DUPAGE COUNTY

Winfield Creek

Watershed-Based Plan

August 2017

Love Blue. Live Green.

DuPage County Stormwater Management

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1. Introduction

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

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

DuPage County Stormwater Management received a Section 319 grant from the Illinois Environmental Protection Agency (IEPA) to fund the development of five sub-watershed plans, including Klein Creek, Sawmill Creek, Kress Creek, St. Joseph Creek, and Winfield Creek, which is the focus of this document (Figure 1). The purpose of the Winfield Creek Watershed Plan is to develop recommendations to improve the quality of Winfield 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 Winfield Creek

2. Winfield Creek Watershed Planning Area

2.1 Planning Area

The Winfield Creek (a portion of HUC#071200040802) watershed is located in the central part of DuPage County, IL as shown in Figure 2, It is tributary to the West Branch DuPage River with a confluence in the west side of Winfield, IL. The West Branch DuPage River converges with the East Branch DuPage River near Bolingbrook, IL south of the DuPage County line in Will County, IL to become the DuPage River. The DuPage River eventually converges with the Des Plaines River and Kankakee Rivers in Channahon, IL to form the Illinois River.

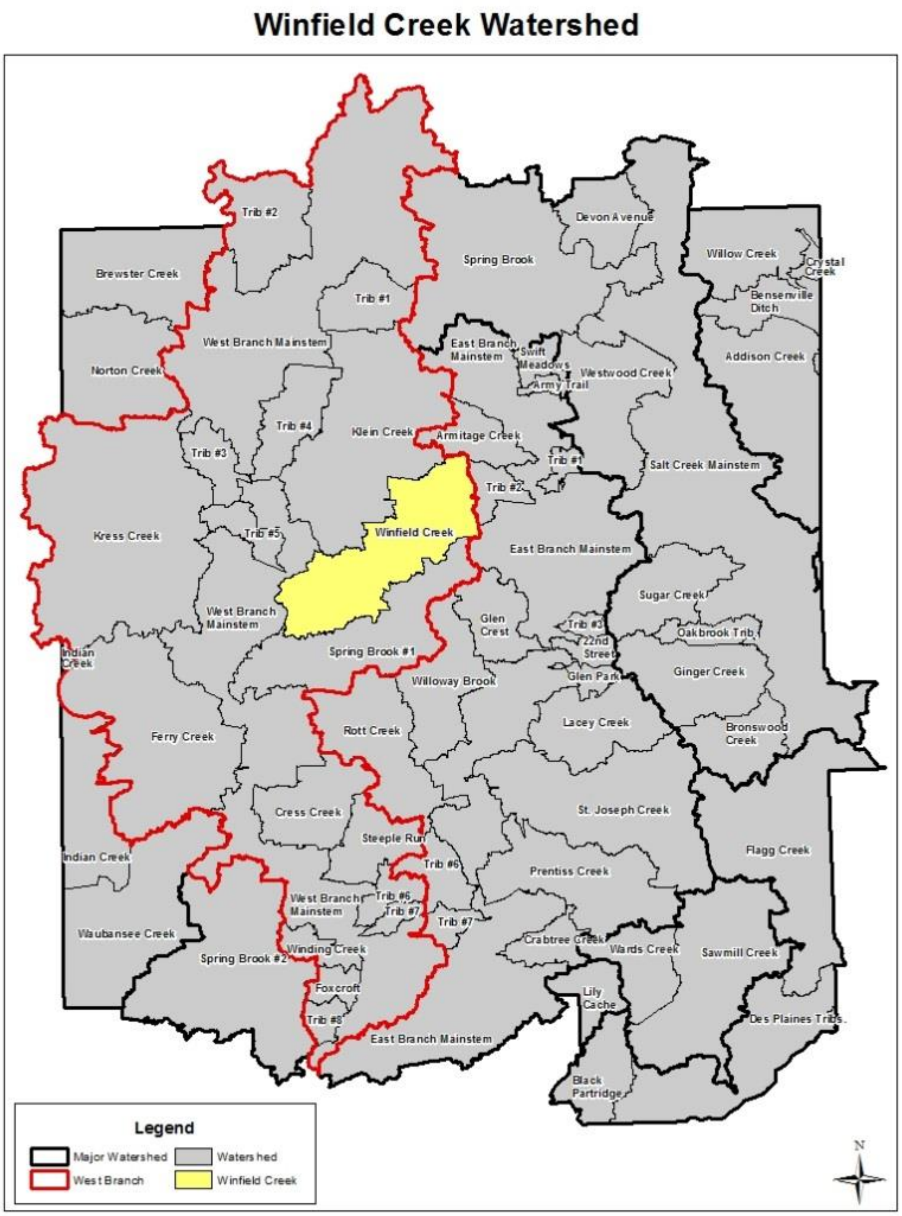

Figure 2 Winfield Creek Watershed's location within the West Branch DuPage River Watershed

Winfield Creek Watershed is a typical suburban area that drains a total of approximately 8.5 square miles in central DuPage County. Shown in Figure 3, the watershed includes portions of the Village of Carol Stream, the Village of Glendale Heights, the Village of Glen Ellyn, the City of Wheaton, the Village of Winfield and unincorporated DuPage County.

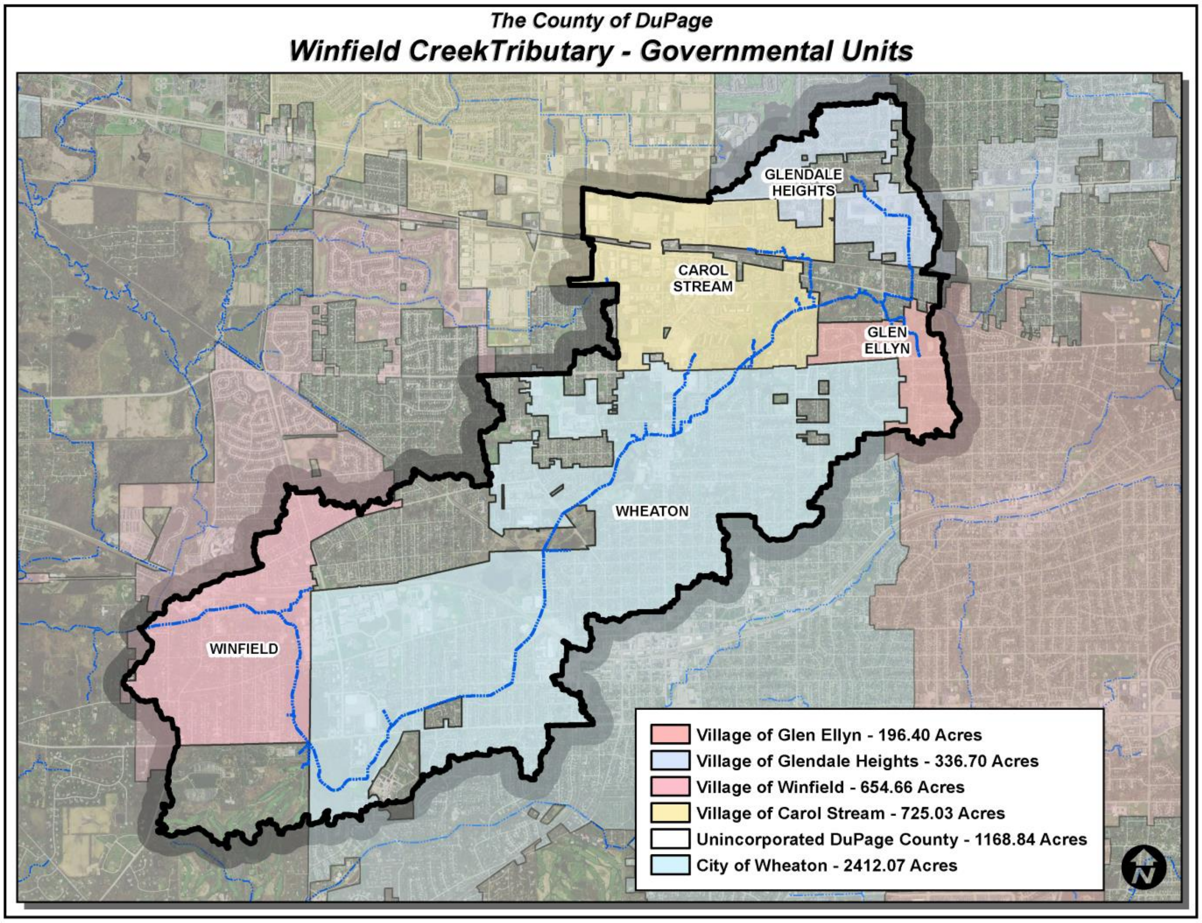

Figure 3 Municipal boundaries within the Winfield Creek Watershed

As shown in Figure 4, Winfield Creek watershed flows in a general south-west direction beginning near North Avenue and flowing south-west until reaching south of Roosevelt Road and east of Shaffner Road where it turns north and then west until it meets with the West Branch of the DuPage River between Gary's Mill Road and High Lake Road and west of Winfield Road.

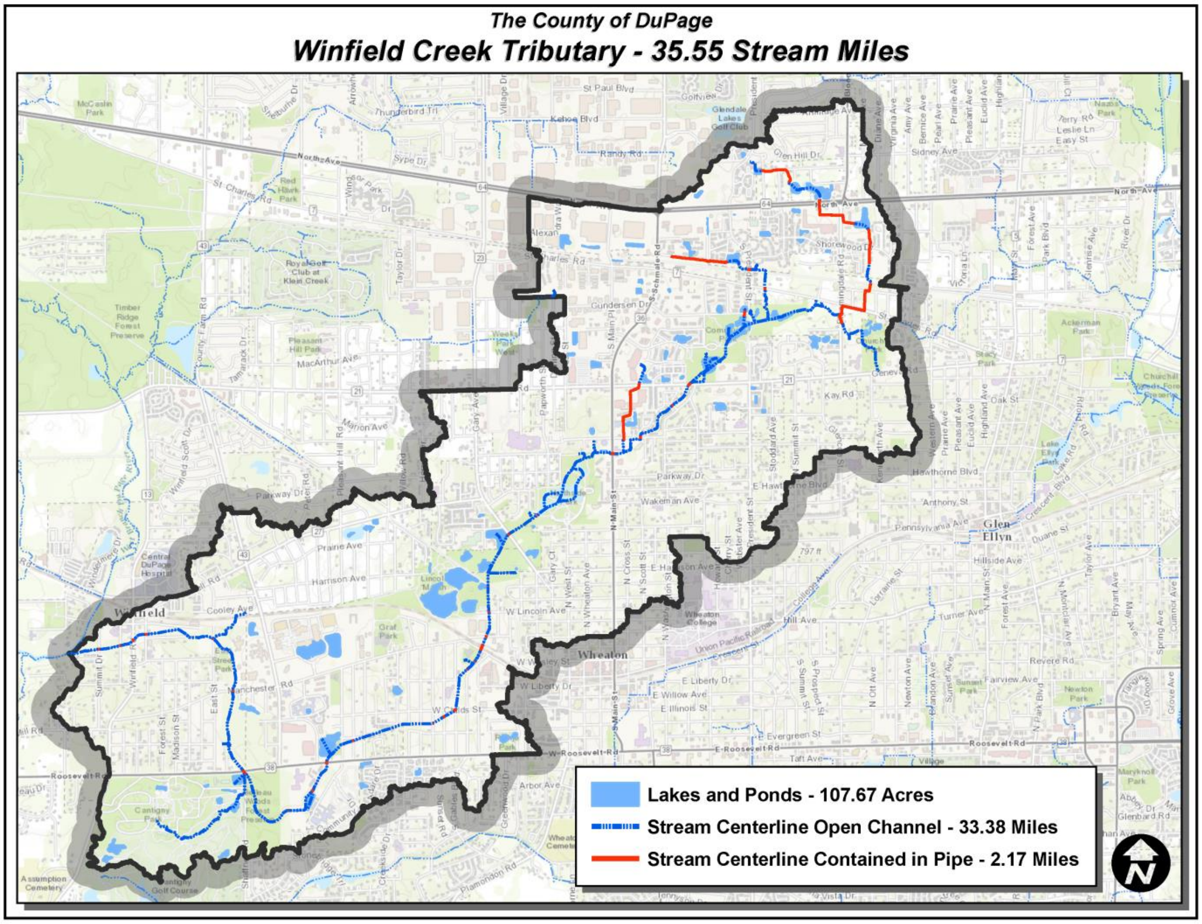

Figure 4 Winfield Creek Watershed

The Winfield Creek watershed has been divided into 4 subwatersheds for the purposes of this study, which are shown in Figure 5. Subwatershed #1 is the south end of the watershed and encompasses the confluence with the West Branch DuPage River. The Union Pacific Railroad and County Farm Road form the upper edge of this subwatershed as drainage has been diverted around these features to a central flow point. Subwatershed #2 is the central part of the Winfield Creek watershed. Most of subwatershed #2 is incorporated Wheaton as well as some smaller pockets of unincorporated DuPage County. Subwatershed #3 encompasses the area from the northern edge of subwatershed #2 to Geneva Road at the northern boundary. Subwatershed #3 is a small subwatershed consisting mainly of the industrial and commercial areas of Carol Stream. Subwatershed #4 encompasses the northern section of the Winfield Creek watershed within Carol Stream, Glendale Heights, and unincorporated DuPage County. Subwatershed #4 is largely made up of multi-family residential complexes.

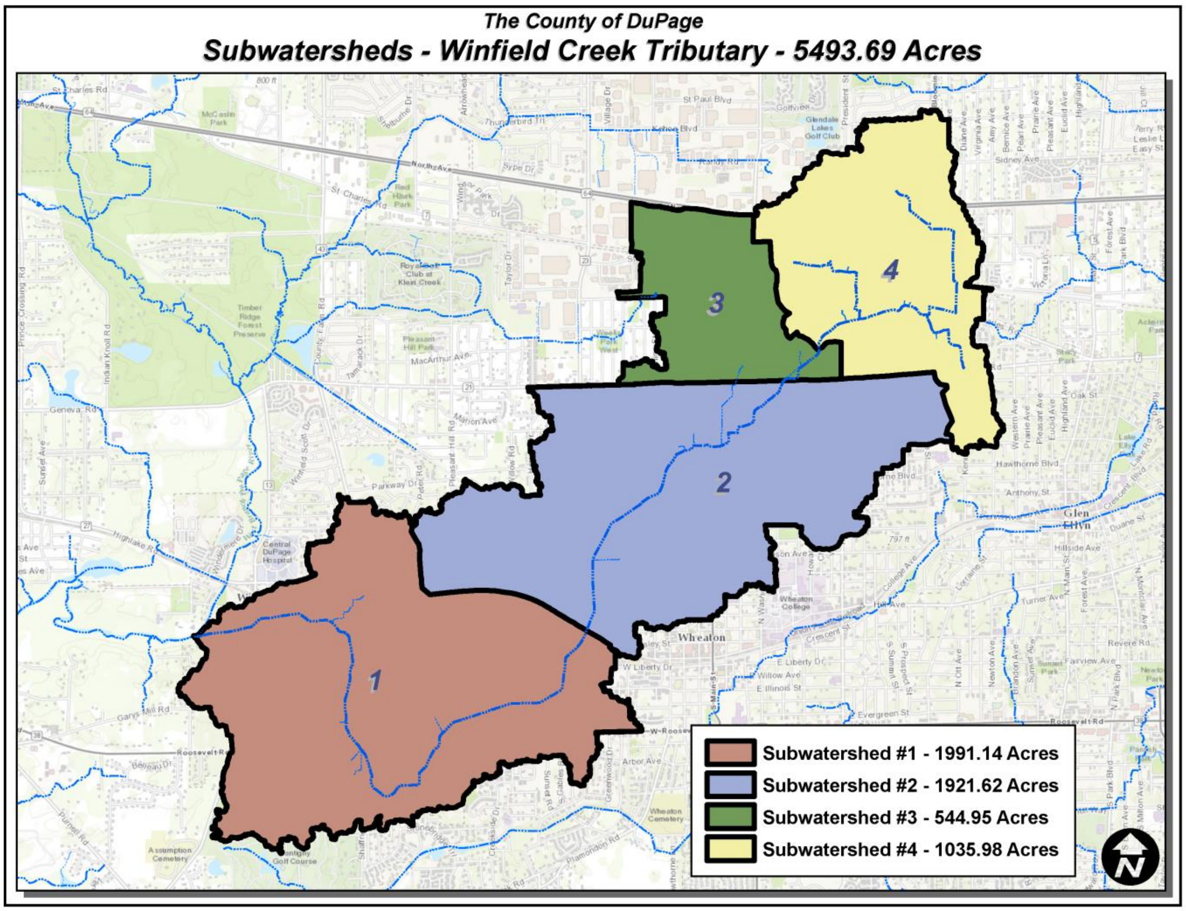

Figure 5 Sub-watersheds in Winfield Creek Watershed

2.2 Local Stakeholders

To understand the Winfield 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 Winfield 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 Winfield Creek Watershed Steering Committee

Early in the Plan development, DuPage County convened a Winfield 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), the Illinois Department of Transportation, and ComEd, 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, in person and remotely, 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 Winfield Creek Watershed Steering Committee members meet to discuss the plan

2.2.2 West 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 West Branch Watershed Protection Workgroup consists of local public agencies, organizations, businesses and residents who all have the common goal of improving the West 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 October 5, 2016 to introduce the Winfield Creek Watershed Plan to the group and seek assistance in the water quality assessment. Staff provided subsequent updates via email and during the following March 9, 2017 meeting, both of which were held in the watershed. As environmental champions in the local community, this workgroup will be important to future implementation of the Plan.

2.2.3 Local Community Outreach

Although prominent agencies and environmentally minded individuals may be the easiest targets when developing watershed plans, local residents, business owners and others are the key to identifying both localized water quality issues and solutions. DuPage County has a long-standing history of engaging local communities in the development and, as importantly, implementation of watershed plans and the Winfield 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.

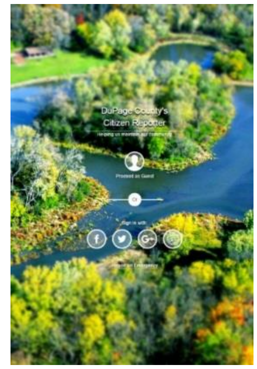

Figure 7 DuPage County water quality planning app

DuPage County mailed 364 letters with an overview of the Plan, contact information and instructions on using the web application to all single-family homes within the floodplain defined by a 1% chance flood. Further, staff distributed several hundred targeted brochures to 22 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 Winfield Creek Watershed Plan and web application. 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 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 Winfield Creek and the surrounding watershed to meet federal, statewide and regional water quality initiatives. Specifically, proposed recommendations found in the Plan will improve physical stream conditions, streamside cover, habitat and impoundments.

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

Median age within the Winfield Creek watershed ranges from 18-27 in some areas to 53-86 in other areas as shown in Figure 9. The youngest population based on median age is located in the east central part of the watershed as indicated in the blue area on the map. This cluster of younger individuals (median age 18-27) is most likely associated with the Wheaton College campus. The campus itself is located just outside the watershed on College Avenue. For a majority of the watershed, the median age is 36-44 years old.

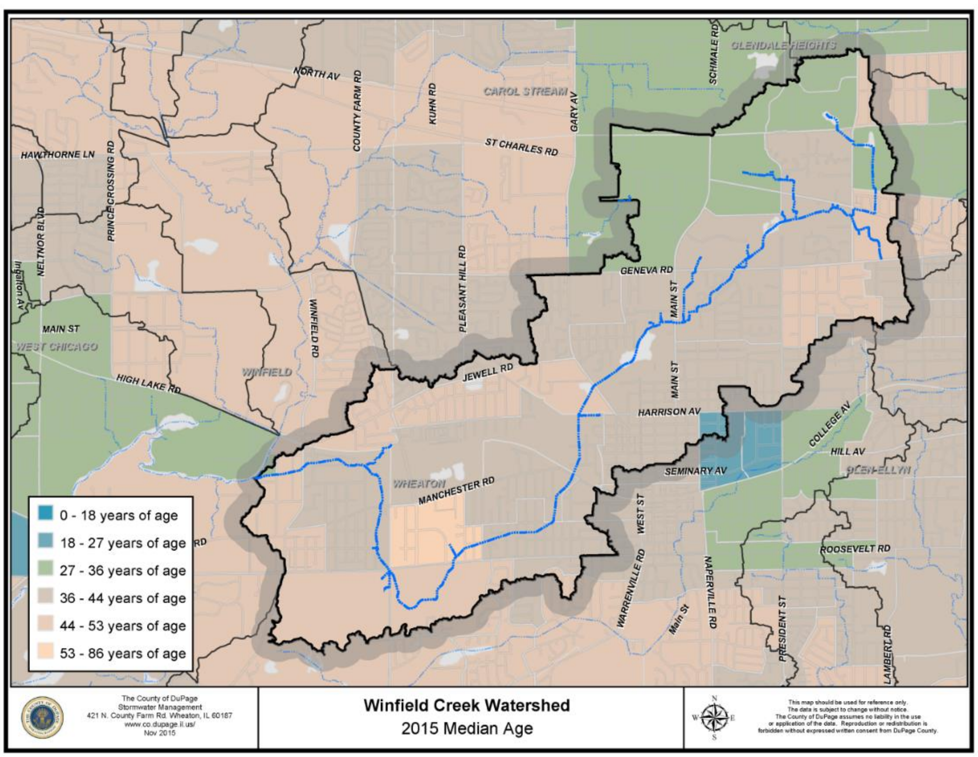

Figure 9 Winfield Creek Median Age

[1] 2010 Census Data: https://www.census.gov/geo/maps-data/data/tiger.html

The population density ranges from 0 to 1,000 people per square mile in the less dense areas to 4,000 to 22,000 people per square mile in the more densely populated areas based on the most recent available census data (Figure 10). The least densely populated area of the watershed is in the southwest corner. This area includes Cantigny Park as well as larger residential properties within the Village of Winfield. The higher density sections of the watershed (4,000-22,000 people per square mile) are typically characterized by apartment complexes condominiums, and single family parcels with smaller yards. The areas with a population density of 1,000 to 4,000 people per square mile contain single family residential parcels as well as institutions and commercial areas. Institutional and commercial land uses can reduce the overall population density of an area as they either do not contain residences, or the percentage of the property that contain residences are relatively small in comparison to the amount of land. Examples of these institutional land uses on the Winfield Creek watershed include the DuPage County Government complex, Marianjoy Rehabilitation Hospital, the Theosophical Society in America, senior living facilities, and several schools. Facilities such as senior living facilities may have relatively large resident populations, but they are often surrounded by expansive grounds which can offset the denser populations in one or two buildings.

Projected population growth rate for the Winfield Creek watershed from 2015 to 2020 ranges from -1.25% to 55.36% (Figure 11). This is a large range, with some areas decreasing slightly or staying the same while other areas have a significant increase. The general trend is a slight increase in population growth rate as projected from 2015 to 2020. There does not appear to be a correlation between projected growth rates and land use or property type within the Winfield Creek watershed. DuPage County, like other collar counties surrounding the City of Chicago have increased in population of the past several decades and that trend is projected to continue in the next five years.

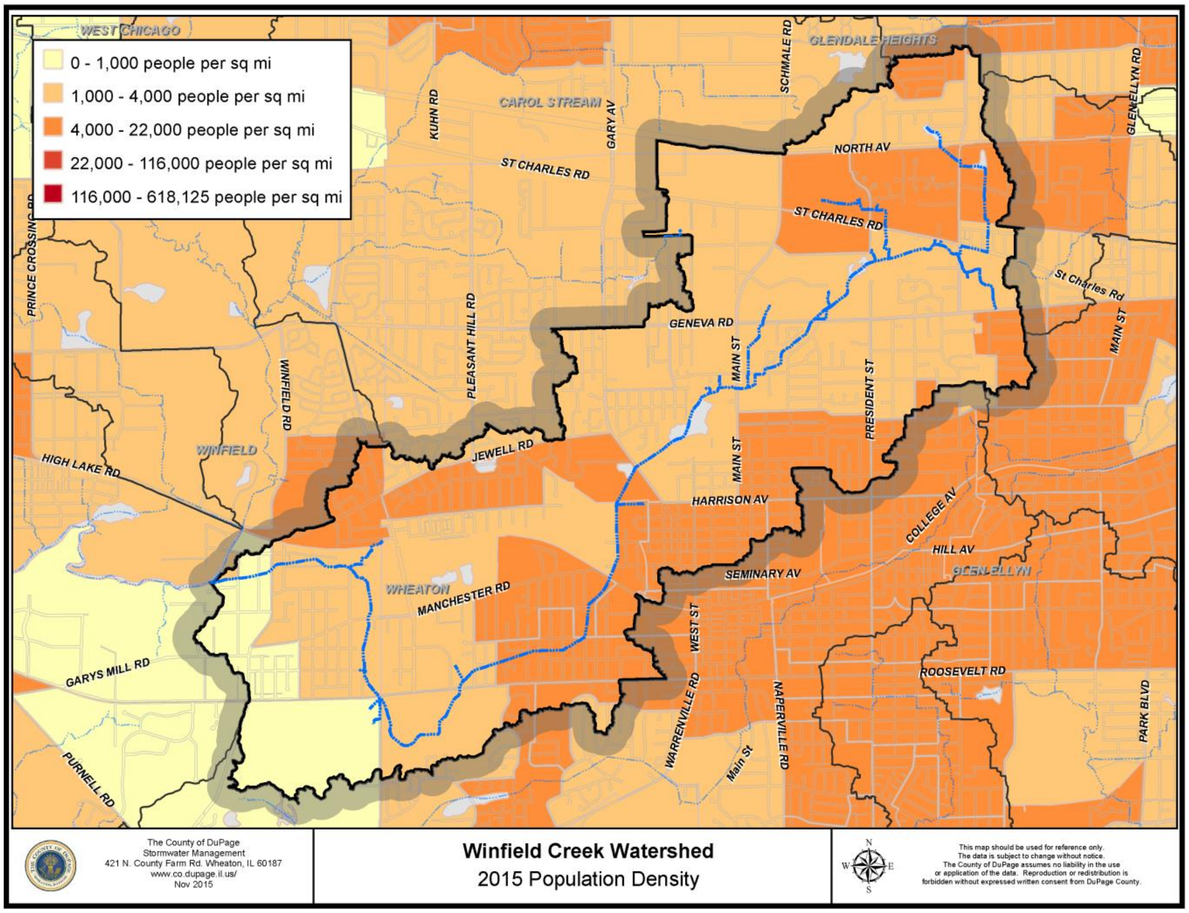

Figure 10 Winfield Creek Population Density

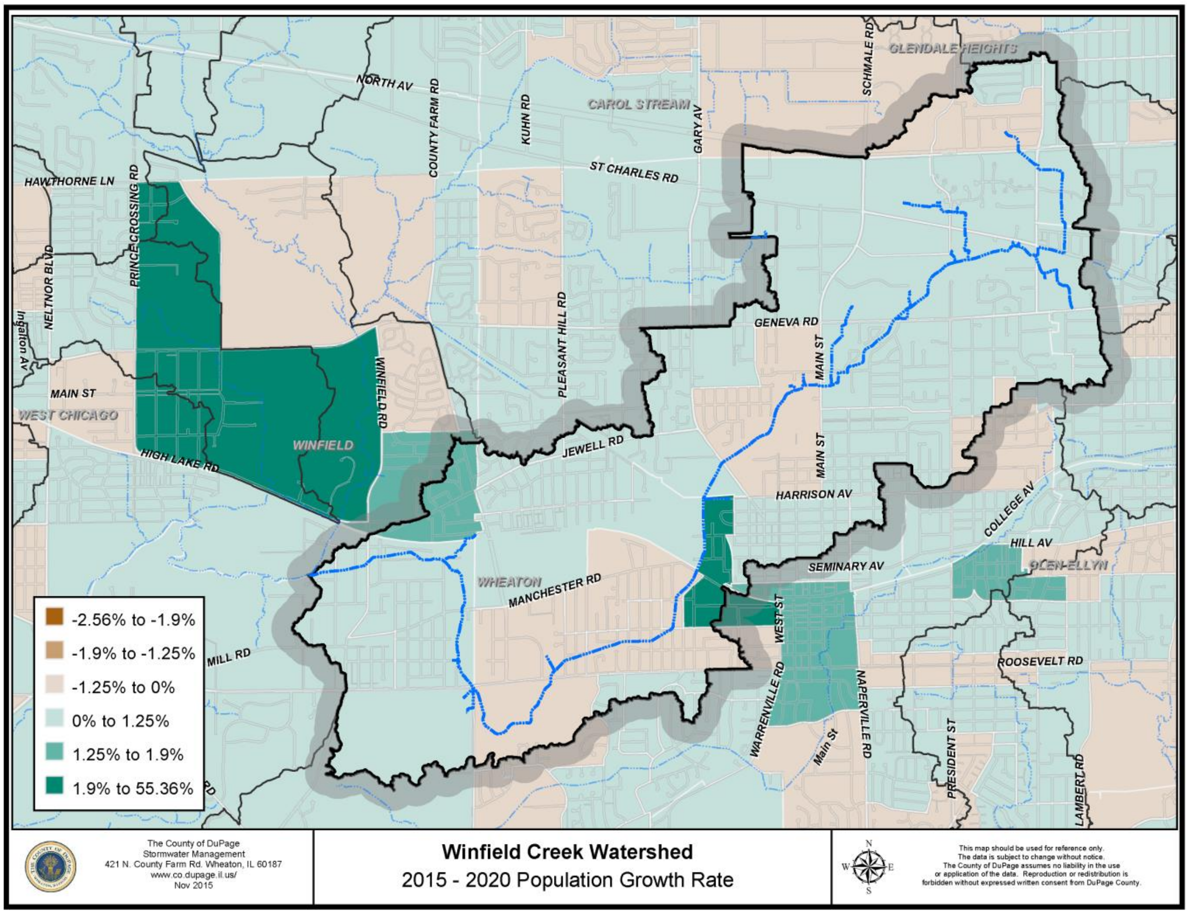

Figure 11 Winfield Creek Population Growth

Median household income in the Winfield Creek watershed ranges from $12,000 - $43,000 to $104,000 - $200,001 (Figure 12). The highest concentration of the upper income levels are in the east- central part of the watershed, north of Jewell Road, south of Geneva Road, and on either side of Gary Avenue as well as the west-central portion of the watershed around Wheaton College in Wheaton and the portion of the watershed within the Village of Glen Ellyn. The lowest income areas are at the northeast and southeast corners of County Farm Road and Roosevelt Road in the southern part of the watershed, and north of Geneva Road and west of Main St/ Schmale Road in the northern part of the watershed. The majority of the watershed has a median income of $73,000 - $104,000.

Unemployment rates in the Winfield Creek watershed are low for a majoirty of the areas. As shown in Figure 13, most of the watershed has an unemployment rate of 0-4.4%. Ther are areas of slightly higher unemployment (4.4-11%) scattered throughout. Two pockets of higher unemployment (11-17.6%) are located in the northwest corner of the watershed around the intersection of Main St an St Charles Road and in the southwest corner of the watershed around the intersection of Winfield and Manchester Roads.

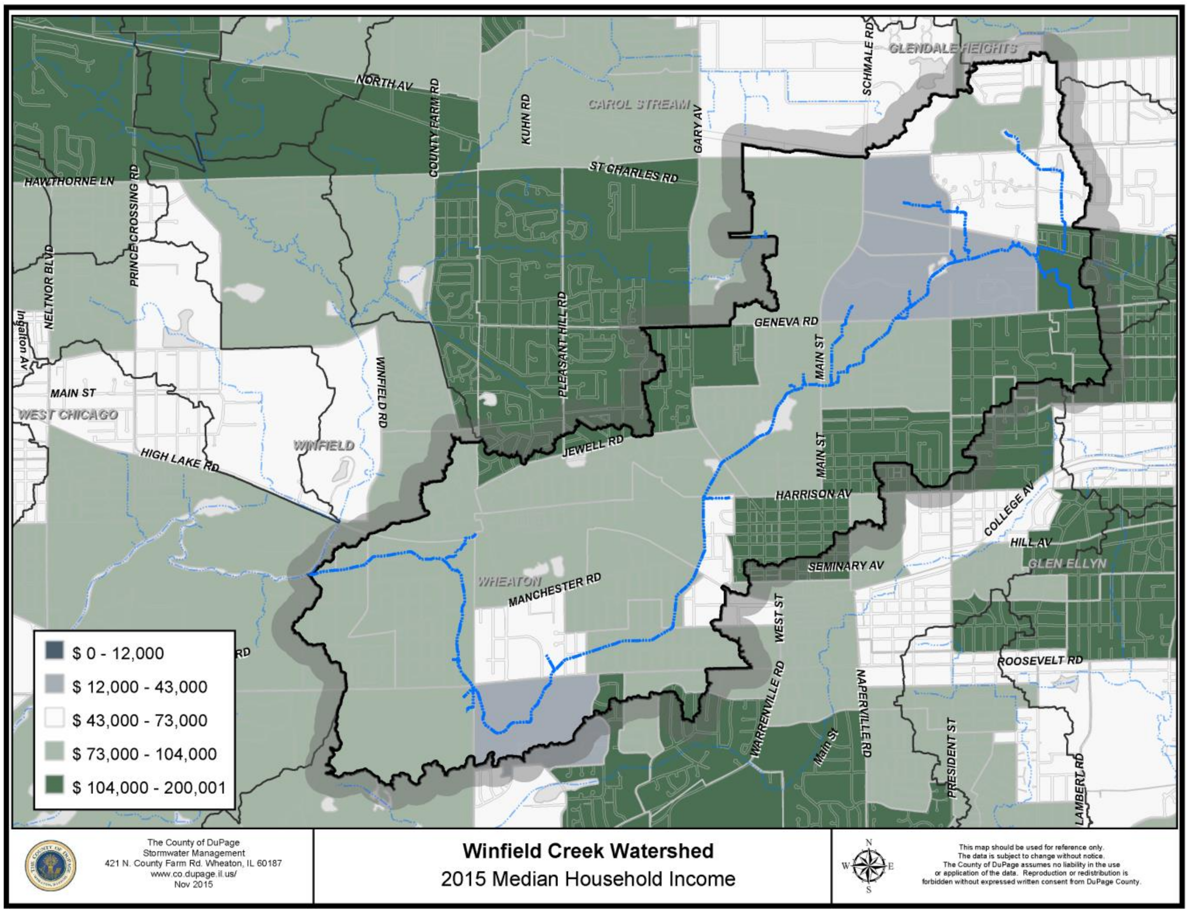

Figure 12 Winfield Creek Median Income

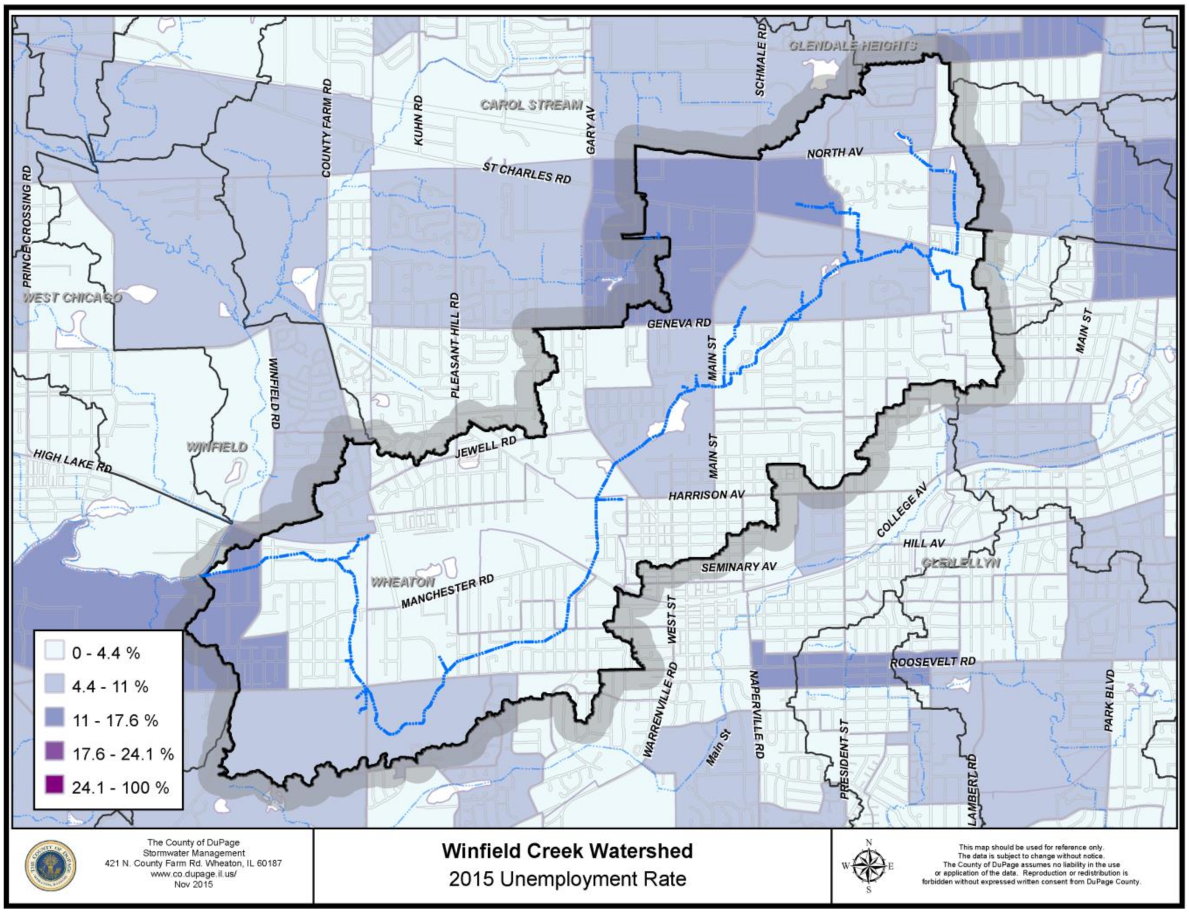

Figure 13 Winfield Creek Unemployment Rate

3.2 Local Jurisdictions

The Winfield Creek watershed is entirely within the limits of DuPage County, Illinois. The watershed spans over 3 of the 9 townships within DuPage County. This includes sections of Milton, Winfield, and Bloomingdale Townships. The municipalities within the Winfield Creek watershed are Carol Stream, Glendale Heights, Glen Ellyn, Wheaton, Winfield as well as unincorporated DuPage County (Tables 1 and 2). The largest amount of land is within the City of Wheaton and unincorporated DuPage County with 43% and 21% of the land area respectively.

Municipalities	Acreage	Percent of Watershed
Carol Stream	725	13%
Glendale Heights	336	6%
Glen Ellyn	196	4%
Unincorporated	1170	21%
Wheaton	2412	44%
Winfield	654	12%
Townships	**Acreage**	**Percent of Watershed**
Bloomingdale	286	5%
Milton	4306	78%
Winfield	901	16%
County	**Acreage**	**Percent of Watershed**
DuPage	5493	100%

Table 1 Winfield Creek Governmental Units

Permittee	Permit Number
Carol Stream, Village of	ILR400308
DuPage County	ILR400502
Glen Ellyn, Village of	ILR400199
Glendale Heights, Village of	ILR400342
Wheaton, City of	ILR400470
Winfield, Village of	ILR400474

Table 2 MS4 Permittees

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

- For unincorporated areas within the Watershed, ***DuPage County*** oversees all zoning, drainage, permitting and the Countywide Stormwater Management and Flood Plain Ordinance

(Ordinance) enforcement.[2] 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.

3.3 Physical & Natural Features

3.3.1 Climate

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

Average annual precipitation in the nearest NOAA recording station (West Chicago, DuPage Airport) is 36.91 inches (Table 3). Summer is the wettest season, with an average rainfall of 12.61 inches in the summer months. The least amount of precipitation occurs in the winter months, with an average total of 4.45 average inches for winter.

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

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

Table 3 Climate data for Chicago West Chicago Airport, IL US (courtesy of NOAA)

3.3.2 Topography

As shown in Figure 14, topography of the Winfield Creek watershed varies from a high point around 800 feet above sea level in the headwater areas in the northeastern end of the watershed to the lowest point at the confluence with the main stem of the West Branch of the DuPage River within the Village of Winfield.

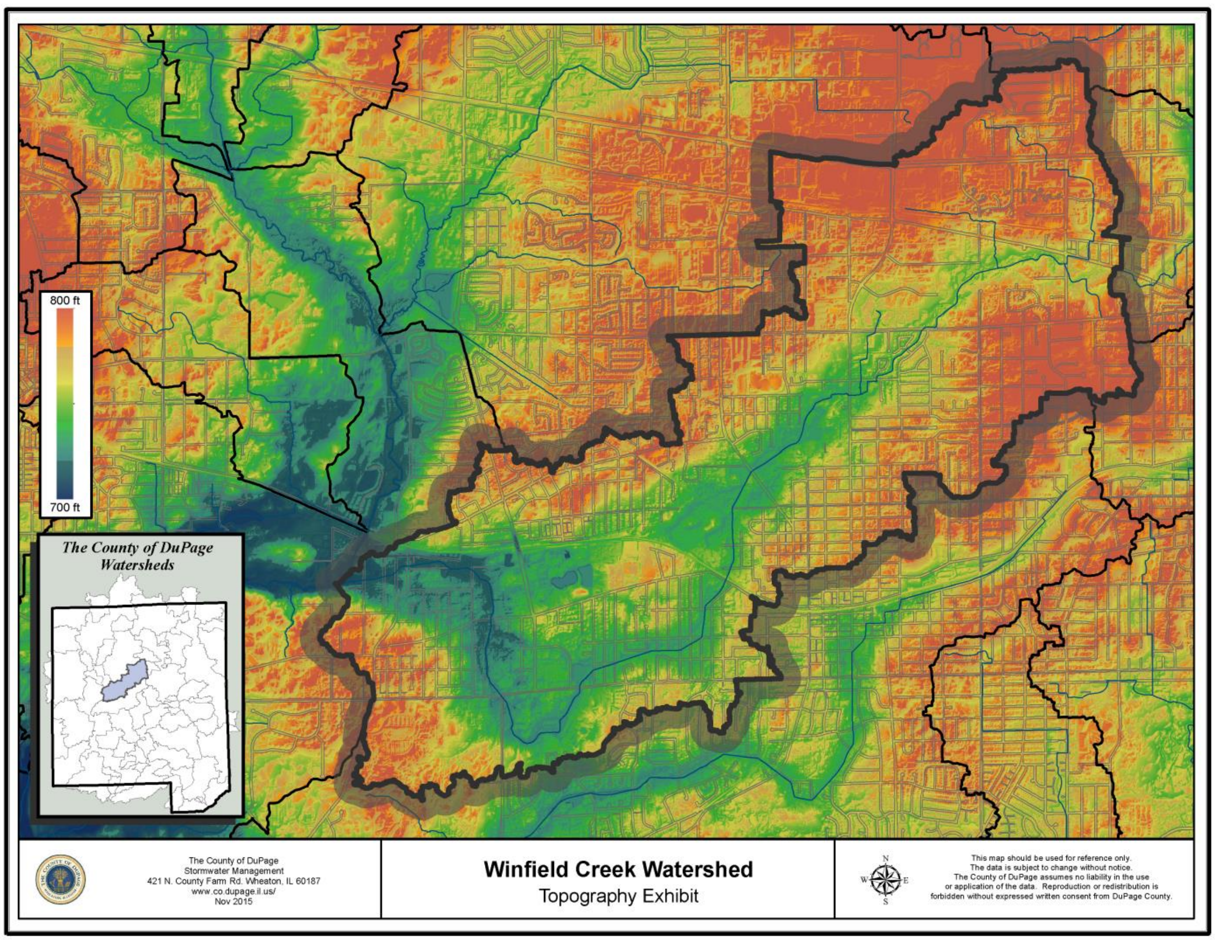

Figure 14 Winfield Creek Topography

3.3.3 Geology

Like the rest of DuPage County, the geology of the Winfield 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.[4] Till is high in clay, thus causing much of the poor drainage that is characteristic of the region.[5] Loess deposits and the underlying till are the parent material for the fertile topsoil that developed over thousands of years by the tallgrass prairies.[6]

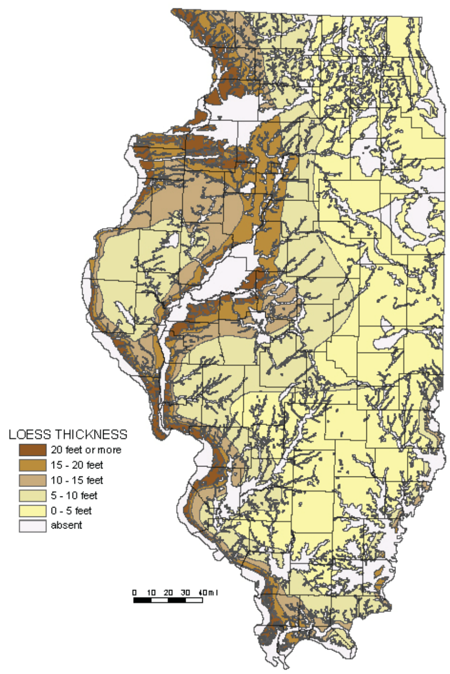

Figure 15 Illinois State Geologic Survey Loess thickness in Illinois

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

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[4] Illinois State Geologic Survey Bulletin 104, plate 1

[5] NRCS Soil Survey of DuPage and Parts of Cook Counties, 1979

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

gardens or infiltration trenches, it is important to evaluate soil type to determine if and how well the practice will infiltrate stormwater.[7]

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.[8] Mentioned before, the parent material is glacial till and loess in this region.

The soils in the Winfield Creek Watershed are mainly silt loam and silty clay loam in texture. As evidenced in Figure 16 and Table 4, the soil series that make up the largest percentages of the watershed are the Orthents, Markham, and Markham-Ashkum- Beecher complex. Orthents, or disturbed urban soils constitue over 15% of the land area. 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.

[7] 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

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

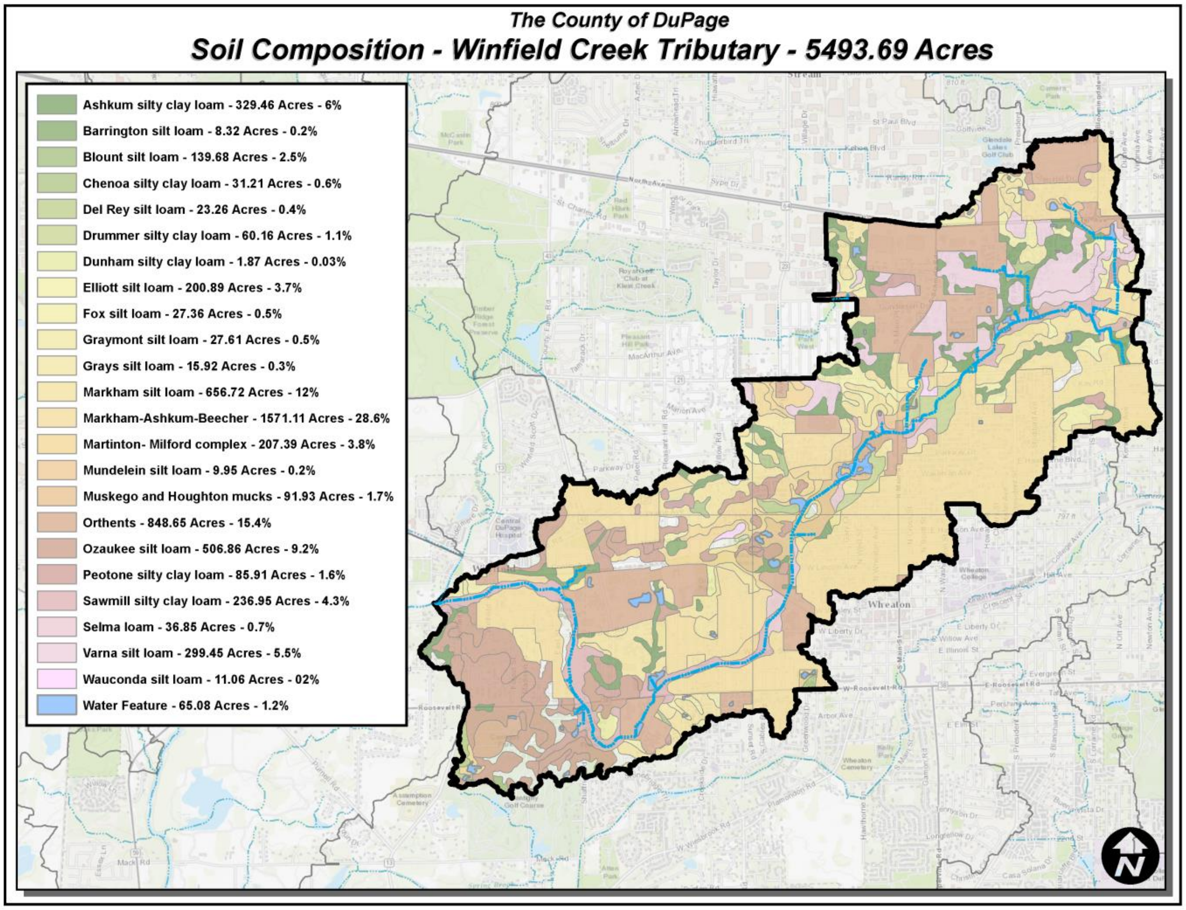

Figure 16 Soil series mapped in the Winfield Creek watershed. (NRCS Soil Survey of DuPage County)

Soils 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 (Soil Survey 1997). In this region, the parent material is glacial till and loess. Which was deposited during the Wisconsinan glaciation.

Winfield Creek Tributary Soil Series			
Series Name	**Acres**	**% of watershed**	**Texure**
Ashkum	329.46	6.00%	silty clay loam
Barrington	8.32	0.20%	silt loam
Blount	139.68	2.50%	silt loam
Chenoa	31.21	0.60%	silty clay loam
Del Rey	23.26	0.40%	silt loam
Drummer	60.16	1.10%	silty clay loam
Dunham	1.87	0.03%	silty clay loam
Elliott	200.89	3.70%	silt loam
Fox	27.36	0.50%	silt loam
Graymont	27.61	0.50%	silt loam
Grays	15.92	0.30%	silt loam
Markham	656.72	12.00%	silt loam
Markham Ashkum Beecher	1571.11	28.60%	
Martinton- Milford	207.39	3.80%	
Mundelein	9.95	0.20%	silt loam
Muskego and Houghton Mucks	91.93	1.70%	muck
Orthents	848.65	15.40%	
Ozaukee	506.86	9.20%	silty clay loam
Peotone	85.91	1.60%	silty clay loam
Sawmill	236.95	4.30%	silty clay loam
Varna	299.45	5.50%	silt loam
Wauconda	11.06	0.20%	silt loam
Water Feature	65.08	1.20%	

Table 4 Winfield Creek Watershed soil series data. (NRCS Soil Survey of DuPage County)

3.3.4.1 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 Winfield 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

Figure 17 Hydric Soils

3.3.4.2 Hydrologic Soils Group

Hydrologic soil groups refer to the runoff potential of a soil.[9]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

[9] NRCS soil survey of DuPage County (2001).

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.[10] Some finer textured soils may be included if they are well aggregated, of low bulk density, or have more than 35% rock fragment.[11]
- ***Hydrologic Soil Group B*** consists of soils with a moderately low runoff potential when thoroughly wet. The texture of these soils is usually loamy sand or sandy loam with between 10% to 20% percent clay and less than 50% to 90% sand. Some finer textured soils may be included if they are well aggregated, of low bulk density, or have more than 35% rock fragment.
- ***Hydrologic Soil Group C*** consists of soils with a moderately high runoff potential when thoroughly wet. The texture of these soils is typically loam, silt loam, sandy clay loam, clay loam and silty clay loam with between 20% to 40% clay and less than 50% sand. Some finer textured soils may be included if they are well aggregated, of low bulk density, or have more than 35% rock fragment.
- ***Hydrologic Soil Group D*** consists of soils with a high runoff potential when thoroughly wet. The texture of these soils is clayey with greater than 40% clay and less than 50% sand.

[10] 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

[11] National Engineering Handbook

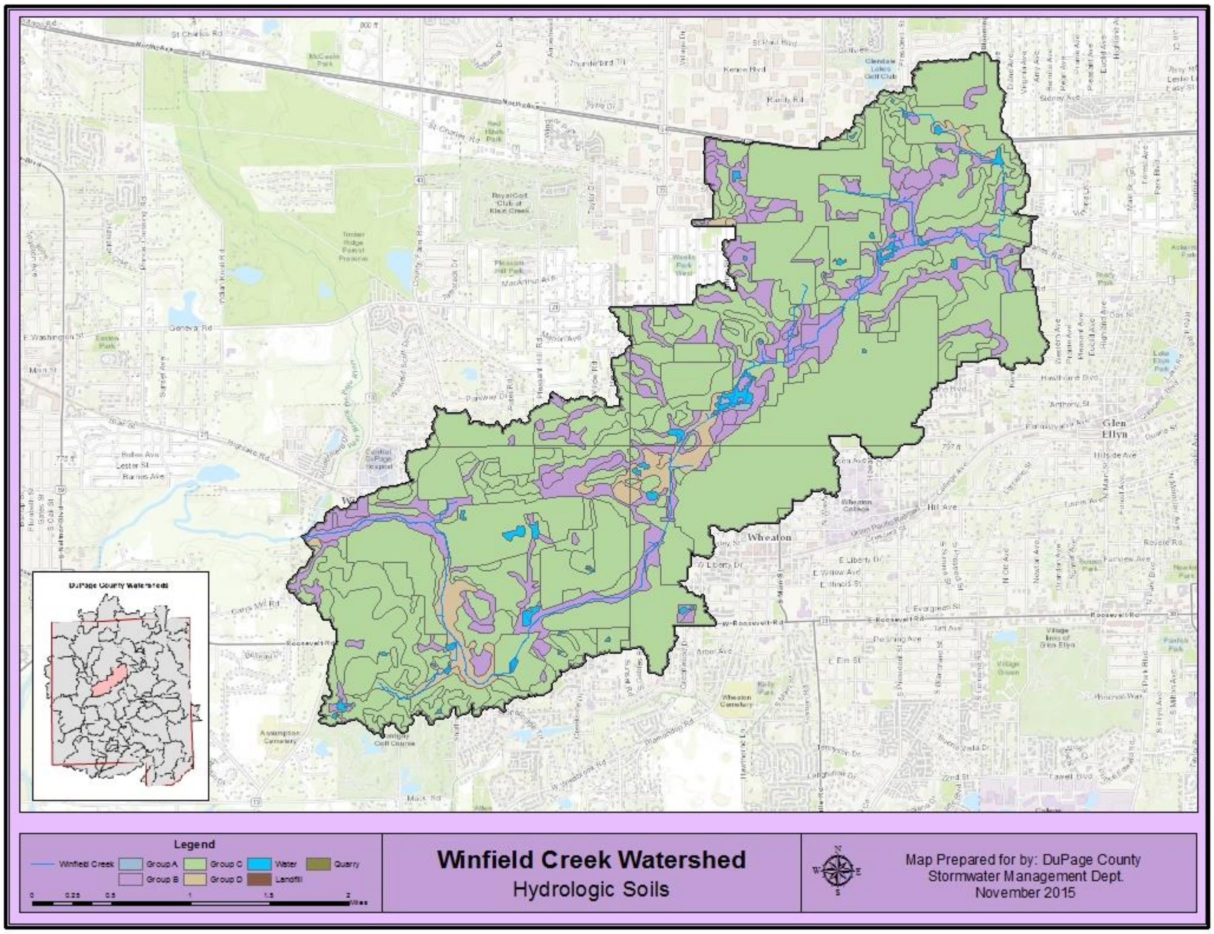

Figure 18 Hydrologic Soil Groups

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

Hydrologic soil group classifications may not be accurate in regard 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.

3.3.4.3 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
Barrington	N	Moderately Well Drained	B	Moderate	Moderate	Moderate
Blount	N	Somewhat Poorly Drained	C	Moderate	Slow	Slow
Chenoa	N	Somewhat Poorly Drained	B	Moderate	Moderate	Moderate
Del Rey	N	Somewhat Poorly Drained	C	Moderate	Slow	Slow
Drummer	Y	Poorly Drained	B	Moderate	Moderate	Moderate
Dunham	Y	Poorly Drained	B	Moderate	Moderate	Moderate
Elliott	N	Somewhat Poorly Drained	C	Moderate	Slow	Slow
Fox	N	Well Drained	B	Moderate	Moderate	Moderate
Graymont	N	Moderately Well Drained	B	Moderate	Moderate	Moderate
Grays	N	Moderately Well Drained	B	Moderate	Moderate	Moderate
Markham	N	Moderately Well Drained	C	Moderate	Slow	Slow
Markham Ashkum Beecher	Y	N/A	C	Moderate	Slow	Slow
Martinton-Milford	Y	N/A	C	Moderate	Slow	Slow
Mundelein	N	Somewhat Poorly Drained	B	Moderate	Moderate	Moderate
Muskego	Y	Very Poorly Drained	A	Low	High	High
Orthents	N	Moderately Well Drained	C	Moderate	Slow	Slow
Ozaukee	N	Moderately Well Drained	C	Moderate	Slow	Slow
Peotone	Y	Very Poorly Drained	B	Moderate	Moderate	Moderate
Sawmill	Y	Poorly Drained	B	Moderate	Moderate	Moderate
Varna	N	Moderately Well Drained	C	Moderate	Slow	Slow
Wauconda	N	Somewhat Poorly Drained	B	Moderate	Moderate	Moderate
Water Feature	N/A	N/A	N/A	N/A	N/A	N/A

Table 5 Winfield Creek Watershed soil properties

3.3.4.4 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).[12]

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 Winfield Creek Watershed is illustrated in Table 6.

Series Name	Soil Erodibility (Kf)
Ashkum	0.43
Barrington	0.43
Blount	0.55
Chenoa	0.49
Del Rey	0.43
Drummer	0.43
Dunham	0.55
Elliott	0.49
Fox	0.49
Graymont	0.43
Grays	0.49
Markham	0.43
Markham Ashkum Beecher	0.37
Martinton- Milford	0.28
Mundelein	0.43
Muskego	0.37
Orthents	0.32
Ozaukee	0.43
Peotone	0.37
Sawmill	0.43
Varna	0.43
Wauconda	0.37
Water Feature	N/A

Table 6 Soil Erodibility

[12] 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

3.4 Land Use & Land Cover

Land use in the Winfield Creek watershed is dominated by single family residential use. The rest of the watershed land use is a combination of commercial, industrial, institutional, multifamily, agricultural, and open space uses. Land use is discussed further in the Water Quality Assessment section of this document.

Land Use	Acres
Commercial	604.24
Industrial	1561.18
Institutional	326.96
Multi-Family Residential	107.93
Open Space	999.16
Residential	2527.79
Transportation	1565.14
Vacant	234.48
Agricultural	112.69

Table 7 Land Use in Winfield Creek Watershed

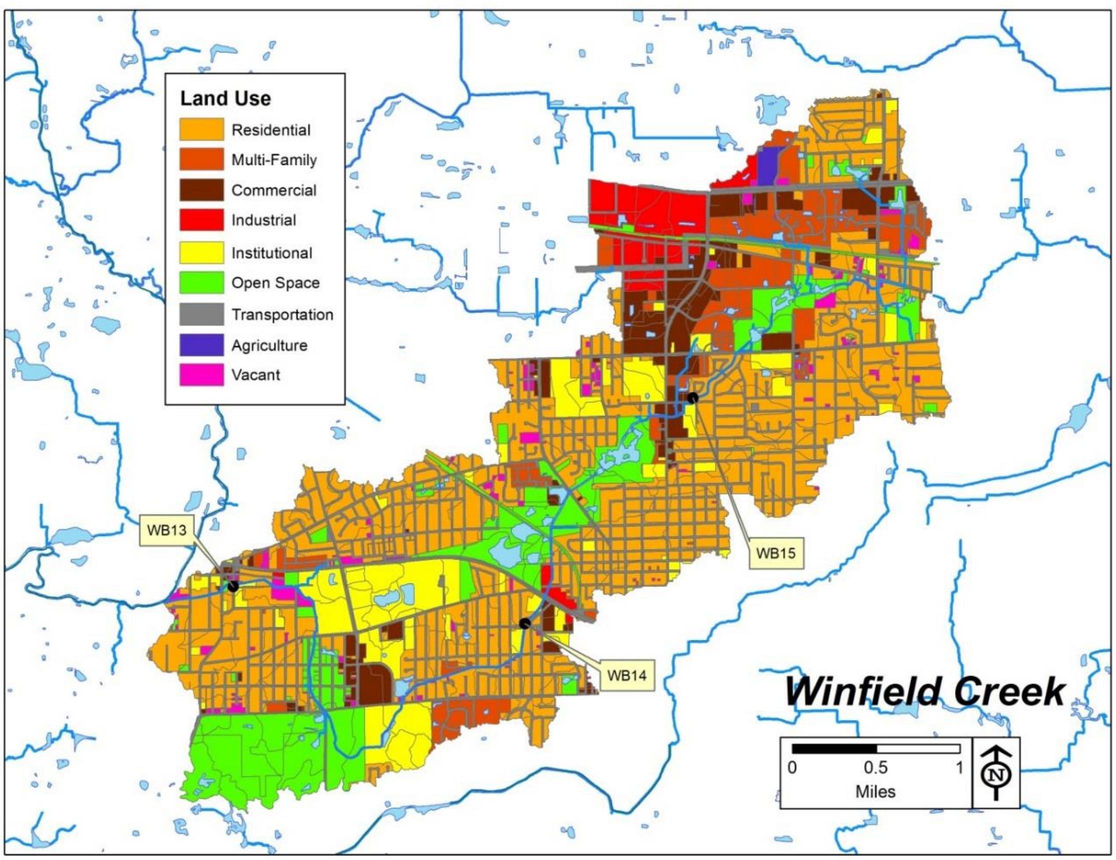

Figure 19 Land Use

3.4.1 Historical Land Cover

Like most Midwestern areas, the Winfield 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 20.

As this snapshot of the Winfield Creek watershed from 1956 shows, this area had already experienced some development from agricultural use as early as 60 years ago. The City of Wheaton was incorporated as a village in 1859 and it became the County seat in 1867. This would help the area to propel the development from agricultural use early on, despite the distance from the City of Chicago. As shown in Figure 20, the area still had a significant amount of land use in agriculture in 1956. Development quickly filled in remaining farm fields over the next half century. By 2014, the Winfield Creek watershed was significantly developed.

Figure 20 Typical land use in Winfield 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 Winfield Creek Watershed is no exception. Of the Watershed's approximately 5494 acres, more than 1796 acres – or 33% of the Watershed – has impervious cover (Figure 21). 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.

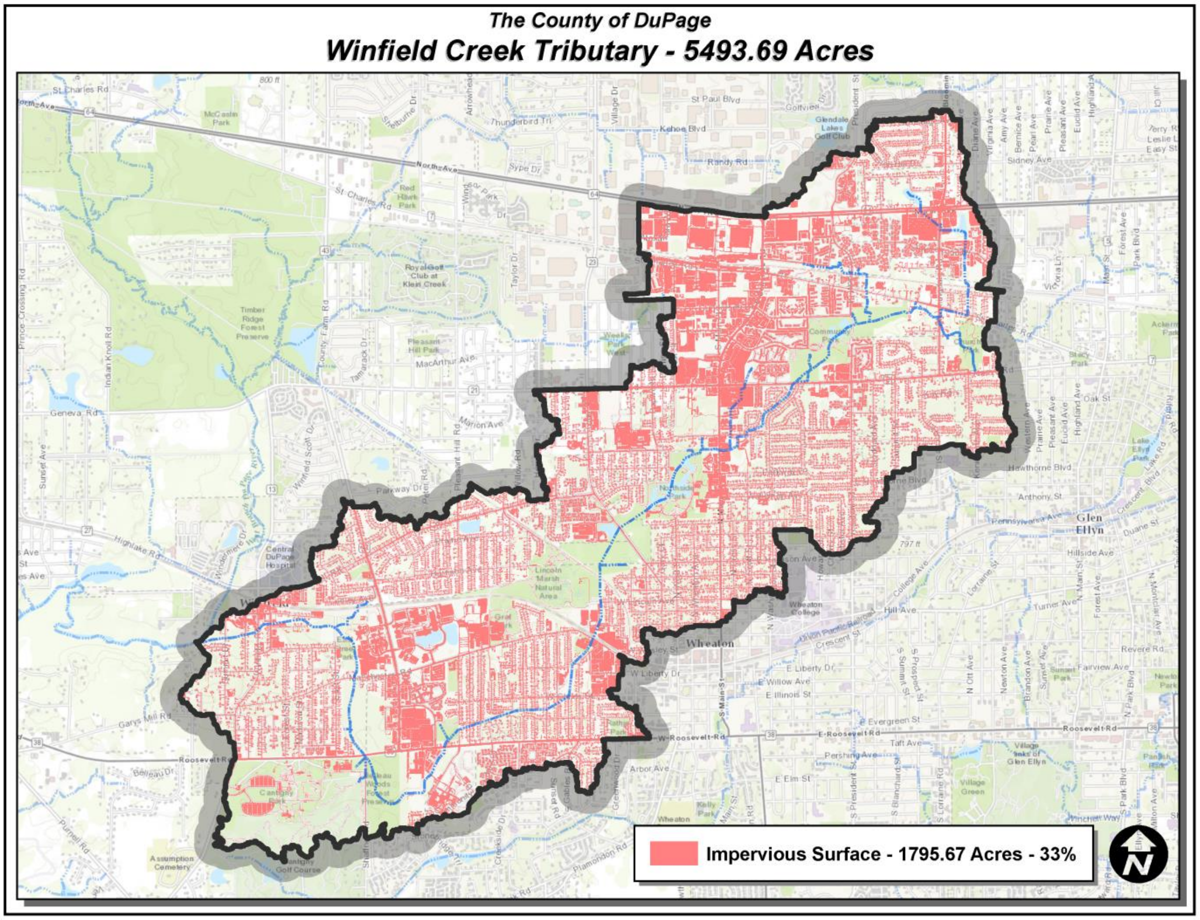

Figure 21 Impervious Surface Cover

Of particular concern is the amount of impervious road cover in the planning area with public roads occupying 915 acres within the Winfield Creek Watershed. These roadways account for 50% of the Watershed's total impervious cover (Table 8). A significant amount of polluted stormwater runoff generated in the Watershed is conveyed to Winfield Creek and its tributaries along these transportation corridors.

Entity	Lane Acreage	Lane Miles
Bloomingdale Township	6.73	1.85
City of Wheaton	348.94	99.92
DuPage County DOT	159.02	34.69
Illinois DOT	56.80	18.36
Milton Township	102.72	28.13
Village of Carol Stream	47.30	13.01
Village of Glen Ellyn	18.10	4.98
Village of Glendale Heights	51.11	14.05
Village of Winfield	125.04	34.42
Total	**915.75**	**249.41**

Table 8 Roadway Impervious Surface Cover

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 22 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 23).

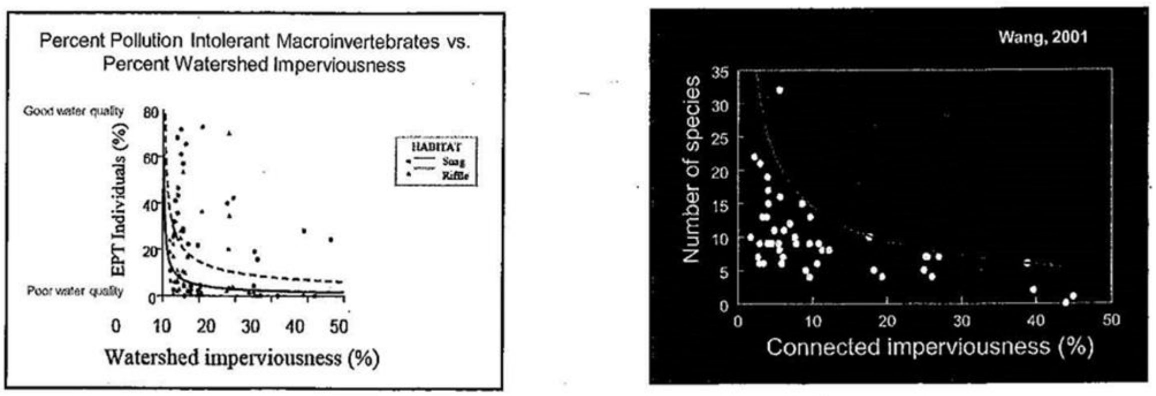

Figure 22 Comparison of impervious cover in a watershed to aquatic species.[13]

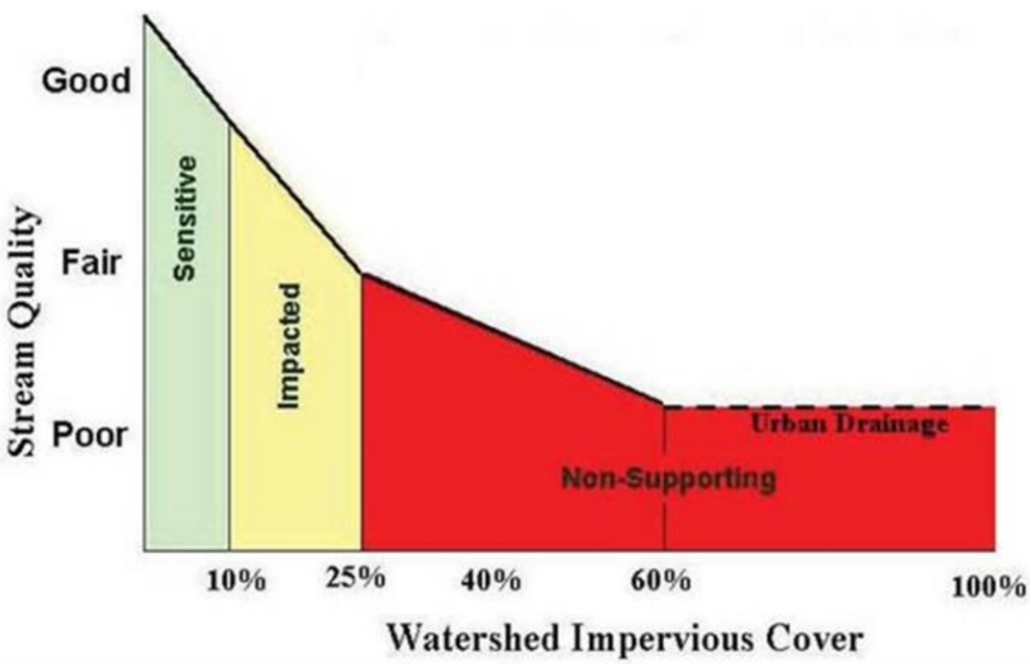

Figure 23 Comparison of stream quality to impervious cover in a watershed

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[13] 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.[14] 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.[15]

There are around 355 acres of wetland in the Winfield Creek watershed (Figure 24). This constitutes about 6% of the land surface area. On the contrary, hydric soils- an indicator of wetlands - are found over 2602 acres of the watershed, which accounts for about 47% of the planning area. As discussed earlier, less than 14% 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.

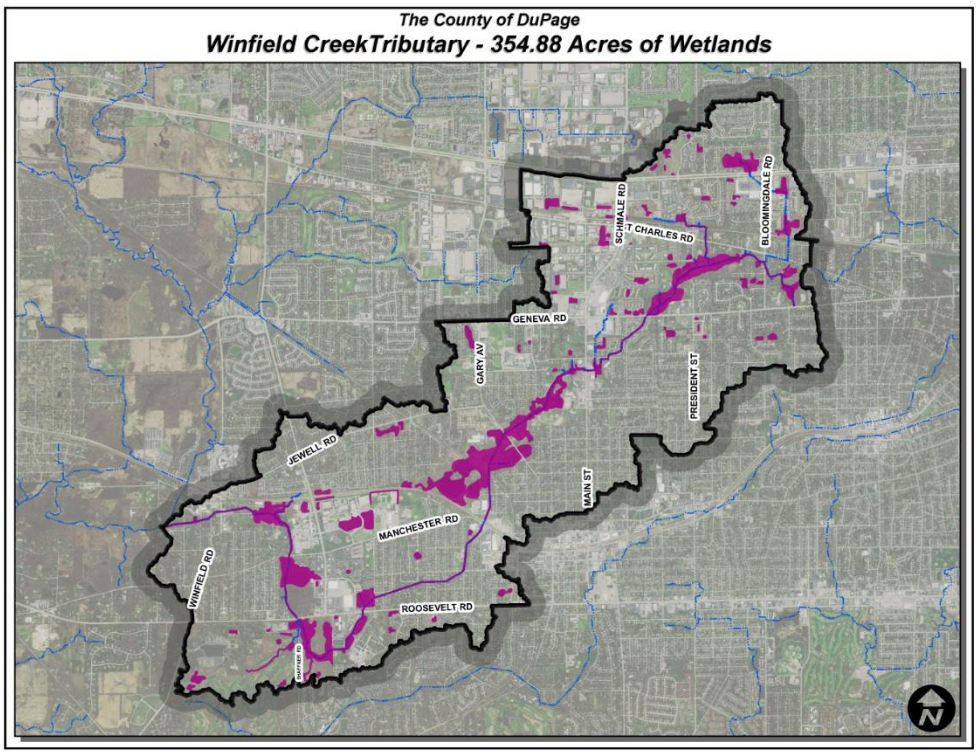

Figure 24 Winfield Creek Watershed Wetland Inventory [16]

[14] 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

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

[16] Of the wetlands that remain, it is important to note that the DuPage County Wetland Map was created using National Wetland Inventory 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 all

There are critical wetlands found in the headwater areas north of the intersection of St. Charles Road and President Street in Glendale Heights, illustrated in Figure 25. 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. A headwater tributary to Winfield Creek flows through this critical wetland complex.

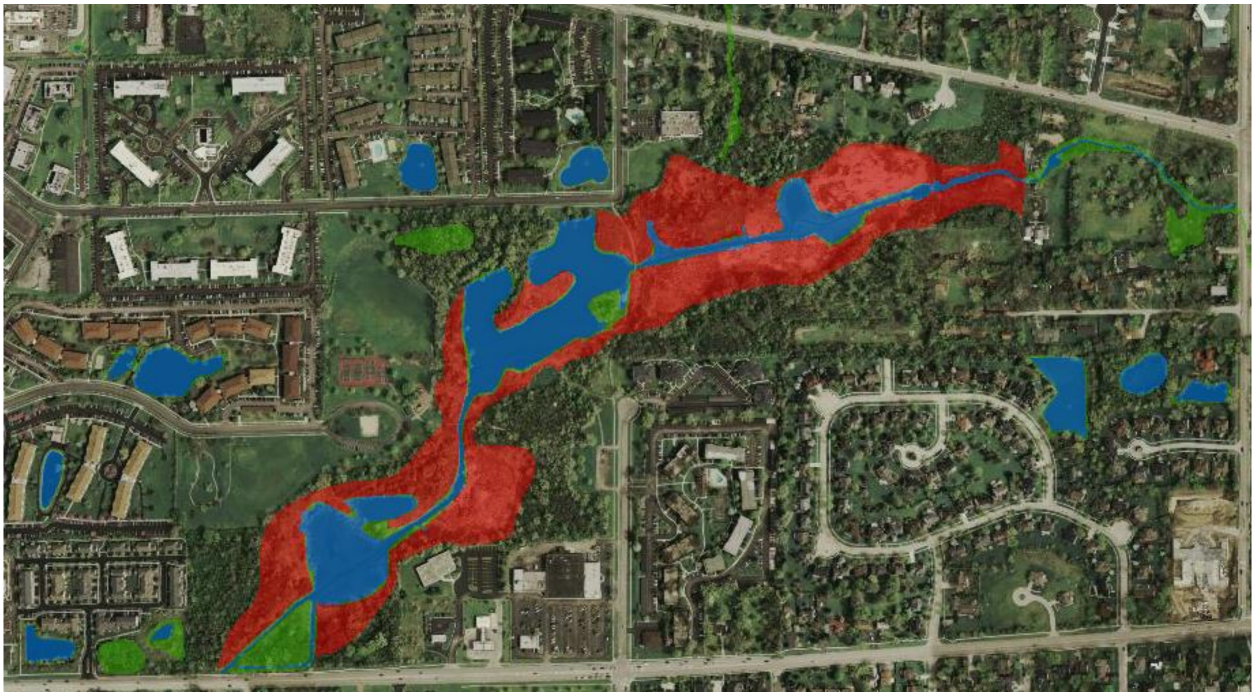

Figure 25 Critical Wetlands on Village of Glendale Heights Property

3.4.4 Open Space

Another result of the significant development in the Winfield Creek Watershed is a decrease in open space. The Watershed has about 522 acres of open space, which is less than 10% of the surface area (Figure 31). 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:

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mapped as wetlands. These areas may not provide the same functions and water quality and habitat benefits as true wetlands.

- ***Lincoln Marsh:*** Owned by the Wheaton Park District, Lincoln Marsh is a 150 acre wetland complex located in Wheaton. The expansive marsh is surrounded by prairie, woodlands, and savannas. Trails, boardwalks, and an obstacle course merge recreation with the natural environment.[17]

Figure 26 Lincoln marsh (Wheaton Park District)

[17] https://lincolnmarsh.org/

- ***Black Willow Marsh:*** Jointly owned by DuPage County and the Forest Preserve District of DuPage County, Black Willow Marsh is a relatively small landlocked wetland area near the intersection of North Avenue and Bloomingdale Road.

Figure 27 Black Willow Marsh

- ***Village of Glendale Heights Wetland Complex***: North of Geneva Road and President Street, lies a large wetland complex owned by the Village of Glendale Heights. Winfield Creek runs directly through this area.

Figure 28 Glendale Heights Wetland Complex

- **Cantigny Park:** Privately owned and operated by the Robert McCormick Foundation, Cantigny Park is a 500-acre site which includes parks, gardens, a golf course, and museums. The site contains a large area of open space, including manicured landscaped areas (gardens and golf course) as well as natural areas. A small tributary to Winfield Creek runs through the site.

Figure 29 Winfield Creek Tributary through Cantigny Park

- ***Belleau Woods:*** About half of the Belleau Woods Forest Preserve falls within the Winfield Creek watershed. This natural woodland area also contains ephemeral wetlands, and the riparian environment surrounding Winfield Creek.

Figure 30 Belleau Woods (Photo Courtesy of Forest Preserve Distirct of DuPage County)

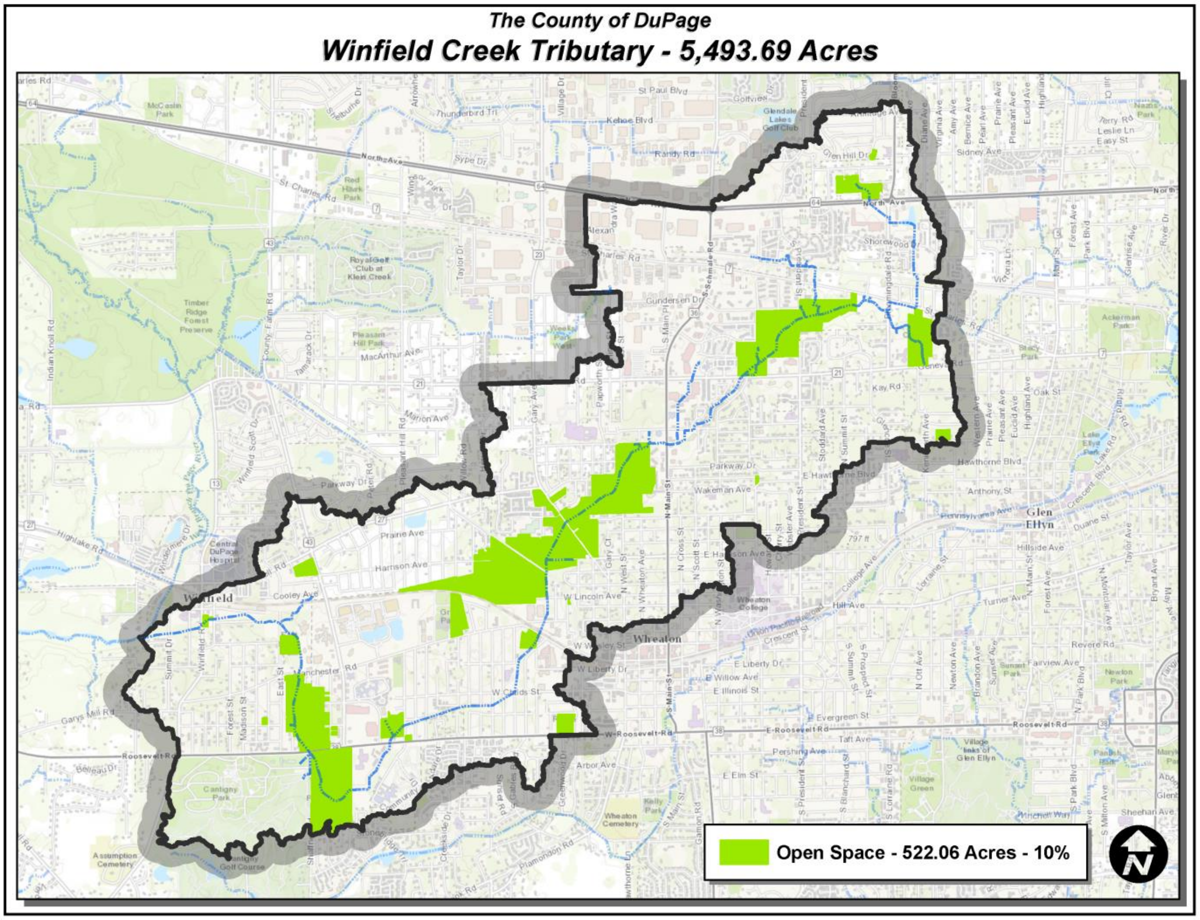

Figure 31 Winfield Creek Watershed open space

3.5 Water Resource Conditions

3.5.1 Watershed Drainage System

As previously mentioned, the Winfield Creek Watershed is located in the central part of DuPage County and drains stormwater from three townships and five municipalities. Winfield Creek mainstem (WBWF001) begins north of North Avenue and west of Bloomingdale Road. WBWF001 runs southeast until it reaches St. Charles Road where it runs west along the road before crossing it at Bloomingdale Road and turns south-east. Shortly after passing under Bloomingdale Road WBWF001 meets up with its two major tributaries. WBWF003 begins at Geneva Road and runs north-east until reaching WBWF001. WBWF002 begins north of St. Charles Road and runs south-east until connecting to WBWF001. WBWF001 then continues south-east until it passes below Roosevelt Road, turning north-west until it connects to the West Branch of the DuPage River north of Manchester Road and west of Winfield Road.

Stormwater within the Winfield Creek watershed flows in a general south-west direction beginning near North Avenue and flowing south-west until reaching south of Roosevelt Road and east of Shaffner Road where it turns north and then west until it meets with the West Branch of the DuPage River between Gary's Mill Road and High Lake Road and west of Winfield Road.

Stormwater within the Winfield Creek Watershed flows in a general north to south direction beginning near Army Trail Road. Tributaries to Winfield Creek flow from the east and west. The creek continues south until reaching the West Branch of the DuPage River.

Of the estimated 187,704 linear feet of Winfield Creek, approximately 2.17 miles, or about 7% of the stream length is piped (Figure 32). Piped segments are mainly in the headwaters to the north. 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.

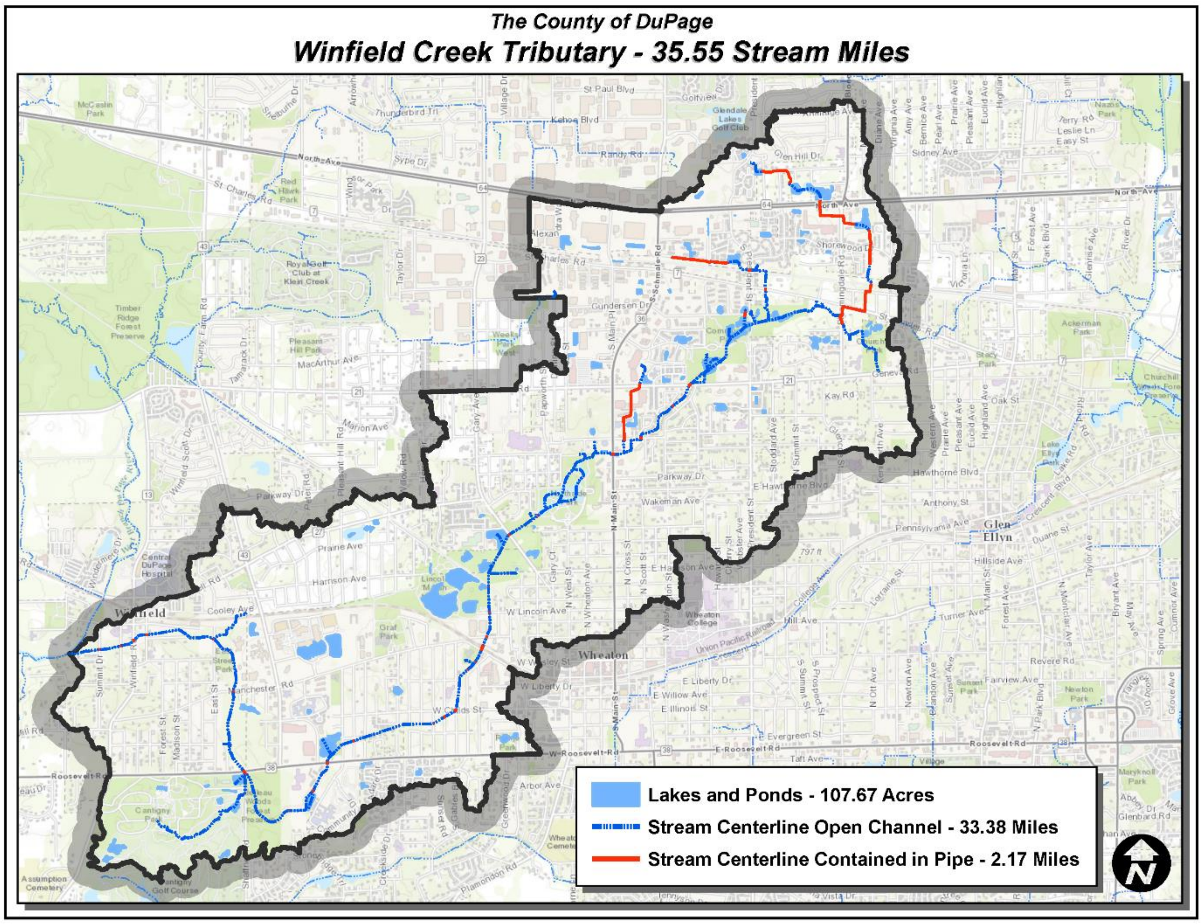

Figure 32 Piped stream segments of Winfield Creek

3.5.2 Physical Stream Conditions

During the development of the Plan, DuPage County staff performed stream assessments along Winfield Creek and its tributaries, where possible, to identify sediment accumulation, streambank erosion, channelization and riparian buffer. Figure 33 shows the 23 data collection points and 4 reaches, outlined above.

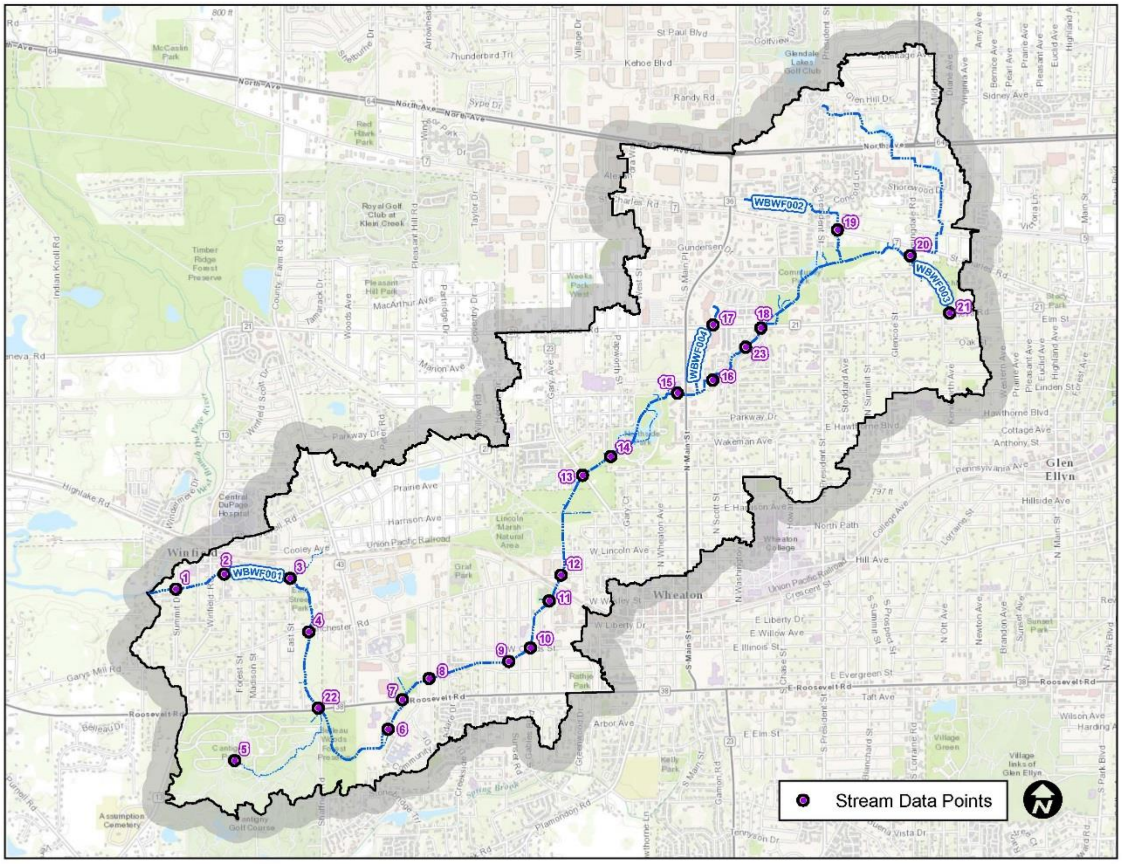

Figure 33 Stream assessment points for Winfield Creek

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 Winfield 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 23 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 34, sediment accumulation for Winfield Creek ranges from high to low throughout the reaches.

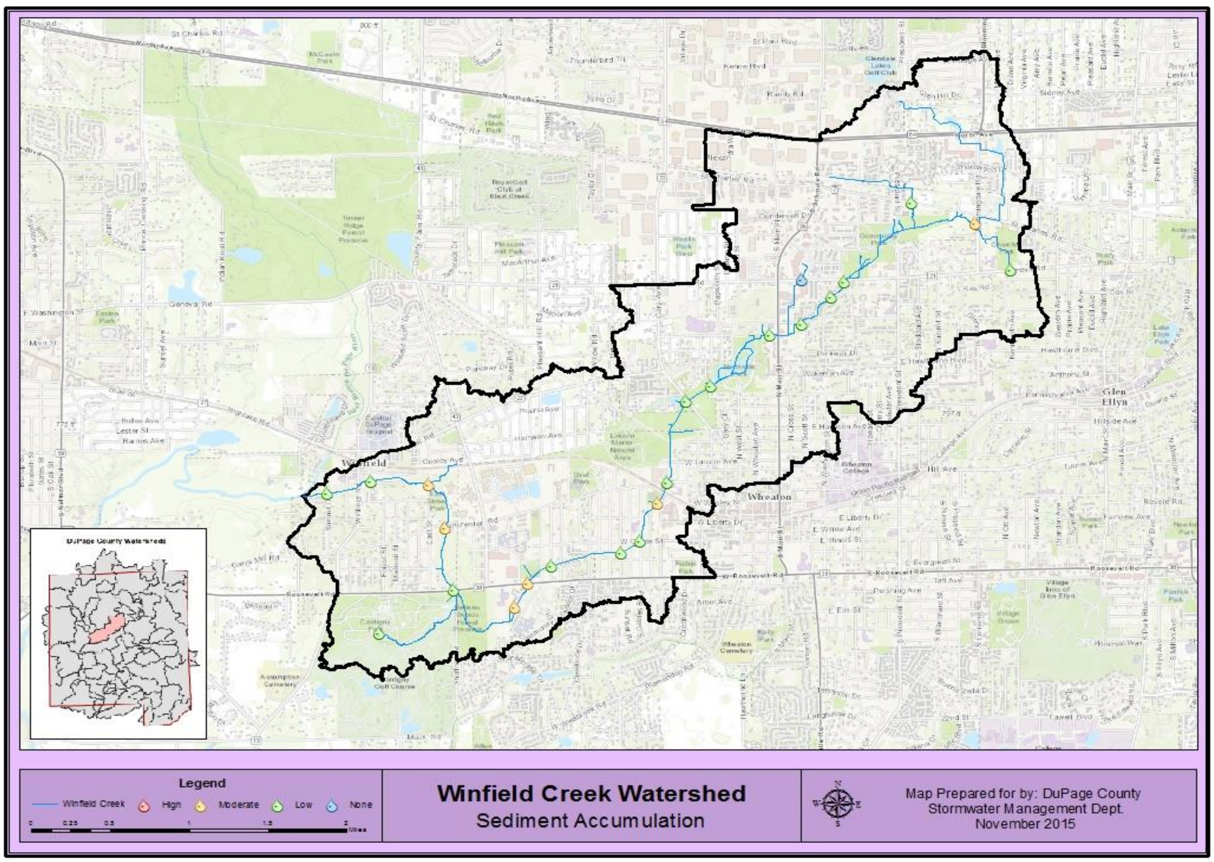

Figure 34 Sediment accumulation along Winfield Creek.

3.5.2.2 Streambank Erosion

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

Figure 35 Erosion along Winfield Creek

When assessing streambank erosion on Winfield Creek, both sides of stream were evaluated at each of the 23 data points for erosion. Shown in Table 9, a total of 2,792 feet of streambank were 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, 21% of the streambank assessed exhibited no erosion, meaning there is little potential for future problems in these areas. Another 40% has moderate erosion, meaning the bank was moderately stable with small areas of erosion. However, 39% has high erosion, which leaves the bank relatively unstable and has obvious bank sloughing. Figure 36 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.

Reach Code	Stream Length Assessed (ft)	None or Low Erosion (ft/%)		Moderate Erosion (ft/%)		High Erosion (ft/%)	
1	2421	330	14%	780	32%	1311	54%
2	150	150	100%	0	0%	0	0%
3	131	131	100%	0	0%	0	0%
4	90	0	0%	0	0%	90	100%
Totals	**2792**	**611**	**21%**	**780**	**40%**	**1401**	**39%**

Table 9 Erosion Severities of Winfield Creek Watershed

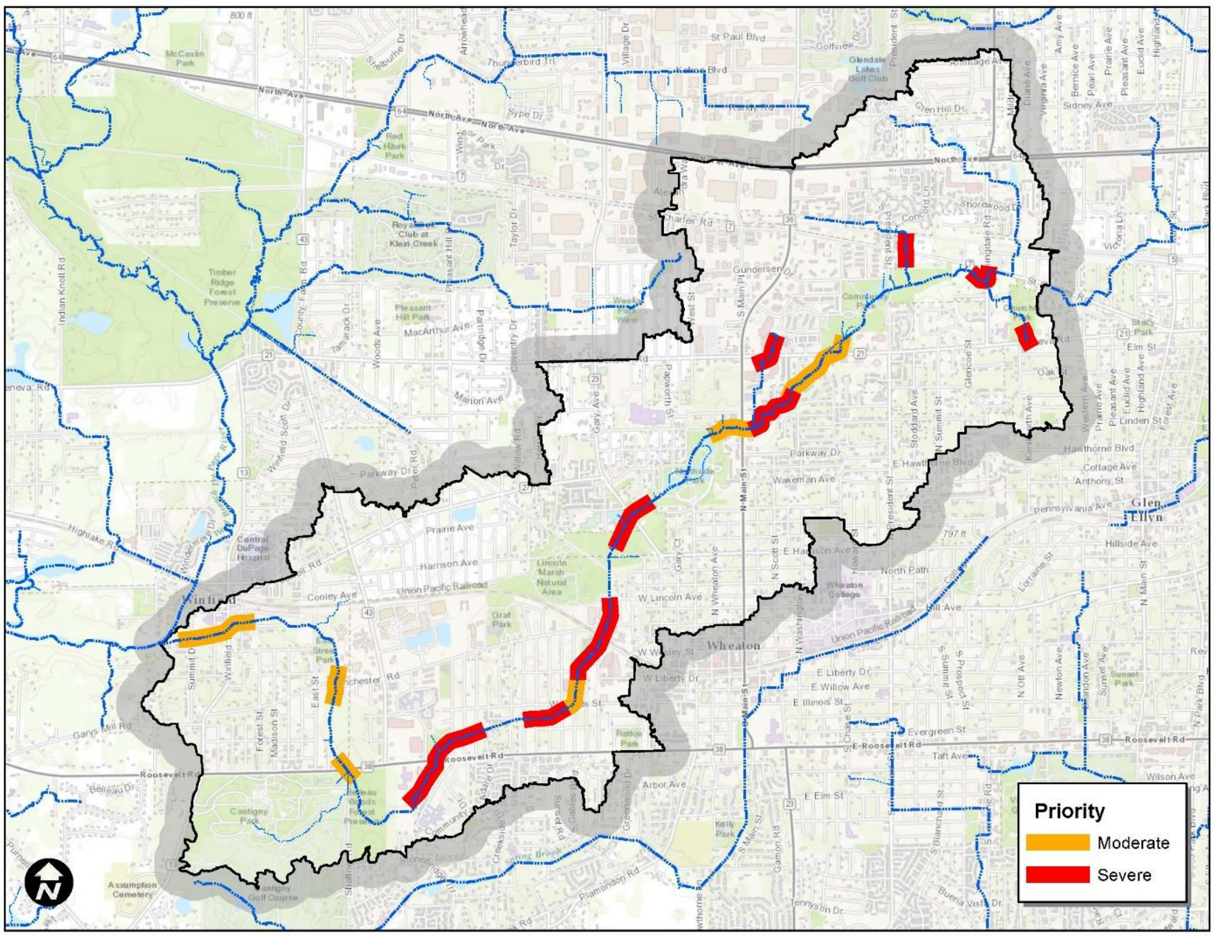

Figure 36 Stream Bank Erosion

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 37, most of the Winfield Creek sites assessed (80%), had little to no evidence of channelization, meaning there was a natural meander to the stream. Moderate channelization was also found over 20% of the assessed segments, which is characterized by a straight channel with some concrete or armor. There were no locations found along Winfield Creek that displayed had high channelization, which is a straight channel with concrete streambed and banks.

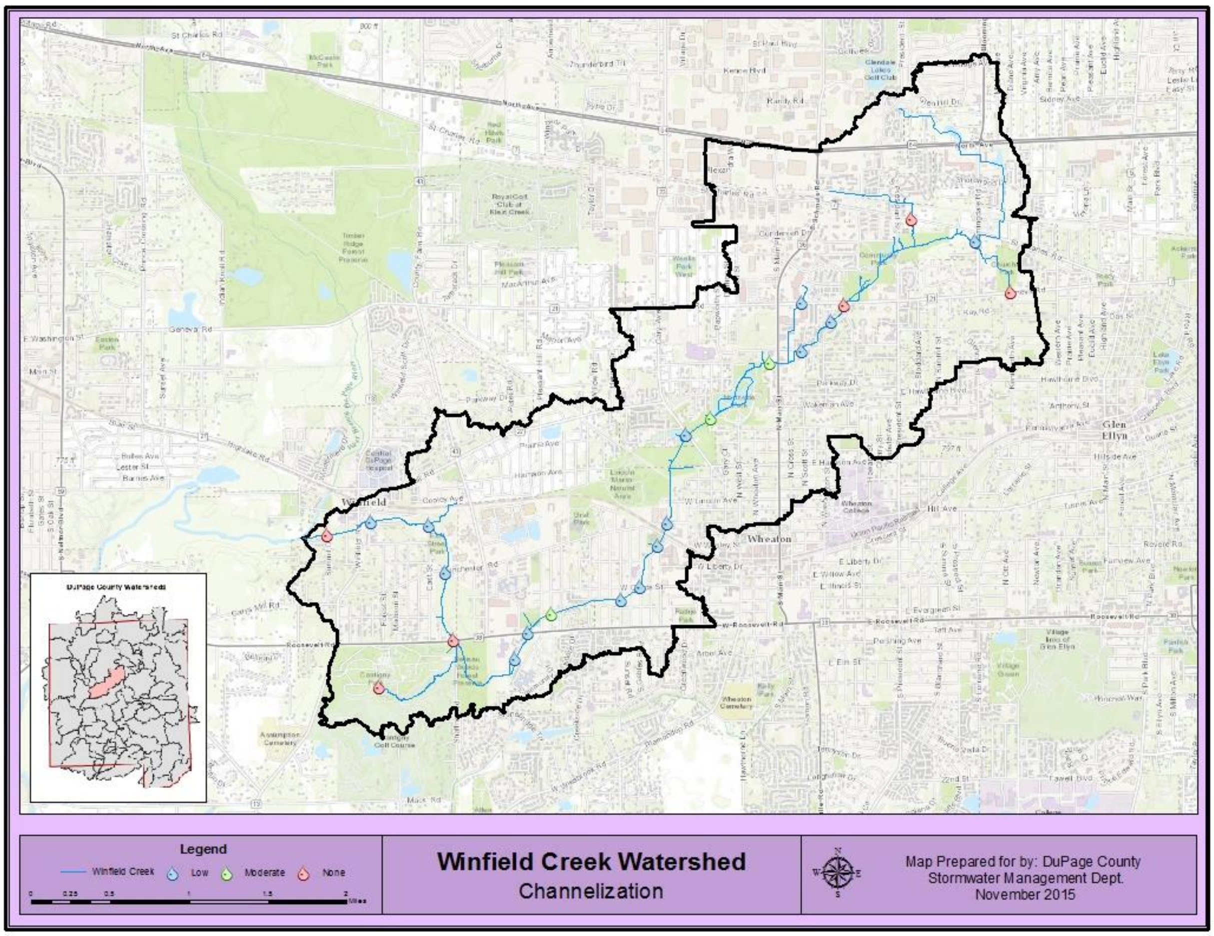

Figure 37 Channelization of Winfield Creek

Reach Code	Stream Length Assessed (ft)	None or Low Channelization (ft/%)		Moderate Channelization (ft/%)		High Channelization (ft/%)	
1	2421	2091	86%	330	14%	0	0%
2	150	150	100%	0	0%	0	0%
3	131	131	100%	0	0%	0	0%
4	90	90	100%	0	0%	0	0%
Totals	**2792**	**2462**	**80%**	**330**	**20%**	**0**	**0%**

Table 10 Winfield Creek Channelization

3.5.2.4 Riparian Buffers

At each stream assessment location, the condition of the riparian buffer was determined for each of the banks. For the purpose of this study, only naturally vegetated buffers were considered to be in good or moderate condition as the DuPage Ordinance has established that mowed turf buffers provide little or no function to the stream system.[18] 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.

Reach Code	Stream Length Assessed (ft)	Good Condition (ft/%)		Fair Condition (ft/%)		Poor Condition (ft/%)	
1	2421	696	29%	990	41%	735	30%
2	150	0	0%	150	100%	0	0%
3	131	41	31%	90	69%	0	0%
4	90	90	100%	0	0%	0	0%
Totals	**2792**	**827**	**28%**	**1230**	**31%**	**735**	**41%**

Table 11 Vegetative Riparian Buffer Widths in Winfield Creek

3.5.3 Stormwater Detention Basins

In an attempt to create a comprehensive inventory of detention basins throughout the Winfield 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 and partner municipality staff physically assessed each of them, compiling the data into an ArcGIS Collector Application. The basin assessments included type, buffer and erosion. Staff then assessed the overall water quality benefit of each of the 136 basins (Figure 38), rating each good, fair or poor.

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

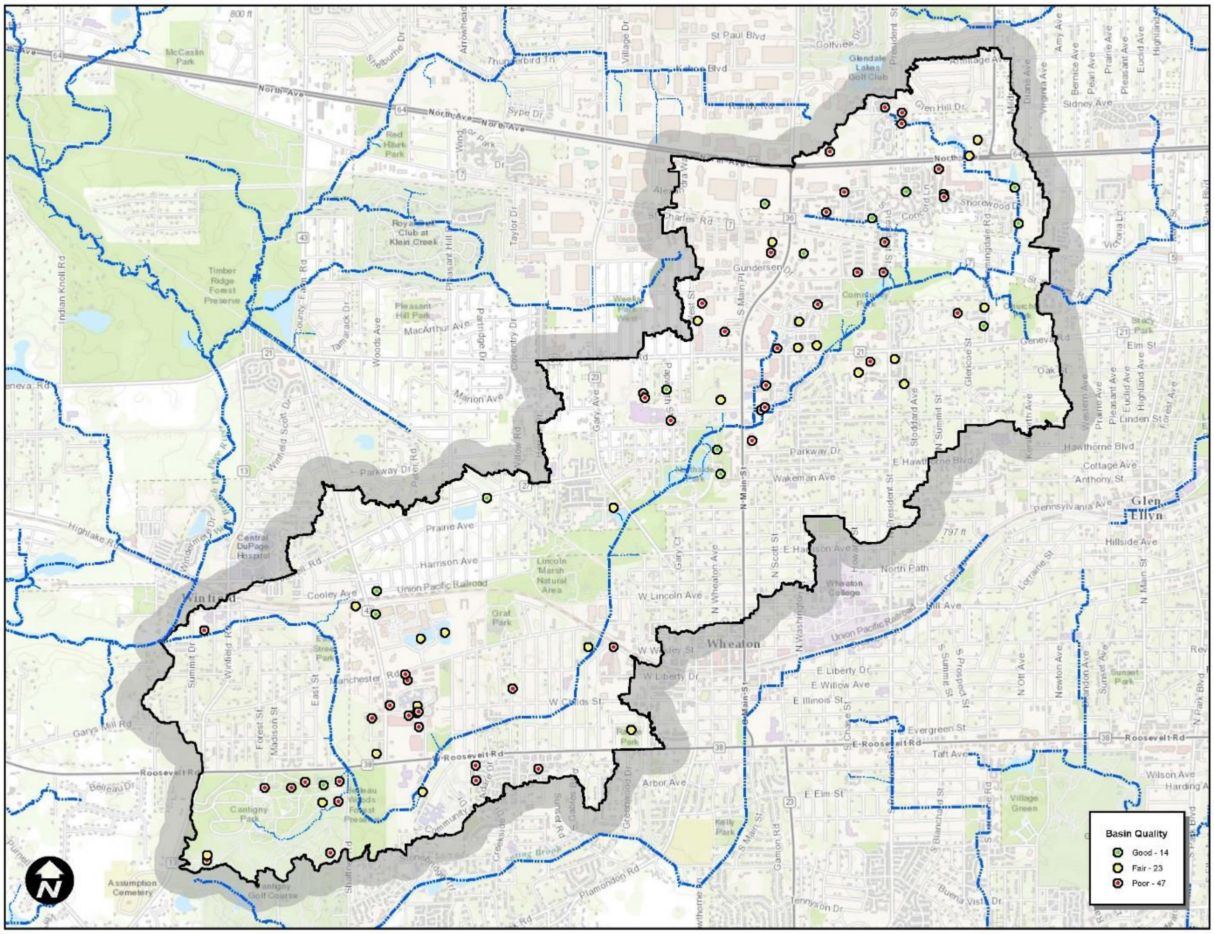

Figure 38 Types of Detention Basins in Winfield Creek Watershed

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 73 basins within the watershed as poor, as shown in Table 12. Those basins were then compared to critical areas within the watershed to prioritize opportunities for retrofits.

Political Jurisdiction	# of Basins	Detention Basin Type					Water Quality Benefit		
		Wet	Dry Turf	Dry Naturalized	Wet w/ Extended Dry	Constructed Wetland	Good	Fair	Poor
Carol Stream	38	22	8	3	1	4	5	12	21
Glen Ellyn	5	2	1	2	0	0	3	1	1
Glendale Heights	18	15	1	0	2	0	5	1	12
Unincorporated	21	18	0	3	0	0	5	8	8
Wheaton	53	31	21	0	0	1	3	20	30
Winfield	1	1	0	0	0	0	0	0	1
Total	**136**	**89**	**31**	**8**	**3**	**5**	**21**	**42**	**73**

Table 12 Detention Basin Assessments in Winfield 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 803 residences within the Winfield Creek Watershed that receive drinking water from community or private groundwater wells (Figure 39). 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.[19]

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

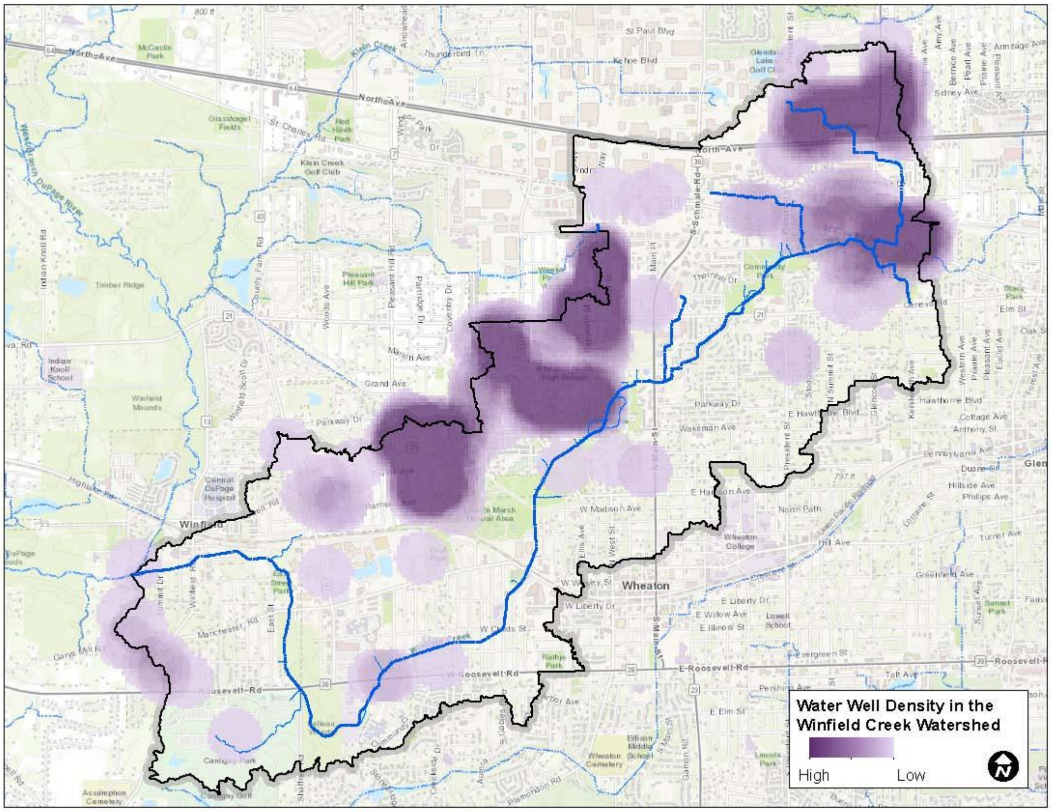

Figure 39 Density of private well water sources in Winfield Creek Watershed.[20]

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.[21] 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.

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 (Figure 40).[22]

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[20] http://www.rmms.illinois.edu/RMMS-JSAPI/

[21] Illinois Groundwater Protection Program, established under Section 17.2 of the IGPA

[22] https://pubs.usgs.gov/ha/730k/report.pdf

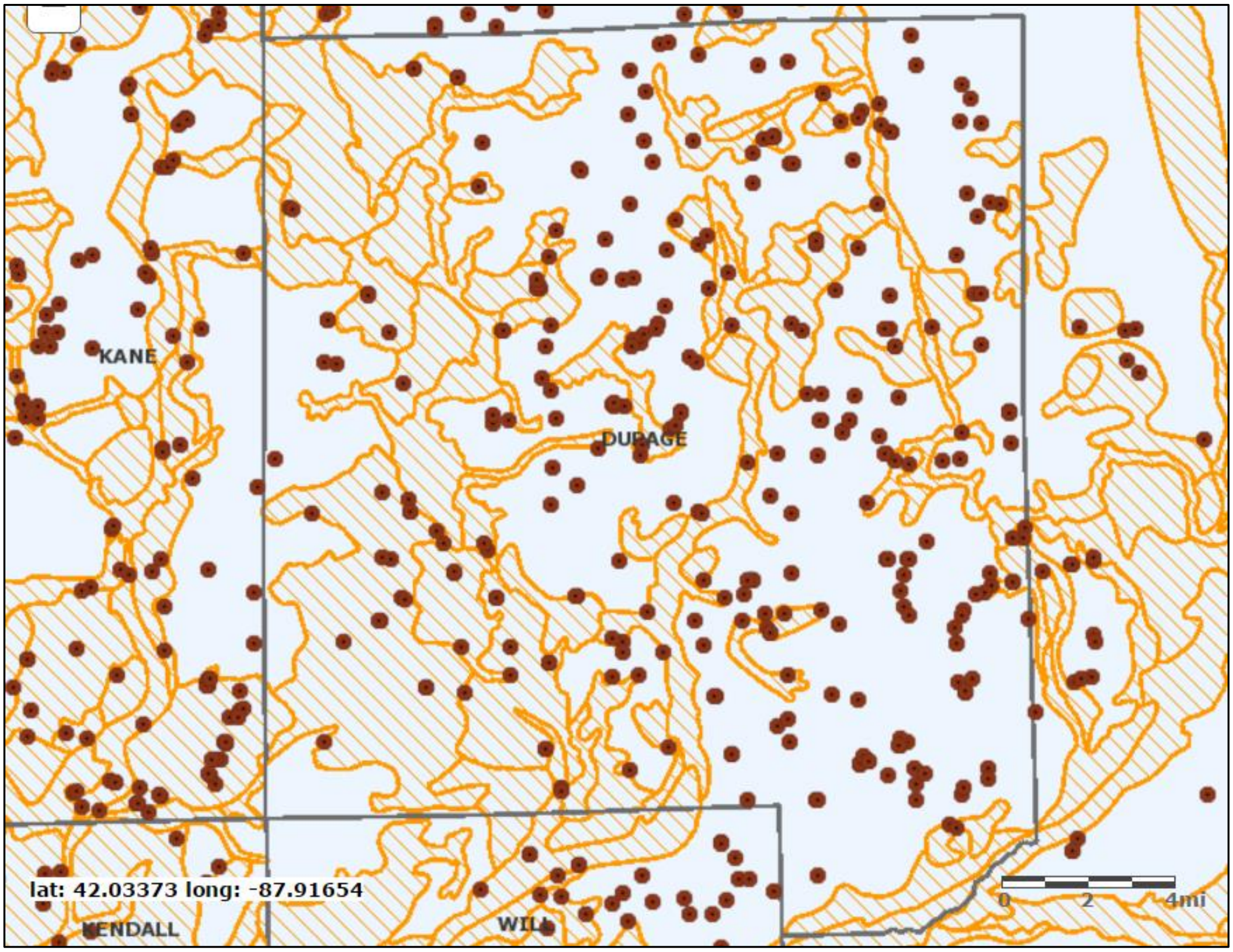

Figure 40 Potential aquifers (orange) and community wells (brown) in DuPage County.[23]

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

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

3.5.5 Surface Water Quality

3.5.5.1 Designated Uses, Assessment & Impairment Status

Every two years, in accordance with Sections 305(b) and 303(d) of the federal Clean Water Act (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 Winfield Creek Watershed. These designated uses are aquatic life, fish consumption, primary contact, secondary contact and aesthetic quality.

Winfield Creek was first added to Illinois' §303(d) list in 2012 as assessment unit IL_GBKF-01, which extends approximately 6.89 miles from the bridge crossing at Bloomingdale Road downstream until the confluence with West Branch DuPage River.

Of the five designated uses of Winfield 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). Alteration of streamside vegetative cover and dissolved oxygen are recognized as causes of the aquatic life impairment. Channelization, loss of riparian habitat, impounded waters, and urban runoff from storm sewers are suspected sources of the noted causes. Table 14 summarizes the causes and sources of these impairments, and the next section discusses them in further detail.

Designated Use	**Use ID**[24]	**Assessed in 2016 Integrated Report**	**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 Winfield Creek 2016 determination of designated uses

Waterbody	**Assessment Unit ID**	**Size**	**Causes of Impairment(s)**	**Sources of Impairment(s)**
Winfield Creek	IL_GBKF-01	6.89 miles	Alteration in stream-side or littoral vegetative covers and oxygen, dissolved.	Channelization; loss riparian habitat; dam or impoundment; and urban runoff/storm sewers.

Table 14 Assessment Information for waterbodies in the Winfield Creek Watershed

[24] Use IDs correspond to the following: Aquatic Life (582), Fish Consumption (583), Primary Contact (585), Secondary Contact (586), and Aesthetic Quality (590).

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 waterbody impairments throughout those watersheds.[25] 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 West Branch DuPage River watershed in 2006 and established two monitoring stations to collect chemical, biological and habitat information along Winfield Creek. As shown below in Figure 41, the DRSCW monitoring takes place at three points along Winfield Creek: immediately upstream from the Cole Avenue bridge crossing (WB15), approximately 950 feet upstream from the Childs Street bridge crossing (WB14), and immediately downstream of the Church Street bridge crossing (WB13).

[25] 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

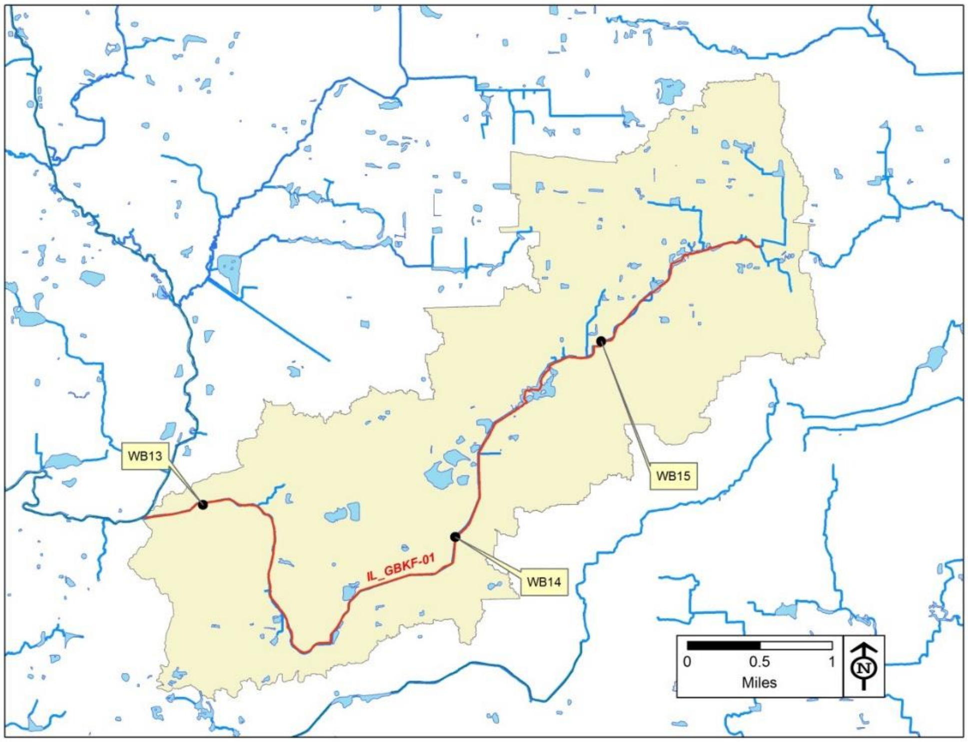

Figure 41 DRSCW monitoring sites along Winfield Creek

At each of these collection points, fIBI (Figure 42), mIBI (Figure 43) and Qualitative Habitat Evaluation Index (QHEI) (Figure 44) data was collected in 2009, 2012 and 2015. As shown in Figure 42, fIBI scores indicate a severe impairment for aquatic life (fish) and trending toward a decline, except for WB15 (which is moderately impaired and demonstrating improvement. As shown in Figure 43 mIBI scores indicate a severe impairment for aquatic life (macroinvertebrates) and trending toward a decline. QHEI scores note that habitat conditions are fair throughout the watershed and trending toward improvement.

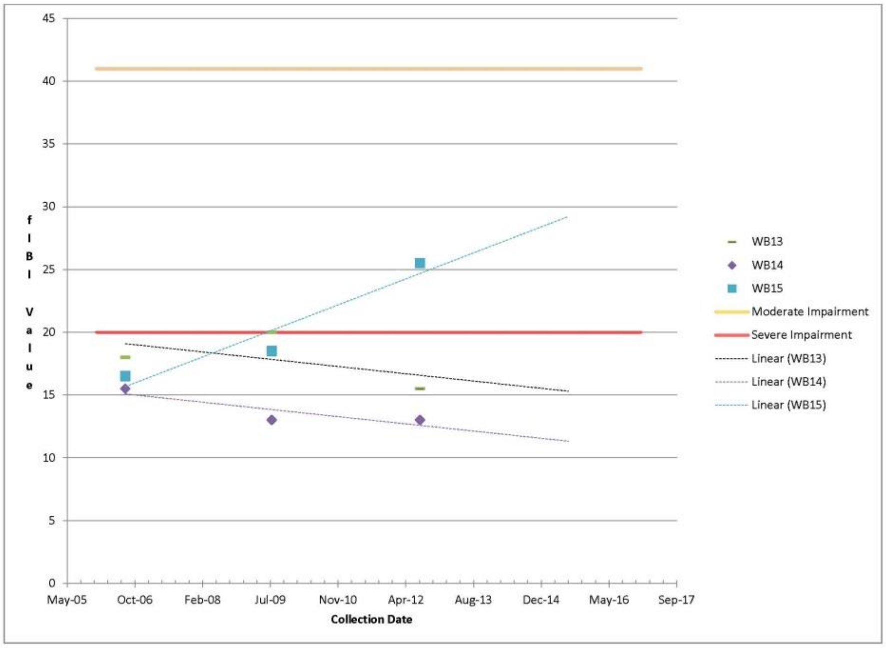

Figure 42 fIBI scores for Winfield Creek

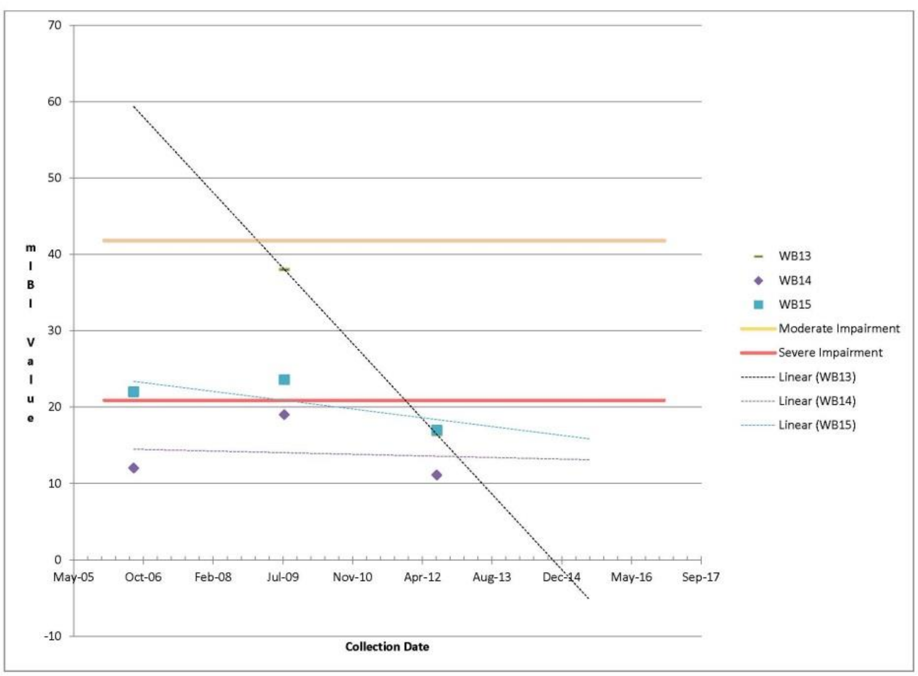

Figure 43 mIBI scores for Winfield Creek

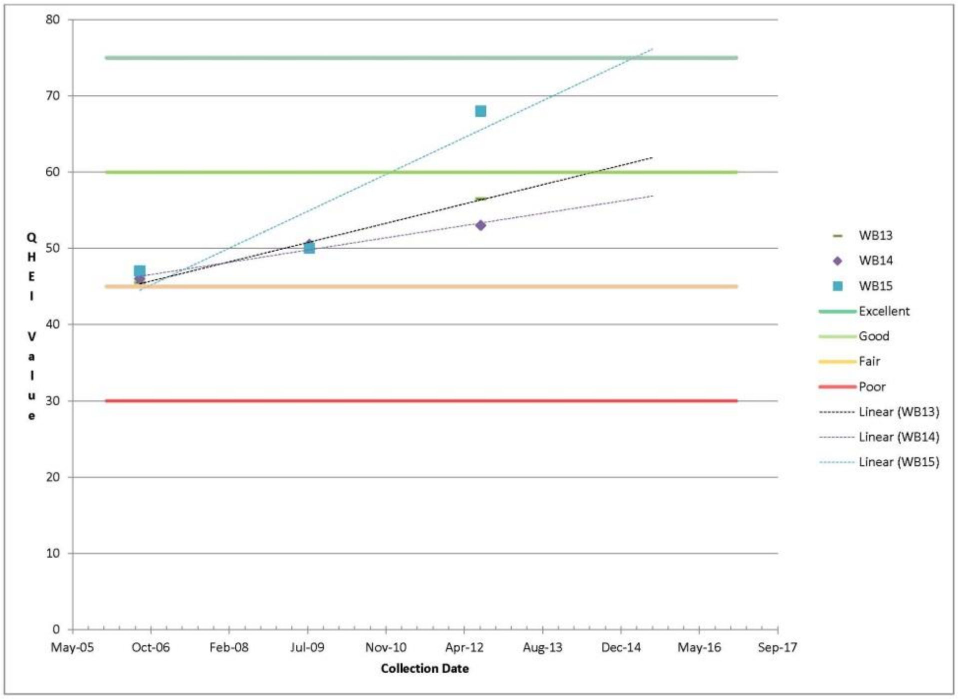

Figure 44 QHEI scores for Winfield Creek

Bioassessment surveys of Winfield Creek were completed in 2009, 2012, and 2015. As shown in Table 15, the monitoring indicated poor physical stream condition, typical of a degraded urban stream. The results of this monitoring indicate elevated concentrations of ammonia and chloride within the water column, as well as a need to restore the habitat within the stream and riparian corridor so that the assimilative capacity can be increased.

Station	Proximate Stressor(s)	Project Description	Project Objective
WB13	Ammonia-nitrogen; Chloride; Lack of pool and riffle sequence(s); Poor substrate and riparian corridor	Habitat restoration	Increase assimilative capacity
WB14	Ammonia-nitrogen; Chloride; Lack of pool and riffle sequence(s); Poor substrate and riparian corridor	Habitat restoration	Increase assimilative capacity
WB15	Chloride; Lack of pool and riffle sequence(s); Poor substrate and riparian corridor	Habitat restoration	Increase assimilative capacity

Table 15 DRSCW's bioassessment conclusions

3.5.6 Citizen Reporter Web Application

The DuPage County Citizen Reporter App was launched in May 2016.[26] The intent of this web-based GIS application is to collect observations from DuPage County citizens on water quality impairments or concerns. These observations can then be used for the purpose of identifying water quality practices or projects for watershed planning efforts. The public can view the observations and "vote" if they agree with the report. Photos and comments can also be attached to these reports.

In an effort to engage the citizens of the Winfield Creek Watershed, an informational flyer was sent to each resident or property owner within the floodplain of the Winfield Creek Watershed. Mailings were sent to properties within the 100-year floodplain encouraging residents to use the app or contact us by email or phone to share observations on Winfield Creek. A total of 10 responses were received. As detailed in Table 16, observations include stream erosion, blockages, and sedimentation.

Type of Impairment	Number of Reports
Stream Blockage	3
Sediment	2
Streambank Erosion	5
Water Quality Issues	
Illegal Dumping	
Garbage	
Other	
Total	10

Table 16 Citizen reports form DuPage County's reporter web application

The highest number of reports were related to streambank erosion. Blockages included fallen trees and debris, which could be addressed by County or municipal maintenance staff right away. Streambank erosion and sedimentation were included in the overall watershed stream assessment information.

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

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 Winfield Creek. Table 17 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 Dissolved Oxygen	Channelization Loss of Riparian Habitat Impoundments (Culvert Crossings/Dams) 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	Streambank modifications/destabilization
Debris/Floatables/Trash	Changes in stream flow due to hydraulic and hydrologic alteration from surrounding development
Petroleum Hydrocarbons	Streambank erosion
Oil & grease	Municipal point source discharges
Other flow regime alterations	Site clearance (land development or redevelopment)
Total Suspended Solids	Source unknown
Aquatic Algae	

Table 17 Causes and sources of degraded water quality in the Winfield Creek Watershed

3.6.1.1 Nonpoint Source Pollutant Load Modeling

Based on the dissolved oxygen impairment, the DRSCW assessments, and perceived impairments by DuPage County staff, pollutants within Winfield Creek may include TSS, TN and TP in addition to the physical stream alterations. 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 Winfield Creek watershed, STEPL was used to generate background nonpoint source loads for TN, TP, TSS and BOD.

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

In order to determine pollutant loadings for each land use category, the IEPA’s Region 5 spreadsheet was used. Figures 45 through 48 maps the background pollutant loads of TN, TP, TSS and BOD for existing land use in the Winfield Creek Watershed.

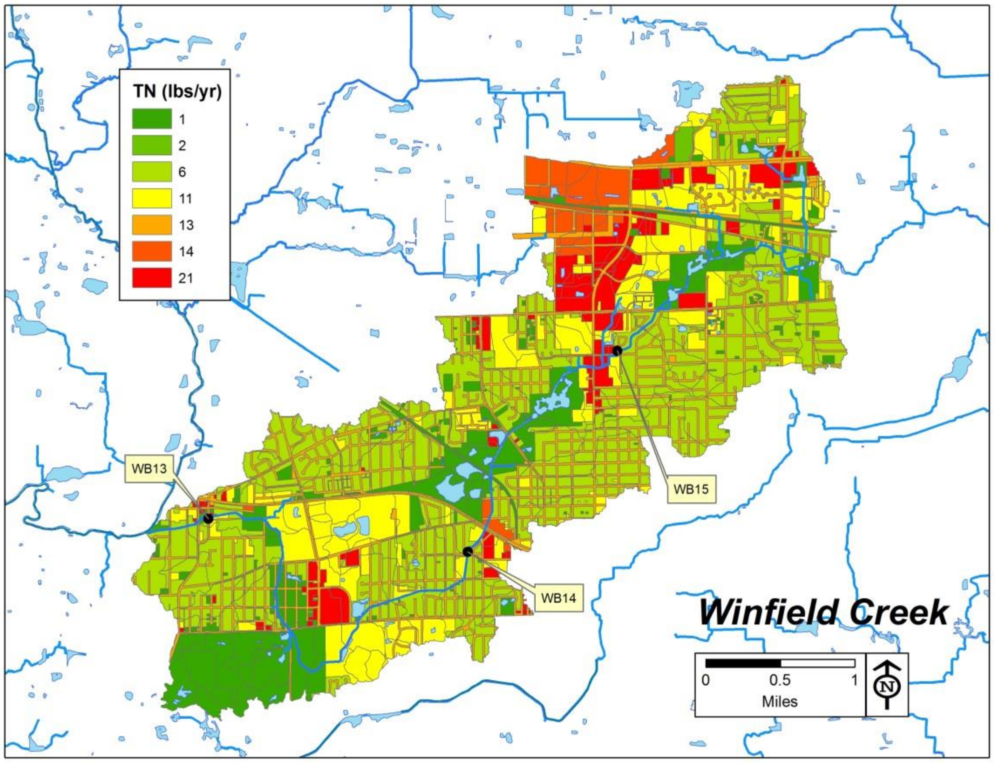

Figure 45 TN concentrations based on land use within Winfield Creek Watershed

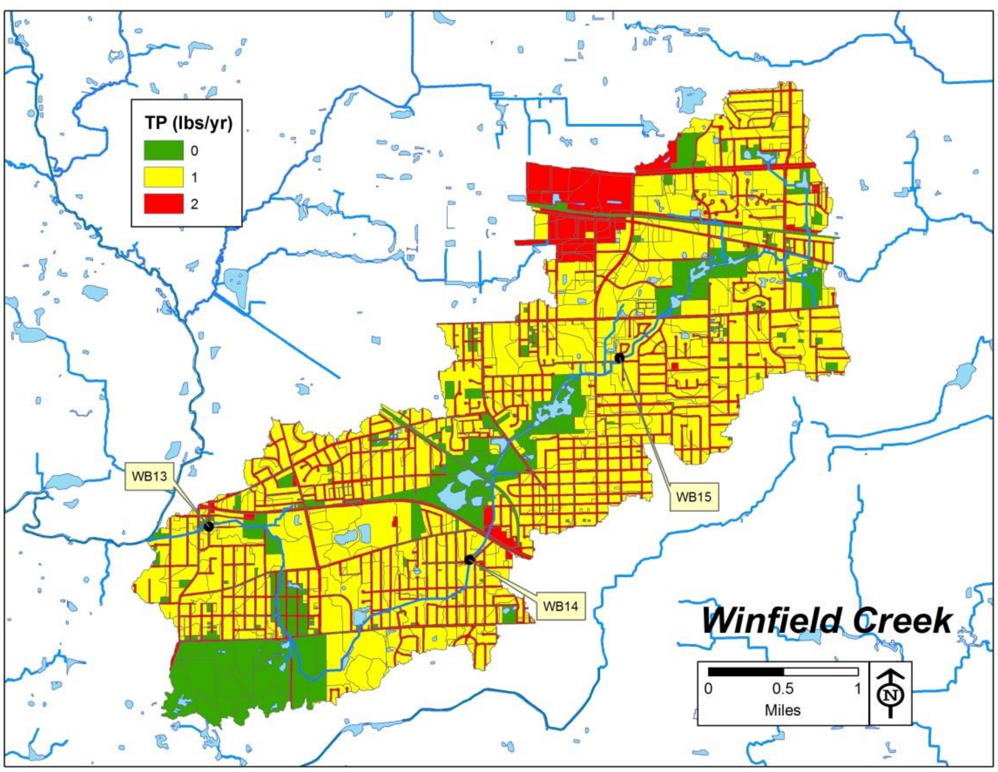

Figure 46 TP concentrations based on land use within Winfield Creek Watershed

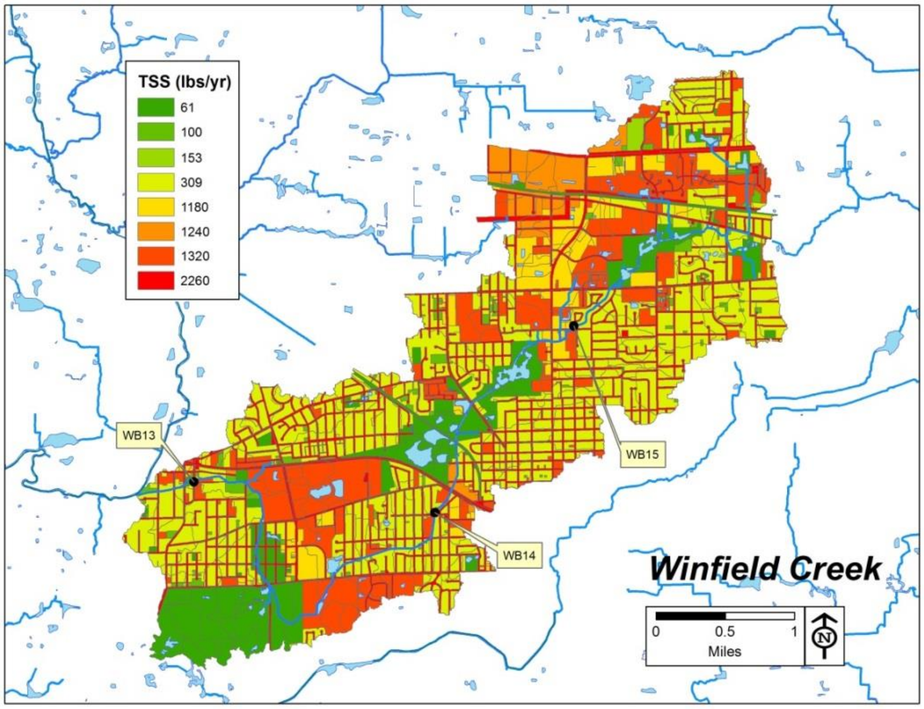

Figure 47 TSS concentrations based on land use within Winfield Creek Watershed

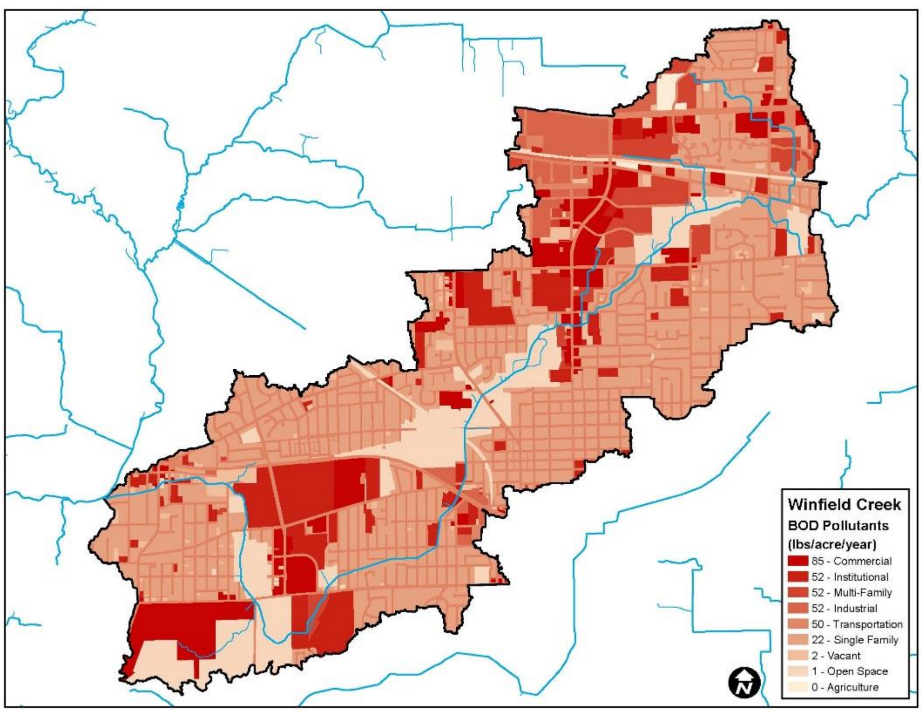

Figure 48 BOD based on land use within Winfield Creek Watershed

As highlighted above in Figures 45 through 48, the highest concentration of TP and TN per acre are originating in sub-watershed #3, which encompasses the northwest portion of the watershed around St. Charles Road. TSS appears to be 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. Table 18 through Table 221 show the highest total pollutant are originating from runoff from subwatersheds #1 and #2.

Sub-Watershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space	Total
1	1,596	78	1439	306	1,396	2,085	943	147	0	7,990
2	515	105	759	271	1196	2,754	1089	77	0	6,766
3	781	1121	61	986	211	88	277	42	3	3,570
4	472	97	188	2,314	468	1,218	556	52	33	5,398
Totals	3,364	1,401	2,447	3,877	3,271	6,145	2,865	318	36	23,724

Table 18 TN loads by land use (lbs/yr) for each of Winfield Creek's sub-watersheds

Sub-Watershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space	Total
1	311	12	245	51	256	386	157	13	0	1,431
2	101	16	129	45	220	510	181	7	0	1,209
3	152	172	10	163	39	16	46	4	0	602
4	92	15	32	383	86	226	93	5	4	936
Totals	656	215	416	642	601	1,138	477	29	4	4,178

Table 19 TP loads by land use (lbs/yr) for each of Winfield Creek's sub-watersheds

Sub-Watershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space	Total
1	24	2	31	8	28	77	31	4	0	205
2	8	3	16	7	24	102	36	2	0	198
3	12	34	1	24	4	3	9	1	0	88
4	7	3	4	57	10	45	19	2	0	147
Totals	51	42	52	96	66	227	95	9	0	638

Table 20 TSS loads by land use (t/yr) for each of Winfield Creek's sub-watersheds

Sub-Watershed	Commercial	Industrial	Institutional	Transportation	Multi-Family	Residential	Agriculture	Vacant	Open Space	Total
1	7,385	281	6214	948	6,269	9,420	1980	393	0	32,890
2	2,385	380	3,279	840	5368	12,444	2287	205	0	27,188
3	3,612	4035	266	3,056	946	397	582	112	8	13,014
4	2,186	348	812	7,169	2,099	5,505	1167	140	90	19,516
Totals	15,568	5,044	10,571	12,013	14,682	27,766	6,016	850	98	92,608

Table 21 BOD loads by land use (lbs/yr) for each of Winfield 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	36952.3	5925.7	139111.4	868.4
Streambank Erosion Caused Pollutant Loads	0.1	0.1	0.3	0.1
Total Background Loads	36952.4	5925.7	139111.7	868.5

Table 22 Streambank erosion pollutant load estimates

3.6.1.3 Nonpoint Source Pollutants of Concern

As previously noted, the recommendations found in the Winfield Creek Watershed will surround restoring the physical characteristics of the stream channel, impoundments, and surrounding riparian environment in addition to reducing TN, TP, TSS and BOD loads. 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 nitrogen (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.[27] These TN loadings contribute to the Gulf of Mexico's "dead zone," which occurs annually due to eutrophication. Eutrophication is an excessive amount of nutrients in a body of water that can cause excessive plant growth, which, in turn, limits the amount of available oxygen for aquatic animals and macroinvertebrates (hypoxia).

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

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

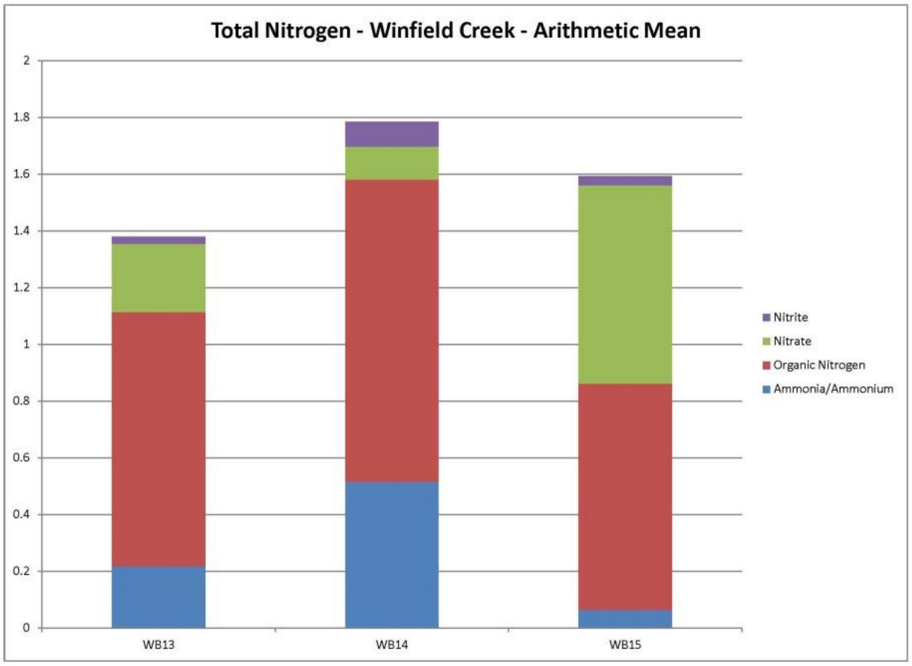

Figure 49 Average total nitrogen concentrations at DRSCW stations

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.[28]

3.6.1.3.4 Biological Oxygen Demand (BOD)

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

3.6.2 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

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

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 Winfield 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 Winfield Creek Watershed holds its own NPDES Permit No. ILR40 with the IEPA, and, therefore, is required to define best management practices (BMPs) and goals for each of the minimum control measures, to be reported annually. DuPage County assists other permit holders by providing several of the six minimum control measures on a regional scale.

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

3.7 Land Management Practices

3.7.1 Conservation Easement Programs

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

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

3.7.2 Local Ordinances

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

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

Several communities have waived their legal authority to enforce the Ordinance, either partially or wholly, within their jurisdiction. In these communities, the County conducts either some (partial waiver communities) or all (non-waiver communities) aspects of the permitting process for development sites subject to the Ordinance requirements. Table 23 shows the waiver status of municipalities within the Winfield 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.

Municipalities	Waiver Status
Carol Stream	Full Waiver
Glendale Heights	Partial Waiver
Glen Ellyn	Full Waiver
Unincorporated	Partial Waiver
Wheaton	Partial Waiver
Winfield	Partial Waiver

Table 23 Ordinance waiver status of Winfield Creek Watershed communities

3.7.3 Local Planning Documents

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

Many of the municipalities within the Winfield Creek Watershed have developed comprehensive plans. However, as new comprehensive plans can be developed every few years, each municipality should be contacted for the most recent planning information. Additionally, Cantigny Park has developed "Project New Leaf" a multi-year revitalization plan that is currently underway.

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 Winfield 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 large scale river restoration projects.

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. [29]

4.1.1.1.1 Infiltration Practices

Infiltration practices are designs that enhance the absorption of runoff through a soil matrix. These practices slow and retain stormwater runoff to facilitate pollutant removal. Increasing the time it takes for water to reach a nearby water body in smaller storm events also results in lower storm elevations and overland runoff that can cause localized flooding. Slowing runoff causes excess sediment and debris to drop out and to allow water to seep into the soil. Slowing runoff and allowing for infiltration reduces peak flows thereby reducing streambank erosion to improve water quality. Infiltration practices recommended throughout the Winfield 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.[30]

Pollutant removal rates of infiltration practices can vary, but overall they are among the most efficient at removing pollutants due to the fact the all of the stormwater in smaller events is captured and infiltrated into the soil, eliminating runoff. This plan proposes utilizing infiltration practices over 6 to 11.5% 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.

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[29] https://www.epa.gov/green-infrastructure/what-green-infrastructure
[30] 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 Winfield Creek watershed to reduce runoff at the source. Rain barrels are storage containers that are located above ground. They capture runoff from the gutters of a structure and store water so it can be later used to water landscaping and gardens. Cisterns function in the same way as rain barrels, but are usually larger, placed underground and evacuated by pump. Cisterns and rain barrels should be emptied prior to rainfall to reduce runoff volume.

4.1.1.2 Detention Basin Retrofits

Many of the detention basins in Winfield 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 5% of the drainage area of subwatershed #1 and 1% of subwatersheds 2, 3, and 4. Additionally, site specific basin retrofits have been identified throughout the watershed. A wetland detention pond can remove up to 20% of nitrogen, 44% of phosphorus, 77% of BOD and 63% of TSS. (from STEPL) 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%.[31]

4.1.1.3 Riparian Buffer Enhancement

The Winfield Creek Watershed has overall poor riparian buffers that average only 10 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 Winfield Creek Watershed, recommendations include increasing the acreage of new wetland and

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[31] Pollutant removal rates were based on published research (National Pollutant Removal Performance Database, Illinois Green Infrastructure Study), approved watershed plans (CMAP Boone- Dutch Creek), and STEPL.
http://www.stormwaterok.net/CWP%20Documents/CWP-07%20Natl%20Pollutant%20Removal%20Perform%20Database.pdf
http://www.epa.state.il.us/green-infrastructure/docs/draft-final-report.pdf
http://www.cmap.illinois.gov/documents/10180/12317/BooneDutchCrkWatshdPlan-ExecSumm_FINAL_CMAP-March2016.pdf/7ec35a0f-5fa4-4543-b949-03d745140bf9
http://it.tetratech-ffx.com/steplweb/default.htm

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.

4.1.1.5 Hydrodynamic Separators

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

Five-year goals for the watershed include installation of oil and grit separators along roadways to treat 1 to 3% of the watershed. Oil and grease separators are designed specifically to treat roadway runoff for oil, grease, floatables and sediment. Manufacturer specifications vary, but a typical oil and grit separator can remove more than 97% of oil from the first flush runoff from roadways. Installation of these practices over even 1% of the watershed can have a measurable impact to Winfield 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 Winfield 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. While there are no known dams within the Winfield Creek Watershed, 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 Winfield 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 Winfield 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 Winfield'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 Winfield 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.[32] Aside from providing nutrient, sediment and flood control, they also support a stable base flow and produce essential food sources for downstream reaches. Enclosing a stream often removes floodplain storage, increases velocity and (indirectly) erosion downstream and eliminates habitat along with many biological processes. Daylighting projects will restore natural streams from piped reaches, allowing headwater streams to re-access the floodplain.

4.1.2 BMP Programs

4.1.3.1 Street Sweeping

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

The need for sweeping can vary depending on the volume of traffic, presence of parkway trees and proximity to pedestrian traffic, homes and businesses. Based on data from the Center for Watershed Protection, pollutant removal rates from street sweeping can be improved by implementing vacuum style sweepers rather than mechanical sweepers.[33] Additional information should be obtained from municipalities in regard to street sweeper types, volume of traffic per roadway, as well as proximity to trees and public spaces. As roadways comprise 50% of the impervious area in the Winfield Creek Watershed, significant benefit can be achieved by increasing or strategically timing street sweeping.

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 Winfield Creek, ultimately contributing to overbank flooding, stagnant water, and erosion. 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 24 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 Winfield Creek Watershed Plan, stakeholders will have discretion of where some of the BMP projects may be installed in the watershed.

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

[33] 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/

Sub-watershed	BMP	Sub-watershed Treated	Nitrogen Reduction (lbs/yr)	Phosphorus Reduction (lbs/yr)	BOD Reduction (lbs/yr)	Sediment Reduction (t/yr)	Estimated Cost
1	Bioretention	5.0%	251.69	57.24	NA	NA	$10,407,355
	Bioswale	3.0%	119.85	27.9045	NA	5.54	$3,285,150
	Infiltration Trench	2.5%	99.88	17.8875	575.58	4.61	$5,203,678
	Oil & Grit Separators	3.0%	11.99	2.1465	NA	0.92	$384,000
	Permeable Pavers	2.5%	179.78	32.1975	NA	4.61	$3,907,338
	Dry Wells	2.5%	99.88	17.8875	575.58	4.61	$5,203,678
	Filterra	1.0%	27.17	10.017	NA	1.76	na
	Detention Basin Retrofit	5.0%	79.90	31.482	1036.04	8.00	$3,882,450
Total			**790.21**	**165.2805**	**1151.15**	**22.06**	**$32,273,648**
2	Bioretention	1.0%	42.63	9.672	NA	NA	$2,008,290
	Bioswale	2.0%	67.66	15.717	NA	3.56	$2,113,100
	Infiltration Trench	1.0%	33.83	6.045	190.32	1.78	$2,008,290
	Oil & Grit Separators	1.0%	3.38	0.6045	NA	0.30	$128,000
	Permeable Pavers	2.5%	152.24	27.2025	NA	4.46	$3,769,963
	Dry Wells	1.0%	33.83	6.045	190.32	1.78	$2,008,290
	Filterra	1.0%	23.00	8.463	NA	1.70	na
	Detention Basin Retrofit	1.0%	13.53	5.3196	171.28	1.54	$749,190
Total			**356.57**	**73.749**	**380.63**	**13.58**	**$12,035,933**
3	Bioretention	1.0%	22.49	4.816	NA	NA	$569,765
	Bioswale	2.0%	35.70	7.826	NA	1.58	$599,500
	Infiltration Trench	1.0%	17.85	3.01	91.10	0.79	$569,765
	Oil & Grit Separators	1.0%	1.79	0.301	NA	0.13	$72,000
	Permeable Pavers	2.5%	80.33	13.545	NA	1.98	$1,069,563
	Dry Wells	0.5%	8.93	1.505	45.55	0.40	$284,882
	Filterra	1.0%	12.14	4.214	NA	0.76	$0
	Detention Basin Retrofit	1.0%	7.14	2.6488	81.99	0.69	$212,550
Total			**179.21**	**35.217**	**136.65**	**5.64**	**$3,165,475**
4	Bioretention	1.0%	34.01	7.488	NA	NA	$1,083,076
	Bioswale	2.0%	53.98	12.168	NA	2.65	$1,139,600
	Infiltration Trench	1.0%	26.99	4.68	136.61	1.32	$1,083,076
	Oil & Grit Separators	1.0%	2.70	0.468	NA	0.22	$480,000
	Permeable Pavers	2.5%	121.46	21.06	NA	3.31	$2,033,150
	Dry Wells	0.5%	13.50	2.34	68.31	0.66	$541,538
	Filterra	1.0%	18.35	6.552	NA	1.26	na
	Detention Basin Retrofit	1.0%	10.80	4.1184	122.95	1.15	$404,040
Total			**270.98**	**54.756**	**204.92**	**9.42**	**$6,360,440**
Grand Total			**1596.97**	**329.0025**	**1873.35**	**50.70**	**$53,835,495**

Table 24 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 Winfield Creek, some are more critical than others in certain portions of the watershed. Based on land use, sub-watersheds #1, and #2 are the most critical because of institutional and more dense residential land uses. Sub-watershed #3 and #4 are less 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

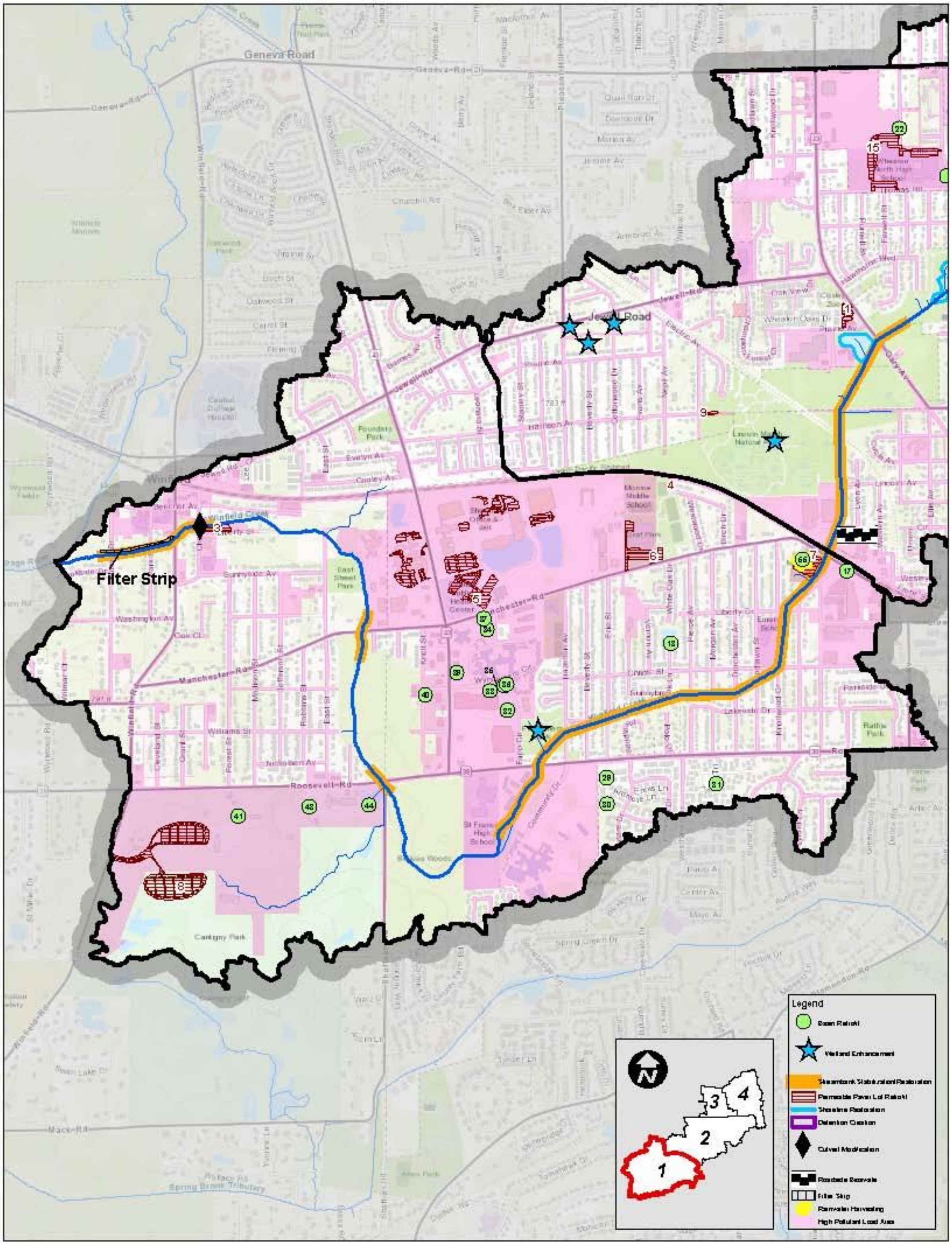

Figure 50 Site-specific BMP projects in Winfield Creek sub-watershed #1

4.1.2.2 Sub-Watershed #2

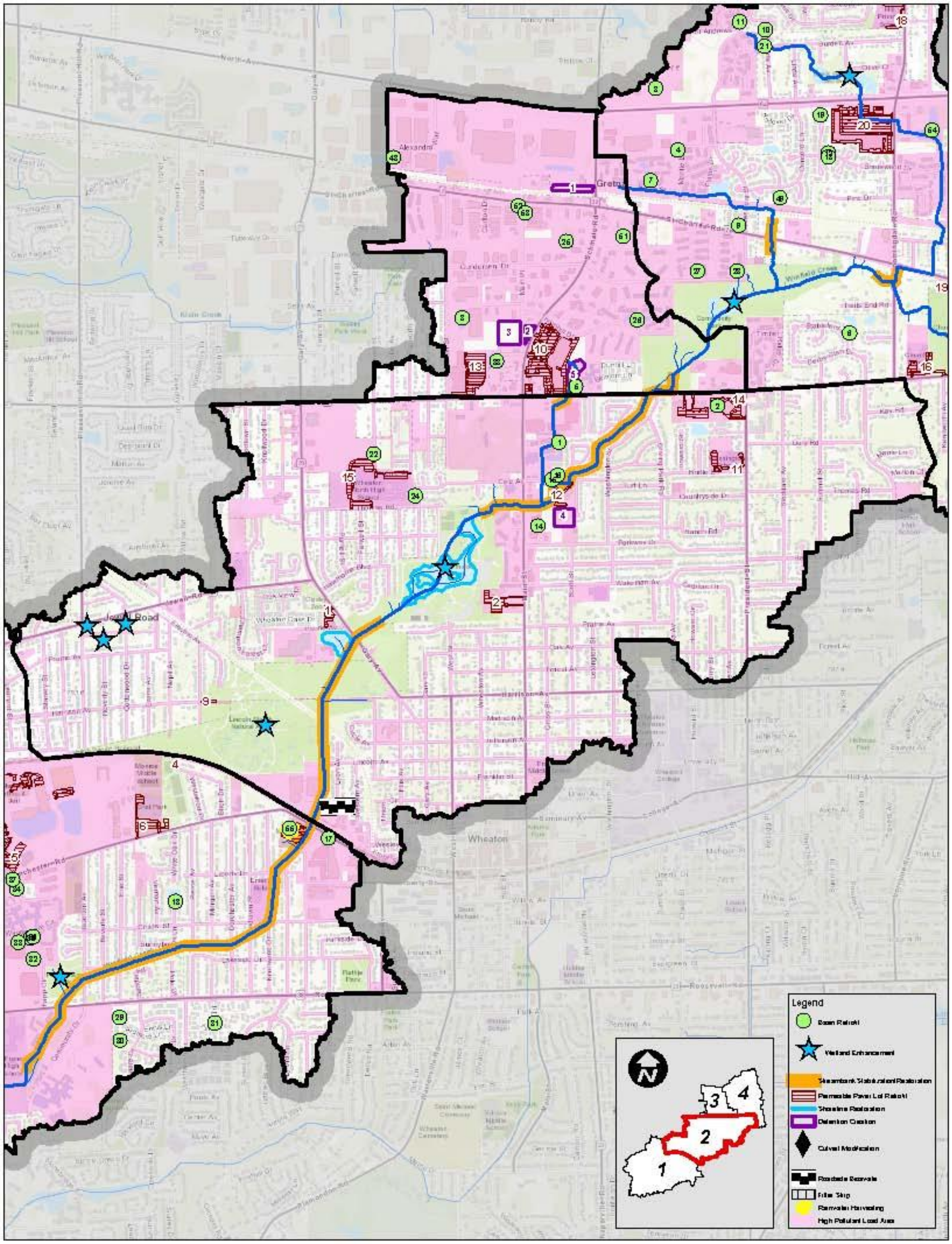

Figure 51 Site-specific BMP projects in Winfield Creek sub-watershed #2

4.1.2.3 Sub-Watershed #3

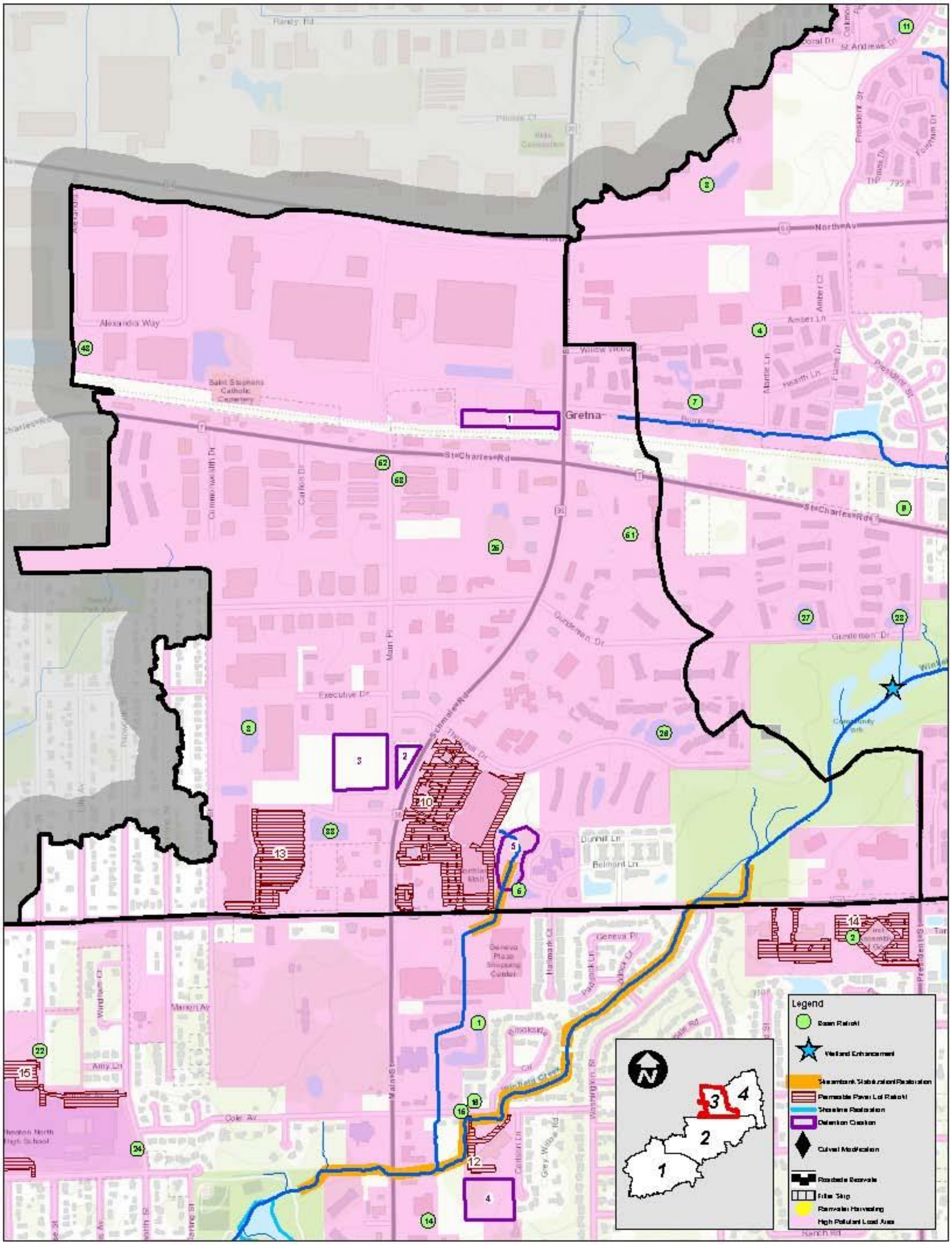

Figure 52 Site-specific projects in Winfield Creek sub-watershed #3

4.1.2.4 Sub-Watershed #4

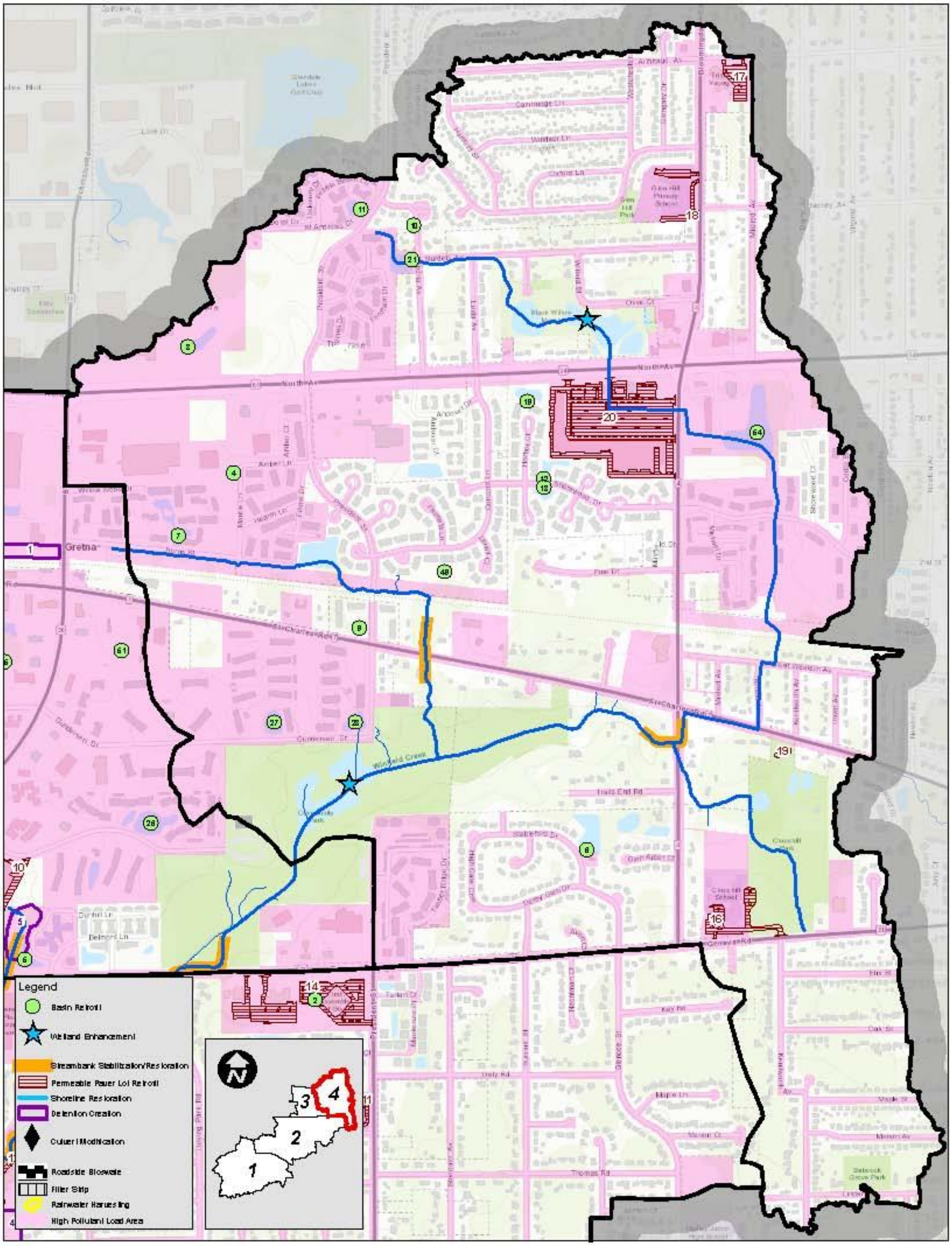

Figure 53 Site-specific projects in Winfield Creek sub-watershed #4

4.2 Planning, Policy & Programming

4.2.1 Open Space Protection

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

4.2.2 Align Ordinances with Best Practices

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

Working with Geosyntec, DuPage County has already developed a guidance document and checklist for municipalities to self-audit their ordinances.[34] In addition, CMAP offers technical assistance programs that may be of use for communities who wish to audit their ordinances, as it is often a time-consuming endeavor.

4.2.3 Watershed Planning

Continued watershed planning efforts, on both a local and regional level, to identify localized projects, programs and practices to improve the quality of Winfield 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 Winfield 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 Winfield 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. Further DuPage County is a funding sponsor of The Conservation Foundation's Conservation@Home and Work,

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[34] www.dupageco.org/swm

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. 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. Several schools within the Winfield Creek Watershed have earned flags with more anticipated next school year.

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 Winfield Creek Watershed, additional targeted efforts could be made in the following areas:

- Inform residents, particularly those with property located within in the Winfield 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 25 includes recommendation on how to reach target audiences within the Winfield 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 25 Tools and mediums for reach target audiences within the Winfield Creek Watershed

4.4 Summary of BMP Projects & Programs

Table 26 provides a comprehensive overview of the BMP projects described previously in this section. Again, these are all measures any stakeholder within the Winfield Creek Watershed may utilize to improve the quality of the creek, depending on funding, expertise and other factors.

BMP Type	Scenario	Est. Qty.	Units	N Red. (lb/yr)	P Red. (lb/yr)	BOD Red. (lb/yr)	Sed. Red. (T/yr)	Estimated Cost ($)
Bioretention / Rain Gardens	WW	16.95	ac	450	101	na	na	$17,729,617
Detention Basin Retrofits	WW	13.46	ac	111	44	1,412	11	$5,248,230
Detention Basin Retrofits	SS	31.93	ac	1013	289	8,599	68	$11,695,506
Native Detention Creation	SS	14.28	ac	192	39	828	7	$4,568,373
Education & Outreach	WW	3	#	na	na	na	na	$15,000
Dry Well	WW	8.48	ac	179	32	994	9	$8,864,808
Filter Strips	SS	.91	ac	15	2	78	1	$51,889
Rainwater Harvesting	SS	.94	ac	3	1	17	0	97,974
Bioswale	WW	12.98	ac	277	64	na	13	$7,137,350
Bioswale	SS	0.28	ac	25	5	na	1	$155,931
Tree Well/ Filtera	WW	5	#	81	29	na	5	na
Oil & Grit Separator	WW	133	#	20	4	na	2	$1,064,000
Culvert Modification	SS	1	#	na	na	na	na	$3,037,183
Permeable & Porous Pavements	SS	78.75	ac	477	76	na	11	$61,816,746
Permeable & Porous Pavements	WW	16.48	ac	641	113	na	17	$12,936,015
Streambank Protection (stabilization)	WW	20,202	ft	111	42	223	69	$5,050,500
Streambank Protection (stabilization)	SS	2,181	ft	0.1	0.1	0.3	0.1	$545,250
Wetland Restoration / Enhancement	SS	143.37	ac	na	na	na	na	$2,007,113
Weekly Street Sweeping	WW	1,663	ac	na	34	633	14	$2,445,343
Totals				**3,485**	**834**	**12,564**	**160**	**144,466,828**

Table 26 Summary of projects with pollutant load reductions and cost.[35]

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

4.5 Summary of Pollutant Loads & Potential BMP Pollutant Load Reductions

Table 27 provides potential pollutant load reductions for each of the BMP projects described above. Although all of these projects are recommended for attaining the measure able goals outlined in Section 5.3, the totality of these projects exceed the goals.

BMP	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	BOD Reduction (lbs/yr)	Sediment Reduction (ton/yr)
Site-Specific				
Streambank Stabilization	7	3	15	4
Detention Basin Retrofits	1074	393	10,875	134
Bioswales	104	23		6
Filter Strips	115	19	499	8
Permeable Pavers	292	49	na	10
Watershed-Wide				
Streambank Stabilization	13	5	27	7
Bioretention	839	176	na	na
Bioswale	516	111	na	23
Oil & Grit	43	7	0	3
Permeable Pavers	898	149	0	23
Rainwater Harvesting	54	9	246	3
Tree Well/ Filterra	136	46		9
Detention Retrofit	266	97	3199	26
Background Rates	36,952	5,926.00	139,112	869.00
Total Reduction	**4,357.00**	**1087**	**14,861**	**256**
Percent Reduction	**12%**	**18%**	**11%**	**29%**

Table 27 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 Winfield 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 Winfield Creek. For others, regional groups, such as CMAP, offer technical assistance grants to assist with plan implementation. Table 28 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 municipal governments, Indian tribes and educational institutions	Environmental education and training for students, conservation corps, youth groups, citizen groups, corporations, landowners and government agencies through projects that restore wetlands and streams	https://www.epa.gov/wetlands/5-star-wetland-and-urban-waters-restoration-grants#Applying
Streambank Cleanup and Lakeshore Enhancement (SCALE)	IEPA	Up to $3,500	Groups with established and recurring stream or lakeshore cleanups	Implementation of streambank or lakeshore cleanup events	http://www.epa.illinois.gov/topics/water-quality/surface-water/scale/index
Pre-Disaster Mitigation Grant 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 28 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 Winfield 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 29 provides general guidance on implementing initiatives found in the Winfield 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 Winfield 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 29 Winfield 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 30, 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	2	4	6
	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
Reduce bank erosion and increase daylighting, where possible, to improve and protect in-stream water quality.	Acres of new riparian buffer	1	2	5
	Acres of restored riparian buffer	1	2	5
	Acres of in-stream restoration	2	5	10
	Linear feet streambank stabilization	500	2,000	5,000
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 30 Milestones for determing success in carrying out Winfield Creek Watershed Plan.

5.3 Criteria for Determining Progress

The primary criterion by which progress will be measured within the Winfield Creek Watershed Plan is through measuring pollutant load reductions, specifically TN, TP, TSS and BOD. Table 31 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	36,952 lb/yr	5% Load Reduction = 370 lb/yr (1,848 lb total)	15% Load Reduction = 554 lb/yr (5,543 lb total)
Phosphorus (Total) Load Reduction	5,926 lb/yr	10% Load Reduction = 119 lb/yr (593 lb total)	25% Load Reduction = 148 lb/yr (1,482 lb total)
Sediment Load Reduction (TSS)	869 ton/yr	10% Load Reduction = 17 tons/yr (87 tons total)	25% Load Reduction = 22 tons/yr (217 ton total)
BOD Load Reduction	139,112 lb/yr	5% Load Reduction = 1,391 lb/yr (6,956 lb total)	15% Load Reduction = 2,087 lb/yr (20,867 lb total)
fIBI Scores	WB13 = 16	WB13 >18	WB13>20
	WB14 = 13	WB14 >15	WB14> 18
	WB15 = 26	WB15 > 26	WB15 > 26
mIBI Scores	WB13 = 38	WB13 ≥ 38	WB13 ≥ 38
	WB14 = 11	WB14 >15	WB14 > 18
	WB15 = 16	WB15 > 18	WB15 > 20
QHEI Scores	WB13 = 56	WB13 > 58	WB13 > 60
	WB14 = 53	WB14 > 55	WB14> 58
	WB15 = 68	WB15 ≥ 68	WB15 ≥ 68

Table 31 Winfield Creek Watershed Plan criteria for determining progress.[36]

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 Winfield 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 Winfield Creek is both attaining designated uses and meeting water quality standards. In addition, monitoring provides vital information to update

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

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

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

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

SI: State of Illinois

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

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

Winfield Creek Watershed

						Pollutant Load Removals				
GIS Object ID	**Current Condition**	**Location**	**Ownership**	**Municipality**	**Proposed Condition**	**N (lb/yr)**	**P (lb/yr)**	**BOD (lb/yr)**	**TSS (t/yr)**	**Priority**
1	wet bottom	Apartment Complex, Main St & Cole	Private	Wheaton	wetland detention	5	2	64	0	2
2	dry bottom	Church, President St and Geneva Rd	Private	Wheaton	native basin	33	7	144	1	2
3	wet bottom	Office Complex, Executive Dr	Private	Carol Stream	wetland detention	19	7	223	2	2
4	dry bottom	North Ave east of Schmale	Private	Carol Stream	native basin	27	5	117	1	2
5	wet bottom	Assisted Living Facility	Private	Carol Stream	wetland detention	12	4	144	1	2
6	wet bottom	Stableford Dr	Private	Glen Ellyn	wetland detention	12	4	138	1	3
7	wet bottom	Burns St Apartment Complex	Private	Glen Ellyn	wetland detention	13	5	160	1	2
8	wet bottom	North Ave Industrial Bldg	Private	Glendale Heights	wetland detention	12	4	144	1	2
9	wet bottom	Jameson Ct	Private	Carol Stream	wetland detention	11	4	130	1	3
10	dry bottom	Roberta Avenue	Public	Glendale Heights	native basin	5	1	23	0	2
11	wet bottom	Oakmont Dr. Apartments	Private	Glendale Heights	wetland detention	8	3	96	1	2
12	wet bottom	Shorewood Dr. Townhomes North Pond	Private	Glendale Heights	wetland detention	3	1	37	0	3
13	wet bottom	Shorewood Dr. Townhomes South Pond	Private	Glendale Heights	wetland detention	2	1	20	0	3
14	wet bottom	Commercial Bldg, Parkway and Main St	Private	Wheaton	wetland detention	4	1	48	0	2
15	dry bottom	Medical Bldg, Cole Ave	Private	Wheaton	native basin	3	1	13	0	2
16	dry bottom	Townhome Complex, Cole Ave	Private	Wheaton	native basin	3	1	14	0	3
17	dry bottom	Park District	Public	Wheaton	native basin	18	4	80	1	1
18	wet bottom	Clinton Court	Private	Wheaton	wetland detention	6	2	76	1	3
19	wet bottom	Harbor Court Townhomes	Private	Glendale Heights	wetland detention	7	3	88	1	3
21	wet bottom	Fordam Dr Apartments	Private	Glendale Heights	wetland detention	40	14	479	4	2
22	dry bottom	Wheaton North High School, north pond	Public	Wheaton	native basin	81	16	351	3	1
24	dry bottom	Wheaton North High School, south pond	Public	Wheaton	native basin	30	6	128	1	1
25	wet bottom	Schmale and Gunderson Dr, Commercial Complex	Private	Carol Stream	wetland detention	5	2	64	0	2
26	wet bottom	Thornhill Drive Apartments	Private	Carol Stream	wetland detention	44	16	526	4	2
27	wet bottom	Gundersen Drive Apartments	Private	Carol Stream	wetland detention	24	9	287	2	2
28	wet bottom	President Street Apartments	Private	Carol Stream	wetland detention	15	5	175	1	2
29	wet bottom	Gresham Circle north pond, Townhomes	Private	Wheaton	wetland detention	10	3	115	1	3
30	wet bottom	Gresham Circle south pond, Townhomes	Private	Wheaton	wetland detention	15	5	178	1	3
31	wet bottom	Woodcutter Lane, Townhomes	Private	Wheaton	wetland detention	13	5	154	1	3
32	dry bottom	Commercial Business Complex	Private	Wheaton	native basin	30	6	128	1	2
33	wet bottom	Commercial Business Complex	Private	Carol Stream	wetland detention	13	5	160	1	2
38	dry bottom	Commercial Business Complex	Private	Wheaton	native basin	11	2	48	0	2
39	dry bottom	Office Building	Private	Wheaton	native basin	7	1	32	0	2
40	wet bottom	Office Building	Private	Wheaton	wetland detention	4	1	48	0	2
41	wet bottom	Cantigny Park	Private	Wheaton	wetland detention	11	4	128	1	2
43	wet bottom	Cantigny Park	Private	Wheaton	wetland detention	1	0	16	0	2
44	wet bottom	Cantigny Park	Private	Wheaton	wetland detention	20	7	239	2	2
48	dry bottom	Business Park	Private	Carol Stream	native basin	22	4	96	1	2
51	wet bottom	Commercial Building, St. Charles Rd	Private	Carol Stream	wetland detention	5	2	64	0	2
52	dry bottom	Commercial Building, Main Place and St. Charles	Private	Carol Stream	native basin	15	3	64	1	2
53	dry bottom	Commercial Building, Main Place and St. Charles	Private	Carol Stream	native basin	11	2	48	0	2
34/37	dry bottom	Assisted Living Facility, Wyndemere Ct	Private	Wheaton	native basin	18	4	80	1	2
35/36	dry bottom	Assisted Living Facility, Wyndemere Ct	Private	Wheaton	native basin	15	3	64	1	2
						668	**186**	**5425**	**43**	
1	building	Wheaton Park District garage	Public	Wheaton	Rainwater Harvesting	3	1	17	0	1
1	turf swale	Union Avenue right of way	Public	Wheaton	Bioswale	25	5	na	1	1
1	wet bank	Along Winfield Creek between Summit Dr. and Winfield Rd	Public	Winfield & DuPage County	Filter Strips	15	2	78	1	1
						0	0	0	0	

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1	wet bank	Multiple	Multiple	Multiple	Streambank Stabilization					1
1	dry land	West of Schmale and north of Great Western Trail	Private	Multiple/ Com Ed/ DuPage County	Detention Creation	46	9	200	2	1
2	dry land	Main Place and Schmale Rd	Private	Multiple/ DuPage County	Detention Creation	7	1	31	0	1
3	dry land	Main Place	Private	Multiple/ DuPage County	Detention Creation	58	12	250	2	1
4	dry land	Carlson Lane	Private	Multiple/ DuPage County	Detention Creation	50	10	215	2	1
5	dry land	Dunhill Lane	Private	Multiple/ DuPage County	Detention Creation	31	6	132	1	1
						192	**39**	**828**	**7**	
1	wetland	Wheaton Park District	Public	Wheaton	Wetland Enhancement					
2	wetland	Community Park Carol Stream	Public	Carol Stream	Wetland Enhancement					1
3	wetland	Black Willow Marsh	Public	FPDDPC	Wetland Enhancement					1
4										
5	wetland	Northside Park	Public	Wheaton Park District	Wetland Enhancement					
6										1
7	wetland	Linhcoln Marsh	Public	Wheaton Park District	Wetland Enhancement & Shoreline Stabilization					1
8	wetland	Firefighter Park	Public	Wheaton	Wetland Enhancement					1
	pond	Elliot Lake	Public	Wheaton	Shoreline Stabilization					1
	road culvert	Church Street	Public	Winfield/ DuPage County	Culvert Modification					
1	dry bottom	Cozley Zoo	Public	Wheaton Park District	Permeable Pavers	6	1	na	0	1
2	parking lot	First Baptist Church of Wheaton	Private	Wheaton	Permeable Pavers	14	2	na	0	3
3	parking lot	Northeast corner of Church and Liberty St, Church	Private	Winfield	Permeable Pavers	5	1	na	0	2
4	parking lot	Graf Park	Public	Wheaton Park District	Permeable Pavers	1	0	na	0	2
5	parking lot	DuPage County Government Complex	Public	DuPage County	Permeable Pavers	78	13	na	2	1
6	parking lot	Monroe Middle School	Public	Wheaton	Permeable Pavers	15	2	na	0	1
7	parking lot	Wheaton Park District, Park Services Center	Public	Wheaton	Permeable Pavers	8	1	na	0	1
8	parking lot	Cantigny Park	Private	Winfield	Permeable Pavers	77	12	na	2	1
9	parking lot	Lincoln Marsh	Public	Wheaton	Permeable Pavers	1	0	na	0	1
10	parking lot	Commerical Complex, Geneva and Schmale	Private	Carol Stream	Permeable Pavers	63	10	na	1	1
11	parking lot	Washington School	Public	Wheaton	Permeable Pavers	9	1	na	0	1
12	parking lot	Cole Avenue, Church	Private	Wheaton	Permeable Pavers	6	1	na	0	2
13	parking lot	Commericial Complex Main St. and Geneva Rd	Private	Carol Stream	Permeable Pavers	35	6	na	1	1
14	parking lot	Geneva and President St, Church	Private	Wheaton	Permeable Pavers	30	5	na	1	2
15	parking lot	Wheaton North High School	Public	Wheaton	Permeable Pavers	31	5	na	1	1
16	parking lot	Churchill School	Public	Glen Ellyn	Permeable Pavers	11	2	na	0	1
17	parking lot	Bloomingdale Rd and Armitage Ave, Church	Private	Glendale Heights	Permeable Pavers	7	1	na	0	2
18	parking lot	Glen Hill School	Public	Glendale Heights	Permeable Pavers	6	1	na	0	1
19	parking lot	Churchill Park	Public	Glen Ellyn Park District	Permeable Pavers	1	0	na	0	1
20	parking lot	Commercial Complex, North Ave and Bloomingdale Rd	Private	Glendale Heights	Permeable Pavers	73	12	na	2	2
						477	76	0%	11	
					Total pollutant load removal	**2240**	**533**	**12599**	**114**	

Appendix B

Winfield Creek Watershed

GIS Object ID	Current Condition	Location	Ownership	Municipality	Proposed Condition	Size of Pond	Priority	Total Estimated Cost
1	wet bottom	Apartment Complex, Main St & Cole	Private	Wheaton	wetland detention	1.26	2	$491,974
2	dry bottom	Church, President St and Geneva Rd	Private	Wheaton	native basin	1.08	2	$345,493
3	wet bottom	Office Complex, Executive Dr	Private	Carol Stream	wetland detention	0.91	2	$353,746
4	dry bottom	North Ave east of Schmale	Private	Carol Stream	native basin	0.47	2	$150,822
5	wet bottom	Assisted Living Facility	Private	Carol Stream	wetland detention	1.04	2	$406,364
6	wet bottom	Stableford Dr	Private	Glen Ellyn	wetland detention	1.41	3	$548,810
7	wet bottom	Burns St Apartment Complex	Private	Glen Ellyn	wetland detention	0.63	2	$245,634
8	wet bottom	North Ave Industrial Bldg	Private	Glendale Heights	wetland detention	0.45	2	$176,867
9	wet bottom	Jameson Ct	Private	Carol Stream	wetland detention	0.33	3	$130,386
10	dry bottom	Roberta Avenue	Public	Glendale Heights	native basin	0.31	2	$100,458
11	wet bottom	Oakmont Dr. Apartments	Private	Glendale Heights	wetland detention	0.70	2	$273,168
12	wet bottom	Shorewood Dr. Townhomes North Pond	Private	Glendale Heights	wetland detention	0.34	3	$133,730
13	wet bottom	Shorewood Dr. Townhomes South Pond	Private	Glendale Heights	wetland detention	0.26	3	$100,704
14	wet bottom	Commercial Bldg, Parkway and Main St	Private	Wheaton	wetland detention	0.26	2	$99,838
15	dry bottom	Medical Bldg, Cole Ave	Private	Wheaton	native basin	0.05	2	$17,541
16	dry bottom	Townhome Complex, Cole Ave	Private	Wheaton	native basin	0.04	3	$12,992
17	dry bottom	Park District	Public	Wheaton	native basin	0.18	1	$57,401
18	wet bottom	Clinton Court	Private	Wheaton	wetland detention	0.92	3	$357,498
19	wet bottom	Harbor Court Townhomes	Private	Glendale Heights	wetland detention	0.41	3	$159,060
21	wet bottom	Fordam Dr Apartments	Private	Glendale Heights	wetland detention	0.16	2	$60,459
22	dry bottom	Wheaton North High School, north pond	Public	Wheaton	native basin	0.78	1	$249,837
24	dry bottom	Wheaton North High School, south pond	Public	Wheaton	native basin	0.81	1	$257,783
25	wet bottom	Schmale and Gunderson Dr, Commercial Complex	Private	Carol Stream	wetland detention	0.75	2	$292,023
26	wet bottom	Thornhill Drive Apartments	Private	Carol Stream	wetland detention	0.49	2	$190,909
27	wet bottom	Gundersen Drive Apartments	Private	Carol Stream	wetland detention	1.25	2	$486,730
28	wet bottom	President Street Apartments	Private	Carol Stream	wetland detention	0.77	2	$298,907
29	wet bottom	Gresham Circle north pond, Townhomes	Private	Wheaton	wetland detention	0.54	3	$208,717
30	wet bottom	Gresham Circle south pond, Townhomes	Private	Wheaton	wetland detention	0.57	3	$222,093
31	wet bottom	Woodcutter Lane, Townhomes	Private	Wheaton	wetland detention	0.46	3	$181,111
32	dry bottom	Commercial Business Complex	Private	Wheaton	native basin	0.71	2	$227,561
33	wet bottom	Commercial Business Complex	Private	Carol Stream	wetland detention	0.96	2	$372,620
38	dry bottom	Commercial Business Complex	Private	Wheaton	native basin	1.20	2	$383,257
39	dry bottom	Office Building	Private	Wheaton	native basin	0.04	2	$12,014
40	wet bottom	Office Building	Private	Wheaton	wetland detention	0.25	2	$99,409
41	wet bottom	Cantigny Park	Private	Wheaton	wetland detention	0.38	2	$146,413
43	wet bottom	Cantigny Park	Private	Wheaton	wetland detention	0.12	2	$48,743
44	wet bottom	Cantigny Park	Private	Wheaton	wetland detention	1.57	2	$612,530
48	dry bottom	Business Park	Private	Carol Stream	native basin	1.11	2	$356,343
51	wet bottom	Commercial Building, St. Charles Rd	Private	Carol Stream	wetland detention	0.78	2	$304,432
52	dry bottom	Commercial Building, Main Place and St. Charles	Private	Carol Stream	native basin	0.36	2	$116,700
53	dry bottom	Commercial Building, Main Place and St. Charles	Private	Carol Stream	native basin	0.16	2	$51,341
34/37	dry bottom	Assisted Living Facility, Wyndemere Ct	Private	Wheaton	native basin	1.66	2	$531,725
35/36	dry bottom	Assisted Living Facility, Wyndemere Ct	Private	Wheaton	native basin	0.32	2	$101,577
						27.25		**$9,975,721**
1	building	Wheaton Park District garage	Public	Wheaton	Rainwater Harvesting	0.94	1	$97,974
1	turf swale	Union Avenue right of way	Public	Wheaton	Bioswale	0.28	1	$155,931

Appendix B

1	wet bank	Along Winfield Creek between Summit Dr. and Winfield Rd	Public	Winfield & DuPage County	Filter Strips	0.91	1	$51,889
1	wet bank	Multiple	Multiple	Multiple	Streambank Stabilization	20202.19	1	$5,050,548
1	dry land	West of Schmale and north of Great Western Trail	Private	Multiple/ Com Ed/ DuPage County	Detention Creation	1.98	1	$633,365
2	dry land	Main Place and Schmale Rd	Private	Multiple/ DuPage County	Detention Creation	0.70	1	$224,738
3	dry land	Main Place	Private	Multiple/ DuPage County	Detention Creation	7.59	1	$2,428,565
4	dry land	Carlson Lane	Private	Multiple/ DuPage County	Detention Creation	1.91	1	$609,993
5	dry land	Dunhill Lane	Private	Multiple/ DuPage County	Detention Creation	2.10	1	$671,712
						14.28		**$4,568,373**
1	wetland	Wheaton Park District	Public	Wheaton	Wetland Enhancement	11.76		$164,670
2	wetland	Community Park Carol Stream	Public	Carol Stream	Wetland Enhancement	36.61	1	$512,502
3	wetland	Black Willow Marsh	Public	FPDDPC	Wetland Enhancement	9.02	1	$126,325
4								
5	wetland	Northside Park	Public	Wheaton Park District	Wetland Enhancement	9.85		$137,905
6							1	
7	wetland	Linhcoln Marsh	Public	Wheaton Park District	Wetland Enhancement & Shoreline Stabilization	59.96	1	$839,427
8	wetland	Firefighter Park	Public	Wheaton	Wetland Enhancement	16.16	1	$226,284
						143.37		**$2,007,113**
	pond	Elliot Lake	Public	Wheaton	Shoreline Stabilization	3.97	1	
	road culvert	Church Street	Public	Winfield/ DuPage County	Culvert Modification			$3,037,183
1	dry bottom	Cozley Zoo	Public	Wheaton Park District	Permeable Pavers	0.92	1	$719,537
2	parking lot	First Baptist Church of Wheaton	Private	Wheaton	Permeable Pavers	2.33	3	$1,826,678
3	parking lot	Northeast corner of Church and Liberty St, Church	Private	Winfield	Permeable Pavers	0.76	2	$593,578
4	parking lot	Graf Park	Public	Wheaton Park District	Permeable Pavers	0.12	2	$96,973
5	parking lot	DuPage County Government Complex	Public	DuPage County	Permeable Pavers	12.95	1	$10,167,766
6	parking lot	Monroe Middle School	Public	Wheaton	Permeable Pavers	2.44	1	$1,917,993
7	parking lot	Wheaton Park District, Park Services Center	Public	Wheaton	Permeable Pavers	1.37	1	$1,073,841
8	parking lot	Cantigny Park	Private	Winfield	Permeable Pavers	12.70	1	$9,965,599
9	parking lot	Lincoln Marsh	Public	Wheaton	Permeable Pavers	0.22	1	$174,254
10	parking lot	Commerical Complex, Geneva and Schmale	Private	Carol Stream	Permeable Pavers	10.48	1	$8,226,029
11	parking lot	Washington School	Public	Wheaton	Permeable Pavers	1.47	1	$1,152,712
12	parking lot	Cole Avenue, Church	Private	Wheaton	Permeable Pavers	0.96	2	$750,479
13	parking lot	Commericial Complex Main St. and Geneva Rd	Private	Carol Stream	Permeable Pavers	5.79	1	$4,543,066
14	parking lot	Geneva and President St, Church	Private	Wheaton	Permeable Pavers	5.00	2	$3,925,805
15	parking lot	Wheaton North High School	Public	Wheaton	Permeable Pavers	5.16	1	$4,049,811
16	parking lot	Churchill School	Public	Glen Ellyn	Permeable Pavers	1.80	1	$1,416,840
17	parking lot	Bloomingdale Rd and Armitage Ave, Church	Private	Glendale Heights	Permeable Pavers	1.09	2	$856,501
18	parking lot	Glen Hill School	Public	Glendale Heights	Permeable Pavers	1.02	1	$798,672
19	parking lot	Churchill Park	Public	Glen Ellyn Park District	Permeable Pavers	0.15	1	$119,432
20	parking lot	Commercial Complex, North Ave and Bloomingdale Rd	Private	Glendale Heights	Permeable Pavers	12.03	2	$9,441,180
						78.75		**$61,816,746**
					Total pollutant load removal			**$86,761,478**

Winfield Creek