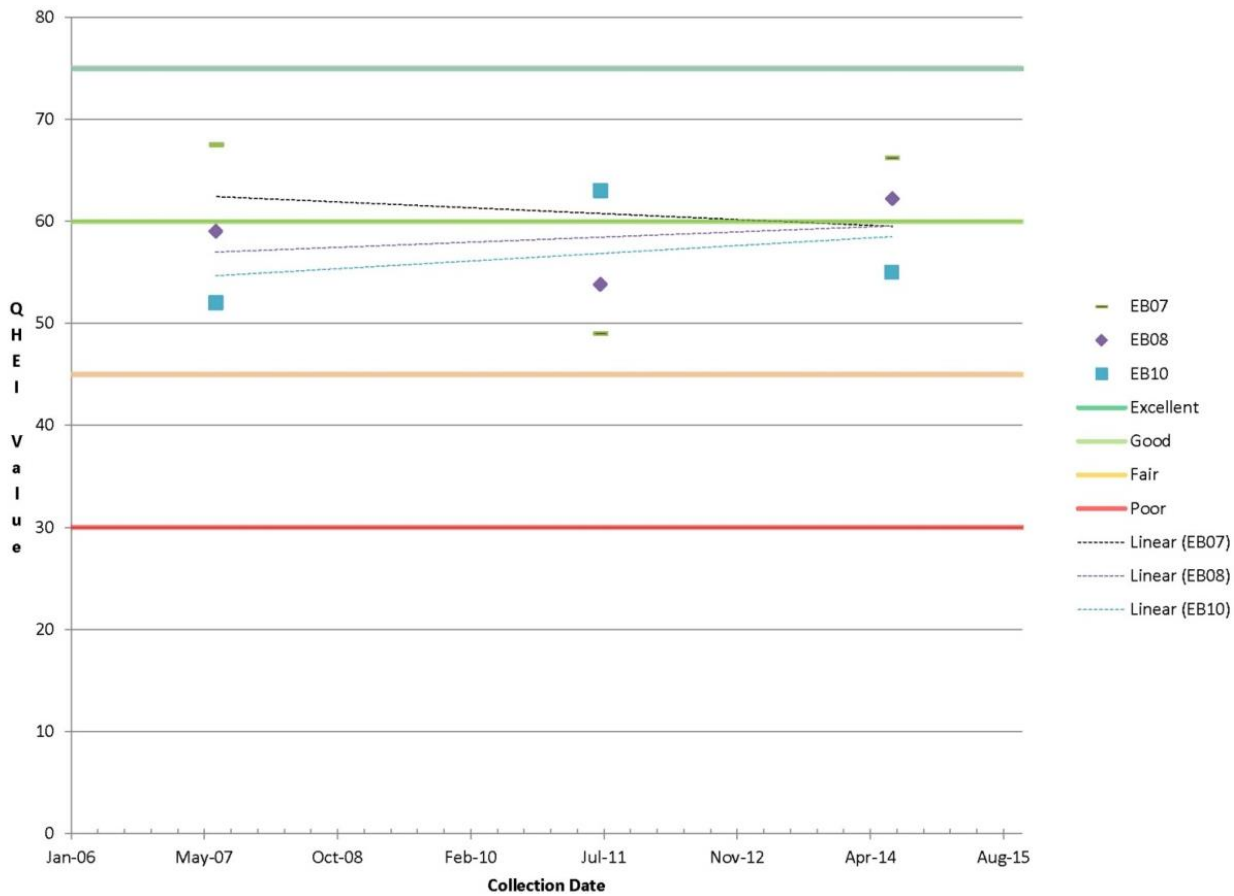

Figure 43 QHEI scores for St. Joseph Creek.

In addition, DRSCW assessed TP and DO levels at each of the monitoring stations. Table 16 provides levels for 2007, 2011 and 2014.

Site	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Total Phosphorus (mg/L)
EB07	9/25/2007	5.92	23.00	0.532
	6/17/2011	18.1	22.00	0.113
	6/22/2011	10.3	20.90	0.127
	6/27/2011	11.5	21.10	0.168
	7/7/2011	11	22.90	0.326
	7/15/2011	9.7	22.00	0.243
	7/26/2011	9.6	25.70	0.131
	6/2/2014	7.4	21.85	0.158
	6/17/2014	9.53	25.31	0.166
	7/2/2014	6.73	21.19	0.147
	7/14/2014	9.51	22.24	0.172
	7/31/2014	9.73	23.37	0.235
	8/11/2014	11.26	21.25	0.150
EB08	10/2/2007	6.22	21.00	0.115

	6/17/2011	19.4	22.60	0.105
	6/22/2011	10	22.70	0.118
	6/27/2011	11.8	21.30	0.140
	7/13/2011	8.2	25.10	0.223
	6/13/2014	10.26	18.97	0.106
	7/2/2014	8.61	21.08	0.225
	7/29/2014	9.99	21.65	0.128
	8/11/2014	10.31	21.99	0.174
EB10	8/23/2007	9.76	25.00	0.133
	11/16/2007	8.95	7.10	0.140
	6/22/2011	11.5	23.60	0.132
	6/27/2011	12	24.70	0.118
	7/10/2014	8.25	24.48	0.206
	8/21/2014	3.88	22.62	0.197

Table 16 DRSCW's assessment of TP and DO on St. Joseph Creek.

To assess existing conditions, the data is interpreted by a statistical analysis to identify which parameters are degrading aquatic life. Bioassessment surveys of St. Joseph Creek were completed in 2011 and 2014. As shown in Table 17, the monitoring indicates elevated concentrations of nitrogen within the water column, as well as a need to restore the habitat within the stream and riparian corridor to allow for increased assimilative capacity.

Station	Proximate Stressor(s)	Project Description	Project Objective
EB07	Ammonia-nitrogen; Total Kjehldahl Nitrogen (TKN); Poor channel condition	Habitat restoration; Stormwater retrofit	Increase assimilative capacity through habitat restoration
EB08	Total Kjehldahl Nitrogen (TKN); Lack of riffles; Poor substrate	Stormwater treatment; Habitat restoration	Increase assimilative capacity
EB10	Ammonia-nitrogen; Total Kjehldahl Nitrogen (TKN); Lack of pool and riffle sequence(s);	Habitat restoration	Increase assimilative capacity; stormwater BMPs for metals

Table 17 DRSCW's bioassessment conclusions.

3.5.6 Citizen Reporter Web Application

The DuPage County Citizen Reporter App was launched in May 2016.[30] 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 St. Joseph Creek Watershed, an informational flyer was sent to each resident or property owner within the floodplain of the St. Joseph Creek Watershed. More than 800 mailings were sent to properties encouraging residents to use the app or contact us by email or

[30] http://gis.dupageco.org/CitizenReporter/

phone to share observations on St. Joseph Creek. A total of 22 responses were received. As detailed in Table 18, observations include stream erosion, blockages, debris and water quality issues.

Type of Impairment:	Number of Issues Reported:
Garbage	0
Illegal Dumping	3
Sediment	2
Stream Blockage	8
Streambank Erosion	4
Water Quality Issue	2
Other	3
Total	**22**

Table 18 Citizen reports from DuPage County's reporter web application.

The highest number of reports were related to stream blockages. Some of these blockages included fallen trees and debris, which could be addressed by County or municipal maintenance staff right away. Streambank erosion was another common issue reported by residents.

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 St. Joseph Creek. Table 19 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.

Cause of Impairment 303(d) Aquatic Life Impairment	***Source of Impairment 303(d) Aquatic Life Impairment***
Alteration in stream-side or littoral vegetative covers	Channelization
Oil & grease	Loss of Riparian Habitat
Other flow regime alterations	Municipal point source discharges
Dissolved Oxygen	Site clearance (land development or redevelopment)
Total Suspended Solids	Streambank modifications/destabilization
Aquatic Algae	Source unknown
	Urban runoff/ storm sewers
Cause of Impairment (Perceived)	***Source of Impairment (Perceived)***
Fecal Coliform	Atmospheric Deposition
Mercury	Contaminated Sediments
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	Impoundments (Culvert Crossings/Dams)
Debris/Floatables/Trash	Changes in stream flow due to hydraulic and hydrologic alteration from surrounding development
Petroleum Hydrocarbons	Streambank erosion

Table 19 Causes and sources of degraded water quality in the St. Joseph Creek Watershed

3.6.1.1 Nonpoint Source Pollutant Load Modeling

The IEPA and DRSCW assessments indicate pollutants of concern within St. Joseph Creek may include BOD, TSS, TN and oil and grease. However, in order to develop a successful plan for reducing pollutants in 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 St. Joseph Creek watershed, STEPL was used to generate background nonpoint source loads for TN, TP, TSS and BOD. Although oil and grease is a pollutant of concern, STEPL is not able to estimate pollutant loads for this.

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 St. Joseph Creek watershed is in a developed “suburban” area, only urban land uses were used.

Figures 44 through 47 maps the background pollutant loads of TN, TP, TSS and BOD for existing land use in the St. Joseph Creek Watershed. It should be noted that oil and grease have been identified as a cause for impairment in St. Joseph Creek. However, current models are not able to model load reductions for oil and grease. While they cannot be modeled, reductions in oil and grease can be realized through elimination and minimization of impervious surfaces, and treating runoff from roads and parking lots.

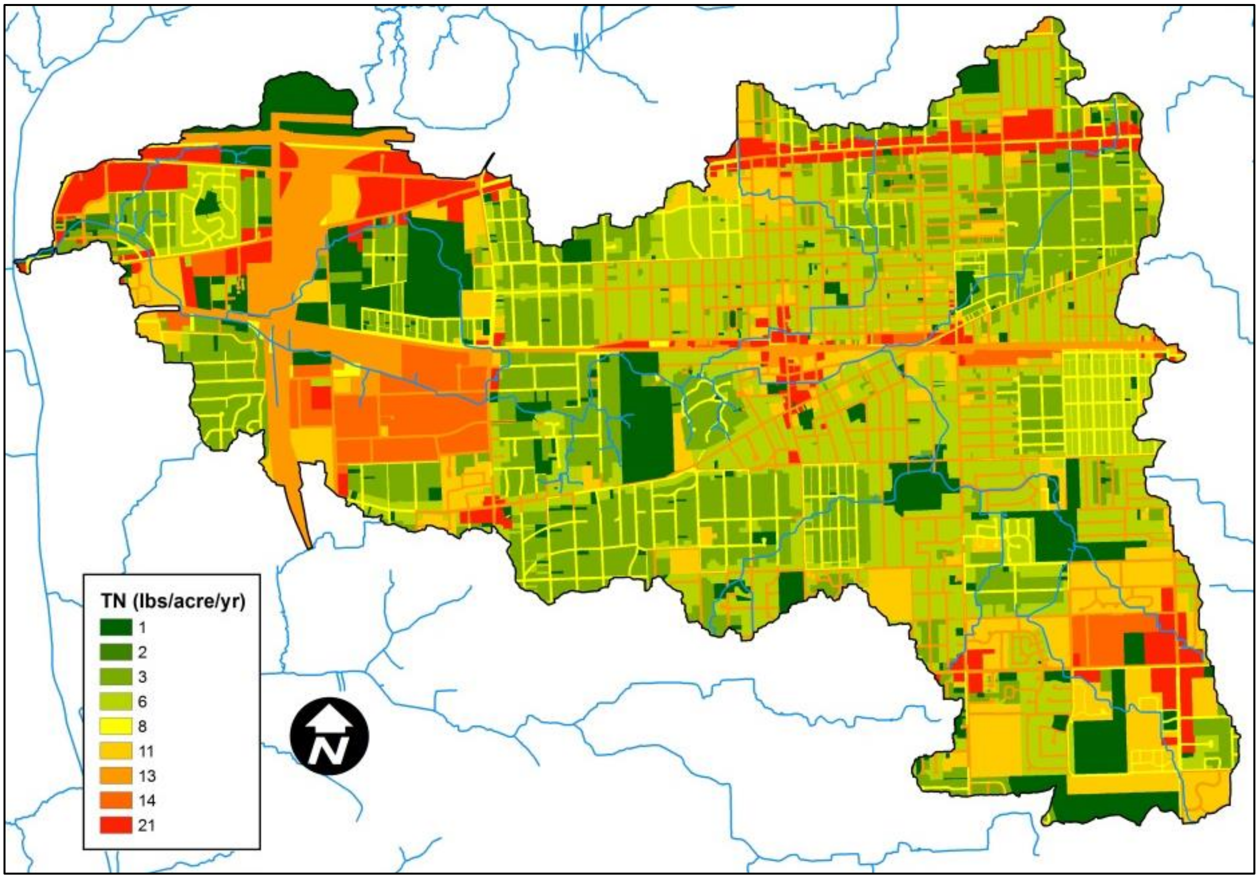

Figure 44 TN concentrations, based on land use, for the St. Joseph Creek Watershed.

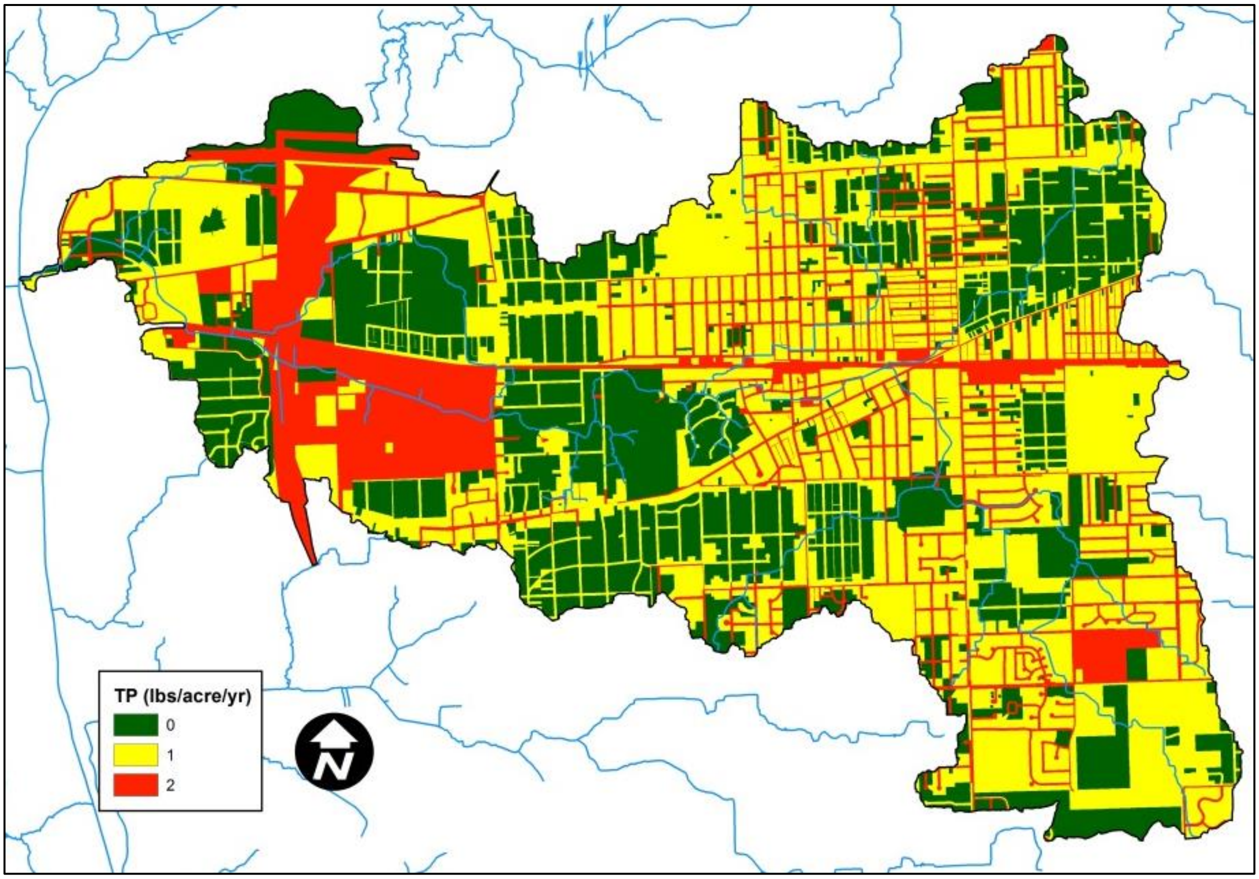

Figure 45 TP concentrations, based on land use, for the St. Joseph Creek Watershed.

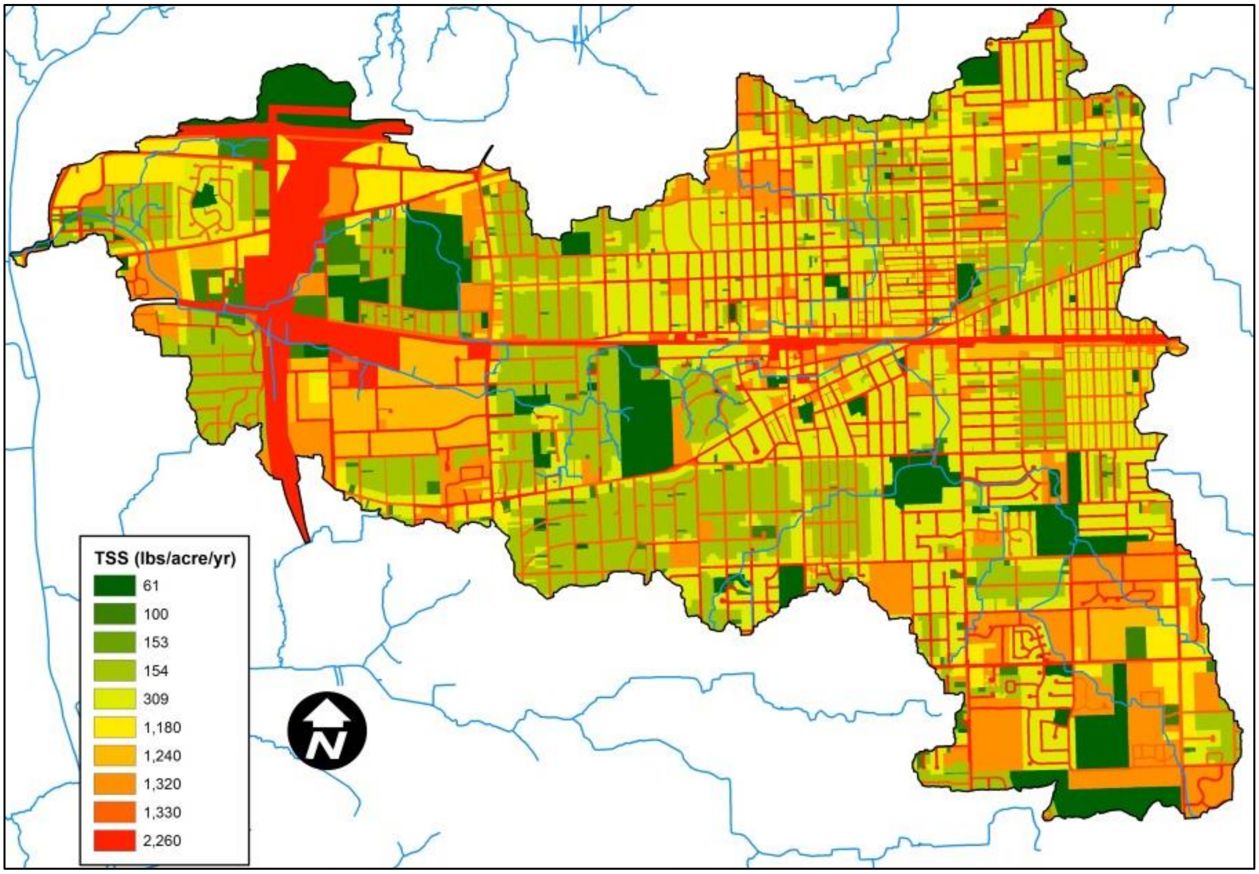

Figure 46 TSS concentrations, based on land use, for the St. Joseph Creek Watershed.

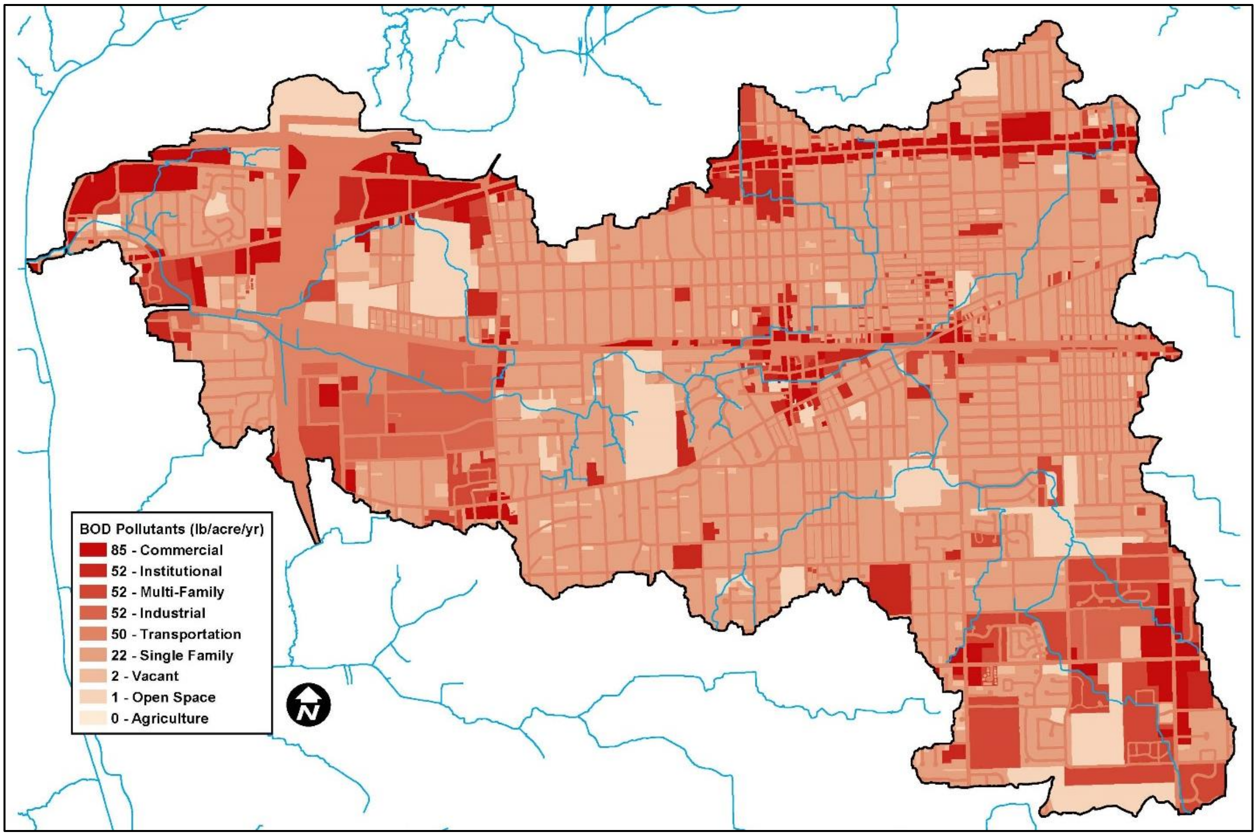

Figure 41 BOD based on land use in the St. Joseph Creek Watershed.

As highlighted in table 20, pollutant load estimates show that the most pollutants per acre are originating in sub-watersheds #1 and #2, which encompasses the western portion of the watershed near the confluence with the East Branch DuPage River as well as downtown Downers Grove and surrounding residential and commercial districts. TSS, TN and TP loads are most concentrated along roadways, industrial areas and dense residential and commercial areas. Sources contributing to high BOD loads include high-density land uses such as commercial, institutional, multi-family and industrial areas. These land use types typically contain a high ratio of impervious area and less open space. These pollutant loads are broken down further according to land use in Tables 21- 24.

Subwatershed	**Nitrogen Load lb/year**	**Phosphorus Load lb/year**	**BOD Load lb/year**	**TSS Load t/year**
W1	17603	2956	61270	443
W2	16432	2829	59708	439
W3	11897	2037	43754	303
Total	**45932**	**7822**	**164732**	**1185**

Table 20 Total Pollutant Loads by Subwatershed.

Subwatershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space
1	1,470	1,453	303	11,114	552	2,047	17	319	329
2	1,083	150	520	9,736	343	4,286	0	81	234
3	554	290	315	6,158	1,569	2,499	0	122	390
Totals	9,736	4,077	2,664	21,540	5,532	19,628	0	158	595

Table 21 TN loads by land use (lbs/yr) for each of St. Joseph Creek's sub-watersheds.

Subwatershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space
1	287	224	52	1,841	101	379	3	29	41
2	211	23	89	1,613	63	794	0	7	29
3	108	45	54	1,020	288	463	0	11	49
Totals	606	292	195	4,474	452	1,636	3	47	119

Table 22 TP loads by land use (lbs/yr) for each of St. Joseph Creek's sub-watersheds.

Subwatershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space
1	22	45	6	273	11	76	1	10	0
2	16	5	11	239	7	159	0	2	0
3	8	9	7	151	32	93	0	4	0
Totals	46	59	24	663	50	328	1	16	0

Table 23 TSS loads by land use (t/yr) for each of St. Joseph Creek's sub-watersheds.

Subwatershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space
1	6,800	5,230	1,309	34,431	2,480	9,252	35	849	883
2	5,010	541	2,246	30,162	1,540	19,364	0	215	629
3	2,563	1,042	1,360	19,078	7,044	11,292	0	326	1,048
Totals	14,373	6,813	4,915	83,671	11,064	39,908	35	1,390	2,560

Table 24 BOD loads by land use (lbs/yr) for each of St. Joseph 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	52,700	8,631	194,232	1,244
Streambank Erosion Caused Pollutant Loads	1,687	650	3,381	1,058
Total Back ground Load	54,387	9,281	197,613	2,302

Table 25 Streambank erosion pollutant load estimates.

3.6.1.3 Nonpoint Source Pollutants of Concern

As previously noted, the recommendations found in the St. Joseph Creek Watershed will surround reducing oil and grease, TN, TP, TSS and BOD loads, which were identified as the leading pollutants within the watershed. 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 (NH_3), nitrites (NO_2) and nitrates (NO_3). 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.[31] 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.

[31] 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

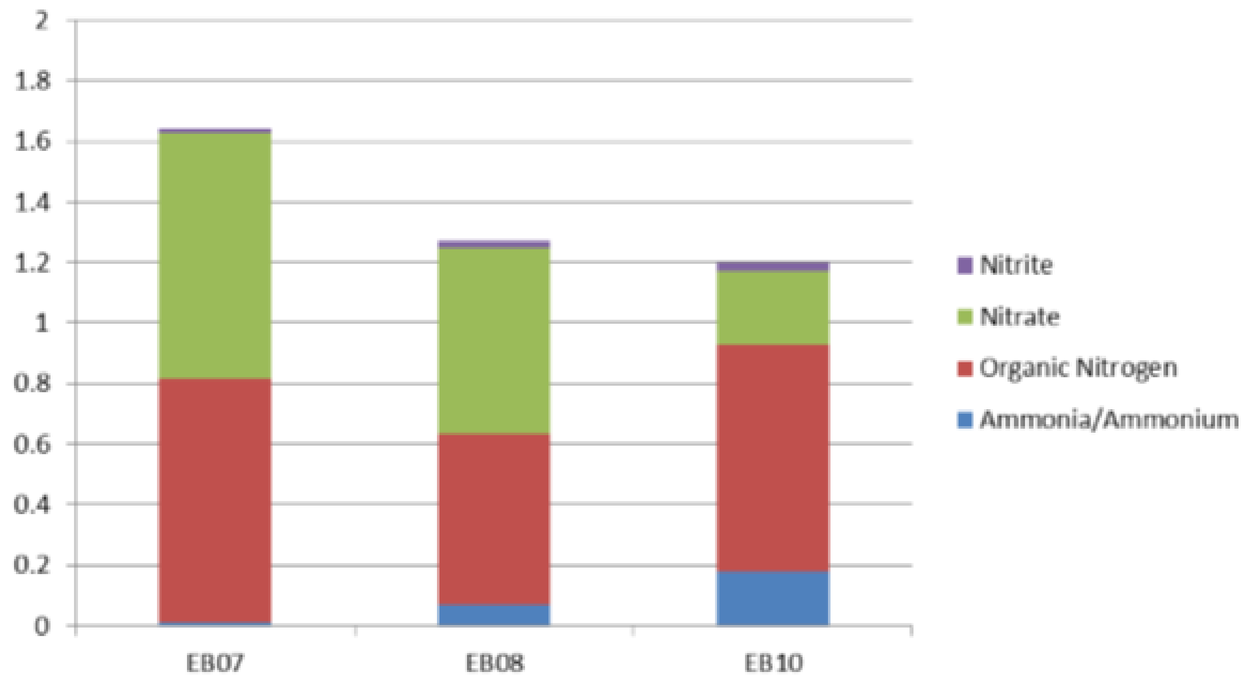

Figure 47 Average total nitrogen concentrations at DRSCW stations.

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.[32]

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 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 Oil & Grease

Oil and grease contaminants are washed into waterways from sources such as vehicle emissions and leaks, food preparation and other non-point sources during rain events. Automobiles use many petroleum based products that are released into aquatic systems from poorly maintained vehicles on roadways, parking lots, and tire wear. These Polycyclic Aromatic Hydrocarbons (PAHs) can have direct or indirect toxic effects on aquatic life. Direct effects of PAHs on aquatic life occur by changing cellular function, causing neurotoxicity, disrupting the endocrine system, suppressing immune responses, and damaging DNA. Indirect effects of PAHs occur by changing food supply or habitats, for example, PAHs can reduce the amount of oxygen available in a system because hydrocarbons consume dissolved oxygen.

[32] 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.

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 St. Joseph 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 St. Josephs 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.

Permittee	Permit Number
Downers Grove Sanitary District WTC	IL0028380
Darien, City of	ILR400180
Downers Grove, Village of	ILR400183
DuPage County	ILR400502
Lisle, Village of	ILR400376
Westmont, Village of	ILR400254

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 26 shows the waiver status of municipalities within the St. Joseph 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
Lisle	Partial Waiver
Downers Grove	Full Waiver
Westmont	Partial Waiver
Darien	Partial Waiver
Unincorporated	Non Waiver

Table 26 Ordinance waiver status of St. Joseph Creek Watershed communities.

3.7.3 Local Planning Documents

Regionally, the St. Joseph 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 St. Joseph 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.

Locally, the Village of Downers Grove – where the majority of St. Joseph Creek lies – has local planning documents guiding green infrastructure development and redevelopment in their downtown area and restoration of St. Joseph Creek from their downtown west to their jurisdictional boundary near I-355. Recommendations from both plans were evaluated in the St. Joseph Creek Watershed Plan.

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 St. Joseph 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 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.[33]

4.1.1.1.1 Infiltration Practices[34]

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 St. Joseph 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 evapotranspirated 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 12-15% 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. Permeable pavers are proposed over 2.5% of the watershed drainage area.

---

[33] https://www.epa.gov/green-infrastructure/what-green-infrastructure
[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 St. Joseph 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. Rainwater harvesting is proposed over 5% of the watershed.

4.1.1.2 Detention Basin Retrofits

Many of the detention basins in St. Joseph 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 10% of the drainage area of subwatershed #1 and 5% of subwatersheds #2 and #3. 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

Mentioned earlier, the St. Joseph Creek Watershed has overall poor riparian buffers that average only 15 feet in width, which should be increased watershed-wide. In addition, areas with existing low quality 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 St. Joseph 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. Wetlands also filter sediments and nutrients in runoff, provide necessary wildlife habitat and help maintain stable water, temperature and chemistry levels in streams.

---

[35] National Pollutant Removal Performance Database, Illinois Green Infrastructure Study), approved watershed plans (CMAP Boone- Dutch Creek), and STEPL.

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 2% 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 2% of the watershed can have a measurable impact to St. Joseph 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 provide 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 St. Joseph Creek. Future stabilization projects should include stream structure additions, such as pool and riffle sequences, for improved habitat.

4.1.1.7 Dam and Culvert 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 St. Joseph Creek Watershed has one small, low head dam that is being recommended for removal. 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.

Culvert crossings can also restrict streamflow, inhibit fish passage, and contribute to low dissolved oxygen levels. Existing culverts should be evaluated to determine where these restrictions exist and proposed retrofits to expand culvert size and/ or place them at lower elevations to allow unrestricted flow and fish passage.

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 St. Joseph 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 St. Joseph 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.

In addition, sections of the St. Joseph's Creek channel were lined with concrete in previous attempts at stabilization of the banks. Removal of concrete lining in the channel will restore the natural stream functions and habitat while reducing the effects of the channelization on downstream properties.

4.1.1.9 Daylighting

Sections of St. Joseph 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.

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

4.1.2 BMP Programs

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. Roadway agencies in the watershed have their own street sweeping schedules and were surveyed for the purposes of this plan. Results of this survey are shown in Table 27.

Entity	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Downers Grove		X	X	X	X	X	X	X	2X	
DG Parking Lots		X	X	X			X	X	X	
DG Business District		X	4X	4X	5X	4X	X	X	2X	
Lisle		X	X	X	X	X	X	X	X	
Lisle Business District		2X	2X	2x	2X	2X	2X	2X	2X	
Darien			X				X	X	X	
Westmont		X	X	X	X	X	X	2X	2X	
DG Township	1X - Spring						1X - Fall			
Lisle Township	1X - Spring			as needed			1X - Fall			
DuDOT	1X per year									
IDOT		2X- between April & November								
IL Tollway	2X	2X	2X	2X	2X	2X	2X	2X	2X	2X

Table 27 Street sweeping schedules within the St. Joseph Creek Watershed.

The Village of Downers Grove has the greatest amount of roadway miles and currently has a monthly (or more) sweeping schedule. 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.

Municipalities and roadway agencies were not surveyed on catch basin cleanout for this plan. Additional studies should evaluate catch basin cleanout frequencies to identify areas for improvement. 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 St. Joseph Creek, ultimately contributing to overbank flooding and erosion. In particular, the

[37] Neely et al. 2008. Deriving Reliable Pollutant Removal Rates for Municipal Street Sweeping and Storm Drain Cleanout Programs in the Chesapeake Bay Basin. Center for Watershed Protection. http://owl.cwp.org/mdocs-posts/lawn-_deriving_reliable_polllution_removal_rates/

culvert under Webster Street in Downers Grove is perpetually blocked by debris filing in after storm events. In addition, DuPage County staff identified the undersized culvert as a blockage for fish passage.

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 28 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 St. Joseph 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	2.5%	117.4	23.6	0	0	$4,181,760
	Bioswale	7.5%	147.05	58.9	1568.5	22.7	$9,282,370
	Infiltration Trench	5.0%	490.05	78.5	2439	20.95	$1,237,649
	Oil & Grit Separators	1.0%	5.6	0.95	0	0.4	$198,400
	Permeable Pavers	2.5%	440.05	70.55	0	10.45	$77,101,200
	Rainwater Harvesting	5.0%	28.6	3.95	113.6	0.6	$1,610,043
	Weekly Street Sweeping	12.5%	0	14	260.1	5.6	$805,613
	Detention Retrofit	10.0%	392.15	138.25	4390.2	36.1	$7,500,905
Total			**1621**	**389**	**8771**	**97**	**$101,917,941**
2	Bioretention/ Rain Gardens	2.5%	139.8	29.95	0	0	$4,181,760
	Bioswale	5.0%	95.35	39.55	1072.9	14.6	$7,110,534
	Infiltration Trench	5.0%	476.8	79.15	2504.45	20.2	$1,422,107
	Oil & Grit Separators	1.0%	4.9	0.8	0	0.35	$223,200
	Permeable Pavers	2.5%	429.55	71.3	0	10.1	$9,996,000

	Rainwater Harvesting	5.0%	46.6	7.7	206.65	1	$1,850,001
	Weekly Street Sweeping	12.5%	0	12.35	229.45	4.95	$925,681
	Detention Retrofit	5.0%	190.3	69.45	2251.1	17.35	$4,309,415
Total			**1383**	**310**	**6265**	**69**	**$30,018,697**
3	Bioretention/ Rain Gardens	2.5%	154.95	33.25	0	0	$3,136,320
	Bioswale	5.0%	69.85	28.95	792	10.65	$5,484,901
	Infiltration Trench	5.0%	350.15	58.15	1806.8	14.7	$1,096,980
	Oil & Grit Separators	1.0%	3.05	0.5	0	0.25	$173,600
	Permeable Pavers	2.5%	314.85	52.2	0	7.4	$7,644,000
	Rainwater Harvesting	5.0%	39.15	6.45	168.8	0.85	$1,427,048
	Weekly Street Sweeping	12.5%	0	7.7	143	3.1	$714,049
	Detention Retrofit	5.0%	140.1	51.05	1667.45	12.75	$3,324,182
Total			**1072**	**238**	**4578**	**50**	**$23,001,080**
Grand Total			**4076**	**937**	**19614**	**215**	**$154,937,719**

Table 28 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 oil and grease, TN, TP, TSS and BOD in St. Joseph 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 it is heavily industrial and is home to two major interstates. Sub-watershed #2 falls close behind as it, again, contains major roadways and commercial areas. Sub-watershed #3 is not as critical; however, implementing BMPs there will have a positive effect on the watershed as a whole.

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

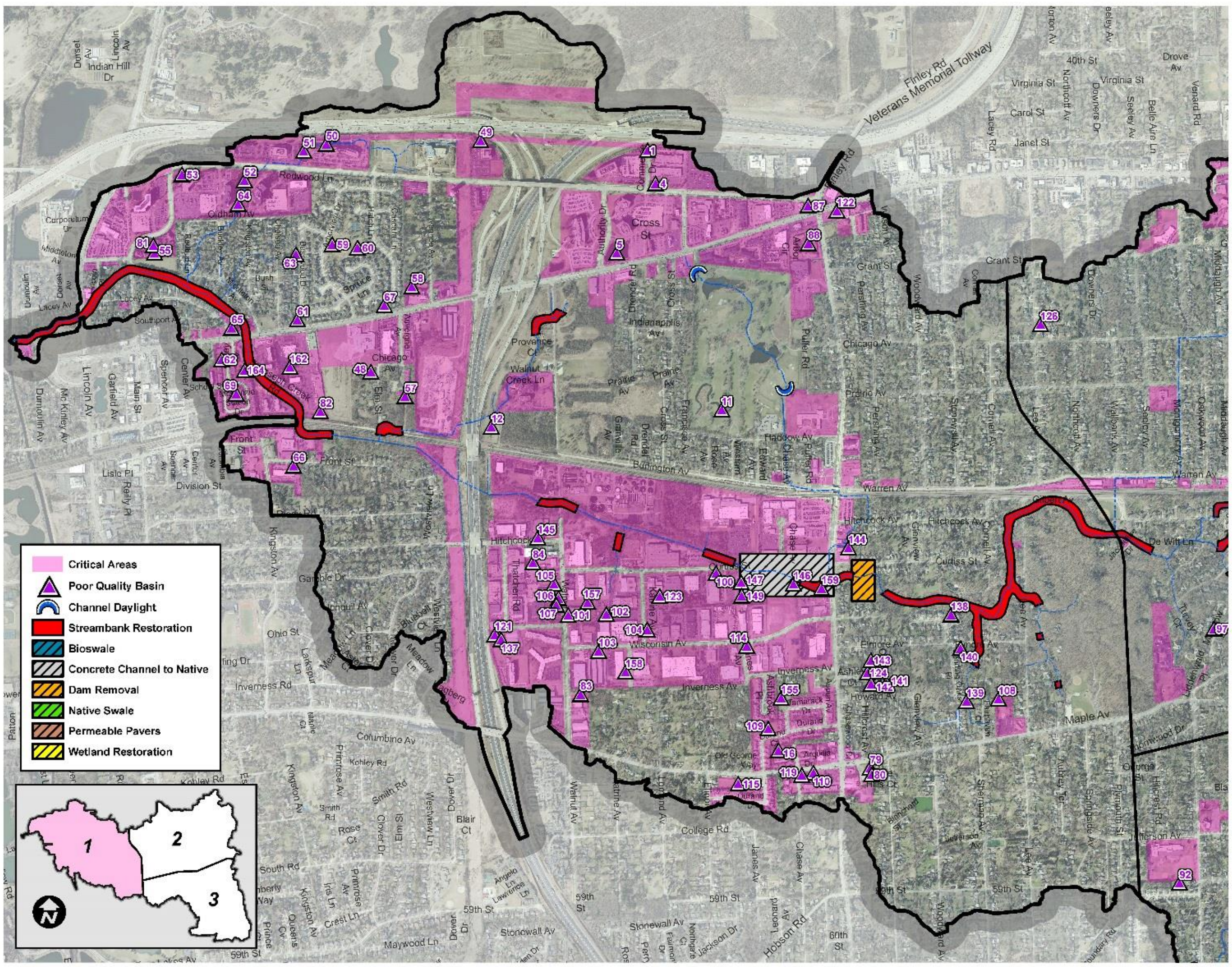

Figure 48 Site-specific BMP projects in St. Joseph Creek sub-watershed #1.

4.1.2.2 Sub-Watershed #2

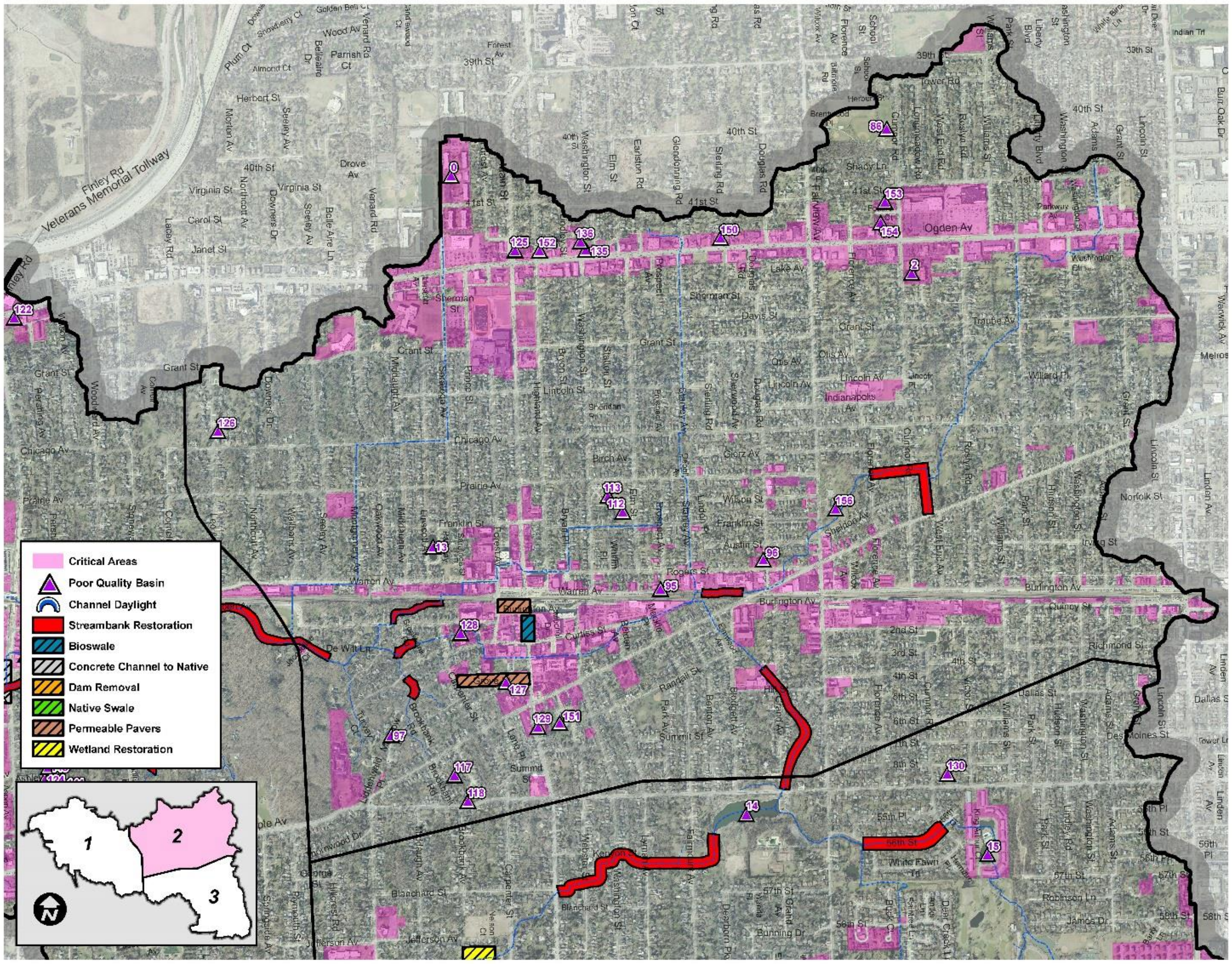

Figure 49 Site-specific BMP projects in St. Joseph Creek sub-watershed #2.

4.1.2.3 Sub-Watershed #3

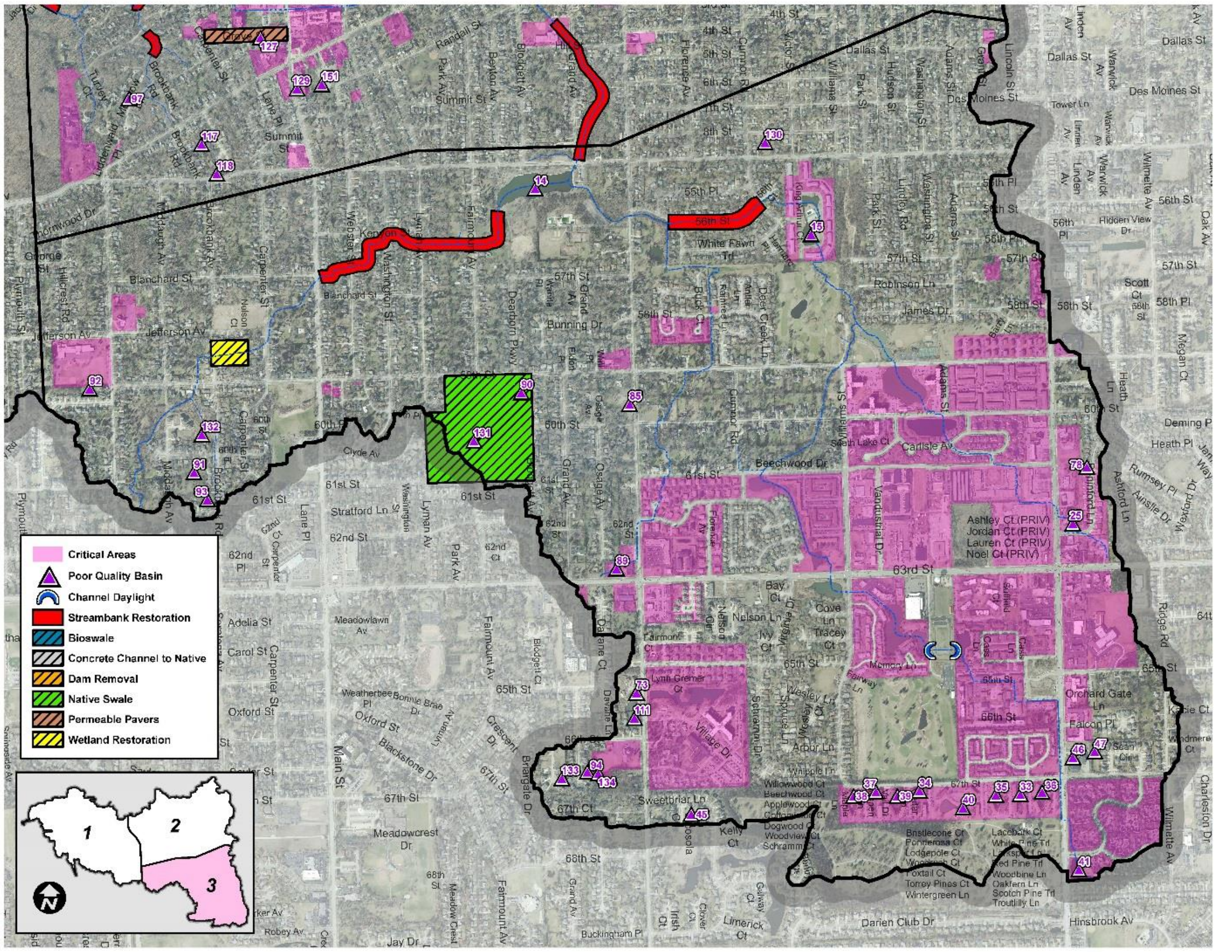

Figure 50 Site-specific projects in St. Joseph Creek sub-watershed #3.

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.

[38] www.dupageco.org/swm

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 St. Joseph 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 St. Joseph 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 St. Joseph 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. In 2015, the Village of Downers Grove was one of the selected communities and the Village of Lisle was selected in 2016. Further DuPage County is a funding sponsor of The Conservation Foundation's Conservation@Home and Work, rain barrel and the annual DuPage River Sweep – all of which aim to improve the integrity of waterways countywide.

SCARCE is a DuPage County partner in educating teachers, students and local organizations about watersheds. In particular, SCARCE recently collaborated with the Village of Downers Grove to bring their watershed education into nearly every school, library and church within the municipality. DuPage County also developed a Water Quality Flag in partnership with SCARCE that awards institutions for engaging in a series of educational trainings and hands-on activities, as well as installing green infrastructure on site. To date, two schools within the St. Joseph 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 St. Joseph Creek Watershed, additional targeted efforts could be made in the following areas:

- Inform residents, particularly those with property located within in the St. Joseph 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, composing 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 29 includes recommendation on how to reach target audiences within the St. Joseph 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 29 Tools and mediums for reach target audiences within the St. Joseph Creek Watershed.

4.4 Summary of BMP Projects & Programs

Table 30 provides a comprehensive overview of the BMP projects described previously in this section. Again, these are all measures any stakeholder within the St. Joseph 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)	Oil Reduction (lb/yr)	Estimated Cost ($)
Bioretention / Rain Gardens	WW	11	ac	412	87	na	na	na	$11,499,840
Dam Removal	SS	1	#	na	na	na	na	na	$300,000
Detention Basin Retrofits	WW	43.39	ac	722	286	8309	66	na	15,134,502
Detention Basin Retrofits	SS	51	ac	1176	247	8006	55	na	$17,796,195
Education & Outreach	WW	4	#	na	na	na	na	na	$20,000
Bioswale	WW	21	ac	395	151	na	59	na	$21,877,805
Bioswale	SS	0.17	ac	na	na	na	na	na	$182,890
Infiltration Trench	WW	3.58	ac	1317	216	6750	56	na	$3,756,736
Tree Well	SS	30	#	na	na	na	na	na	$464,000

Oil & Grit Separator	SS	9	#	12	1	na	1	varies by manufacturer	$223,200
Oil & Grit Separator	WW	24	#	14	2	na	na	varies by manufacturer	$595,200
Permeable & Porous Pavements	SS	2.56	ac	15	2	0	0	na	$3,345,408
Permeable & Porous Pavements	WW	179	ac	1219	203	na	31	na	$163,742,040
Streambank Stabilization	SS	25,308	ft	306	118	613	192	na	$7,592,400
Wetland Restoration	WW	201	ac	na	na	na	na	na	$13,527,300
Wetland Restoration	SS	1.2	ac	na	na	na	na	na	$80,760
Rainwater Harvesting	WW	118	ac	114	18	489	3	na	$4,887,092
Daylighting	SS	4268	ft	na	na	na	na	na	$640,200
Weekly Street Sweeping	WW	1663	ac	na	34	633	14	na	$2,445,343
TOTALS				**5,702**	**1,365**	**24,800**	**477**		**$268,110,911**

Table 30 Summary of projects with pollutant load reductions and cost (10-year goal).[39]

4.5 Summary of Pollutant Loads & Potential BMP Pollutant Load Reductions

Table 31 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	N Reduction (lbs/yr)	P Reduction (lbs/yr)	BOD Reduction (lbs/yr)	Sediment Reduction (t/yr)
SITE SPECIFIC				
Streambank Stab	306	118	613	192
Pond Retrofits	1176	247	8006	55

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

Permeable Pavers	15	2	N/A	N/A
Bioswales	N/A	N/A	N/A	N/A
WATERSHED WIDE				
Bioretention	412	87	N/A	N/A
Bioswale	395	151	N/A	N/A
Infiltration Trench	1317	216	6750	56
Oil & Grit Sep.	14	2	N/A	N/A
Permeable Pavers	1219	203	N/A	N/A
Rainwater Harvesting	114	18	489	3
Weekly Street Sweeping	N/A	34	633	14
Detention Retrofit	722	286	8309	66
	5689.7	1363.8	24800	385.6
Background Rates	52700	8631	194232	1244
Total Reduction	**5689.7**	**1363.8**	**24800**	**385.6**
Percent Reduction	**11%**	**16%**	**13%**	**31%**

Table 31 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 St. Joseph 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 St. Joseph Creek. For others, regional groups, such as CMAP, offer technical assistance grants to assist with plan implementation. Table 32 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/lta
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 municpal 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 Program (PDM)	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-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/OpenSpaceLandsAquisitionDevelopment-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 ag 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 32 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 St. Joseph 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 33 provides general guidance on implementing initiatives found in the St. Joseph 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 St. Joseph 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 33 St. Joseph Creek Watershed Plan 10-year implementation schedule.

5.2 Interim Measurable Milestones

Milestones are specific, measureable, achievable, relevant and time-sensitive subtasks needed to achieve an overall goal; in this case, implement a BMP. As outlined in Table 34, 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**
Improve and protect the ecological integrity of the surface water resources.	Acres of impervious surface reduction	-	10	20
	No. of green infrastructure practices	5	10	25
	Acres of restored wetland	2	5	10
	Acres of new wetland	-	2	5
	No. of detention basin retrofits	2	5	10
	No. of hydrodynamic separators	3	6	10
	No. of dam modifications	-	-	1
Build on partnerships with local stakeholders to foster sustainable programs, policy and re-development.	No. of ordinance updates	-	1	2
	No. of plans created and/or updated	5	7	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
	Linear feet of daylighting	-	-	100

Reduce bank erosion and increase daylighting, where possible, to improve and protect in-stream water quality.	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	5,000	10,000
Raise public awareness on the impacts of land management practices on water quality to prompt behavioral change.	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
Preserve and connect open space, particularly near waterbodies.	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

Table 34 Milestones for determing success in carrying out St. Joseph Creek Watershed Plan.

5.3 Criteria for Determining Progress

The primary criterion by which progress will be measured within the St. Joseph Creek Watershed Plan is through measuring pollutant load reductions, specifically TN, TP, TSS and BOD. Table 35 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	54,387 lb/yr	5% Load Reduction = 544 lb/yr (2,719 lb total)	15% Load Reduction = 816 lb/yr (8,158 lb total)
Phosphorus (Total) Load Reduction	9,281 lb/yr	10% Load Reduction = 186 lb/yr (928 lb total)	25% Load Reduction = 232 lb/yr (2,320 lb total)
Sediment Load Reduction (TSS)	2302 ton/yr	10% Load Reduction = 46 tons/yr (230 ton total)	25% Load Reduction = 57 tons/yr (575 ton total)
BOD Load Reduction	197,613 lb/yr	5% Load Reduction = 1976 lb/yr (9,880 lb total)	15% Load Reduction = 2,964 lb/yr (29,642 lb total)
Oil & Grease Reduction	N/A	1% Oil & Grit Separator	2% Oil & Grit Separator

fIBI Scores	EB07 – 26	EB07 – >26	EB07 – >26
	EB08 – 11	EB08 – >11	EB08 – >11
	EB10 – 14	EB10 – >14	EB10 – >14
mIBI Scores	EB07 – 24	EB07 – >24	EB07 – >24
	EB08 – 17	EB08 – >17	EB08 – >17
	EB10 – 16	EB10 – >16	EB10 – >16
QHEI Scores	EB07 – 68	EB07 – >68	EB07 – >68
	EB08 – 62	EB08 – >62	EB08 – >62
	EB10 – 55	EB10 – >55	EB10 – >55

Table 35 St. Joseph 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 St. Joseph Creek Watershed Plan implementation efforts. To ensure accuracy, this requires all BMPS are also tracked throughout the Watershed. Long-term monitoring of these BMPs will be necessary to determine whether St. Joseph 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 St. Joseph 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 cycle. DuPage County supports and contributes to the DuPage River Salt Creek Workgroup ambient monitoring of waterways.
- ***DRSCW:*** Chemical (water column), fish, mussel, macroinvertebrate and habitat monitoring efforts along St. Joseph Creek to track how restoration efforts have improved biological index and habitat scores. Chemical monitoring includes total suspended solids, total nitrogen, total phosphorus, fecal coliform, chlorides, and oil and grease.
- ***IEPA:*** The Surface Water Section of the IEPA monitors the quality of surface waters in Illinois, including St. Joseph 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

[40] Percent reduction matches Illinois Nutrient Reduction Strategy year 2025 goal.

monitoring water quality, recording illicit discharge or engaging in streambank enhancement projects.

Although monitoring during implementation of the St. Joseph Creek Watershed Plan is vital to its success, monitoring of the BMPs will ensure long-term success to the vitality of St. Joseph 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

Map ID	Description of BMP	Quantity	Units	Name	Responsible Party	Priority	N (lbs/yr)	P (lbs/yr)	BOD (lbs/yr)	TSS (t/yr)
	Streambank Stabilization	12,010	feet	Stream Restoration	Village of Downers Grove	1				
	Bioswales	3950	feet	Downers Grove Bioswales	Village of Downers Grove	1	0.06	0.015	0.87	0.0075
	Oil & grit Separators	9	each	Downtown Downers Grove Hydrodynamic Separators-Residential	Village of Downers Grove	1	10	1	0	0.571
				Downtown Downers Grove Hydrodynamic Separators-Commercial	Village of Downers Grove		3	1	0	0.235
	Permeable Paver Parking Lot	1.77	Ac	BNSF Train Parking Lot	Village of Downers Grove	1	12	1	0	0.233
	Permeable Pavers	0.79	AC	Roadway Pavers	Village of Downers Grove	1	3	0.5	0	0.064
	Water Quality Feature	1	each	Vertical Living Wall Concept	Village of Downers Grove	1				
	Tree Wells	30	each	Downtown Downers Grove Tree Wells	Village of Downers Grove	1				
	Permeable Paver Street			Grove St	Village of Downers Grove	1				
	Daylighting	4328	feet	Downers Grove Golf Club	Downers Grove Park District	2				
	Daylighting	300	feet	Belereive Park	Westmont Park District					
14	Detention Pond Retrofit	6.23	Ac	Patriot Park, 55th St, Downers Grove	Downers Grove Park District	1				
156	Detention Pond Retrofit	1.13	Ac	Hummer Park	Downers Grove Park District	1				
33-40	Wet Detention Pond Retrofit	1.93	Ac	The Ponds (6 pond retrofit), 67th and Cass Ave	Private	1	96	38	1377	8.47
112 & 113	Dry Detention Pond Retrofit			Washington Park. Prairie Ave. & Washington St	Downers Grove Park District		95	22	496	3.501
13	Detention Pond Retrofit	1	Ac	Princess Lake	Downers Grove Park District	1	23	9	331	2.0345
11	Detention Pond Retrofit		feet	Downers Grove Golf Club	Downers Grove Park District	1	7	2	62	0.6715
164	Detention Pond Retrofit	0.81	Ac	McKenzie Ponds	Private	1	19	4	277	1.3765
59, 60, 67	Detention Pond Retrofit	1.37	Ac	Arborview	Lisle Park District	1	19	4	98	0.6935
131	Detention Pond Retrofit	4.07	Ac	YMCA	Private	1	8	1	43	0.243
58	Detention Pond Retrofit	0.89	Ac	Arborview 2	Private	2	28	6	146	1.0315
41	Wet Detention Pond Retrofit	0.9	Ac	Bavarian Lane	Private	2	8	3	115	0.71
25	Dry Turf Retrofit	0.1	Ac	EMRO	Private	2	5	0.63	27	0.1545
78	Dry Turf Retrofit	2.09	Ac	Beniford	Village of Westmont	2	3	1	45	0.278
15	Wet Detention Pond Retrofit	2.4	Ac	King Arthur	Private	2	10	2	144	0.7125
2	Wet Detention Pond Retrofit	0.4	Ac	Cumnor	Private	2	10	2	144	0.7125
153	Dry Turf Retrofit	0.1	Ac	Foxfire	Private	2	43	5	227	1.2905
154	Dry Turf Retrofit	0.1	Ac	211 Foxfire Ct	Private	2				
150	Dry Turf Retrofit	0.1	Ac	600 Ogden Ave	Private	2	5	0.6	27	0.156
135	Dry Turf Retrofit	0.1	Ac	Speedway - A	Private	2	11	1	59	0.3355
136	Dry Turf Retrofit	0.1	Ac	Speedway - B	Private	2				
152	Dry Turf Retrofit	0.1	Ac	950 Ogden	Private	2	16	2	85	0.4825
125	Dry Turf Retrofit	0.1	Ac	1000 Ogden	Private	2	12	2	66	0.3735
0	Wet Detention Pond Retrofit	0.1	Ac	Saratoga	Private	2	5	2	65	0.402
122	Dry Turf Retrofit	0.1	Ac	Belmont	Private	2	10	1	52	0.2955
87	Dry Turf Retrofit	0.1	Ac	Shell	Private	2	6	0.7	30	0.1715
88	Dry Turf Retrofit	0.1	Ac	Arbor Circle	Private	2	3	0.7	18	0.1235
4	Wet Detention Pond Retrofit	0.3	Ac	Arboretum Business	Private	2	24	3	127	0.7235
1	Wet Detention Pond Retrofit	0.1	Ac	Arboretum Business 2	Private	2	13	3	195	0.9645
5	Wet Detention Pond Retrofit	1.9	Ac	Corridors	Private	2	33	7	488	2.418
49	Wet Detention Pond Retrofit	0.3	Ac	410 warrenville	Private	2	10	2	147	0.728
50	Wet Detention Pond Retrofit	0.9	Ac	Corporetum 1	Private	2				
51	Wet Detention Pond Retrofit	0.8	Ac	Corporetum 2	Private	2				
52	Wet Detention Pond Retrofit	1	Ac	801 warrenville N	Private	2				
64	Wet Detention Pond Retrofit	0.6	Ac	801 warrenville S	Private	2				
53	Wet Detention Pond Retrofit	0.5	Ac	Arboretum Lakes	Private	2	11	2	164	0.828
81	Dry Turf Retrofit	0.1	Ac	middleton Place N	Private	2	11	2	164	0.828
55	Wet Detention Pond Retrofit	0.1	Ac	middleton Place S	Private	2	14	3	179	0.923
62	Dry Turf Retrofit	0.1	Ac	Chesterbrook Academy South	Private	1	need info			

82	Dry Turf Retrofit	0.9	Ac	Ogden office buliding	Private	2	41	5	218	1.24
66	Dry Turf Retrofit	0.12	Ac	lisle library	Lisle Library	2	13	2	71	0.404
145	Dry Turf Retrofit	0.1	Ac	Downers Industrial 1	Private	2	0.7	0.2	8	0.1105
84	Wet Detention Pond Retrofit	0.1	Ac	Downers Industrial 2	Private	2	3	1	33	0.2735
105	Dry Turf Retrofit	0.1	Ac	Downers Industrial 3	Private	2	9	2	39	0.365
106	Dry Turf Retrofit	0.1	Ac	Downers Ind 4	Private	2	4	0.75	16	0.1465
107	Dry Turf Retrofit	0.02	Ac	Downers Ind 5	Private	2				0
101	Dry Turf Retrofit	0.3	Ac	Downers Ind 6	Private	2	4	0.78	16	0.1515
157	Dry Turf Retrofit	0.5	Ac	Downers Ind 7	Private	2	7	1	29	0.271
102	Dry Turf Retrofit	0.3	Ac	Downers Ind 8	Private	2	26	5	105	0.9925
103	Dry Turf Retrofit	0.1	Ac	Downers Ind 9	Private	2	14	3	59	0.559
121	Dry Turf Retrofit	0.2	Ac	Downers Ind 10	Private	2				
137	Dry Turf Retrofit	0.2	Ac	Downers Ind 11	Private	2	32	6	132	1.2455
83	Dry Turf Retrofit	0.2	Ac	Downers Ind 12	Private	2	11	2	47	0.4395
158	Dry Turf Retrofit	1	Ac	Downers Ind 13	Private	2	17	3	69	0.65
104	Dry Turf Retrofit	0.09	Ac	Downers Ind 14	Private	2	10	2	42	0.395
123	Dry Turf Retrofit	0.3	Ac	Downers Ind 15	Private	2	6	1	26	0.247
100	Dry Detention Pond Retrofit	0.27	Ac	Downers Ind 16	Private	2	18	4	75	0.709
147	Dry Turf Retrofit	0.2	Ac	Downers Ind 17	Private	2	23	5	96	0.908
149	Dry Turf Retrofit	0.25	Ac	Downers Ind 18	Private	2	60	12	247	2.3255
114	Dry Turf Retrofit	0.12	Ac	Downers Ind 19	Private	2	34	7	139	1.3125
146	Dry Turf Retrofit	0.4	Ac	Downers Ind 20	Private	2	15	3	62	0.588
155	Dry Turf Retrofit	0.5	Ac	Downers Ind 21	Private	2	69	14	284	2.673
109	Dry Turf Retrofit	0.74	Ac	Downers Ind 22	Private	2	44	9	183	1.7235
16	Wet Detention Pond Retrofit	0.2	Ac	Downers Ind 23	Private	2	21	7	234	1.921
115	Dry Turf Retrofit	1.3	Ac	Downers Ind 24	Private	2	42	8	172	1.623
119	Dry Turf Retrofit	0.04	Ac	Downers Ind 25 - belmont maple shopping center	Private	2	30	4	158	0.901
110	Dry Turf Retrofit	0.07	Ac	Downers Ind 26 - belmont maple shopping center 2	Private	2				
159	Channel Restoration Concrete to Native	0.4	Ac	Stream Restoration	Private	1				
	Wetland Restoration	1.33	Ac	Brookbank Rd	Public	1				
89	Dry Turf Retrofit	0.1	Ac	63rd St	Private	1	0.65	44	435	
						1				
129	Dry Turf Basin	0.1	Ac	5329 Main Condos	Private	1				
151	Dry Turf Basin	0.25	Ac	Constitution Park	Public	1	52	6	275	1.568
14	Wet Detention Pond Retrofit	6.2	Ac	Barth Pond	Public	1				
38	Wet Detention Pond Retrofit	0.16	Ac	Aspen Ln. Pond	Private	1				
37	Wet Detention Pond Retrofit	0.23	Ac	Vail Dr. Pond	Private	1				
39	Wet Detention Pond Retrofit	0.15	Ac	Cedar Ln. Basin	Private	1				
34	Wet Detention Pond Retrofit	0.17	Ac	Lake Shore Dr. Pond	Private	1				
40	Wet Detention Pond Retrofit	0.8	Ac	Park Ln. Pond	Private	1				
35	Wet Detention Pond Retrofit	0.25	Ac	Alpine Ln. Basin	Private	1				
33	Wet Detention Pond Retrofit	0.18	Ac	Tuder Ln. Basin	Private	1				
36	Wet Detention Pond Retrofit	0.18	Ac	Echo Ln. Pond	Private	1				

Appendix B

Map ID	Municipality	Ownership	Current Condition	Location	Proposed Condition	Quantity	Units	Total Cost Estimate
	All	Public & Private	eroded streambanks	various	streambank stabilization	12,010	linear feet	$3,002,500
	Downers Grove	Public & Private	Sheet pile dam	St Joseph Creek east of Belmont Ave	dam removal	1	each	na
	Downers Grove	Private	Concrete lined channel	St. Joseph Creek west of Belmont	remove concrete and restore natural channel	360	linear feet	$90,000
	Downers Grove	Public	Piped stream segment	Downers Grove Golf Club	Daylighting- remove pipe and restore natural stream channel	4328	linear feet	$1,082,000
	Downers Grove	Public	Asphalt Parking Lot	BNSF train station	permeable pavers	0.79	Ac	$620,150
	Downers Grove	Public	Road parkway area	Mochel Dr	water quality feature	1	each	$466,396
	Downers Grove	Public	Road parkway area	Main St	Bioswales	3950	Ac	$550,000
	Downers Grove	Public	Degraded wetland	Brookbank Rd north of 59th St	wetland restroration	1	Ac	$14,000
	Downers Grove	Public	Turf swales	Indian Boundary YMCA & O'Neill School	native bioswales	580	Ac	$319,000,000
	Westmont	Public	Piped stream segment	Bellerive Park- 63rd St	Daylighting- remove pipe and restore natural stream channel	300	linear feet	$75,000
0	Downers Grove	Private	Wet	Saratoga Ave. Apartments	wetland detention	0.1	Ac	$39,000
1	Downers Grove	Private	Wet	Warrenville adn Commerce	wetland detention	0.1	Ac	$39,000
2	Westmont	Private	Wet	Cumnor Rd. / South of Ogden Ave.	wetland detention	0.4	Ac	$156,000
4	Downers Grove	Private	Wet	Warrenville and Commerce	wetland detention	0.3	Ac	$117,000
5	Downers Grove	Private	Wet	2655 Ogden	wetland detention	1.9	Ac	$741,000
11	Downers Grove	Private	Wet	South golf course pond	wetland detention	0.83	Ac	$323,700
12	Downers Grove	Public	Dry Turf Basin	East of I-355 and north of Metra tracks	native basin			$0
13	Downers Grove	Public	Wet	4908 linscott	wetland detention	1	Ac	$390,000
14	Downers Grove	Public	Wet	patriots park barth pond	wetland detention	6.23	Ac	$2,429,700
15	Westmont	Private	Wet	55th & King Arthur Ct.	wetland detention	2.4	Ac	$936,000
16	Downers Grove	Private	Wet	chase and old george way	wetland detention	0.2	Ac	$78,000
25	Westmont	Private	Wet with Extended Dry Detention	Pond behind Speedway	wetland detention	0.1	Ac	$39,000
33	Westmont	Private	Wet	Tuder Ln. Apts.	wetland detention	0.18	Ac	$70,200
34	Westmont	Private	Wet	Lake Shore Dr. Apartments	wetland detention	0.17	Ac	$66,300
35	Westmont	Private	Wet	Alpine Ln. Apartments	wetland detention	0.25	Ac	$97,500
36	Westmont	Private	Wet	Echo Ln. Apts	wetland detention	0.18	Ac	$70,200

Appendix B

37	Westmont	Private	Wet	Vail Dr. Apartments	wetland detention	0.23	Ac	$89,700
38	Westmont	Private	Wet	Aspen Ln. Apartmnents	wetland detention	0.16	Ac	$62,400
39	Westmont	Private	Wet	Cedar Ln. Apartments	wetland detention	0.15	Ac	$58,500
40	Westmont	Private	Wet	Next to Westmont Village Leasing Office	wetland detention	0.8	Ac	$312,000
41	Darien	Private	Wet	Tall Pines & Cass Ave	wetland detention	0.9	Ac	$351,000
45	Darien	Public	Dry Turf Basin	Dicosola Ct.	native basin	0.33	Ac	$105,600
46	Westmont	Private	Dry Turf Basin	Cass Ave. and 67th St. Apartments	native basin	0.23	Ac	$73,600
47	Darien	Private	Dry Turf Basin	Sean Circle Bear yard	native basin	1.27	Ac	$406,400
48	Lisle	Private	Dry Turf Basin	4700 Elm Ave	native basin	1.18	Ac	$377,600
49	Lisle	Private	Wet	410 Warrenville Rd, north of parking lot	wetland detention	0.3	Ac	$117,000
50	Lisle	Private	Wet	650 Warrenville Rd, north of building	wetland detention	0.9	Ac	$351,000
51	Lisle	Private	Wet	750 Warrenville Rd	wetland detention	0.8	Ac	$312,000
52	Lisle	Private	Wet with Extended Dry Detention	801 Warrenville Rd	wetland detention	1	Ac	$390,000
53	Lisle	Private	Wet	1001 Warrenville Rd	wetland detention	0.5	Ac	$195,000
55	Lisle	Private	Wet	Between 1007 & 1009 Middleton Pl	wetland detention	0.1	Ac	$39,000
57	Lisle	Private	Dry Turf Basin	East of 4740 Auvergne Ave	native basin	0.27		$86,400
58	Lisle	Private	Dry Turf Basin	560 Ogden Ave, behind building	native basin	0.89	Ac	$284,800
59	Lisle	Public	Dry Turf Basin	4455 Arbor View Dr	native basin	0.95	Ac	$304,000
60	Lisle	Public	Dry Turf Basin	4455 Arbor View Dr	native basin	0.76	Ac	$243,200
61	Lisle	Private	Dry Turf Basin	4558 Basswood Dr	native basin	0.24	Ac	$76,800
62	Lisle	Private	Dry Turf Basin	4622 Lacey Ave, south of parking lot	native basin	0.1	Ac	$32,000
63	Lisle	Private	Dry Turf Basin	4464 Basswood Dr, side yard	native basin	0.17	Ac	$54,400
64	Lisle	Private	Wet	801 Warrenville Rd	wetland detention	0.6	Ac	$234,000
65	Lisle	Private	Dry Turf Basin	906 Ogden Ave, west of building	native basin	0.12	Ac	$38,400
66	Lisle	Public	Dry Turf Basin	777 Front St, north of building	native basin	0.12	Ac	$38,400
67	Lisle	Private	Dry Turf Basin	4587 Hatch Ln, backyard	native basin	0.42	Ac	$134,400
69	Lisle	Private	Wet	Behind 800-808 McKenzie Station Dr	wetland detention	0.13		$45,302
73	Downers Grove	Private	Dry Turf Basin	fairview and village	native basin	0.23		$80,150
78	Westmont		Dry Turf Basin		native basin	2.09	Ac	$728,323
79	Unincorporated DuP	Private	Dry Basin	maple ave	native basin	0.29	Ac	$92,800
80	Unincorporated DuP	Private	Dry Turf Basin	maple ave	native basin	0.12	Ac	$38,400
81	Lisle	Private	Dry Turf Basin		native basin	0.1	Ac	$32,000
82	Lisle	Private	Dry Turf Basin		native basin	0.9	Ac	$288,000

83	Downers Grove	Private	Dry Turf Basin		native basin	0.2	Ac	$64,000
84	Downers Grove	Private	Wet		wetland detention	0.1	Ac	$34,848
85	Downers Grove	Private	Dry Turf Basin	fairway ct	native basin	0.1	Ac	$32,000
86	Downers Grove	Public	Dry Turf Basin	4053 cumnor	native basin	0.88	Ac	$281,600
87	Downers Grove	Private	Dry Turf Basin		native basin	0.1	Ac	$32,000
88	Downers Grove	Private	Dry Turf Basin		native basin	0.1	Ac	$32,000
89	Downers Grove	Private	Dry Turf Basin	412 63rd	native basin	0.1	Ac	$32,000
90	Downers Grove	Public	Dry Turf Basin	59th and blodgett	native basin	1	Ac	$320,000
91	Downers Grove	Private	Dry Turf Basin	59th and dearborn pkwy	native basin	0.1	Ac	$32,000
93	Downers Grove	Private	Dry Turf Basin	brookbank and wallen pl	native basin	0.14	Ac	$44,800
94	Downers Grove	Private	Dry Turf Basin	6631 saint james ct	native basin	0.26	Ac	$83,200
95	Downers Grove	Private	Dry Turf Basin	Warren Ave	native basin	0.06	Ac	$19,200
96	Downers Grove	Private	Dry Turf Basin	4942 douglas	native basin	0.12	Ac	$38,400
100	Downers Grove	Private	Dry Turf Basin	2425 Curtiss	native basin	0.27	Ac	$86,400
101	Downers Grove	Private	Dry Turf Basin	5225 walnut	native basin	0.3	Ac	$96,000
102	Downers Grove	Private	Dry Turf Basin	2700 wisconsin	native basin	0.3	Ac	$96,000
103	Downers Grove	Private	Dry Turf Basin	2701 wisconsin	native basin	0.1	Ac	$32,000
104	Downers Grove	Private	Dry Turf Basin	2560 wisconsin	native basin	0.09	Ac	$28,800
105	Downers Grove	Private	Dry Turf Basin	5126 walnut	native basin	0.1	Ac	$32,000
106	Downers Grove	Private	Dry Turf Basin	5224 walnut	native basin	0.1	Ac	$32,000
107	Downers Grove	Private	Dry Turf Basin	5230 walnut	native basin	0.02	Ac	$6,400
109	Downers Grove	Private	Dry Turf Basin	durand and chase	native basin	0.74	Ac	$236,800
110	Downers Grove	Private	Dry Turf Basin	2309 maple	native basin	0.07	Ac	$22,400
111	Downers Grove	Private	Dry Turf Basin	6576 fairview	native basin	0.4	Ac	$128,000
112	Downers Grove	Public	Dry Turf Basin	815 franklin	native basin	1.62	Ac	$518,400
114	Downers Grove	Private	Dry Turf Basin	wisconsin and janes	native basin	0.12	Ac	$38,400
115	Downers Grove	Private	Dry Turf Basin	2430 durand	native basin	1.3	Ac	$416,000
117	Downers Grove	Private	Dry Turf Basin	maplewood ct	native basin	0.44	Ac	$140,800
119	Downers Grove	Private	Dry Turf Basin	2311 maple	native basin	0.04	Ac	$12,800
121	Downers Grove	Private	Dry Turf Basin	5300 thatcher	native basin	0.2	Ac	$64,000
122	Downers Grove	Private	Dry Turf Basin	ogden and belmont	native basin	0.1	Ac	$32,000
123	Downers Grove	Private	Dry Turf Basin	east of 5224 katrine	native basin	0.3	Ac	$96,000
124	Downers Grove	Private	Dry Turf Basin	2130 ashley ct	native basin	0.45	Ac	$144,000
125	Downers Grove	Private	Dry Turf Basin	highland and ogden	native basin	0.1	Ac	$32,000
126	Downers Grove	Private	Dry Turf Basin	4616 Lee	native basin	0.42	Ac	$134,400
128	Downers Grove	Private	Dry Turf Basin	1127 gilbert	native basin	0.15	Ac	$48,000
129	Downers Grove	Private	Dry Turf Basin	5329 main	native basin	0.1	Ac	$32,000
130	Downers Grove	Private	Dry Turf Basin	8th and cumnor	native basin	0.79	Ac	$252,800
131	Downers Grove	Private	Dry Turf Basin	59th and lyman	native basin	4.07	Ac	$1,302,400
132	Downers Grove	Private	Dry Turf Basin	brookbank and 61st	native basin	0.23	Ac	$73,600
135	Downers Grove	Private	Dry Turf Basin	lindley and ogden	native basin	0.1	Ac	$32,000
136	Downers Grove	Private	Dry Turf Basin	lindley and ogden	native basin	0.1	Ac	$32,000
137	Downers Grove	Private	Dry Turf Basin	5300 walnut	native basin	0.2	Ac	$64,000
138	Downers Grove	Private	Dry Turf Basin	1918 elmore	native basin	0.28	Ac	$89,600
139	Downers Grove	Private	Dry Turf Basin	5465 bending oaks	native basin	0.35	Ac	$112,000
140	Downers Grove	Private	Dry Turf Basin	5401 bending oaks	native basin	0.22	Ac	$70,400
141	Downers Grove	Private	Dry Turf Basin	5421 Challen pl	native basin	0.19	Ac	$60,800
145	Downers Grove	Private	Dry Turf Basin	2820 hitchcock	native basin	0.1	Ac	$32,000
146	Downers Grove	Private	Dry Turf Basin	5240 belmont	native basin	0.4	Ac	$128,000
147	Downers Grove	Private	Dry Turf Basin	2301 curtiss	native basin	0.2	Ac	$64,000
149	Downers Grove	Private	Dry Turf Basin	2301 Curtiss	native basin	0.25	Ac	$80,000

Appendix B

150	Downers Grove	Private	Dry Turf Basin	sterling and ogden	native basin	0.1	Ac	$32,000
151	Downers Grove	Public	Dry Turf Basin	935 maple	native basin	0.25	Ac	$80,000
152	Downers Grove	Private	Dry Turf Basin	highland and ogden	native basin	0.1	Ac	$32,000
153	Downers Grove	Private	Dry Turf Basin	214 firefox	native basin	0.1	Ac	$32,000
154	Downers Grove	Private	Dry Turf Basin	211 foxfire	native basin	0.1	Ac	$32,000
155	Downers Grove	Private	Dry Turf Basin	tamarack and chase	native basin	0.5	Ac	$160,000
156	Downers Grove	Public	Dry Turf Basin	Hummer Park	native basin	1.13	Ac	$361,600
157	Downers Grove	Public	Dry Turf Basin	5225 walnut	native basin	0.5	Ac	$160,000
158	Downers Grove	Private	Dry Turf Basin	2659 wisconsin	native basin	1	Ac	$320,000
159	Downers Grove	Private	Dry Turf Basin	belmont & curtiss	native basin	0.4	Ac	$128,000
TOTAL								$343,848,070