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Poplar Creek Watershed Action Plan

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In-kind match has generously been provided by the City of Elgin, Forest Preserve District of Cook County, Fox River Study Group, Village of Hoffman Estates, Village of Schaumburg, Village of South Barrington, and Village of Streamwood. The planning process was coordinated by the Chicago Metropolitan Agency for Planning (CMAP), formerly the Northeastern Illinois Planning Commission (NIPC). CMAP or former NIPC staff members who worked on the plan include Laura Barghusen, Jesse Elam, Tim Loftus, Jason Navota, Dawn Thompson, Jennifer Welch, and Jeff Wickenkamp. The authors gratefully acknowledge the many contributors to this planning process and especially the members of the Poplar Creek Watershed Coalition.

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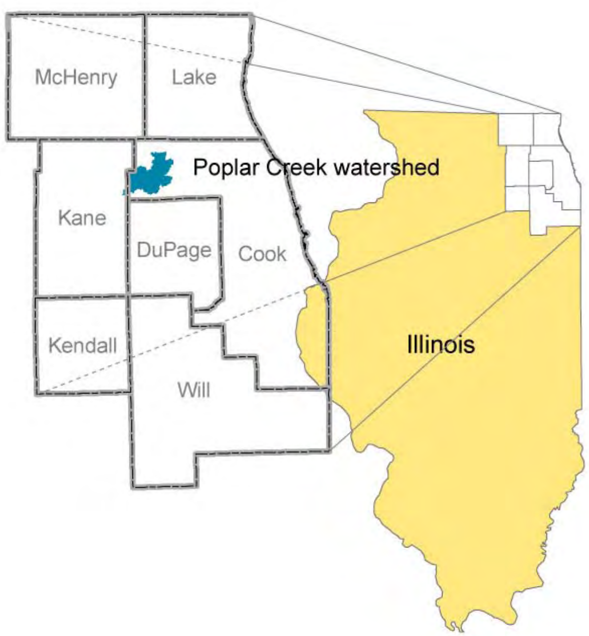
1. INTRODUCTION

1.1. Overview

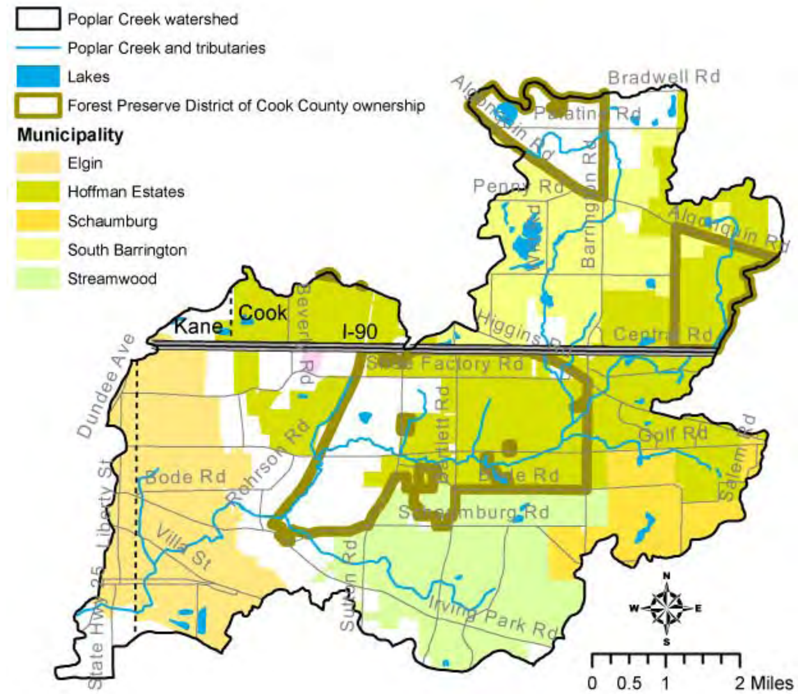
The Poplar Creek watershed[1] is situated primarily in northwestern Cook County, Illinois, but includes a small portion of northeastern Kane County as well (Figure 1-1). A tributary to the Upper Fox River Basin, the Poplar Creek Watershed occupies forty-four square miles (approx. 28,500 acres) and includes parts of eleven suburban communities. The City of Elgin and Villages of Hoffman Estates, Schaumburg, South Barrington, and Streamwood are the primary municipalities in the watershed. The Forest Preserve District of Cook County is a large landowner within the watershed as well (Figure 1-2).

Figure 1-1. Location map of Poplar Creek watershed.



[1] Hydrologic Unit Code 0712000612

Figure 1-2. Municipalities and Forest Preserve District of Cook County in Poplar Creek watershed.



The Illinois Environmental Protection Agency (IEPA) has determined water quality in Poplar Creek to be impaired and has included the stream on its 303(d) list, the compilation of water bodies in the state that do not support their designated uses — in the case of Poplar Creek, aquatic life support and primary contact recreation (i.e., swimming). This is discussed in more detail in Section 2. The Poplar Creek Watershed Coalition, a group of citizens, municipal officials, and resource agency professionals, is undertaking an initiative — supported by a grant from the IEPA under Section 319 of the Clean Water Act and assisted by the Chicago Metropolitan Agency for Planning (CMAP) — to develop a watershed based plan for Poplar Creek to help control water quality impairments and meet other goals of the group.

The plan that follows is intended to meet U.S. Environmental Protection Agency guidelines for States' implementation of non-point source management programs under the Section 319 of the Clean Water Act and for the award of Section 319 grants to States to implement those programs[2]. Thus, the Poplar Creek Watershed Based Plan addresses the nine required components of a watershed based plan:

(a) An identification of the causes and sources that need to be controlled to achieve pollutant load reductions estimated in this plan;
(b) An estimate of the load reductions expected for the management measures described under (c) below;
(c) A description of the non-point source management measures that will need to be implemented to achieve the load reductions estimated under (b) above;
(d) An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan;
(e) An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented;
(f) A schedule for implementing the non-point source management measures identified in this plan;
(g) A description of interim, measurable milestones for determining whether non-point source management measures or other control actions are being implemented;
(h) A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards; and
(i) A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) above.

1.2. Importance to Reader and Why You Should Become Involved

One of the most crucial components of any successful watershed planning initiative is the participation of the people who either reside in the watershed or who have a stake in the sustainable use of natural resources. Members of the general public, including the residents of the Poplar Creek watershed, are concerned about and entitled to clean and safe water, a healthy natural environment that is an integral part of their community, and access to high-quality recreational resources. Such quality-of-life outcomes, however, can neither be assumed nor taken for granted. By improving cooperation among actors within the Poplar Creek watershed and by providing educational opportunities to local communities about their role in watershed protection, it is hoped that this initiative will lead people to do their part to improve or protect the natural-resource base that is expected to sustain present and future generations alike.

1.3. The Poplar Creek Watershed Coalition Mission Statement

The Poplar Creek Watershed Coalition pursues collaborative stewardship of local water and natural resources through the development and implementation of the Poplar Creek Watershed Action Plan; a guide for resource protection and improvement activities where progressive best management practices of urban stormwater are emphasized.

[2] Federal Register, Volume 68, Number 205, 23 October 2003, Notices

1.4. The Poplar Creek Watershed Coalition and its Goals

During the past few years, a number of people representing a variety of interests have been meeting to discuss Poplar Creek Watershed resources, learn from each other, and develop a watershed plan that is detailed enough to be effective and eligible for certain types of grant money. The Poplar Creek Watershed Coalition (referred to as the Coalition or PCWC hereafter) is a collection of municipal, park district, and forest preserve district representatives, resource-agency representatives, planners, and residents of the watershed. Appendix F provides information about Coalition activities (e.g., meeting minutes and frequency, special events) and the structure of governance.

The Coalition has developed two types of goals: resource-based goals and watershed-coordination goals. Resource-based goals are related to the physical or biological aspects of naturally occurring phenomena distributed throughout the watershed. Watershed-coordination goals have largely to do with the socio-political context within which work is accomplished. The goals and their associated objectives are outlined below.

1.4.1. RESOURCE-BASED GOALS

(Goal 1) Protect and restore aquatic and terrestrial habitat quality and quantity.

- (Obj A) Identify remaining open-space parcels for either acquisition or conservation-easement placement.
- (Obj B) Eradicate invasive species and restore native plant communities.

(Goal 2) Protect surface and groundwater resources: attain designated uses, protect shallow-aquifer water, and respect public drinking water supplies downstream (i.e. Fox River).

- (Obj A) Manage stormwater / urban runoff to protect water quality.
- (Obj B) Protect remaining wetlands from degradation or loss.
- (Obj C) Promote principles and practices of conservation design.

(Goal 3) Reduce flooding and flood damages

- (Obj A) Promote principles and practices of conservation design.
- (Obj B) Coordinate with the Poplar Creek Watershed Planning Council to enlist the support of regional resources.
- (Obj C) Encourage and support mitigation of floodprone properties where feasible.

(Goal 4) Improve recreational resource availability and access.

- (Obj A) Promote Coalition-sponsored activities that raise public awareness of watershed resources and create opportunities for outdoor enjoyment.

1.4.2. WATERSHED COORDINATION GOALS

(Goal 5) Increase communication and coordination among municipal decision-makers and other stakeholders within the watershed.

- (Obj A) Create mechanisms for contact, discussion, and information sharing.
- (Obj B) Use the Poplar Creek Watershed Planning Council as another forum for deliberations.
- (Obj C) Pursue greater integration with municipal comprehensive planning.

(Goal 6) Ensure that municipal code and ordinances are supportive of watershed plan goals and objectives.

(Obj A) Review and compare relevant ordinances for consistency across watershed municipalities.

(Goal 7) Develop an outreach and education campaign to support watershed plan goals and objectives.

(Obj A) Tailor and target educational messages to distinct audiences.

(Obj B) Work with the Fox River Ecosystem Partnership (FREP) at developing a shared resource to be dedicated to outreach and education.

(Goal 8) Develop a mechanism for maintaining the presence and efficacy of the Poplar Creek Watershed Coalition.

(Obj A) Strengthen ties with FREP and participate in an effort to clarify strategies for a developing a working relationship.

(Obj B) Pursue funding to support a watershed coordinator.

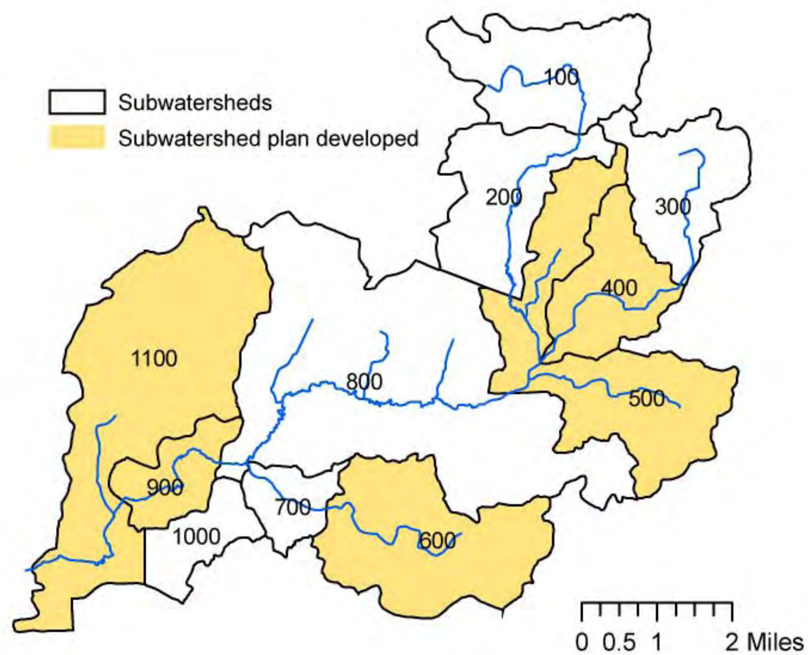
1.5. Guide to What Follows

Section 2 discusses the present status of Poplar Creek in terms of potential causes and sources of water quality impairment. Criteria used to gauge current and future conditions will be addressed as will a monitoring plan to be implemented to measure future progress.

Sections 3–6 presents subwatershed action plans. The Poplar Creek Watershed has been subdivided into eleven subwatersheds, of which five had plans developed for them (Figure 1-3). Subwatershed action plans were developed for those subwatersheds that are "hotspots," or likely to contribute above average pollutant loads. Action plans developed at the subwatershed scale are tailored to address the local situation and designed to involve the primary municipality present within the subwatershed. Action plans strive to pinpoint recommended BMPs along with the information necessary to meet USEPA guidelines and enhance the likelihood of implementation.

Section 7 presents measures prioritized or implemented at the watershed-wide scale, typically non-structural measures such as open space protection and pollutant source reduction. The last chapter features strategies, objectives, and tactics that address implementation and monitoring issues.

Figure 1-3. Status of subwatershed action plan development.



2. WATER QUALITY CONCLUSIONS AND RECOMMENDATIONS

This section presents a summary of what appear to be the most significant causes and likely sources of impairment in Poplar Creek. Only data for the stream itself (i.e., not lakes) are considered here. More detail, as well as information on lake water quality, can be found in the Watershed Resource Inventory (WRI) in Appendix A. The ultimate purpose of the analysis is to help select best management practices (BMPs) that address the pollutants affecting the stream. A central conclusion of the WRI is that water chemistry does not appear to be a crucial limiting factor in the documented degradation of the aquatic community in Poplar Creek.

In the sections below, average concentrations and loads are calculated for potential causes of impairment as identified on IEPA's 303(d) list. Additional pollutants that the IEPA did not identify as causes of impairment are also analyzed. To target BMPs to areas of the watershed that appear to be contributing the highest pollutant loads, finally, an analysis was conducted to identify "hotspot" subwatersheds, i.e., those that generate higher than average pollutant loads per unit area.

2.1. Background

Surface waters, rivers and lakes, provide many potential beneficial uses to society. Several of these beneficial uses have been designated in Illinois Pollution Control Board rules and regulations. Certain designated uses apply to nearly all water bodies in Illinois, while other designated uses are specific to a water body and thus, perhaps less common. For each designated use in every water body, IEPA determines the degree to which the designated use is attained or supported. The designated uses assessed by IEPA include aquatic life, aesthetic quality, primary contact (swimming), secondary contact (fishing and boating), public and food processing water supply, fish consumption, and indigenous aquatic life.

Poplar Creek has two designated uses — aquatic life and primary contact recreation — and the IEPA considers both to be in nonsupport, meaning that Poplar Creek is impaired. Aquatic life use assessments are typically based on the interpretation of a variety of data, including physico-chemical water data, physical habitat data, and biological monitoring data. Driven by Illinois water quality standards, set by the Illinois Pollution Control Board, *primary contact* means "any recreational or other water use in which there is prolonged and intimate contact with the water involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing."[1] The assessment of primary contact use is based on fecal coliform bacteria data. See the *Illinois Integrated Water Quality Report and Section 303(d) List – 2006* for a more detailed description of aquatic life, primary contact, and other designated use assessments.

The potential causes of impairment[2] for Poplar Creek identified by IEPA include chloride (Cl), low dissolved oxygen (DO), sedimentation/ siltation, silver (Ag), total dissolved solids (TDS), total suspended solids (TSS), and fecal coliform (FC). IEPA likewise identified potential sources of impairment as runoff from highways, roads, and bridges (not construction related), urban runoff and storm sewer discharge, and unknown sources related to fecal coliform contamination. Because of these impairments, Poplar Creek

[1] 35 Illinois Administrative Code 301.355
[2] A "potential cause of impairment" is one which is suggested by the chemical data available to IEPA; it is a preliminary diagnosis of what might be causing the impairment to the designated use.

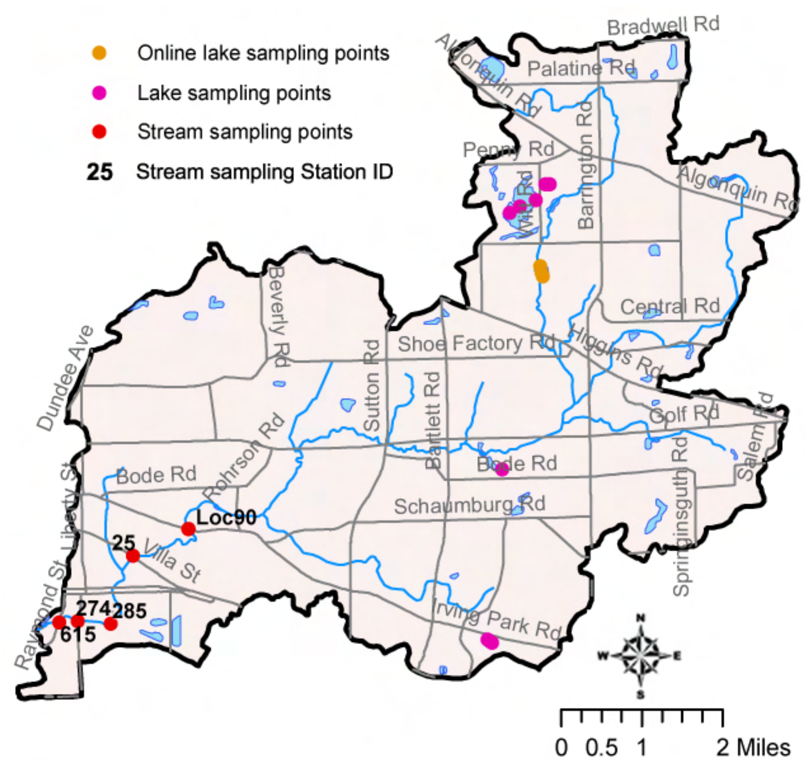
has been reported as a Category 5[3] water body and thus, a total maximum daily load[4] (TMDL) is needed[5].

The thrust of the Poplar Creek Watershed Plan is to address the sources of stream impairment rather than treat the symptoms. Remediating the consequences of urbanization on stream quality and hydrology, therefore, requires attention to the systems employed by communities in the watershed to manage urban stormwater. Though not listed as an explicit source of impairment, hydromodification is another inevitable outcome of urbanization and poses a particularly vexing problem for watershed planners. Similarly, road salts applied during the winter season and other pollutants from highways, roads, and bridges are a source of water quality impairment that requires new thinking at village, county, and state departments of transportation. Only by addressing these sources at both policy and operational levels, and across multiple levels of decision-making, will the causes of steam impairment be reduced and local water quality improved.

2.2. Methodology

In 2004 the Fox River Study Group (FRSG) and the Illinois State Water Survey released a comprehensive database of water quality data for the Fox River watershed. Five stations with water quality data for Poplar Creek were identified in the database (Figure 2-1), although data from one were confined to 1982. The IEPA's Ambient Water Quality Monitoring Network station (IEPA code DTG 02) is Station 25 in the FRSG database. Ultimately the data from the Metropolitan Water Reclamation District's station at Route 19 (Location 90, or Station 895 in the FRSG database) proved most useful, with the best currency and sample frequency.

Figure 2-1. Locations of data collection points for the Poplar Creek watershed in the Fox River Study Group database (2004).



A simple count of the number of times a sample exceeded the numeric Illinois water quality standard ("exceedance," or "exceedance frequency") was employed to screen pollutants. According to the IEPA's assessment methodology, one exceedance of a standard when a water body is determined to be Not Supporting of

[3] USEPA's latest Integrated Report guidance (2005) requires all waters of the state to be reported in a five category system as outlined on page 84 of the *Illinois Integrated Water Quality Report and Section 303(d) List – 2006.*

[4] Total Maximum Daily Load (TMDL) – a water pollution budget for an impaired waterbody; sets the pollutant load reduction target(s) for a watershed and thus, the amount of pollution a waterbody can receive while still attaining water quality standards and/or designated uses.

[5] Poplar Creek is not scheduled for TMDL development during 2006-2007, but some time by 2019.

aquatic life use makes a given chemical parameter a potential cause of impairment.[6] This screening procedure is used here to identify additional potential causes of impairment. Pollutants that are not addressed in this section are not considered to be potential causes of impairment by IEPA or by the PCWC.

The water chemistry sampling stations are all clustered in Subwatersheds 900 and 1100 near the mouth of the stream (Figure 2-1). Because of this, it is impossible to attribute violations of water quality standards to practices in any specific upstream subwatershed. One of the chief recommendations from the PCWC for future monitoring is for the municipalities in the watershed to support the FRSG's effort to collect water quality samples at more locations within the watershed (see Section 8). To address the need to target "hotspot" subwatersheds, an alternative method was employed that estimates loads based on land use. Average pollutant concentrations and loads were calculated for the potential causes of impairment identified by IEPA and in this plan (with the exceptions of sedimentation and hydromodification). The last five years of available data are employed for these calculations (2001–2005, except for oil and grease, which was 1993–1998). Approximately 50 individual samples are available for each chemical parameter.

It should be noted here that the relative infrequency of sample collection imposes a serious constraint on the accuracy of pollutant load estimates. This is especially true for particulate pollutants of non-point origin, for which research shows that the loading rate is highly variable over time. For example, pollutant loading rates during snowmelt and storm runoff events are frequently several orders of magnitude greater than those during low flow periods.[7]

Furthermore, it is very common for 80–90 percent or more of the annual load to be delivered during the 10 percent of the time that features the highest loading rates.[8] Thus, failure to sample during the relatively rare high-flow events will hurt the accuracy of load estimates. Caveats aside, these are the data that are available to work with.

Table 2-1. Relationships between concentration and flow (2001–2005).

		Mean concentrations (mg/L)	
	Pearson vs. Flow	Flow Weighted	Sample Average
Total P	0.51	0.12	0.08
Oil & Grease	–0.03	8	9
FC (summer)*	0.35	286	249
TSS	0.60	39	20
Total N	0.74	1.96	1.34
TDS	–0.01	663	701
Silver	–0.07	~0.0004	~0.0004
Chloride	0.07	232	231
DO	0.02	9.5	9.3

* Fecal coliform concentrations are geometric means and are given in colonies per 100 mL.

Average concentrations and loads were computed using a time and flow weighting procedure explained in Appendix B. Unfortunately, flow data and concentration data were not available for the same station. On the assumption that flow would be conserved between the two locations, USGS gage 05550500 at Station 25 provided flow data and Location 90 provided the concentration data. While the stations are separated by a relatively short distance (1.2 stream miles), as can be seen in Figure 2-1, some unquantifiable error is introduced into the estimates by this procedure. The estimates in the section below should also be considered preliminary as they are based on a sparse dataset. As can be seen in Table 2-1, however, the

[6] *Illinois Integrated Water Quality Report and Section 303(d) List – 2006*, p. 43.
[7] Richards, R.P. 1998. *Estimation of pollutant loads in river and streams: A guidance document for NPS programs.* Project report prepared under Grant X998397-01-0, U.S. Environmental Protection Agency, Region VIII, Denver. 108 p.

[8] Baker, D.B. 1988. *Sediment, nutrient, and pesticide transport in selected lower Great Lakes tributaries*. EPA-905/4-88-001. USEPA Great Lakes Program Office, Chicago, IL 225 p. (as cited in Richards, 1998)

simple average of the samples and the flow weighted mean concentration are very similar except when there is a strong relationship between flow and concentration, as indicated by the Pearson value (0 = no relationship, 1 = perfect positive correlation, –1 = perfect negative correlation). This is as expected and suggests that the flow weighting procedure is appropriate even given the thin dataset.

2.3. Discussion of Causes of Impairment Identified on the IEPA 303(d) List

2.3.1. FECAL CONTAMINATION

The fecal coliform standard is frequently exceeded and compliance has shown little improvement over the period of record. Over the last five years for which data are available, the flow weighted geometric mean concentration of fecal coliform bacteria between May and October was 286 per 100 mL. A 30 percent reduction in fecal coliform is therefore needed to meet the geometric mean standard of 200 per 100 mL.

Table 2-2. Fecal coliform values for 2001–2005 (May–October)

	Concentration (No./100 mL)
Flow weighted geometric mean	286
Samples	
Max	4,300
75th	560
Median	180
25th	130
Min	9

Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19); USGS mean daily flow data for Villa Street gage (05550500).

Given the information available for this analysis, it is very difficult to single out sources of fecal contamination with any certainty. The Technical Advisory Committee for the planning process was asked to comment on potential sources of fecal contamination in the watershed. Its responses are shown in Table 2-3.

Table 2-3. Potential sources of fecal contamination.

Potential Source of Fecal Contamination	Technical Advisory Committee and Agency Consensus
Municipal point sources	None above FWRD
Combined sewer overflows	Occasional
Sanitary sewer overflows	Occasional
Collection system failure	Accidental, not quantifiable
Urban storm sewers	Contributes some
Wildcat sewer	No
Domestic wastewater lagoons	No
Feedlots	Unlikely
Aquaculture	None
Animal holding and management areas	Some horse farms
Manure lagoons	None
Sludge	Unlikely
Wastewater	Unknown
Geese	Many present
Pet waste	Unknown
Landfills	Present
Inappropriate disposal/wildcat dumping	Likely, locations unknown
Industrial land treatment	Unknown
Onsite wastewater systems (e.g. septic tanks)	Must be inventoried
Septage disposal	Possible but illegal

There are no wastewater treatment plant discharges into Poplar Creek, and the infrequent overflows from sanitary and combined sewers cannot account for fecal coliform exceedance in 30–50 percent of samples. Furthermore, conversations with municipal engineers and public works officials suggest that illicit connections to storm sewers are rare in residential portions of the watershed.

Septic systems are prevalent in the northeastern part of the watershed, however, and represent a potential source of contamination. Table 2-4 indicates the density of septic systems by subwatershed. The median age of residential developments in Subwatersheds 100, 200, and 300 suggests that septic systems may well be failing in the absence of conscientious maintenance. However, there are no available data on septic failure rates or locations. A recommended municipal program of septic inspection is developed in Section 7, chiefly for the Village of South Barrington.

Table 2-4. Septic system density and age of development by subwatershed.

Sub-watershed	Housing units with septic service in 1990	Median age of structure (2006)	Septic tanks per acre (1990)
100	1,323	25	0.63
200	450	26	0.24
300	305	30	0.19
400	31	30	0.02
500	126	30	0.04
600	85	32	0.03
700	59	14	0.09
800	201	29	0.03
900	82	18	0.09
1000	102	16	0.13
1100	356	55	0.07
Total	**3,119**	**29**	**0.11**

Source: U.S. Census 1990 and 2000. Block group data intersected with USGS-defined subwatersheds. Median age of structure is estimated as the median reported in Census 2000 plus six years. Data on housing units with septic service was not available from the 2000 Census.

Several other potential sources remain. There are a few horse farms in the northeast portion of the watershed, and it is possible that they contribute to fecal contamination, but their relative importance is probably small. Pet waste from residential areas, while unquantified in Poplar Creek, has been shown elsewhere to be a significant source of bacterial contamination.[9] Programs to control animal waste must feature a combination of enforcement through ordinance and public and school-based education, as discussed in Section 7. The Canada Goose (*Branta canadensis*) almost certainly contributes to fecal contamination. Potential methods of managing goose populations are discussed in Section 7. Finally, there are at least five unpermitted landfills and three permitted landfills in the Poplar Creek watershed that may very well leach fecal contamination to surface waters. However, no data are available to assess the magnitude of the contribution, if any.

2.3.2. DISSOLVED OXYGEN

Despite appearing in the 2006 305(b) report as a potential cause of impairment, it is somewhat difficult to determine whether low dissolved oxygen is problematic in Poplar Creek given the sparse data set. The flow weighted mean concentration of dissolved oxygen was 9.5 mg/L between 2001 and 2005 at the MWRD station at State Route 19 (Chicago Street.) During this time dissolved oxygen fell below the 5 mg/L absolute standard only once, during the summertime dissolved oxygen sag. The spread in the sample values would suggest that dissolved oxygen is well above the standard almost all the time. It should be noted here that time of day will also affect sample concentrations: higher during daytime and lower at night.

Table 2-5. Dissolved oxygen values for 2001–2005.

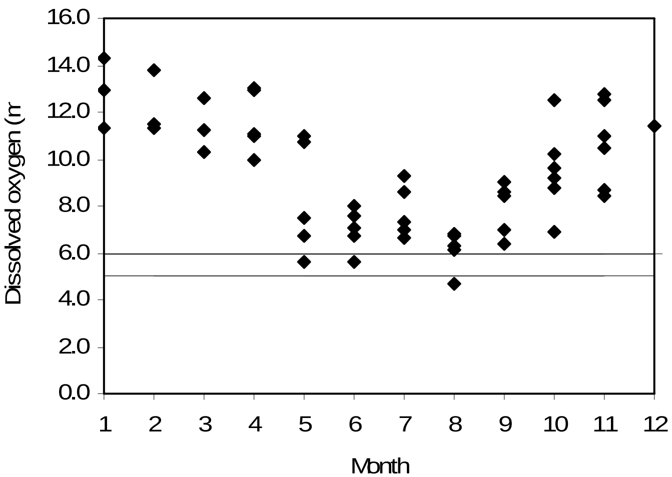
	Concentration (mg/L)
Flow weighted average	9.5
Samples	
Max	14.3
75th	11.3
Median	9.1
25th	7.0
Min	4.7

Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19); USGS mean daily flow data for Villa Street gage (05550500).

[9] Source: Pollution Prevention Fact Sheet: Animal Waste Collection; available at http://www.stormwatercenter.net/Pollution_Prevention_Factsheets/AnimalWasteCollection.htm

However, Illinois regulations also require that dissolved oxygen be above 6 mg/L for at least 16 of every 24 hours. Another two samples fall below the 6 mg/L standard and, as Figure 2-2 indicates, numerous samples are very close to 6 mg/L. These observations suggest that continuous dissolved oxygen monitoring would likely reveal reason for concern, showing summertime dissolved oxygen frequently at levels that stress aquatic life. As a safety measure the minimum ambient concentration needs to increase by at least 28 percent in order to stay above 6 mg/L.

Figure 2-2. Monthly variation in dissolved oxygen (2001–2005).



Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19); USGS mean daily flow data for Villa Street gage (05550500).

2.3.3. TOTAL SUSPENDED SOLIDS

While there is no numerical water-quality standard for total suspended solids (TSS) in Illinois, a general guideline is 80 mg/L. The flow weighted mean concentration of total suspended solids was 39 mg/L between 2001 and 2005, well below the guideline. However, the maximum measured ambient concentration needs to be reduced by 7 percent to avoid any samples exceeding the guideline.

Table 2-6. Total suspended solids (TSS) values for 2001–2005.

	Concentration (mg/L)
Flow weighted average	39
Samples	
Max	86
75th	29
Median	14
25th	8
Min	4

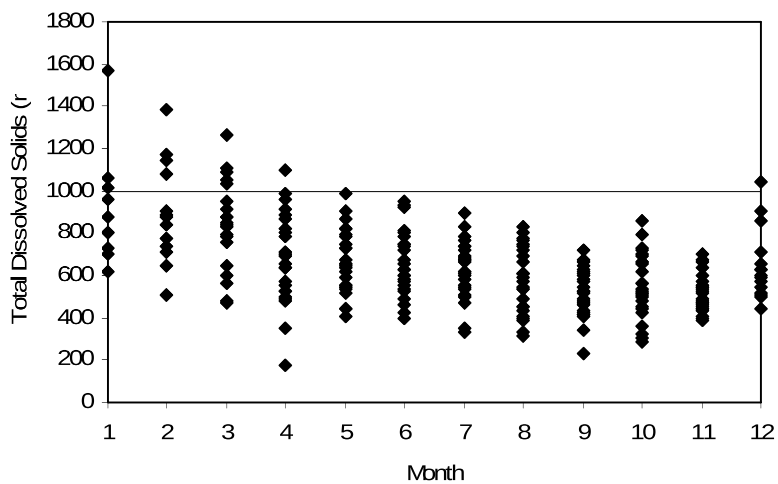
Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19); USGS mean daily flow data for Villa Street gage (05550500).

Furthermore, as discussed in Section 2.5 below, there is some circumstantial evidence that stormwater controls in the watershed are having an effect on TSS delivery to the creek. Many existing stormwater controls constructed for flood control, such as dry ponds and wet unvegetated ponds, effectuate removal of TSS by settling. Concentrations of TSS only exceed the 80 mg/L guideline during higher flows. This may indicate that sediments are being resuspended in higher flows and that increased maintenance or design retrofits would improve performance during high flow conditions. Resuspension during high-flow events may also be due to remobilization of sediment that has been brought into the stream system from historical land-use change. Thus, legacy sediment that spends much time in storage somewhere along the channel bottom is slowly making its way out of the Poplar Creek system and into the mainstem Fox River below Elgin.

2.3.4. TOTAL DISSOLVED SOLIDS

As can be seen in Table 2-7, the mean concentration of total dissolved solids is well below the standard of 1,000 mg/L. However, spikes do occur occasionally. The maximum measured ambient concentration exceeded the standard by 28 percent. Total dissolved solids concentration is quite closely related to chloride ($R^2 = 0.81$), and, like chloride, shows a strong seasonal trend, with concentrations higher in the winter than other months (Figure 2-3). This suggests that road salt is likely a chief contributor to elevated levels of total dissolved solids, of which chloride is an important component.

Figure 2-3. Monthly distribution of total dissolved solids concentrations for 1979–2005 (mg/L).



Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19)

Table 2-7. Total dissolved solids (TDS) values for 2001–2005.

	Concentration (mg/L)
Flow weighted average	663
Samples	
Max	1384
75th	834
Median	678
25th	516
Min	288

Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19); USGS mean daily flow data for Villa Street gage (05550500).

2.3.5. CHLORIDE

The average concentration of chloride appears to be well within the Illinois general use standard of 500 mg/L. As with total dissolved solids, spikes in concentration that exceed the standard do occur in winter. While the annual mean concentration of chloride is 232 mg/L, the winter average is 391 mg/L (December through April). The positive relationship between chloride and streamflow is also stronger in the winter, suggesting nonpoint sources. The maximum measured ambient concentration exceeds the standard by 23 percent.

Table 2-8. Chloride values for 2001–2005.

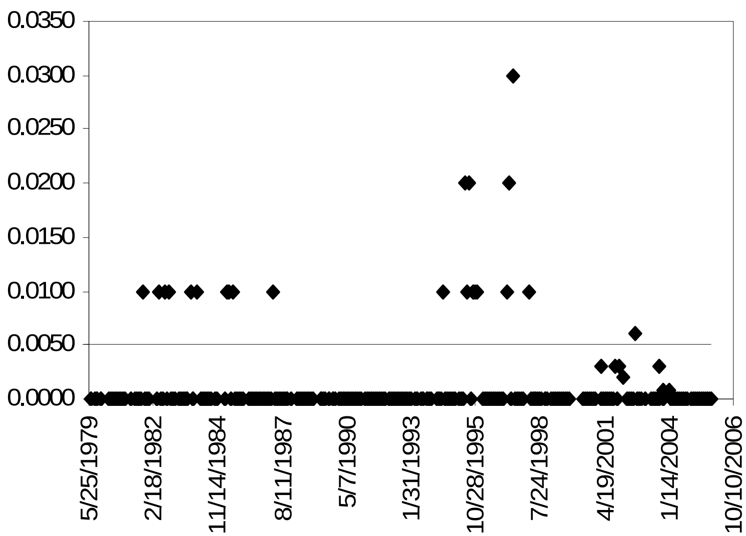
	Concentration (mg/L)
Flow weighted average	232
Samples	
Max	651
75th	308
Median	180
25th	134
Min	74

Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19); USGS mean daily flow data for Villa Street gage (05550500).

2.3.6. SILVER

The metal, silver, in Poplar Creek has periodically exceeded the Illinois standard of 0.005 mg/L. There were periods of elevated silver levels in the mid-1980s, mid-1990s, and early 2000s (Figure 2-4). On a time and flow averaged basis, silver concentrations between 2001 and 2005 were quite low, on the order of ~0.0004 mg/L, but it is clear, even given the infrequency of sampling, that silver tends to surge periodically. The maximum measured ambient concentration needs to be reduced by 17 percent to meet the standard.

Figure 2-4. Total silver values for 1979–2005 (mg/L).



Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19)

It is difficult to establish the source of silver contamination. Most likely the source is a photography lab, either professional or amateur, although an electroplating or other industrial operation could be the source. It is hoped that ongoing illicit discharge detection and elimination activities by the municipalities will eventually uncover the source(s). BMPs recommended for the industrial areas in the subwatershed action plans may also help control silver levels and watershed-wide education may convince the discharger(s) to engage in source control.

Table 2-9. Total silver values for 2001–2005

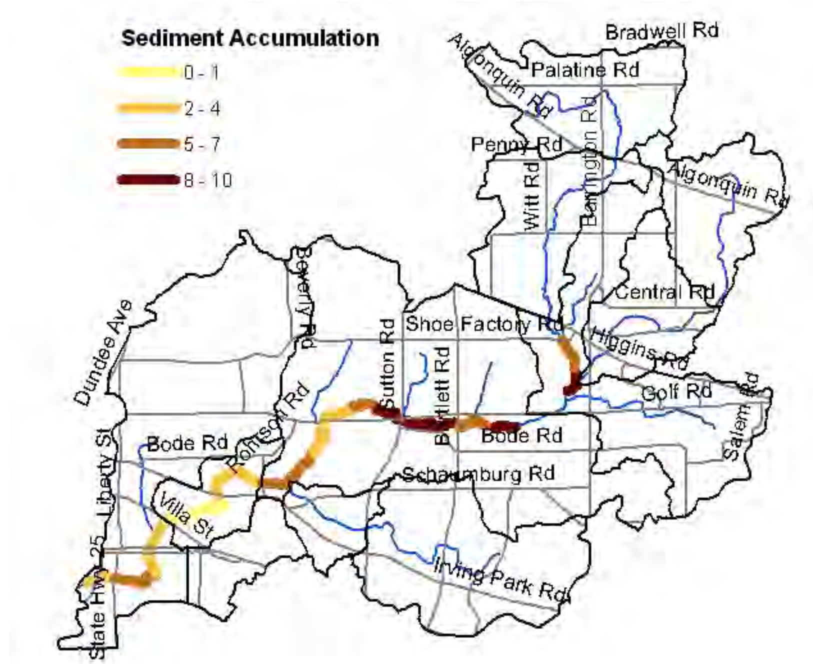
	Concentration (mg/L)
Flow weighted average	~0.0004
Samples	
Max	0.006
75th	0.000
Median	0.000
25th	0.000
Min	0.000

2.3.7. SEDIMENTATION

The 2006 303(d) list identifies sedimentation/siltation as a potential cause of impairment. There is no Illinois numeric standard for sedimentation. While it is not a complete dataset and is only semi-quantitative, the NIPC stream inventory conducted in 2002 is suggestive as to where in Poplar Creek sedimentation is most severe, at least along the mainstem. Sedimentation is most severe in the in middle of the watershed through the Poplar Creek Forest Preserve (Figure 2-5). The inventory also noted that substrates were highly embedded through that stretch.

Several factors may be at work in sediment accumulation. Natural causes certainly play a role in that the gradient of the stream is lower through the middle section of the watershed and velocity is accordingly slower, forcing sediment deposition. While sedimentation would be occurring in this stretch in a completely natural condition, eroding stream banks upstream caused by increased post-development flows are probably major contributors to sediment accumulation in the forest preserve. Most likely the best approach to correcting sedimentation is to reduce the sediment load being deposited. It is hoped that upstream detention basin retrofits will improve lower flow release rates to reduce erosion and that buffer improvements and stream bank stabilization can reduce sediment loading, as called for in the subwatershed action plans. In particular, a study of soil erodibility (soil k-factors) in the watershed suggests that the eastern side of the watershed, especially north of I-90, has more erodible soils closer to streams (see Watershed Resource Inventory, Appendix A). This suggests that buffer maintenance is especially important in South Barrington and upper Hoffman Estates. Furthermore, it is possible that row cropping in the forest preserve contributes to sedimentation; recommendations for agricultural activities are found in Section 7.

Figure 2-5. Sediment accumulation by stream reach.



Source: Northeastern Illinois Planning Commission Fox River Stream Inventory (2002). 0 = least accumulation; 10 = most accumulation. Remainder of stream network not assessed.

2.4. Discussion of Causes of Impairment Not Identified by IEPA

2.4.1. OIL AND GREASE

Illinois has not promulgated a standard for oil and grease for general use water bodies, as Poplar Creek is classified. However, a standard of 15 mg/L is applied to the Des Plaines River system to protect secondary contact and indigenous aquatic life support uses, while a much more restrictive standard (0.1 mg/L) is applied to rivers used for public water supply. Poplar Creek exceeded the standard for the less-healthy Des Plaines River fairly frequently through the 1990s and, although it is not used for public water supply, it does drain into the Fox River, a public drinking water supply for approximately 110,000 people living in Elgin, Sleepy Hollow, and Bartlett and another 142,000 people living downstream in Aurora. This suggests that oil and grease should be considered a potential cause of impairment.

Table 2-10. Oil and grease values for 1993–1998

	Concentration (mg/L)
Flow weighted average	8
Samples	
Max	31
75th	10
Median	7
25th	4
Min	1

Source: Metropolitan Water Reclamation District data for Location 90 (Poplar Creek at Illinois Route 19); USGS mean daily flow data for Villa Street gage (05550500).

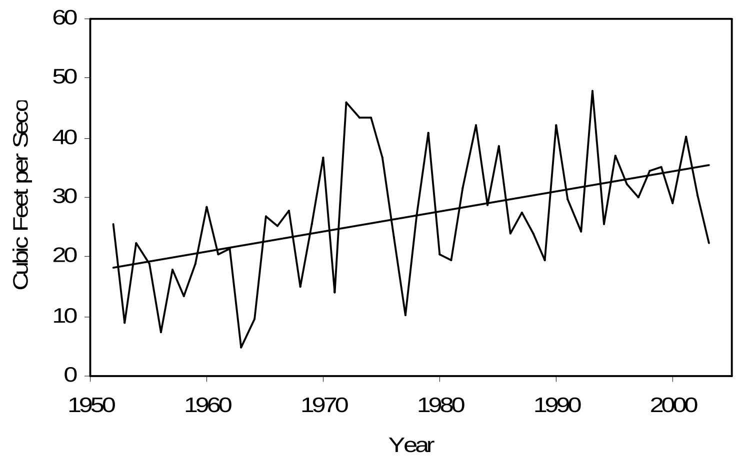
Over the years five years (1993–1998) before sampling was discontinued, the flow weighted oil and grease concentration in Poplar Creek was approximately 8 mg/L, about half of the secondary contact and indigenous life support standard but well above the 0.1 mg/L standard for public supply waterways. Because no standard truly applies in Poplar Creek, a load reduction target cannot be specified.

It would be suspected that the chief source of oil and grease contamination is runoff from commercial, industrial, and transportation land uses, but the relationship between flow and concentration is weak and slightly negative, as shown in Table 2-1. This suggests instead that point sources or illicit cross-connections are to blame. There are very few permitted industrial point sources in the watershed, and those for which U.S. EPA has information discharge below Route 19, so their contributions are not captured in the data used to calculate mean concentration. This suggests that illicit discharges may be at work, but it should be borne in mind that the dataset is sparse and somewhat unreliable, and it is certain that some of the oil and grease loading is due to non-point sources. Finally, sampling for oil and grease was discontinued at MWRD Location 90 in 1998, as mentioned above. It is recommended that the sampling regime be restarted in order to monitor the effectiveness of the planned BMPs.

2.4.2. HYDROMODIFICATION

The natural flow pattern of a stream system is a reflection of a number of contributing variables including climate, land cover/land use, soils, topography, geology, and stream dimensions. Aquatic communities respond and adapt to the flow regime and also reflect ambient water quality. Land use change will very often impact the flow regime of a stream system; this is particularly true with urbanization. The resulting modification in stream flow regime or hydrology is known as hydromodification.

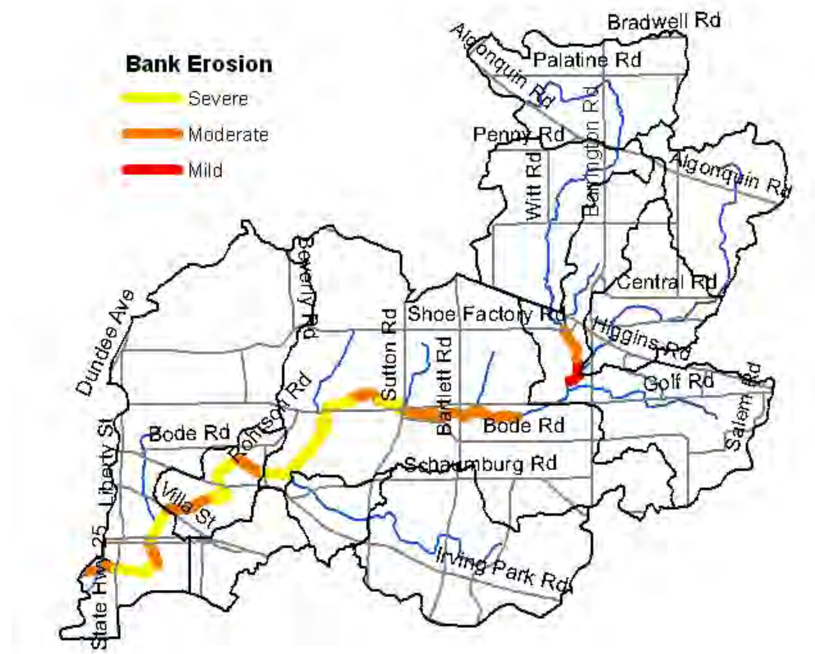
Figure 2-6. Historical mean annual streamflow in Poplar Creek (1951–2003).



Source: USGS flow data for Villa Street gage (05550500).

In general, IEPA identifies "impacts from hydrostructure flow regulation/modification" (i.e., dams) as a potential source of water quality impairment. To this, USEPA adds channelization and channel modification and stream bank and shoreline erosion to round out the top three major types of hydromodification activities. The latter type is often symptomatic of land-use change. An abundance of scientific evidence exists to support the fact that hydromodification is a leading source of stream impairment. While hydromodification has not been implicated by IEPA as a source of impairment in Poplar Creek, erosion is severe in some reaches (Figure 2-7) and, as noted in the subwatershed plans, many reaches of the main stem and tributaries have been channelized. These conditions most likely contribute to water quality declines through subsequent deposition of sediment. As for hydrostructures, the NIPC stream inventory did not note any dams on the mainstem, although there are a handful of weirs and reservoirs located on the tributaries.

Figure 2-7. Severity of bank erosion by stream reach.



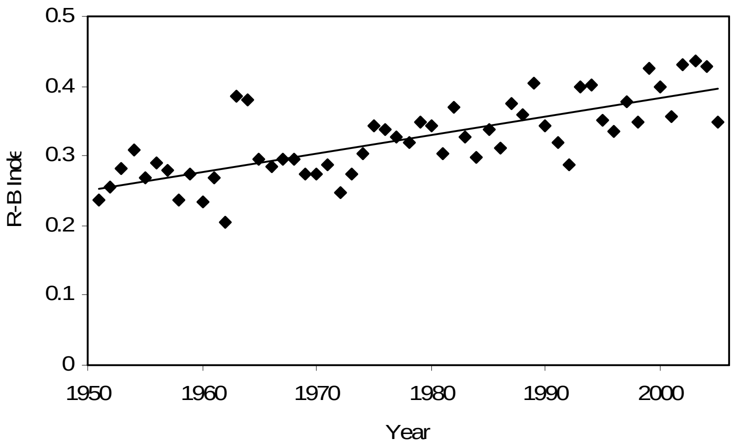
Source: Northeastern Illinois Planning Commission Fox River Stream Inventory (2002). Remainder of stream network not assessed.

Perhaps the biggest change in hydrology, and one not explicitly recognized by IEPA, is simply increased flow and increased variation in flow. Streamflow has increased dramatically in Poplar Creek from the 1950s to the 2000s as urbanization magnified runoff delivery to the stream (Figure 2-6). Not only this, but the day to day difference in magnitude between low flows and high flows has also increased — Poplar Creek is now "flashier." Scientists from the Water Quality Laboratory at Heidelberg College[10] have developed a way to quantify flashiness with the Richards-Baker Flashiness Index

[10] D.B. Baker, R.P. Richards, T.T. Loftus, and J.W. Kramer. 2004. A new flashiness index: characteristics and applications to Midwestern rivers and streams. *Journal of the American Water Resources Association* 40(2):503-522.

(RBFI), which measures oscillations in streamflow relative to total flow. The index is independent of the amount of rainfall in a given year. Over the period of record, the RBFI value for Poplar Creek climbed fairly steadily, increasing 46 percent from 1951 to 2005 (Figure 2-8).

Figure 2-8. Richards-Baker Flashiness Index for Poplar Creek (1951–2005).



Source: Calculated from USGS flow data for Villa Street gage (05550500).

Efforts to improve water quality must address hydromodification. Furthermore and in addition to stemming stream bank erosion and limiting channelization, if not dechannelizing certain reaches where practicable, improving water quality will require modifying detention basins to decrease release rates during smaller storms as well as finding opportunities to decrease the total volume of stormwater runoff.

2.5. Load Estimation and Subwatershed Targeting

As already mentioned above, the water quality sampling stations are all clustered in Subwatersheds 900 and 1100 near the mouth of the stream (Figure 2-1). Because of this, it is impossible to attribute violations of water quality standards to practices in any specific upstream subwatershed and impossible to calculate loads exported by each subwatershed from empirical data. As an alternative, pollutant loads for the eleven subwatersheds of Poplar Creek were estimated by use of the so-called Simple Model that relates yearly pollutant export to standard land use categories. The version used here was developed by Northeastern Illinois Planning Commission (NIPC) for the Lake County Stormwater Management Commission.[11] To generate load estimates, acreages in each land use category for each subwatershed were multiplied by pollutant export coefficients for that land use (Price 1993). The Northeastern Illinois Planning Commission's 2001 land use figures were employed for the analysis. More details can be found in Appendix B. Although IEPA has identified silver and chloride as potential causes of impairment, the Simple Model does not include export coefficients for these pollutants.

The results of the loading analysis were used to identify "hotspot" subwatersheds, those that contribute a higher than average pollutant load per unit area. Using the loads shown in Table 2-12, the "contribution index" in Table 2-13 suggests that, with a few exceptions, Subwatersheds 400, 500, 600, 900, 1000, and 1100 generate higher pollutant loads per unit area than the others. The subwatershed plans (Sections 3–6) therefore concentrate on these hotspot subwatersheds.

[11] Thomas H. Price. 1993. *Unit area pollutant load estimates for Lake County, Illinois Lake Michigan watersheds*. Northeastern Illinois Planning Commission. Report prepared for Lake County Stormwater Management Commission.

Table 2-12. Estimated annual pollutant load by subwatershed.

	TSS	BOD	TDS	O&G	*FC
100	288,476	14,852	1,162,262	581	88,626
200	515,552	28,587	1,094,454	1,366	139,124
300	298,151	17,374	1,017,641	1,529	74,930
400	1,127,575	58,248	2,385,584	14,885	118,870
500	1,463,159	80,794	3,099,442	14,523	241,641
600	1,249,469	71,934	2,162,629	8,714	231,122
700	137,243	7,793	384,225	575	45,066
800	1,846,023	89,524	6,569,730	13,821	258,004
900	518,884	24,764	948,388	2,767	61,210
1000	447,145	17,780	875,472	1,897	44,546
1100	2,321,080	109,593	4,504,390	13,714	411,001
Total	10,212,758	521,245	24,204,215	74,372	1,714,139

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory; Price 1993; L-THIA 2006. Units are lbs/yr except for fecal coliform, which is millions of colonies/yr.

Table 2-13. Pollutant load contribution index**.**

	TSS	BOD	TDS	O&G	FC
100	38	39	65	11	70
200	76	82	68	27	**121**
300	50	57	72	35	75
400	**207**	**210**	**185**	**375**	**130**
500	**117**	**127**	**105**	**159**	**115**
600	**119**	**134**	87	**114**	**131**
700	61	68	72	35	**119**
800	69	66	**104**	71	58
900	**160**	**150**	**123**	**117**	**112**
1000	**155**	**121**	**128**	90	92
1100	**127**	**117**	**104**	**103**	**134**

Contribution index = (Percent of total watershed load coming from subwatershed ÷ Percent of watershed area that subwatershed comprises) × 100. Red font indicates that subwatershed produces disproportionately large pollutant load.

Dissolved oxygen cannot be measured as a pollutant load. It is instead measured as biological oxygen demand (BOD), the reduction in dissolved oxygen by organic materials introduced into the water.

It is important to point out that biological oxygen demand may be only one potential cause of low dissolved oxygen; others include, for example, the low stream gradient through the middle section of the watershed.

Another important caveat should be mentioned with regard to the load estimates. The estimates do not take into account the effect of stormwater treatment practices already in place or other load reductions that occur along the path from the source to the receiving water body. Actual delivery to waterways may therefore be considerably less than the loads calculated (and generally are, as shown in Table 14 below). However, it can be assumed that the relative contribution by each subwatershed remains more or less unaffected. The median age of structures by subwatershed, shown in Table 2-4, suggests that most development occurred around the time of, or just after, MWRD passed its detention ordinance. In terms of historical stormwater controls, therefore, it is not expected that there would be great differences between the subwatersheds with the exception of Subwatershed 1100 which is covered 55% by Elgin including many older sections of the city. This is not to say, of course, that all areas perform equally well, but only that the differences would tend to even out at the watershed scale.

Annual loads for the *entire watershed* were calculated empirically from the flow weighted concentrations presented in the preceding section. The results are presented in Table 2-14, along with a comparison of the empirical loads with the estimates from the Simple Model. Because the flow data are for the 35.2 square mile drainage area above the USGS gage and the entire watershed is 44.3 square miles, the loads were adjusted upwards by a factor of 44.3/35.2 = 1.26. The column headed "Adjusted" shows the result of multiplying the raw calculated load by 1.26.

The "Ratio" column shows the ratio of the empirical load to the Simple Model load. Other than the load for fecal coliform, the results are all within an order of magnitude. Oil and grease is also considerably off the mark and much lower than the empirically-derived load. As discussed in Appendix B, land use-based estimates for fecal coliform and oil and grease were both derived from Purdue's Long-Term Hydrologic Impact Assessment (L-THIA) tool[12] as the NIPC Simple Model does not include export coefficients for fecal coliform and oil and grease.

Table 2-14. Comparison of empirically-derived and predicted pollutant loads (lbs per year except fecal coliform in millions of colonies per year).

	Empirical		Simple	
	Raw	Adjusted	Model	Ratio
Total P	5,352	6,743	18,410	0.37
Oil & Grease	467,491	589,039	74,372	7.92
FC	14,115,301	17,785,279	1,714,139	10.38
TSS	1,944,779	2,450,421	10,212,758	0.24
Total N	88,817	111,909	144,017	0.78
TDS	34,080,712	42,941,698	24,204,215	1.77
Silver	18	23	No estimate	—
Chloride	11,578,752	14,589,227	No estimate	—

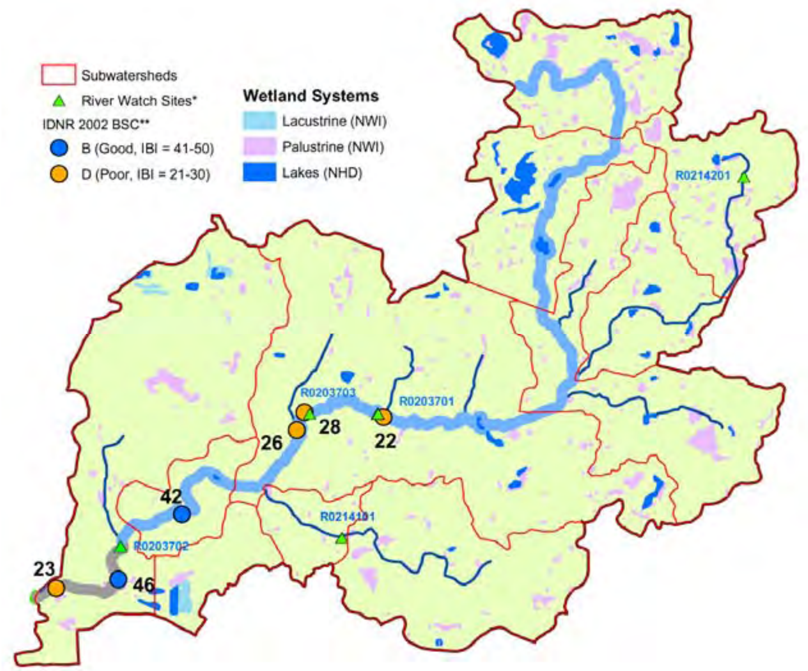
2.6. Biological Assessment

Biological data collected and reviewed in the Watershed Resource Inventory (WRI) indicate that macroinvertebrate populations are generally healthy on the main stem of Poplar Creek, although the data suggest that the East Branch (Subwatersheds 400 and 300) and South Branch (600 and 700) have a lower diversity and poorer habitat.[13] This represents average conditions over 1996 to 2001.

[12] http://www.ecn.purdue.edu/runoff/. The event mean concentrations used in L-THIA are derived from studies in locations that do not necessarily reflect conditions in northeastern Illinois or the Poplar Creek watershed.
[13] RiverWatch volunteer data.

The most recent available data (2002) on fish diversity in Poplar Creek[14] suggest that the stretch of the main stem near Jay Street in Elgin to around Elgin High School has the best diversity of fish species. The stretch of river near the mouth scores poorly, however, as does the stretch of river up to about halfway through the Poplar Creek Forest Preserve (Figure 2-9). For the remainder of the stream and its tributaries, no data are available.

Figure 2-9. Biological Stream Classification and Index of Biotic Integrity scores for Poplar Creek (2002).



Source: Pescitelli, Rung, and Veraldi. *Poplar Creek Watershed Assessment.* October 2003.

[14] Pescitelli, Rung, and Veraldi. *Poplar Creek Watershed Assessment.* October 2003.

The good quality stretch of stream has the highest gradient, and it has been suggested that this is part of the explanation, although it is not open to remedial practices. Likewise, another potential cause of poor fish diversity, the dams along the Fox River, is not open to improvement through a plan for the Poplar Creek watershed. It is also likely that poor habitat conditions influence fish diversity; this plan therefore makes recommendations below on instream habitat improvement practices.

2.7. Recommended Management Measures and Load Reduction Targets

This section presents a summary of the water quality best management practices (BMPs) applicable in the Poplar Creek watershed. The BMPs are derived from a larger list developed by the PCWC that is presented in Appendix E. The subwatershed action plans that follow target the BMPs to specific locations in the watershed. For the most part, the BMPs are for retrofit situations, as this plan can have little influence on growth: while population in the watershed is projected to grow by 12 percent by 2030, much of it will be accommodated through redevelopment, and the land conversion that will be taking place is, for the most part, already in the development pipeline.

Only fecal coliform has an average reduction target (30 percent) as it is the only pollutant that exceeds its standard on a flow-weighted average basis. As a general goal, the remaining potential causes of impairment should be reduced by the amount that would prevent any exceedance of the standards. These reduction targets are discussed in the sections above and summarized in Table 2-15.

Table 2-15. Summary of load reduction targets.

	Load Reduction Target	
	Mean	Maximum
Fecal coliform	30%	—
Biological oxygen demand[15]	Meets standard	28%
Total Suspended Solids	Meets standard	7%
Total Dissolved Solids	Meets standard	28%
Chloride	Meets standard	23%
Silver	Meets standard	17%
Oil and Grease	No standard	No standard

2.7.1. FECAL COLIFORM

2.7.1.1. Nonstructural Controls

The PCWC's approach to fecal coliform reduction should emphasize source reduction, although structural controls play an important role as well. Programs should include pet waste reduction, septic inspection, and goose management, as described in Section 4 (Watershed Wide Measures). Research available on the effectiveness of source reduction, however, is very limited.

2.7.1.2. Structural Controls

The recommended structural approach is to retrofit detention ponds, monitor their performance for one year to determine whether they are removing at least 30 percent of fecal coliform, and if not, install sand filters or other treatment media at the outfalls of ponds serving multifamily land uses. Another alternative would be to install catchbasin inserts treated with antimicrobial agents.[16]

[15] Here is assumed that biological oxygen demand should be reduced by 28 percent to prevent exceedance of the 6 mg/L dissolved oxygen standard. However, there is no correlation information available to estimate the dissolved oxygen improvement from a reduction in BOD. Furthermore, the Metropolitan Water Reclamation District stopped measuring BOD at Location 90 in 1991, so loading information is not available.

[16] Eco-Tec, Inc. manufactures such a product, the Hula Bug. See http://www.adsorb-it.com/Products/HulaBug.html. Other manufacturers may offer similar products.

Research by the Center for Watershed Protection suggests that dry ponds, wet ponds, and wetland treatment ponds all have approximately the same fecal coliform removal efficiency (70–78 percent), presumably because the chief means of removal is settling for all three. While detention basin retrofits are recommended in several places in the subwatershed action plans, they will have little benefit with regard to fecal coliform without specific improvements such as increasing detention time to promote settling and designing inlet and outlet structures to prevent turbulence and resuspension. [17] Such improvements should also improve TSS removal performance. A summary of ideal detention basin improvements is presented in Appendix G.

The Simple Model suggests that multifamily land uses contribute fecal coliform at about twice the level of single family residential, commercial, and industrial uses. If monitoring suggests it, ponds serving multifamily areas are therefore the best candidates for installing filters at outfalls. Finally, while infiltration or bioretention could be utilized to control fecal coliform, soils are not generally favorable in the watershed, as discussed below (Section 2.7.8.2.).

2.7.2. LOW DISSOLVED OXYGEN

There is not conclusive evidence to indicate the source of low dissolved oxygen. The 2002 USGS study found lower dissolved oxygen in the Poplar Creek Forest Preserve, which may have been caused by a lower stream gradient (Watershed Resource Inventory, Appendix A). In subwatersheds 100, 200, and 300, leaking septic systems may increase biological oxygen demand and drive down dissolved oxygen. However, no data are available to shed light on conditions in the headwaters.

Instream measures such as riffle construction can improve dissolved oxygen locally. These are already being targeted to the Poplar Creek Forest Preserve because of its poor aquatic organism diversity, so it is expected that low dissolved oxygen conditions there, if present, will be improved. In general, the structural BMPs recommended in the subwatershed plans reduce biological oxygen demand (BOD), and this is the chief approach employed in this plan to improve dissolved oxygen.

2.7.3. TOTAL SUSPENDED SOLIDS

Total suspended solids should be addressed through a combination of structural and non-structural measures, including detention basin retrofits, stream bank stabilization and erosion control, street sweeping, and constructed wetland treatment.

2.7.4. TOTAL DISSOLVED SOLIDS AND CHLORIDE

Little research has been conducted on the capacity of BMPs to remove dissolved constituents, and what little information is available suggests that most of the mainstream BMPs have little effect. However, chloride makes up about one-third of the TDS load in the main stem. Focusing on this readily managed component, and assuming its main source is road salt, it is recommended that municipalities increase street sweeping and substitute alternative materials and management practices. It is expected that these measures will reduce the periodic exceedances of both TDS and chloride standards. This is described in Section 7 (Watershed Wide Measures) and discussed in the subwatershed action plans. Furthermore, it is recommended that state agencies and regional organizations (e.g., CMAP, Watershed Planning Council, IEPA, IDOT, ISTHA) work on demonstration projects to reduce TDS and chloride loadings.

[17] "Microbes and Urban Watersheds: Ways to Kill 'Em." Watershed *Protection Techniques* 3(1): 566-574. Reprinted in *The Practice of Watershed Protection* (2000), eds. T.R. Scheuler and H.K. Holland.

2.7.5. SILVER

As noted above, it is difficult to establish the source of silver contamination. The most that can be established is that the source(s) is a sporadic point discharge. It is hoped that ongoing illicit discharge detection and elimination activities by the municipalities under NPDES Stormwater Phase II will eventually uncover the source(s). More likely, however, education and outreach as well as an effort by municipalities to raise the profile of the NPDES illicit discharge elimination requirements will encourage the discharger to find a more acceptable means of disposing of silver waste.

2.7.6. SEDIMENTATION

Upstream detention basin retrofits should lower flow release rates to reduce erosion and settle out suspended solids. Furthermore, buffer improvements and stream bank stabilization can reduce sediment loading, as called for in the subwatershed action plans. Stream bank stabilization should be targeted to headwater subwatersheds and the Poplar Creek Forest Preserve. Buffer maintenance is especially important in South Barrington and upper Hoffman Estates. Row cropping in the forest preserve may also contribute to sedimentation; recommendations for agricultural activities are found in Section 7.

The available remedial measures for sediment already accumulated are not recommended. While instream practices to increase velocity could potentially help move existing sediment load, the effect would most likely be only local, although they could help improve habitat as well. Dredging would be unnecessary and ecologically destructive.

2.7.7. OIL AND GREASE

Similar to the recommendation for silver, oil and grease should be addressed partly through illicit discharge detection activities by the municipalities. Secondly, commercial, industrial, and transportation land uses should be targeted for BMPs to control nonpoint source contributions of oil and grease. Green BMPs such as constructed wetlands can be used as well as oil/grit separators with absorptive polymers.

2.7.8. HYDROMODIFICATION

2.7.8.1. Rate Reduction

The chief means of reducing stormwater runoff rates are detention basin retrofits to regulate smaller storms and altering stormwater ordinances to establish rates for the 2-year storm. Some of the watershed was developed before detention ordinances went into effect. When such information is available, these areas are delineated in the subwatershed action plans with recommendations for rate controls where they appear feasible.

2.7.8.2. Volume Reduction

Site-specific practices are not being recommended for volume reduction, although municipalities, institutions, and agencies that wish to implement them are encouraged to do so.

In general, infiltration practices are an attractive strategy for water quality treatment and runoff volume reduction. Infiltration basins and trenches also prevent warming from storage in detention ponds and replenish groundwater in surficial aquifers. In the Poplar Creek watershed, however, they are not an ideal approach. Almost no soil groups meet criteria for the appropriateness of infiltration, i.e., less than 30 percent clay content, less than 40 percent combined clay and silt (to prevent frost heave), and not in Hydrologic Soil Group D.[18] Furthermore, many potential retrofit sites in the watershed may not have space available for infiltrating all runoff, but only the water quality volume.

[18] Drawn from statewide Iowa guidelines at http://www.iowasudas.org/stormwater/documents/2E-3InfiltrationBasins_000.pdf.

Disconnection of impervious areas from the storm sewer system is one means of reducing runoff volume. This is most effectively targeted toward residential areas as part of a public information and outreach campaign. Typical retrofit programs include:

- Rain barrels — Capture roof runoff, typically then used for irrigation. May benefit from municipal program to offer rain barrels at a discount.
- Redirection of roof runoff to pervious areas — Typically accomplished by directing downspout into grassy area or laying French drain if necessary. Rain gardens can also be constructed to accept roof drainage.

These management measures would generally apply only to higher density and older developments. A rain barrel program has been discussed with Elgin officials, who felt it could be effective and worthwhile. The Subwatershed 900+1100 Plan contains further details.

2.7.8.3. Stream and Wetland Restoration

Stream restoration can encompass a variety of techniques, from stream bank stabilization and minor instream practices (such as installation of riffles, devices to divert flow or increase velocity, or habitat features) to comprehensive repair involving redesign of the channel. It is recommended that large scale repair only take place in the subwatersheds identified in Section 7 which meet criteria rendering success more probable. Generally these are the headwater subwatersheds and Subwatershed 800.

As elsewhere in Illinois and most of the urbanized United States, wetland acreage has declined to a small fraction of its presettlement extent. The remainder generally is degraded by hydrologic modification and by invasive species (e.g., reed canary grass, *Phragmites,* purple loosestrife). This plan addresses protection of remaining wetlands through open space preservation (Section 7) and by restoration of selected wetlands, described in the subwatershed plans, to achieve water quality benefits.

2.8. Pollutant Load Reductions by BMPs

Pollutant load reductions for the projects recommended in the subwatershed action plans were calculated by applying a percent pollutant removal drawn from the literature or from a spreadsheet calculator developed by IEPA (Table 2-16). Where other management practices were already in place, the incremental reduction was computed.

Table 2-16. Pollutant Removal by Best Management Practices

	TSS	BOD	Cl	TDS	O&G	FC
Dry Ponds	58%	27%	ND	ND	ND	78%
Wet Ponds	60%	ND	ND	ND	81%	70%
Wetlands	78%	63%	ND	ND	85%	78%
Sand Filters	83%	40%	ND	ND	84%	37%
Swales	65%	30%	ND	ND	62%	–25%
Oil/grit Separators	15%	ND	ND	ND	[5]82%	NA
Catchbasin inserts	[3]30%	ND	ND	ND	[4]30%	[1]Var.
Bank stabiliz.[6]	Var.	NA	ND	ND	NA	NA
Filter strips	73%	51%	ND	ND	ND	[8]NA
Street sweeping	[2]1.5%	1.2%	ND	ND	ND	[7]2%

Source:
- IEPA spreadsheets
- "Comparative Pollutant Removal Capability of Stormwater Treatment Practices." In *Practice of Watershed Protection* (2000), p. 375.
- Federal Highway Administration <http://www.fhwa.dot.gov/ environment/ultraurb/index.htm>
- U.S. Environmental Protection Agency and AbTech. http://www.epa.gov/NE/assistance/ceitts/stormwater/techs/abtechfilter.html
- USGS Water Resources Investigation Report 02-4220
- http://www.mackblackwell.org/web/research/ALL_RESEARCH_PROJECTS/2000s/2018-edwards/MBTC%202018final.doc

Notes:
ND = no data, NA = not intended to control pollutant
[1] Some manufacturers report 80–100 percent removal of bacteria when using inserts treated with antimicrobial agents.
[2] Percent removal of annual load by sweeping run. This rough estimate is derived by dividing IEPA's estimated pollutant removal for weekly sweeping by 52. The annual removal rate actually increases exponentially with sweeping frequency. See USGS Water Resources Investigation Report 02-4220. It should be emphasized that *the sweeper used must be vacuum-assisted or, at the least, a regenerative air sweeper; mechanical brush sweepers are ineffective.*
[3] Average of four brands
[4] Expected long-term performance
[5] The oil-grit separators that the Village of Streamwood Public Works Department has designed include use of a floating polymer to absorb hydrocarbons. Its removal efficiency is estimated to be similar to the AbTech catch basin insert.
[6] It was assumed (imperfectly) that a reduction in sediment loading would be equivalent to a reduction in total suspended solids. Sediment load reduction is a function of a number of factors, including bank height and soil type.
[7] This is the estimated removal efficiency for street sweeping (vacuum assist), the approximate average of two different model results. The load reduction was computed as (% of FC load by land use deposited on streets) × (removal efficiency of street sweeping) × (annual load by land use). USGS Water Resources Investigation Report 02-4220 provides values for percentage of FC load by land use deposited on streets.
[8] Several sources suggest fecal coliform reduction by filter strips is very limited at typical urban runoff concentrations.

2.9. Further Research

Recommendations made in a future update to the Poplar Creek Watershed Based Plan could benefit from additional research. Among these, the most important are the following.

2.9.1. DETENTION BASIN INVENTORY

Efforts to target retrofits to detention basins designed only for flood control (i.e., not for channel protection and pollutant removal as well) or in need of maintenance would be aided by a detention basin inventory. It is recommended that the Lake County Stormwater Management Commission's protocol for such an inventory be followed.

2.9.2. SOURCE OF FECAL CONTAMINATION

The source of pathogenic contamination in Poplar Creek remains unknown. It is recommended that a study be undertaken to determine the source of fecal contamination, most likely a ribotyping study (i.e., determining whether fecal bacteria originate with geese, dogs, humans, or other by DNA testing).[19]

2.9.3. ADDITIONAL WATER CHEMISTRY SAMPLING

The need for improved data has been noted again and again in this section. The PCWC supports the Fox River Study Group's effort to increase sampling further upstream on Poplar Creek.

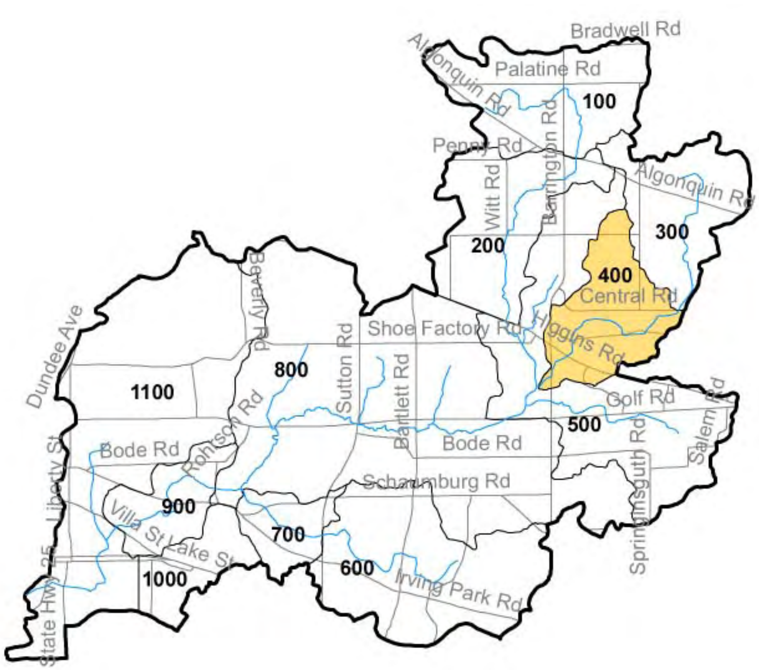
[19] It has been noted that such a study will do little good unless it can assign relative magnitudes of contribution to different sources — for example, 30 percent goose, 40 percent canine, etc.

3. SUBWATERSHED 400 | VILLAGE OF HOFFMAN ESTATES

3.1. Introduction

The Village of Hoffman Estates comprises parts of seven of the eleven subwatersheds in Poplar Creek. It has twice as much area in the watershed (8,800 acres) as the next largest municipalities (Elgin and Streamwood, both with about 4,000 acres). Almost all of Subwatershed 400 is within Hoffman Estates, giving the Village "ownership" over much of the drainage. The NIPC land use pollutant loading model suggests that, because commercial land use is dominant in 400, the subwatershed contributes a higher load per unit area than any other subwatershed of Poplar Creek.

Figure 3-1. Location of Subwatershed 400.



3.1.1. AREA OF SUBWATERSHED 400

Municipality	Acres	Percent
Hoffman Estates	1,291	86%
South Barrington	152	10%
Unincorporated	54	4%
Total	**1,497**	**100%**

Source: Northeastern Illinois Planning Commission's 1:100,000-Scale 2000 Municipal Boundaries Within Northeastern Illinois.

3.1.2. LAND USE IN SUBWATERSHED 400

Commercial is the largest land use category in Subwatershed 400. Almost a quarter of the commercial land in the watershed is found here, although much of the commercial land in 400 is large office complexes such as AT&T, a type of development with a lower impact on water quality than the older retail found elsewhere. In particular, while the relative oil and grease contribution from 400 may be considerably higher than from the other subwatersheds, the land use analysis probably overestimates it.

Land Use (2001) in Subwatershed 400	Acres	Percent
Agriculture	97	6%
Commercial	424	28%
Industrial	81	5%
Institutional	54	4%
Multi-family	126	8%
Open Space	241	16%
Residential	169	11%
Transportation	85	6%
Vacant and Wetland	166	11%
Water	55	4%
Total	**1,497**	**100%**

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory.

3.1.3. LOADING ESTIMATES FOR SUBWATERSHED 400

Pollutant	Lbs/Yr	Contribution Index
TSS	1,127,575	207
Total P	1,362	139
TDS	2,385,584	185
Oil and grease (OG)	14,885	375
Fecal coliform (FC)*	118,870	130

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory and Price 1993. Contribution index = (Percent of total watershed load coming from subwatershed ÷ Percent of watershed area that subwatershed comprises) × 100. Fecal coliform given in millions of colony forming units per year.

3.1.4. POPULATION IN SUBWATERSHED 400

Population is actually expected to decline by a small amount in Subwatershed 400 by 2030. Population density is 3.2 persons per acre, essentially equivalent to the watershed average of 3.3. The chief growth area in the village within Poplar Creek is in Subwatershed 1100.

		2000	2030
Subwatershed 400	Number	4,775	4,433
	Percent change	—	–7%
Hoffman Estates (entire)	Number	49,495	54,590
	Percent change	—	+10%

Source: Census 2000 base and NIPC 2030 population forecasts by quarter-section and municipality.

3.2. Watershed Management Recommendations

3.2.1. WETLANDS AND NATURAL AREAS

As elsewhere in the watershed and, indeed, most of northeastern Illinois, few wetlands remain in Subwatershed 400 and those that are left are degraded. They have already been deeded to the Hoffman Estates Park District for the most part during subdivision for development. Wetland acquisition has been accomplished.

3.2.2. STORMWATER MANAGEMENT FACILITY RETROFITS

Most of the detention basins in Subwatershed 400 are wet ponds, typically with steep sides, little emergent vegetation, and often with riprap shoreline protection. They do offer some water quality benefit through settling, but not as much as naturalized basins with forebays and extended residence times. While retrofits could be attempted, there is no dedicated funding source for maintenance as in the Village of Streamwood's special service areas — the Subwatershed 600 Plan proposes using these funds for water quality retrofits when the ponds come up for maintenance — and such projects likely would not rate highly in the eyes of external funders.

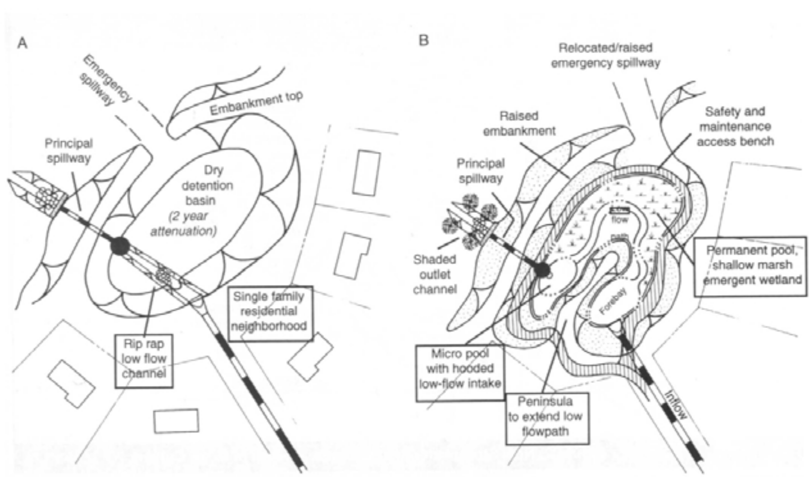
There are also five dry ponds in the industrial area between the Tollway and Hassell Road at Barrington Road. While retrofitting these could bring substantially more benefit, each project is small and scale economies would be unlikely. Rather than attempt to retrofit the dry basins in the industrial park, it may be best to install oil/grit traps at the six outlets carrying undetained or untreated stormwater (two others discharge from wet ponds), which would provide some treatment for areas with detention and without.

The online detention basin serving Restaurant Row farm needs to be reengineered. The bridge on Old Higgins Road serves as the dam and is failing and sedimentation occurs rapidly. This basin and the floodplain area just downstream represent a major opportunity in Subwatershed 400 since there is the possibility of a BMP with a large catchment area (greater than 90 percent of the subwatershed) that positively influences water quality just at the outlet into the Poplar Creek Forest Preserve. Reengineering the online basin itself to provide further water quality benefits probably will not be possible.

However, the floodplain area to the south of the online basin can be used to implement water quality wetlands.

This is one of the most important projects in the plan, yet is one of the more complex. The hospital owns the land and would have to be a partner. Furthermore, the Behrmann's Farm site nearby appears to be contaminated with oil and may need remediation to be reused. There could be the opportunity to leverage federal brownfield funding if available, but the contamination makes the project more complicated. In general, a wetland size of at least 1 percent of the drainage area (i.e., about 13 acres) is needed to provide substantial water quality benefit. This much land is not available, but it may be possible through a cooperative agreement with the Forest Preserve District to utilize some of the land just west of Barrington Road. It is recommended that the Village work with the hospital to finance wetland creation.

Figure 3-2. Schematic design for retrofit of dry detention basin to wetland design. *Watershed Protection Techniques* 1(4): 188–191. Reprinted in *The Practice of Watershed Protection*, eds. T.R. Schueler and H.K. Holland; (Ellicott City, MD: Center for Watershed Protection), p. 713.



If the former project proves unfeasible, then the upstream end of the Higgins Road culvert should be examined. It may be possible to create a wetland just upstream of the culvert by installing a water control structure. There are about 2.5 acres of open floodplain above the culvert available for ponding, but for a variety of reasons this project is less preferable than reconstructing the basin downstream, among them the possibility that it would constitute floodplain filling and the fact that it would be an additional hydromodification.

The business park (Stonegate Properties) between Hassell and Higgins Roads at Barrington Road is served by a dry detention basin about 100 feet from the culvert where the East Branch of Poplar Creek passes under Higgins Road. The basin receives drainage from about 26 largely impervious acres. It is recommended that the basin be retrofitted to a shallow marsh stormwater wetland with a forebay for settling out larger particles (see Figure 3-2 for an example).

3.2.3. STREAM MAINTENANCE

While the banks of the East Branch through Subwatershed 400 are typically eroded, no areas were identified that are especially severe or threatening property. From a flooding standpoint, stream cleanup is a low priority in 400 because it is near the top of the valley and sees little flooding. It has its share of urban trash, however, and the Village now budgets about $50,000 per year for cleanup.

3.2.4. STREAM RESTORATION

Despite extensive storm sewerage, the stream in Subwatershed 400 is for the most part above ground. However, most of it has been channelized, but since little of the stream is surrounded by passive open space, it would be difficult to undertake a remeandering project except in the open area between the Tollway and the multifamily complex just to the west of the Village Hall. As discussed below, the Village expects to identify the complex as a redevelopment area in the next comprehensive plan. A restoration project could be undertaken as part of redevelopment and negotiated as part of a permit approval. While this site has excellent access for construction and maintenance, it is wooded, making such a project more expensive and likely to cause negative impacts. Use of the site as a park, so that residents could enjoy the restored stream, would also be compromised by proximity to the Tollway.

Less comprehensive restoration techniques, such as pool and riffle installation, could be employed. However, it is probably wisest to target aquatic habitat enhancements to the two large forest preserves upstream and downstream of Subwatershed 400 and instead concentrate on protecting the downstream preserve from the pollutants and hydromodification stemming from Subwatershed 400.

From that standpoint, there may be an opportunity to control pollutants from the Tollway that enter the East Branch of Poplar Creek through ditches that drain into a degraded wetland just west of Village Hall. As the wetland contains a large expanse of open water around the apparent channel, it may be possible to install additional wetland plantings, making the water shallower if necessary, lengthening the flow path or otherwise reconfiguring flow. Alternatively, an extended detention system could be installed in the highway right of way. The Illinois State Toll Highway Authority would need to be a partner in such a project aimed at reducing loads of chloride and automobile-generated pollutants to the creek.

3.2.5. STREAM BUFFERS

Stream buffers are relatively substantial throughout the stream course, except in reaches through golf courses and the 30 – 40 residential lots along Rosedale Lane which appear to drain into the creek with only a narrow buffer. Unfortunately, these are the main areas where drainage into the creek occurs overland; elsewhere storm sewerage renders buffers less relevant. The Village should continue to conduct outreach to homeowners along the creek. It is recommended that golf courses take a more comprehensive approach to environmental quality than spot-by-spot buffer maintenance, specifically to strive for Audubon certification as described in Section 7.

3.2.6. DEVELOPMENT AND REDEVELOPMENT

Redevelopment areas will be identified in the next comprehensive plan cycle; they include the Barrington Square Mall, potential STAR Line sites along Tollway, and a multifamily complex adjacent to Village Hall. While this could be an opportunity to obtain water quality benefits by designing in BMPs (e.g., parking island bioretention) during redevelopment, Village staff felt it would reduce the economic value of the site to developers. CMAP and numerous organizations in the region have been working for several years to prove that this is not necessarily the case. Indeed, studies using data from the region suggest that there can be substantial cost savings from the use of "green infrastructure" instead of standard drainage systems.[1] Furthermore, commercial redevelopment must comply, for example, with current Hoffman Estates ratios for parking islands, which are more costly to implement than non-landscaped parking lots. Bioretention may add relatively little additional cost, and may be much more attractive if it reduces the amount of detention that would be required. It is well known that providing detention in built up areas that previously had no quantity controls can be more expensive than on greenfield sites. However, Figure 3-3 shows these undetained areas, and indicates that only a small portion of commercial properties (some of the parking lot and outlots at Barrington Square Mall; lower left) are

[1] For example, see *Changing Cost Perceptions: An Analysis of Conservation Development* by the Conservation Research Institute at http://www.nipc.org/environment/sustainable/conservationdesign/cost_analysis/.

undetained. Ultimately, however, water features (such as a restored stream as part of redevelopment of the multifamily complex) and naturalized approaches to drainage can contribute to the marketability of a development by creating an amenity.

Figure 3-3. Approximate areas with no stormwater detention. From Hoffman Estates *Storm Sewer Map*, December 2002. Thomas Engineering. North is toward the top of the page.

The Hoffman Estates Planning Department suggests a policy statement encouraging water quality enhancements during redevelopment but not enforceable redevelopment standards. As noted in the Subwatershed 600 Plan, the Metropolitan Water Reclamation District intends to prepare redevelopment standards for detention, erosion control, etc. In its review of the draft *Cook County Stormwater Management Plan*, CMAP has recommended to MWRD that the conservation design practices be employed during redevelopment.

3.2.7. EDUCATION AND OUTREACH

Outreach to residents is not a high priority in Subwatershed 400 because of its relatively low population density and relatively high percentage of residents who live in multifamily complexes (i.e., there is little need to educate on proper yard care, car washing, or buffer maintenance).

3.2.8. ROADWAY MANAGEMENT

Most roads in the Village are swept three to four times per year. Thus, there is an opportunity to increase pollutant removal by increasing the frequency of sweeping. Hoffman Estates is a large village in terms of area and is somewhat spread out, both of which likely increase the unit cost of sweeping. Assuming that the pollutant load on streets is partly a function of the number of trips generated by surrounding land uses, it would make sense to concentrate increased sweeping in Subwatershed 400 because of its commercial and multifamily character, land uses that tend to generate a large number of trips. The Village should try to achieve the objective of doubling the sweeping frequency to eight times per year in Subwatershed 400.

3.2.9. LANDSCAPING

Existing Village ordinances do not prohibit native landscaping, although they do not appear to expressly encourage it, based on a cursory check on Municode.com. It is recommended that Village staff review landscaping standards and, in tandem with outreach, propose an ordinance that specifically encourages native landscaping.

3.2.10. CONTAMINATION AND ILLICIT DISCHARGE

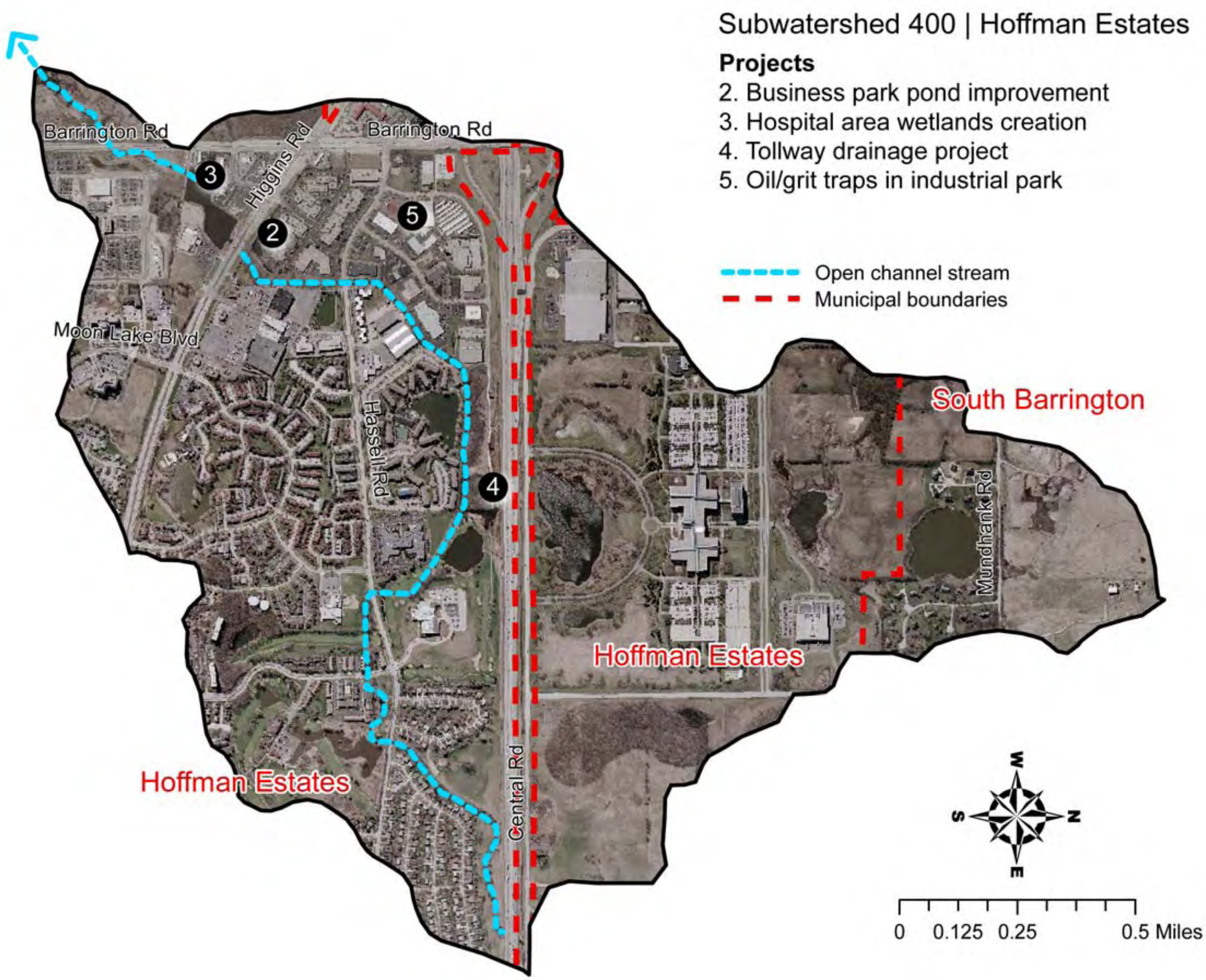
The northwest portion of the Village within Subwatershed 1100 overlies a very high permeability area, a gravel vein; while this is positive from the standpoint of being able to avoid new discharges tributary to Poplar Creek, it may present the potential for groundwater contamination. Pre-treatment of stormwater is recommended. For example, the Life Changers Church at the northwest corner of Beverly Road and the Tollway has a detention basin that will not hold water for any length of time because it discharges to groundwater so quickly. The Church has installed a pump to replenish the basin with well water. The basin receives runoff from the Church's large parking lot without pretreatment, yet it is used in direct contact activities, namely baptisms.

A large area just west of Beverly Road between the Tollway and Route 72 in Subwatershed 1100 is proposed for development, with the area closest to Beverly to be commercial. It may be necessary either to restrict the types of commercial activities within this area or require special material handling practices, as in a recharge protection area ordinance, or to require stormwater pretreatment prior to infiltration.

3.2.11. FUNDING CONSIDERATIONS

Special Service Areas are not a method the Village has used in the past to finance stormwater management improvements. A stormwater utility fee proposal was to go before the Village Board but has been placed on a back burner (as of April 2006) until a more propitious time.

3.3. Project Locations



3.4 Pollutant Reduction and Estimated Cost

		Treatment size	Unit	Incremental Reduction as Percentage of Subwatershed Load BOD	TSS	Cl	TDS	O&G	FC*
1	Biweekly sweeping	Entire	ac	27.7%	33.9%	ND	ND	ND	0.9%
2	Business park pond retrofit	26	ac	1.4%	0.5%	ND	ND	1.2%	ND
3	Hospital area wetlands creation**	~1,350	ac	12.6%	15.6%	ND	ND	17.0%	15.6%
4	Tollway drainage project	15	ac	ND	2.3%	ND	ND	ND	ND
5	Oil/grit traps in industrial park	66	ac	ND	1.1%	ND	ND	2.9%	0.0%
	Total (lbs/yr)*			**24,294**	**2,616**	ND	ND	**3,140**	**19,635**
				41.7%	**53.4%**	**ND**	**ND**	**21.1%**	**16.5%**

		Project size	Unit	Unit cost	Total cost	Funding	Responsibility	Priority
1	Biweekly sweeping	44	curb miles	$30	$30,360	Local	Village	2
2	Business park pond retrofit	1	ea	$50,000	$50,000	IEPA/Owner/Village	Village	2
3	Hospital area wetlands creation**	4.8	ac	$30,000	$144,000	IEPA/hospital	Village	2
4	Tollway drainage project	~15	ac	—	TBD	IEPA/ISTHA	CMAP/ISTHA	3
5	Oil/grit traps in industrial park	6	each	$15,000	$75,000	Village/landowners	Village	1
	Total				**$299,360**			
6	School based education	—	—	—	—	School district	District U-46	—
7	Watershed fund	—	—	—	$15,333	Local	Village	2
8	Native landscaping ordinance	200	staff hours	$75	$15,000	Local	Village	3
9	Redevelopment ordinance	500	staff hours	$75	$37,500	Local	Village	3
10	Golf course Audubon certification	1	ea	$5,000	$5,000	Hilldale GC	Hilldale GC	—
	Total				**$72,833**			

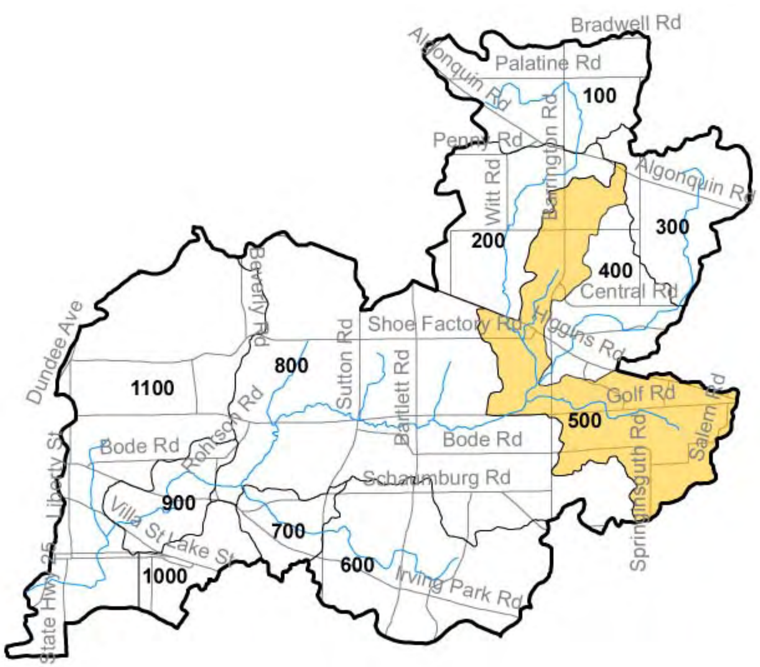
*FC in millions of colonies per year.
**The wetland area will be undersized relative to the drainage area (1% of the drainage area or 13.5 acres would be appropriate). To try to account for this, the pollutant reductions were assumed to be 80% less than for an ideally-sized wetland.
Priority rank by time of implementation: 1 = 2008; 2 = 2009 – 2010; 3 = 2011 – 2013.
HEPD = Hoffman Estates Park District
IEPA = Illinois Environmental Protection Agency
ISTHA = Illinois State Toll Highway Authority

4. SUBWATERSHED 500 | VILLAGES OF SCHAUMBURG, HOFFMAN ESTATES, AND S. BARRINGTON

4.1. Introduction

Subwatershed 500 is an oddly proportioned drainage basin that includes parts of Schaumburg, Hoffman Estates, South Barrington, and a small portion of Streamwood. In terms of land use, it is one of the more diverse in the watershed, with estate lots and farmland in South Barrington, multifamily and retail developments in Schaumburg and Hoffman Estates, and a swath of forest preserve in the center of the subwatershed.

Figure 4-1. Location of Subwatershed 500.



4.1.1. AREA OF SUBWATERSHED 500

Municipality	Acres	Percent
Hoffman Estates	1,768	51%
Schaumburg	890	26%
South Barrington	652	19%
Streamwood	47	1%
Unincorporated	89	3%
Total	**3,446**	**100%**

Source: Northeastern Illinois Planning Commission's 1:100,000-Scale 2000 Municipal Boundaries Within Northeastern Illinois.

4.1.2. LAND USE IN SUBWATERSHED 500

Land Use (2001)	Acres	Percent
Agriculture	160	5%
Commercial	389	11%
Industrial	3	0%
Institutional	122	4%
Multi-family	215	6%
Open Space	989	29%
Residential	1,205	35%
Transportation	32	1%
Vacant and Wetland	279	8%
Water	47	1%
Total	**3,440**	**100%**

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory.

4.1.3. LOADING ESTIMATES FOR SUBWATERSHED 500

Pollutant	Lbs/Yr	Contribution Index
TSS	1,463,159	117
TDS	3,099,442	105
Oils and grease (OG)	14,523	159
Fecal coliform (FC)*	241,641	115

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory; Price 1993; L-THIA 2006. Contribution index = (Percent of total watershed load coming from subwatershed ÷ Percent of watershed area that subwatershed comprises) × 100. Fecal coliform given in millions of colonies.

4.1.4. POPULATION IN SUBWATERSHED 500

Population density in Subwatershed 500 is 3.8 persons per acre, slightly above the watershed average, but is projected to change only slightly by 2030. Residential development may continue to occur in the upper reach of the subwatershed, but it will likely be at very low densities.

		2000	2030
Subwatershed 500	Number	13,020	13,096
	Percent change	—	+1%
Schaumburg (entire)	Number	75,386	83,284
	Percent change	—	+10%
Hoffman Estates (entire)	Number	49,495	54,590
	Percent change	—	+10%
South Barrington (entire)	Number	3,760	4,657
	Percent change	—	+24%

Source: Census 2000 base and NIPC 2030 population forecasts by quarter-section and municipality.

4.2. Watershed Management Recommendations

4.2.1. WETLANDS AND NATURAL AREAS

Most of the existing open space, including wetlands and floodplains, within Schaumburg's portion of Poplar Creek is already protected and owned by either the Village or the Park District.
One of the best opportunities for natural area restoration with a water quality benefit is in Victoria Park, a wetland area in Hoffman Estates but bordering Schaumburg along Bode Road to the south. It accepts stormwater from both Hoffman Estates and Schaumburg at a number of points and the creek running through the wetland has been channelized. The contributing drainage area from Schaumburg is approximately 380 acres, chiefly residential and institutional. Approximately 239 acres ultimately drains into the stream in Victoria Park from Hoffman Estates.

It could be possible to restore the wetland and utilize the area as an education facility by means of an interpretive boardwalk, observation areas, and related improvements. Most likely meanders would need to be reintroduced in the stream and connection to the wetland in the surrounding floodplain reestablished. The species mix is dominated by invasives; Purple loosestrife and canary grass would need to be controlled and the wetland replanted with vegetation appropriate to a stormwater wetland. The project would necessarily involve collaboration between the Village of Schaumburg and the Hoffman Estates Park District. See the Subwatershed 600 plan for images of similar restoration projects in Park Forest and Manhattan, Illinois.

4.2.2. STORMWATER MANAGEMENT FACILITY RETROFITS

As in Streamwood, most detention in Schaumburg is consolidated into regional facilities such as the lakes at Gray Farm and Prairie Parks, both owned by the Park District, although there are a few smaller detention ponds at the eastern and western edges of the village within the Poplar Creek watershed.

There are a number of dry bottom detention ponds owned by the Schaumburg Park District, some used for passive recreation and some less suitable for such activities. About four of them could potentially be retrofitted to extend detention times or be converted to wet pond/wetland designs. Another two along Bode Road and Springinsguth Road drain into the wetland in Victoria Park and provide rate control that would complement a water quality-focused restoration project in Victoria Park. However, if the Victoria Park wetland and stream restoration turns out to be unfeasible, the Village of Schaumburg should explore converting the dry basin at Bode/Springinsguth and the basin just east of the Community Recreation Center to a wetland design. Doing so would improve treatment of approximately 165 acres of residential and institutional land use.

Schaumburg has a revolving loan program for privately owned detention ponds that is administered by the Department of Community Development. The village markets the fund to homeowners' associations, the use of which is partly conditioned on naturalizing the shoreline, so there is some precedent for water quality retrofitting for such detention ponds. Three ponds within Schaumburg would be potential candidates for water quality retrofitting as maintenance becomes necessary. Typical retrofits could include adding a forebay for settling, modifying the outlet to reduce the release rate and detain smaller storm events, lengthening flow paths from inlet to outlet, or replanting shallower basins with wetland flora or creating a planting shelf in deeper basins in addition to naturalizing basin edges.[1]

Brookside Lake in Subwatershed 500 has been a particular problem for Hoffman Estates in terms of siltation and extreme shoreline instability. Historically the Hoffman Estates Park District has held to a "low-maintenance philosophy" with detention ponds, which has led to the extensive use of riprap shoreline protection. The sides of ponds are frequently very steep with wide variations in water level. The pond drains approximately 67 acres. American Lotus is growing in the pond and residents complain that water is too weedy, so Public Works budgets $15,000 annually to clean out the pond. This suggests that Hoffman Estates residents will not readily accept detention basins with wetland designs in residential areas, at least without an outreach campaign. It is likely to be least acceptable in residential areas. However, as discussed just above, there are other means of achieving water quality benefits in wet pond design (forebays, flow path lengthening, etc.).

Most of Schaumburg's land within the Poplar Creek watershed is residential or open space, but there is also a large retail area at Golf and Higgins Roads. While subwatershed-wide use of catchbasin inserts in the public way would be impracticable, it could be feasible to use them in targeted locations, such as that retail area. Catchbasin inserts are not an ideal BMP, but their installation cost is low relative to sand filters or reconfiguring parking lots for swale drainage. They fit readily into catchbasins of standard design and at least one model (the AbTech Ultra-Urban Filter) is designed specifically to remove oil and grease, an important concern for the commercial areas in Poplar Creek (see Section 2).

Some sections of Schaumburg within Subwatershed 500 do not appear to be served by detention facilities (Figure 4-2). This includes a multifamily area just south of Poplar Creek Plaza, a residential area west of Springinsguth Road that discharges at two points into a short section of open ditch, another residential section south of Bode Road, and finally part of the Park District complex, the Community Recreation Center. The lake in Walnut Greens is just downstream of the multifamily area, so detention is indirectly provided through that means. The other areas eventually drain into Victoria Park, which, if wetland meanders are created, could provide treatment and help moderate flow. Yet retrofitting the Park District building to disconnect impervious surfaces could be an important way of showing commitment to restoring a more natural flow regime and serve as an education piece for the community.

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[1] Lake County Stormwater Management Commission. 2004. *Sequoit Watershed Management Plan*. <http://www.co.lake.il.us/smc/planning/sequoitcreek/DrftPlan.asp> Northeastern Illinois Planning Commission. 1986. *Stormwater Detention for Water Quality Benefits*.

Figure 4-2. Approximate areas within Schaumburg in Subwatershed 500 not served by detention facilities.

Source: Schaumburg storm sewer shapefiles from Public Works Department.

4.2.3. STREAM MAINTENANCE

As is typical of urban streams, bank erosion and sloughing is widespread through Subwatershed 500. The area behind the South Barrington Village Hall provides an example with a localized source of impairment. The Village Hall parking lot is not designed with a drainage system beyond overland flow into the creek, and as can be observed in Figure 4-3, runoff is cutting a channel into the bank and delivering a sediment load to the creek. It is recommended that parking lot drainage be redesigned to direct flow away from the creek, potentially with a level spreader that fans overland flow into the open grassy area south of the parking lot (which could also be planted with a strip of deeper-rooted native vegetation). Bank repair should be undertaken in the area along the stream (about 760 feet for both banks, which are silty loam or silty clay loam). The ditch running from Barrington Road should be planted with a vegetative buffer.

Figure 4-3. *Above:* Runoff from South Barrington Village Hall parking lot entering Poplar Creek. *Below left:* Erosion and sloughing behind Village Hall. *Below right:* Ditch from culvert under Barrington Rd in need of vegetative buffer.

4.2.4. STREAM RESTORATION

Only a small length of open channel tributary to Poplar Creek is within Schaumburg. At the northern tip of the village, a tributary enters from Hoffman Estates and flows into the Walnut Greens Golf Course and through an online detention basin. Opportunities to daylight streams are limited. A 60-inch storm sewer trunk runs along Schaumburg Road, into the Village of Streamwood, that accepts discharge from the pond at Gray Farm Park in addition to storm flow collected from the curb and gutter system. It would be difficult and unappealing to convert this storm sewer into an open channel. Smaller instream practices are also possible, but, as in Subwatershed 400, it would be better to reduce pollutant loads and if possible improve the flow regime in this branch of the creek to protect downstream natural areas.

4.2.5. STREAM BUFFERS

Vegetated buffers are typically fairly wide through the subwatershed with some exceptions. The long stretch of creek through Walnut Greens and Poplar Creek Country Club is mostly unbuffered. The Schaumburg Park District owns Walnut Greens, and it is recommended that the District pursue Audubon certification, part of which calls for increasing vegetative buffers in certain areas. The Hoffman Estates Park District likewise owns Poplar Creek Country Club and should likewise pursue Audubon certification. Through Schaumburg, in addition, the stream passage through the Poplar Creek Plaza shopping center is unbuffered and the area just to the east is inadequately buffered. Additionally, the tributaries/ditches beside Bode Road should have a vegetative buffer. Finally, however, streamside buffers are commonly lacking in South Barrington; the Village should encourage landowners to plant and maintain them.

4.2.6. DEVELOPMENT AND REDEVELOPMENT

In Hoffman Estates and Schaumburg, large new commercial and industrial developments are employing low impact development techniques. The Schaumburg Public Works Department recently expanded its facilities and included naturalized drainage as part of the site plan. The newly built Renaissance Schaumburg convention center includes elements of naturalized design, as does the Nantucket Cove development. None of these developments are within Poplar Creek watershed, however.

4.2.7. EDUCATION AND OUTREACH

Village of Schaumburg staff felt that one of the most significant behavioral issues is the use of fertilizer and lawn chemicals by homeowners. While licensing for professional applicators should be pursued, educational programs should be targeted to the individual homeowner to help prevent improper use and runoff into water bodies. Elevated levels of phosphorus in Poplar Creek may be due in part to improper fertilizer application by homeowners.

4.2.8. ROADWAY MANAGEMENT

Local roads are swept 5–8 times per year in Schaumburg, and Hoffman Estates sweeps streets 3–4 times per year. As recommended in the Subwatershed 400 plan, Hoffman Estates should try to double its sweeping frequency to eight times per year. Sweeping frequency in South Barrington is unknown, but the village is quite low density and should therefore have a smaller area of paved roadway per developed acre than more densely developed communities like Hoffman Estates, Schaumburg, and Streamwood.

As other municipalities within the watershed have said, Schaumburg officials suggested that the state and county do not perform adequate maintenance on the roads under their jurisdiction.

4.2.9. LANDSCAPING

Schaumburg is a regional leader in promoting native landscaping and a model worth promoting to other villages. Ordinances requiring naturalized detention, as well as market dynamics, are having a positive effect in Schaumburg. As recommended in the Subwatershed 400, Hoffman Estates should consider developing a natural landscaping ordinance.

4.2.10. CONTAMINATION AND ILLICIT DISCHARGE

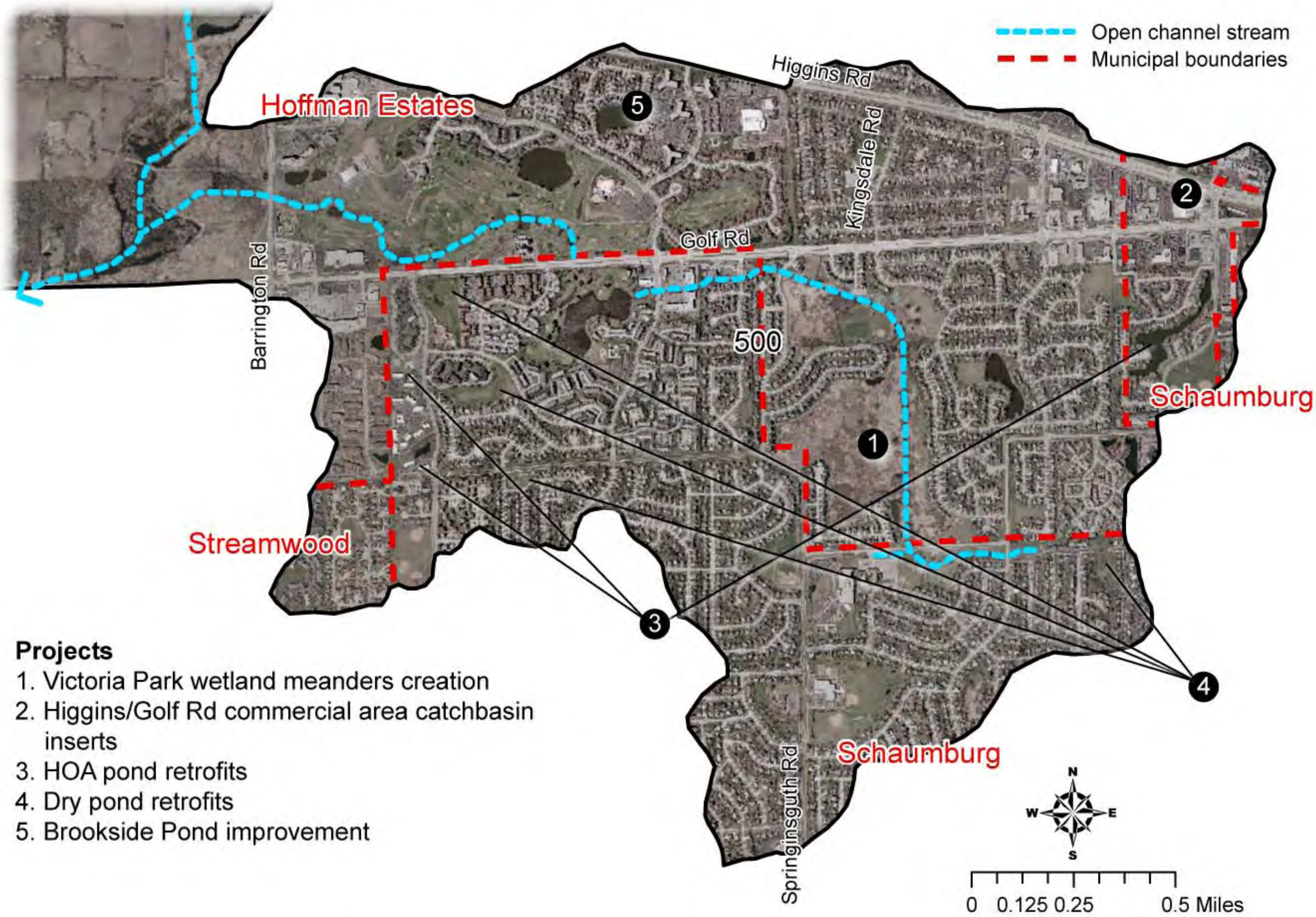
Land use is relatively homogeneous in the portion of Subwatershed 500 within Schaumburg, with the consequence, for example, that it is unlikely there is any significant number of illicit storm sewer connections. The Village does not have a combined sewer system and sanitary sewer overflows do not occur, according to officials. Hoffman Estates officials suggest the same. In residential areas, South Barrington is largely on septic systems and has a low enough density typically not to require storm sewerage.

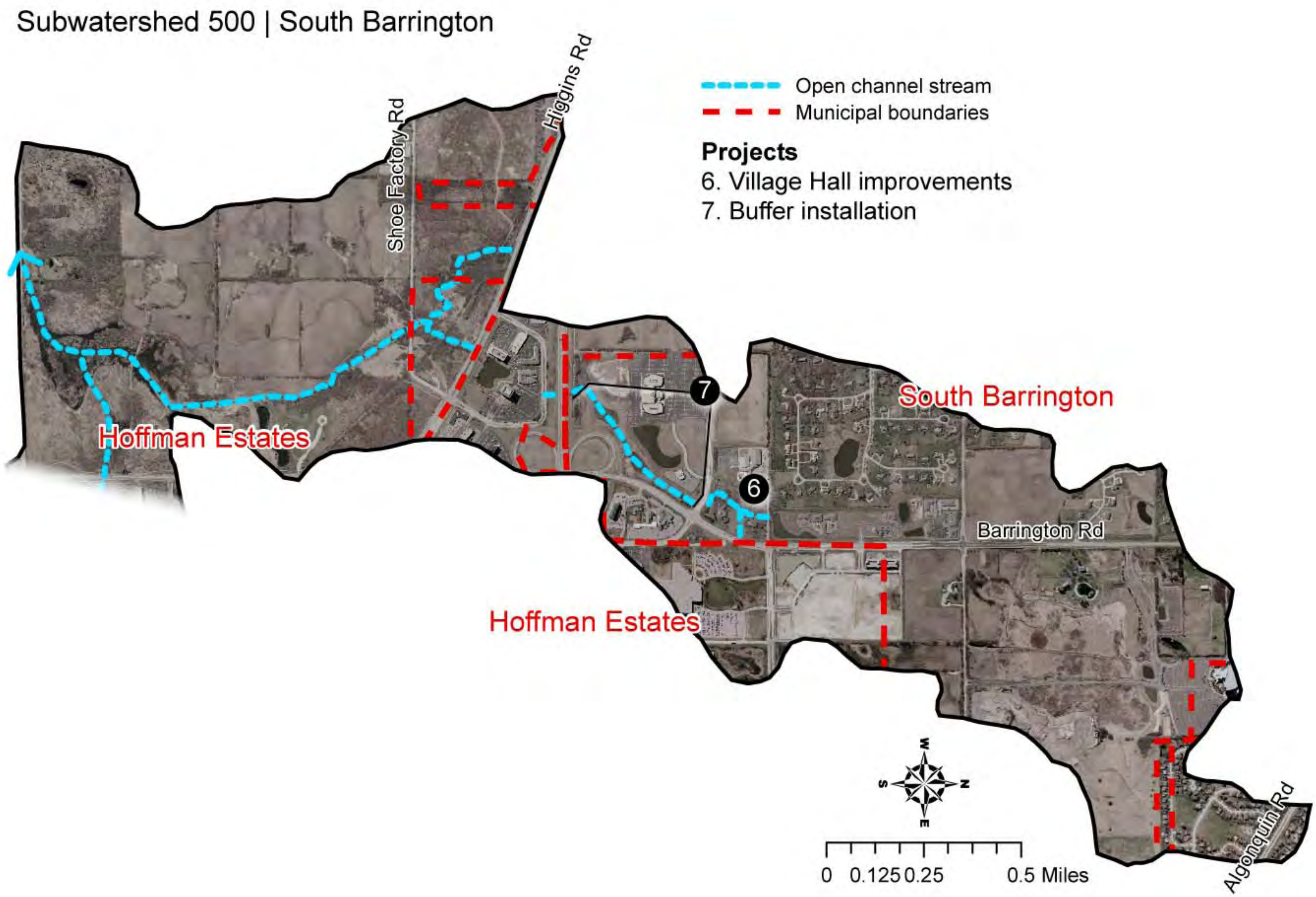
4.2.11. FUNDING CONSIDERATIONS

Schaumburg has a revolving loan program for privately owned detention ponds that is administered by the Department of Community Development.

4.3. Project Locations

Subwatershed 500 | Schaumburg and Hoffman Estates




Subwatershed 500 | South Barrington
Open channel stream
Municipal boundaries
Projects
6. Village Hall improvements
7. Buffer installation
Higgins Rd
Shoe Factory Rd
Hoffman Estates
South Barrington
Barrington Rd
Hoffman Estates
Algonquin Rd
W
S
N
E
0 0.125 0.25 0.5 Miles
6
7

4.4 Pollutant Reduction and Estimated Cost

		Treatment size	Unit	Incremental Reduction as Percentage of Subwatershed Load BOD	TSS	Cl	TDS	O&G	FC*
1	Victoria Park wetland restoration	667	ac	5.7%	5.5%	ND	ND	2.0%	11.0%
2	Golf/Rt 72 area catchbasin inserts	42	ac	0.0%	0.0%	ND	ND	2.8%	0.0%
3	HOA pond retrofits	109	ac	0.0%	0.4%	ND	ND	0.0%	0.4%
4	Dry pond retrofits	118	ac	1.2%	0.5%	ND	ND	0.0%	0.0%
5	Brookside Pond improvement	67	ac	0.0%	0.3%	ND	ND	0.0%	0.2%
6	S. Barrington parking lot	0.35	ac	0.0%	0.1%	ND	ND	0.0%	0.0%
7	Filter strip installation	17	ac	4.3%	0.9%	ND	ND	ND	NA
8	Increase sweeping to 8x/yr	1,730	ac	0.8%	5.7%	ND	ND	0.0%	1.4%
	Total (lbs/yr)*			**9,070**	**194,356**	**ND**	**ND**	**694**	**31,299**
				12.0%	**13.3%**			**4.8%**	**13.0%**

		Project size	Unit	Unit cost	Total cost	Funding	Responsibility	Priority
1	Victoria Park wetland restoration	7	ac	$30,000	$210,000	C2000/IEPA	HEPD/SchPD	3
2	Golf/Rt 72 area catchbasin inserts	42	ea	$1,000	$42,000	Village/landowner	V. Schaumburg	1
3	HOA pond retrofits	3	ea	$50,000	$150,000	IEPA/Village RLF	V. Schaumburg	1
4	Dry pond retrofits	4	ea	$50,000	$200,000	IEPA/Village/SchPD	V. Schaumburg	3
5	Brookside Pond improvement	3.3	ac	—	**$450,000	IEPA/Village	V. Hoffman Est.	2
6	S. Barrington Village Hall improvements						V. S. Barr./PCWC	2
	Streambank stabilization	760	LF	$50	$38,000			
	Parking lot improvement	0.35	ac		$25,000			
	Filter strip installation	100	LF	$50	$5,000			
7	Filter strip installation	2,500	LF	$50	$125,000	IEPA	V. S. Barr./PCWC	1
8	Increase sweeping to 8x/yr	50	curb miles	$30	$7,500	Local	Schaum/Hoff. Est.	1
	Total				**$1,252,500**			
9	School based education	—	—	—	—	School district	District U-46	—
10	Watershed fund (Schaumburg)	—	—	—	$15,333	Local	Villages	—
11	Redevelopment ordinance (Schaumburg)	500	staff hours	$75	$37,500	Local	Villages	—
12	Golf course Audubon certification	2	ea	$5,000	$10,000	Local	Park Districts	—
13	Native landscaping ordinance (S. Barr.)	200	staff hours	$75	$15,000	Local	V. S. Barrington	—
14	Buffer maintenance program (S. Barr.)	100	staff hours	$75	$7,500	Local	V. S. Barrington	—
	Total				**$85,333**			

*FC in millions of colonies per year. **Estimated by Hoffman Estates staff.
Priority rank by time of implementation: 1 = 2008; 2 = 2009 – 2010; 3 = 2011 – 2013. Percentages may not add to 100 due to rounding.
HEPD = Hoffman Estates Park District, SchPD = Schaumburg Park District, IEPA = Illinois Environmental Protection Agency

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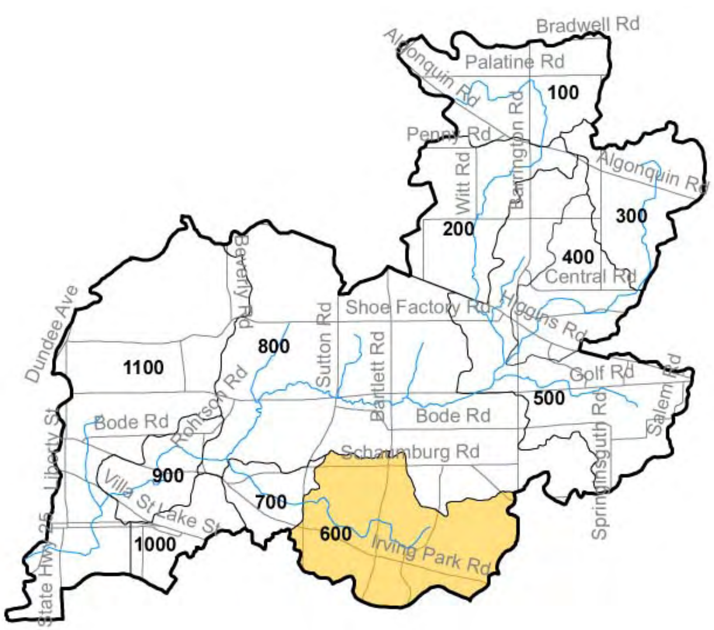
5. SUBWATERSHED 600 | VILLAGE OF STREAMWOOD

5.1. Introduction

Subwatershed 600 feeds the south branch of Poplar Creek. It is primarily residential and the vast majority of it is within the Village of Streamwood. The subwatershed is largely built out, although redevelopment is beginning to occur. Population forecasts suggest growth will occur in Subwatershed 600 at about half the rate of the rest of Streamwood. Only about half of the subwatershed was built before 1970. These considerations suggest that watershed management recommendations should concentrate on retrofit opportunities, public education, and management of existing infrastructure and current operations.

Figure 5-1. Location of Subwatershed 600.



5.1.1. AREA OF SUBWATERSHED 600

Municipality	Acres	Percent
Bartlett	68	2%
Hanover Park	42	1%
Schaumburg	81	3%
Streamwood	2,544	88%
Unincorporated	168	6%
Total	**2,903**	**100%**

Source: Northeastern Illinois Planning Commission's 1:100,000-Scale 2000 Municipal Boundaries Within Northeastern Illinois.

5.1.2. LAND USE IN SUBWATERSHED 600

About 35 percent of the watershed's residential land (single family and multifamily) is found in Subwatershed 600, the second ranked subwatershed in this regard despite being fourth in size. Commercial and industrial uses together make up less than 10 percent of the subwatershed land area.

Land Use (2001)	Acres	Percent
Agriculture	22	1%
Commercial	190	7%
Industrial	64	2%
Institutional	156	5%
Multi-family	107	4%
Open Space	306	11%
Residential	1,706	59%
Transportation	9	0%
Vacant and Wetland	295	10%
Water	36	1%
Total	**2,891**	**100%**

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory.

5.1.3. LOADING ESTIMATES FOR SUBWATERSHED 600

Pollutant	Lbs/Yr	Contribution Index
TSS	1,249,469	119
Total P	2,297	121
Oil & grease	8,714	114
FC	231,122	131
TDS	2,162,629	87

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory and Price 1993. Contribution index = (Percent of total watershed load coming from subwatershed ÷ Percent of watershed area that subwatershed comprises) × 100

5.1.4. POPULATION IN SUBWATERSHED 600

Subwatershed 600 has the highest population density in the Poplar Creek watershed at 7.2 persons per gross acre, more than twice the watershed average of 3.3. Population in the subwatershed is growing slowly and is expected to increase only 8 percent by 2030. Streamwood as a whole is expected to increase 15 percent. Most of Streamwood's growth within the Poplar Creek watershed is taking place in Subwatershed 700.

		2000	2030
Subwatershed 600	Number	20,914	22,498
	Percent change	—	+8%
Streamwood (entire)	Number	36,407	41,852
	Percent change	—	+15%

Source: Census 2000 base and NIPC 2030 population forecasts by quarter-section.

5.2. Watershed Management Recommendations

5.2.1. WETLANDS AND NATURAL AREAS

Almost all of the open space in the subwatershed is in municipal or Park District ownership. This includes wetland areas, which were generally deeded over as undevelopable land during subdivision. Wetland and open space acquisition have already been accomplished.

There are two large former wetlands in Subwatershed 600 that were capped with clay in the 1970s by the Metropolitan Water Reclamation District (MWRD) and that are used for active and passive recreation by the Streamwood Park District. They were meant to provide flood storage during wet periods and recreation in dry periods. MWRD still inspects these facilities twice each year; they are not defunct. They appear to have been drained by ditching. The underlying soils are Muskego/Houghton muck, and both sites are experiencing subsidence. A capped wetland site in Subwatershed 800 is similarly undergoing subsidence, to the point that the ball field on it can no longer be used. The Streamwood Park District is performing restoration work (reseeding, etc.) on that wetland, working with a contractor. Additional funding could be used to enhance this project.

Figure 5-2. Central Park Wetlands post-restoration; Park Forest, Illinois. Image from http://www.backtowetlands.com/.

It would be appropriate to reevaluate the philosophy behind the wetland excavation/capping approach to flood control. The capped wetland in Shady Oaks Park appears to be a good candidate for restoration, as water quality benefits could be expected while maintaining the value of the site for flood storage. A short tributary to the South Branch of Poplar Creek runs through the site that drains roughly 130 acres or 4.5 percent of the subwatershed. A comparable (but larger scale) project could be the restoration of the Central Wetlands in Forest Park in south Cook County (Figure 5-2).

5.2.2. STORMWATER MANAGEMENT FACILITY RETROFITS

Some of Subwatershed 600, primarily on the eastern side, is served by smaller regional detention facilities in Village ownership. These are generally wet bottom in design and present little need for retrofit. However, Kollar Pond, owned by the Park District, serves as a detention facility for the village and also has some water quality problems, as well as a severely eroding shoreline that is causing exposure of utilities. Its outlet is a storm sewer running underneath IL Rte 19, which then becomes an open channel through a residential neighborhood and a golf course. When it was assessed in 1996, Kollar Pond had a higher Trophic State Index than any other lake sampled in the Poplar Creek watershed, making it the most eutrophic standing water body in the watershed.

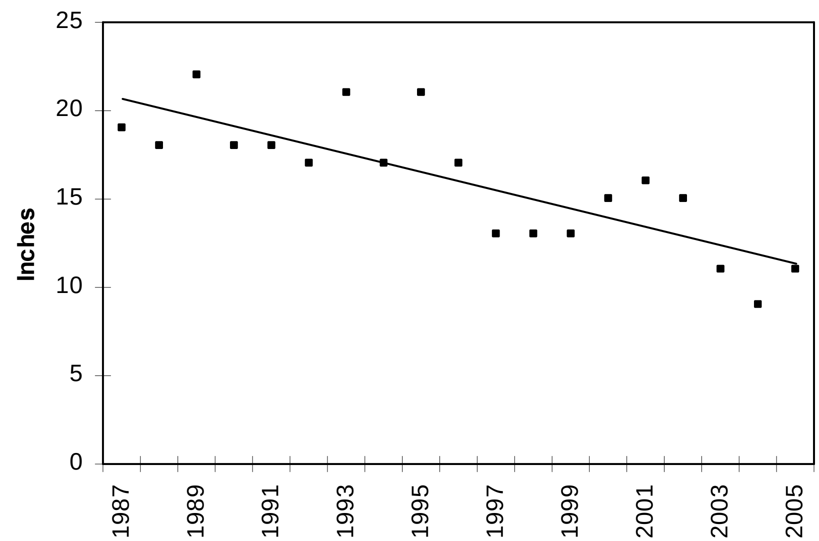
Table 5-1. VLMP water quality data for Kollar Pond, 1990–2001

	TSS	Total N	NH4-N	Total P
1990	25	0.25K	0.35K	0.118
1992	25	0.25K	0.35K	0.118
1994	30	0.03	1.63	0.321
1997	42	0.03K	0.67	0.234
1999	57	0.04K	0.57	0.153
2001	59	0.24	0.30K	0.212

K = actual concentration known to be less than value given
Source: IEPA. VLMP Water Quality Summaries for years 1990 to 2001. Preliminary data only for 1999 and 2001.

Secchi readings taken by a local monitor through Illinois' Volunteer Lake Monitoring Program (VLMP) show that mean transparency — which generally declines with eutrophication — has decreased by about one-half over the last ten years (Figure 5-3). Similarly, VLMP data show that total suspended sediment increased steadily from 1990 to 2001, putting the pond in the severely impaired category using IEPA's Lake Assessment Criteria (Table 5-1).

Figure 5-3. Mean Secchi transparency in Kollar Pond, 1987–2005



Source: IEPA. VLMP Water Quality Summaries for years 1990 to 2001

It may be possible to install wetland plantings to help remove pollutants before outflow to the storm sewer system and make the pond less attractive for the Canada goose (*Branta canadensis*). Doing so would treat runoff from an approximately 114 acre drainage area, about 4 percent of Subwatershed 600. Wetland planting would involve draining and regrading to construct a planting shelf. Funding through the Illinois Clean Lakes Program (part of the Section 319 program) for a Phase I Diagnostic Study and potentially a Phase II Implementation Grant would be obvious steps, but Kollar Pond is less than six acres and arguably serves the primary function of stormwater detention, two conditions that make a funding award less likely. Local funding and assistance through the standard 319 program will most likely be needed.

Streamwood has a monitoring and maintenance program for detention ponds. Maintenance is generally funded through Special Service Area (SSA) assessments set up for each sudivision. This represents an excellent opportunity for locally funded water quality retrofits in the relatively small number of detention ponds in Subwatershed 600. There are approximately five detention ponds that appear to in private hands (managed by homeowners associations, or HOAs) on the west side of Subwatershed 600 within Streamwood that potentially could be retrofitted within the next decade, although it is not precisely known when maintenance will become necessary. Typical retrofits could include adding a forebay for settling, modifying the outlet to reduce the release rate and detain smaller storm events, lengthening flow paths from inlet to outlet, replanting shallower basins with wetland flora or creating a planting shelf in deeper basins, or naturalizing basin edges.

5.2.3. STREAM MAINTENANCE

Two main areas are in need of bank stabilization. First, the stream reach between approximately the municipal pool in Aquarius Park and the Streamwood Oaks Golf Club (approximately 5,500 feet for both banks) has seen moderate bank sloughing (Figure 5-4). There is an online detention basin just east of Whispering Drive with heavy siltation at the inlet. Grass is mown to the edge of the creek and pond and geese populations are dense. Conversion of the detention basin to a wetland design would not be feasible because of a sense of ownership by a local “yacht club.” Second, the stream reach running through Dolphin Park (approximately 2,500 feet, both banks) is likewise undergoing heavy erosion and is mowed to the edge of the bank. However, the pollutant reduction expected from stabilization here is expected to be lower because of the organic nature of the soil.

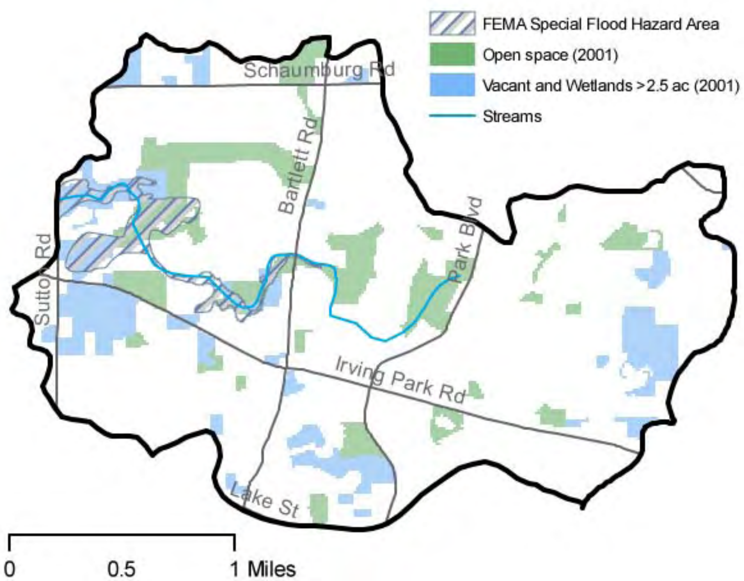
Figure 5-4. South branch of Poplar Creek from Streamwood Blvd (northwest, left; southeast, right)

5.2.4. STREAM RESTORATION

While much of the creek (what open channel there is within the subwatershed) has been channelized, stream segments with potential to be remeandered are somewhat limited. The section of stream through Dolphin Park is abutted by baseball fields. The stream then runs through a residential neighborhood with yards backing up to the creek. Along the stream reach west of Streamwood Oaks Golf Course the Village has had negative experiences in obtaining permits for floodway alterations, a lengthy (potentially several years), costly, and uncertain process for the Village.

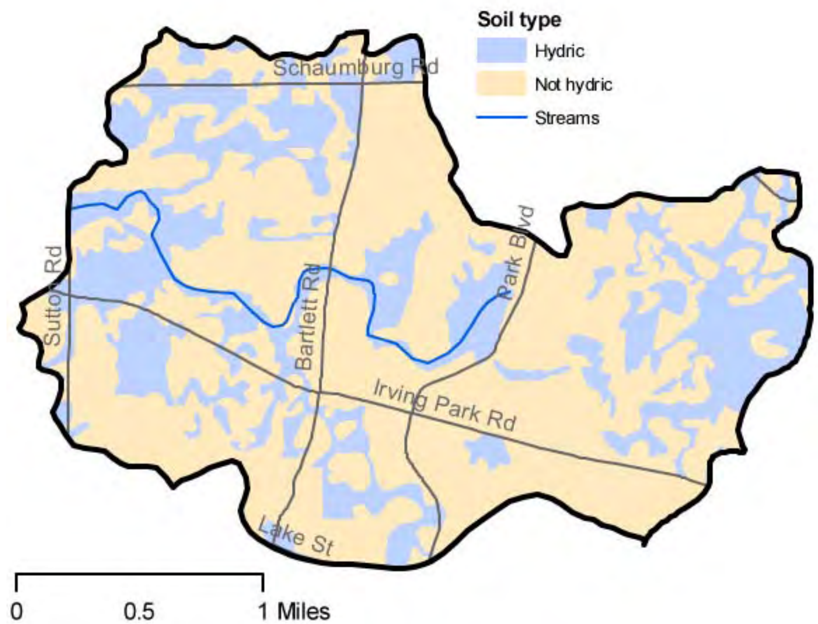
The stretch of creek through Shady Oaks Park, between approximately Oltendorf Road and the edge of the SFHA Special Flood Hazard Area (just slightly east of Bartlett Road), appears to offer the best opportunity. The surrounding land use is passive open space (Figure 5-5). A remeandering project on this section of stream could be combined with wetland restoration taking place along the ditch flowing south and east from Shady Oaks Park.

Figure 5-5. Open space, wetlands, and Special Flood Hazard Area in Subwatershed 600.



Source: Open space and vacant and wetlands from Northeastern Illinois Planning Commission 2001 Land Use Inventory. Special Flood Hazard Area from Federal Emergency Management Agency Q3 Flood Data, 1996.

Figure 5-6. Hydric Soils in Subwatershed 600.



Source: Illinois Department of Transportation's Digital Soils Map for Cook County, Illinois. Shapefile Format. Unknown Publication Date. [DOES NOT MEET NRCS MAPPING STANDARDS OR SPECIFICATIONS]

Daylighting streams is an unlikely possibility, as the storm sewer interceptors chiefly run along boulevard collector streets (e.g., Woodland Heights), which the Village only relatively recently converted from ditches. It would be difficult to do anything other than convert them back to open ditches in the median, expensive and unlikely to improve water quality substantially. There would be little or no aesthetic benefit unless daylighting were to take place in a park setting or perhaps a town center redevelopment project. Neither of those options appears available.

Open ditches fed by piped stormwater enter the stream at several points along the South Branch of Poplar Creek. Two ditches feed into the stream at Dolphin Park from older subdivisions with no detention. It may be possible to modify these ditches by installing energy dissipation measures, small treatment wetlands, and grading the ditch into a gentler swale near the mouth. The wetlands should be designed to maximize runoff storage. It appears that there would be sufficient space available for these treatment measures without disturbing the ball fields in Dolphin Park.

Figure 5-7. Recently completed daylighting and remeandering project on Manhattan Creek, Village of Manhattan, Will County, August 2006.

5.2.5. STREAM BUFFERS

With regard to buffers in residential areas, banks are generally either overgrown with box elder or mowed to the edge — neither makes a good buffer — and the banks are now vertical after heavy channelization. While the creek is in an easement 40 feet on either side of the stream center line, it would probably not be financially or politically feasible to regrade banks, remove the box elder, and replant. It would be appropriate to require buffers and buffer maintenance during redevelopment, perhaps as a condition of a teardown.

5.2.6. DEVELOPMENT AND REDEVELOPMENT

As Subwatershed 600 is already built out, there is no opportunity to preserve water quality by improved site design and development regulations. However, redevelopment poses an opportunity to promote stormwater management for water quality benefits. The Village has been considering writing a stormwater management ordinance for redevelopment. In residential areas, this would mean increased reliance on lot-level BMPs for rate, volume, and pollutant control, especially since older neighborhoods have undetained stormwater flows. It should be noted that the Metropolitan Water Reclamation District also intends to specify standards for stormwater management for redevelopment projects in its Watershed Development Ordinance. However, it is recommended that the Village pursue its own redevelopment stormwater ordinance, as the MWRD Watershed Development Ordinance will serve as a minimum measure that can be superseded by a more stringent municipal ordinance.

There is a marginal commercial area at Bartlett Road and Streamwood Boulevard that is also undergoing subsidence. Stormwater pretreatment and volume control could be made a condition of TIF funds acceptance.

In commercial areas, it is not expected that green BMP installations will be feasible during redevelopment. Property managers will not be committed to the maintenance of bioretention areas or swales. Heavy application of salt in parking lots may be destructive to plantings. Use of infiltration BMPs especially in commercial areas is not seen as a strong possibility. Clayey soil conditions in the commercial areas are also thought to limit their potential use.

5.2.7. EDUCATION AND OUTREACH

Streamwood officials saw primary school-based education as a very strong opportunity, since much of the watershed is in one school district and education at that level may have the most powerful long-term effect. In response to this observation, a recommended school-based education program has been developed. It is discussed in Section 7.

The Village is already conducting outreach to encourage proper application of fertilizers, pesticides, etc. and to maintain buffers. This program should be reviewed for its effectiveness, coverage/ penetration, and to determine whether there are additional steps that could be taken to improve residents' awareness of nonpoint source pollution issues and alternatives they could take. The addition of a watershed-wide educator, as described in Section 7, could also either complement the Village's efforts or allow the Village to reassign the staff charged with NPS education among their other duties.

Most importantly, however, public education must be designed to support the structural improvements outlined in the sections above. That is, education needs to deal with the value of wetlands to water quality and the beneficial aspects of native landscaping, as many residents dislike them on purely aesthetic grounds.

5.2.8. ROADWAY MANAGEMENT

One effective means of controlling transport-generated pollutants would be to increase the frequency of street sweeping. Local roads are now swept 8 times per year. Local roads could be swept more often, but doing so presents a manpower issue. It is recommended that sweeping be increased to once every two weeks.

Primary arterials (where most salt is applied, and probably where most automobile-generated pollutants originate) are swept less often (approximately 2 times per year) because they are under the jurisdiction of the state or county. While Streamwood could take over these management responsibilities from the state or county, doing so could potentially expose the city to increased liability. However, assuming these responsibilities is not out of the question; the City of Elgin has established an intergovernmental agreement with the state to sweep and deice state roads within the City. Increasing county and state commitment to street sweeping or taking over these responsibilities could do a great deal to decrease pollutant loading to the creek.

Streamwood Public Works has tried most of the road salt alternatives and has settled on more intensive management. Roads are plowed from snowfall of one inch and up, then salted once the storm has stopped. Salt is prewetted. Computer control of salt application was tried, but plow operators bypassed the controls — "they want to see it wet behind the truck." There are simple but difficult to overcome incentives behind this behavior. Mixing in sand creates a mess in springtime and might not do much for the sediment load in Poplar Creek. Cinders are problematic because of discoloration. Thus, it appears that there is little opportunity for further improvement in the Village's approach to deicing.

5.2.9. LANDSCAPING

Natural landscaping is not well liked, with the public feeling it represents inferior maintenance by the Village or responsible party. The Village has had some success by putting up rail fences at the turf/native edge. Existing ordinances may conflict somewhat with natural landscaping objectives, but no property owner in the Village has attempted to create a wholly naturalized yard thus far. However, increasing education to promote native landscaping, as recommended in this plan, will make an ordinance update increasingly necessary to ensure consistency.

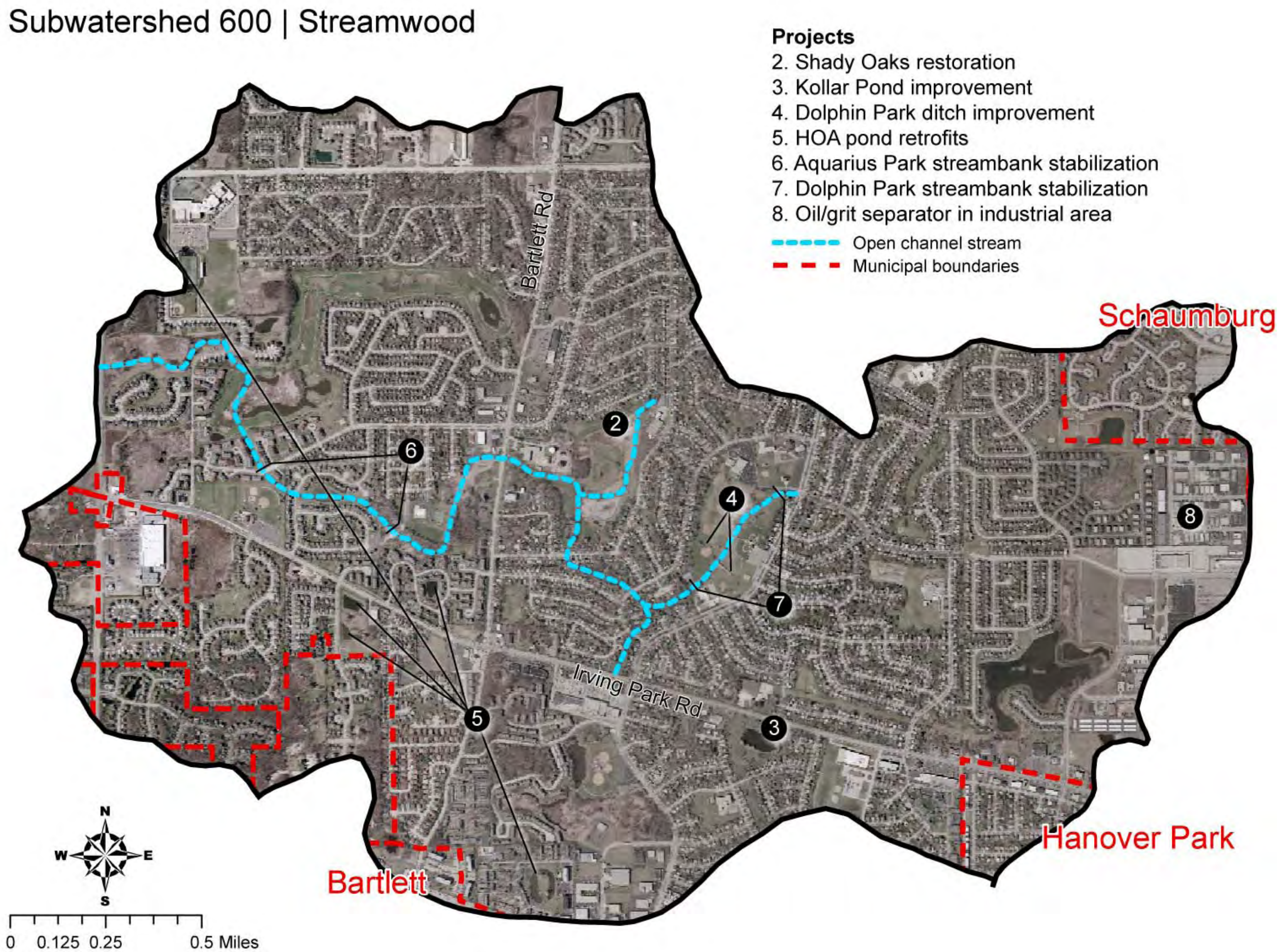
The Village has had success with prescribing native landscaping in new development, as substantial discretion promoting natural landscaping can be exercised at the development review level, and the Village has a strong requirement to preserve 70% of trees on a site (overall average).

5.2.10. CONTAMINATION AND ILLICIT DISCHARGE

Septic systems are uncommon in Subwatershed 600. Sanitary sewer overflows are infrequent. However, there is a sewer pump station in Subwatershed 800 that occasionally overflows into Arlingdale Lake. The Village, MWRD, and Illinois EPA have all been involved in trying to fix the problem, but have not yet been completely successful.

According to Village staff, it is unlikely that there are illicit cross-connections in residential areas. There are probably many floor drains in the industrial area along Barrington Road. Tenant overturn is high and building inspections are therefore presumably frequent, but it is not clear if inspectors evaluate the building with illicit cross-connections in mind. This area is a hotspot that the Village should target in its illicit discharge detection and elimination program under NPDES Phase II. Oil and grease runoff from the industrial area is probably substantial. The Village has developed specifications for an oil/grease separator that uses a polymer insert to absorb hydrocarbons. It is recommended that the Village approach the industrial park owner to install this device.

5.3. Project Locations



5.4 Pollutant Reduction and Estimated Cost

		Treatment size	Unit	Incremental Reduction as Percentage of Subwatershed Load BOD	TSS	Cl	TDS	O&G	FC*
1	Biweekly sweeping	Entire	—	21.6%	27.0%	ND	ND	ND	1.6%
2	Shady Oaks restoration	130	ac	2.5%	2.5%	ND	ND	1.3%	4.5%
3	Kollar Pond improvement	114	ac	0.0%	0.5%	ND	ND	0.1%	0.4%
4	Dolphin Park ditch improvements	100	ac	0.9%	1.6%	ND	ND	0.7%	-1.1%
5	HOA pond retrofits	400	ac	0.0%	1.8%	ND	ND	0.2%	1.4%
6	Aquarius Park streambank stabilization	5,500	LF	0.0%	1.1%	ND	ND	NA	NA
7	Dolphin Park streambank stabilization	2,500	LF	0.0%	4.2%	ND	ND	NA	NA
8	Oil/grit separator in industrial area	39	ac	0.0%	0.6%	ND	ND	2.9%	ND
	Total (lbs/yr)*			**18,000**	**90,917**	ND	ND	**449**	**15,769**
				25.0%	**39.3%**	ND	ND	**5.2%**	**6.8%**

		Project size	Unit	Unit cost	Total cost	Funding	Responsibility	Priority
1	Biweekly sweeping	140	curb miles	$30	$75,600	Village	Village	1
2	Shady Oaks restoration	7	ac	$30,000	$210,000	MWRD/Local	MWRD/Village/SPD	2
3	Kollar Pond improvement	10	ac-ft	$20,000	$200,000	Local	SPD	
4	Dolphin Park ditch improvement					IEPA/Local	Village/SPD	3
	Wetlands	2	ac	$30,000	$60,000			
	Swale retrofit	600	LF	$75	$45,000			
	Total				$105,000			
5	HOA pond retrofits	5	each	$50,000	$250,000	SSA	Village/HOAs	3
6	Aquarius Park streambank stabilization	5,500	LF	$50	$275,000	IEPA/Local	Village/SPD	3
7	Dolphin Park streambank stabilization	2,500	LF	$50	$125,000	IEPA/Local	Village/SPD	3
8	Oil/grit separator in industrial area	1	ea	$15,000	$15,000	Village/owner	Village	1
	Total				**$1,255,600**			
9	School based education				—	School district	District U-46	2
10	Watershed fund				$15,333	Local	Village	1
11	Native landscaping ordinance	200	staff hours	$75	$15,000	Local	Village	1
12	Redevelopment ordinance	500	staff hours	$75	$37,500	Local	Village	2
13	Golf course Audubon certification					Local	Village	3
	Total				**$67,833**			

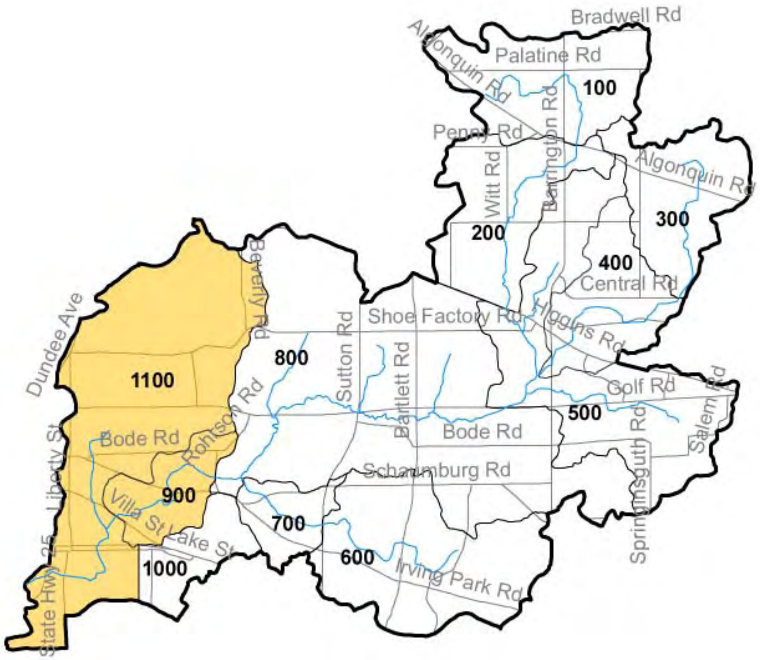
Priority rank by time of implementation: 1 = 2008; 2 = 2009 – 2010; 3 = 2011 – 2013. Percentages may not add to 100 due to rounding. *FC in millions of colonies per year.
SPD = Streamwood Park District
MWRD = Metropolitan Water Reclamation District of Greater Chicago
IEPA = Illinois Environmental Protection Agency
SSA = Special Service Area

6. SUBWATERSHEDS 900 AND 1100 | CITY OF ELGIN

6.1. Introduction

Almost all of Subwatershed 900 and most of 1100 are within the City of Elgin. Most of the remainder is unincorporated or part of Hoffman Estates. The age of development in Subwatershed 1100, especially in the Elgin portion, is much older than elsewhere in the watershed. Many neighborhoods are not served by detention or discharge to combined sewer systems; volume reduction programs are important in these neighborhoods. Elgin is subject to much more flooding than elsewhere in Poplar Creek, especially in the area between Villa Street and Route 19. This plan should seek to reduce flood damages in the lower portion of Subwatersheds 900 and 1100.

Figure 1. Location of Subwatersheds 900 and 1100.



6.1.1. AREA OF SUBWATERSHEDS 900 & 1100

Municipality	Acres	Percent
East Dundee	50	1%
Elgin	3,491	58%
Hoffman Estates	845	14%
South Elgin	100	2%
Unincorporated	1,510	25%
Total	**5,997**	**100%**

Source: Northeastern Illinois Planning Commission's 1:100,000-Scale 2000 Municipal Boundaries Within Northeastern Illinois.

6.1.2. LAND USE IN SUBWATERSHEDS 900 & 1100

Land Use (2001)	Acres	Percent
Agriculture	794	13%
Commercial	316	5%
Industrial	460	8%
Institutional	253	4%
Multi-family	93	2%
Open Space	444	7%
Residential	2,328	39%
Transportation	215	4%
Vacant and Wetland	861	15%
Water	163	3%
Total	**5,928**	**100%**

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory.

6.1.3. LOADING ESTIMATES FOR SUBWATERSHEDS 900 & 1100

Pollutant	Lbs/Yr*	Contribution Index
TSS	2,839,964	132
Total P	4,363	112
TDS	5,452,778	107
Oils and grease (OG)	16,480	105
Fecal coliform (FC)*	472,211	130

Source: Northeastern Illinois Planning Commission 2001 Land Use Inventory; Price 1993; L-THIA 2006. Contribution index = (Percent of total watershed load coming from subwatershed ÷ Percent of watershed area that subwatershed comprises) × 100. *Fecal coliform given in millions of colony forming units per year.

6.1.4. POPULATION IN SUBWATERSHEDS 900 & 1100

The combined population density in Subwatersheds 900 and 1100 of 4.6 persons per acre is somewhat higher than the watershed average. It is projected to grow faster than the watershed as a whole (16 versus 12 percent) but much slower than the rest of Elgin, which is experiencing heavy growth on the west side of the city. Most of the growth in 1100 is, in fact, taking place within Hoffman Estates. Because of the size of the subwatersheds, they are expected to accommodate over 40 percent of the entire watershed's projected growth.

		2000	2030
Subwatersheds 900 & 1100	Number	27,394	31,790
	Percent change	—	+16%
Elgin (entire)	Number	94,487	162,416
	Percent change	—	+72%

Source: Census 2000 base and NIPC 2030 population forecasts by quarter-section and municipality.

6.2. Watershed Management Recommendations

6.2.1. WETLANDS AND NATURAL AREAS

Several areas within subwatersheds 900 and 1100 were identified as open space protection priorities, although their developability is limited. For example, the City owns the lower-quality wetland between Ramona Avenue and Varsity Drive at the outlet of Subwatershed 900, but the wetland area just east of Varsity Drive is in private hands. The creek has been channelized through these parcels. There are regional treatment opportunities here with a project to reconnect the floodplain with the creek, or to divert more flow into a water quality wetland.

The Willow Creek area south of Lord's Park is the second major priority open area in subwatersheds 900 and 1100. Almost all of this 50-acre expanse of wetlands and woods is in private hands and represents a large area of land that should be managed as a unified conservation area. It is recommended that the City or private land trusts pursue acquisition of this area, as discussed in Section 7.

6.2.2. STORMWATER MANAGEMENT FACILITY RETROFITS

Dry bottom basins in 900 and 1100 are potential candidates for conversion to wetland or dry bottom extended detention designs. Wet ponds are used at the large commercial complexes at the corner of Shales Parkway and Route 19. They represent a somewhat lower priority for retrofit in Subwatershed 900 because of the presence of dry ponds and areas with no detention facilities, although, as noted in other subwatershed plans (e.g., 500), there are several design changes to older wet ponds that can be implemented to improve pollutant removal performance and rate control for smaller storm events. Dry ponds are rarer in Subwatershed 1100, a great deal of which is served by larger "regional" wet ponds.

Table 6-1. Dry detention ponds in Subwatershed 900.

Near Intersection	Drainage area (ac)	Land use
Poplar Creek Dr/Hackberry Ct	43	Multifamily
Bode Rd/Brittany Trl	31	Single family
Maroon Dr/Hampton Cir	41	Single family
IL 19 at Poplar Creek	4	Commercial

There are two main areas that appear to produce undetained storm flows (Figure 6-2). Huntington Park Apartments at Poplar Creek and Route 19 does not appear to utilize a detention facility. The approximately 32 acre development discharges to Poplar Creek at two points, and there appears to be sufficient area between the housing units and the stream to construct offline wetlands to treat storm flows, although the space available may require treating only the water quality volume and bypassing higher flows. The entire trailer park (about 50 acres) east of Willard Avenue between Villa Street and Route 19 appears to be undetained within Subwatershed 900 and appears to drain to Poplar Creek at Villa Street. The best opportunity for this area would be to install energy dissipation measures and perhaps a swale in the floodplain area east of Ramona Avenue, decreasing flow slightly and reducing stream channel damage.

Figure 6-2. Areas within Subwatershed 900 not served by detention facilities.

Source: City of Elgin *Storm Sewer Map Book* (April 2006).

There are numerous car dealerships along Route 19, which, with large areas of impervious surface, generate a great deal of runoff. While new cars are sealed fairly tightly and do not deposit the same amount of oil, antifreeze, etc. as a car that has been on the road a few years, there is still high traffic onto the car lots and potentially high pollutant loading from those sources. According to city officials, it is unlikely that a stormwater retrofit program (e.g., Stormceptor installation, catchbasin inserts, swales or bioretention, etc.) targeted specifically to these car lots would be politically feasible. They contribute the majority of retail sales tax revenue in Elgin. However, the car lots appear to change ownership and undergo remodeling fairly often. When that happens, the current stormwater ordinance would apply and BMPs would be required.

6.2.3. STREAM MAINTENANCE

The stream inventory noted that Reach 8 had excessive trash accumulation, with “bicycles, tires, and a bookshelf” found instream. While these findings are probably somewhat ephemeral, they do call attention to the need to conduct stream cleanups in subwatersheds 900 and 1100.

Stream erosion is fairly severe in Subwatersheds 900 and 1100 (see Section 2.4.2). However, unless erosive flows are limited by improved rate control upstream, it will probably be necessary to use harder forms of bank stabilization, such as a-jacks or lunkers (see Figure 6-3 for examples). The areas indicated as having “severe” erosion in the stream inventory should be targeted for stream bank stabilization. A total of approximately 24,000 linear feet (both banks) of shoreline in subwatersheds 900 and 1100 are in reaches rated as severely eroded. Further survey work will be needed to identify specific stretches.

Figure 6-3. *Left:* Successful stabilization in Glencrest using lunkers. *Right:* Successful stabilization in Lockport using a-jacks.

Source: NIPC and U.S. Fish and Wildlife Service. 2005. *Stream Restoration Inventory*

6.2.4. STREAM ENHANCEMENT

Parts of subwatersheds 900 and 1100 show enviable abundance and diversity in their aquatic communities. Yet other reaches of the stream through Elgin have very poor instream aquatic habitat. The 2002 NIPC stream survey showed that the reach through Rolling Knolls scored the lowest for instream habitat of the 22 reaches surveyed. This is almost certainly related to golf course management practices. It is recommended that the City of Elgin concentrate on this reach of the stream. The recommended approach to stream enhancement through Rolling Knolls is described under *Development and Redevelopment* below.

6.2.5. STREAM BUFFERS

Most of the stream corridor through Subwatersheds 900 and 1100 is well buffered. The main exceptions occur along the short stretch running beside the industrial area at Varsity Drive and Villa Street, the residential stretch parallel to Kirk and Ramona Avenues, the industrial area at Villa and Willard, and on a longer stretch through Rolling Knolls Country Club. In the course of working with the owners/operators in the industrial areas to ensure that no illicit discharge is entering the stream, the City should also encourage buffer maintenance. Buffer maintenance in residential areas should be addressed through homeowner education, e.g., through the watershed educator position advocated in Section 4. Rolling Knolls County Club faces a somewhat uncertain future, as discussed below.

The stream inventory indicates that, within approximately 10 feet of the stream in Subwatershed 900, bank cover is generally trees, shrubs, and herbaceous plants, with the exception of POP009 through Rolling Knolls. The high tree cover percentage suggests that there is adequate canopy over the stream.

6.2.6. DEVELOPMENT AND REDEVELOPMENT

The major redevelopment opportunity within Subwatershed 900 is Rolling Knolls Country Club. There appear to be three possible outcomes: (1) its owners may retain ownership and develop part of the site as residential, (2) they may sell the entire site for development, or (3) they may sell it to the City of Elgin Parks Department, as Parks has identified a need for a park on the far east side of the city. The City would need to annex the site in all cases. If the City could acquire it for use as a park, part of the site should be able to be used for a flood storage area. This could become a proposal to the Poplar Creek Watershed Planning Council for Metropolitan Water Reclamation District funding. If it remains a golf course, it should pursue certification by Audubon International, as described in Section 7. If Rolling Knolls is developed, approval should be conditioned on environmental enhancements — e.g., stream bank stabilization, buffer plantings, instream habitat creation — in addition to the normal requirements.

6.2.7. EDUCATION AND OUTREACH

At least some of Elgin within Poplar Creek watershed — mainly close to the Fox River — is served by combined sewers. Such neighborhoods are older and platted with considerably smaller lots

than is typical of newer developments. It may be that drainage, especially from roofs, is directed off lot and into the CSS.
While it is not a component of the City's Long Term Control Plan for CSOs, it could still provide some volume reduction to pursue hydraulic disconnection of impervious surfaces in these neighborhoods. For example, the City could institute a rain garden or rain barrel program. There are many examples of such programs in other cities that a program in Elgin could be modeled after. Such neighborhoods are older and well-organized, with a number of neighborhood groups. It could be possible to take advantage of this structure to introduce rain barrels or rain gardens, for example through a speaker's bureau for neighborhood groups.

Figure 6-4. Planting in Exelon right of way. *Source:* A Sourcebook on Natural Landscaping for Public Officials.

6.2.8. ROADWAY MANAGEMENT

The City should sweep all roads at least eight times per year, including state roads. Elgin is an example to the other municipalities in the watershed because it has entered an intergovernmental agreement with the Illinois Department of Transportation to undertake maintenance on state roads.

6.2.9. LANDSCAPING

The City has a provision in its site design regulations (19.12.730) expressly encouraging native landscaping and cites runoff reduction and habitat creation as benefits.

There is a 200-foot ComEd (Exelon) right of way that extends from the bottom to the top of the watershed, running along Shales Parkway in Elgin and exiting at Summit Street. The ROW is mowed grass (meadow). As there is a great deal of land across the region in utility ROWs, one of the major management recommendations of the Chicago Wilderness *Biodiversity Recovery Plan* was to pursue managing them as native landscapes. Returning the ROW to a state more similar to its earlier vegetation pattern would have a number of benefits, among them habitat that connects to the riparian corridor just north of Route 19 and to a wetland complex north of Summit Street that joins with the Cobbler's Crossing wetland/detention basin. Exelon has been planting certain ROWs with native vegetation.[1] It is recommended that the PCWC and City of Elgin approach Exelon with a proposal to naturalize the ROW and request a funding partnership. The recommended starting point would be the stretch between Bode Road and Route 19.

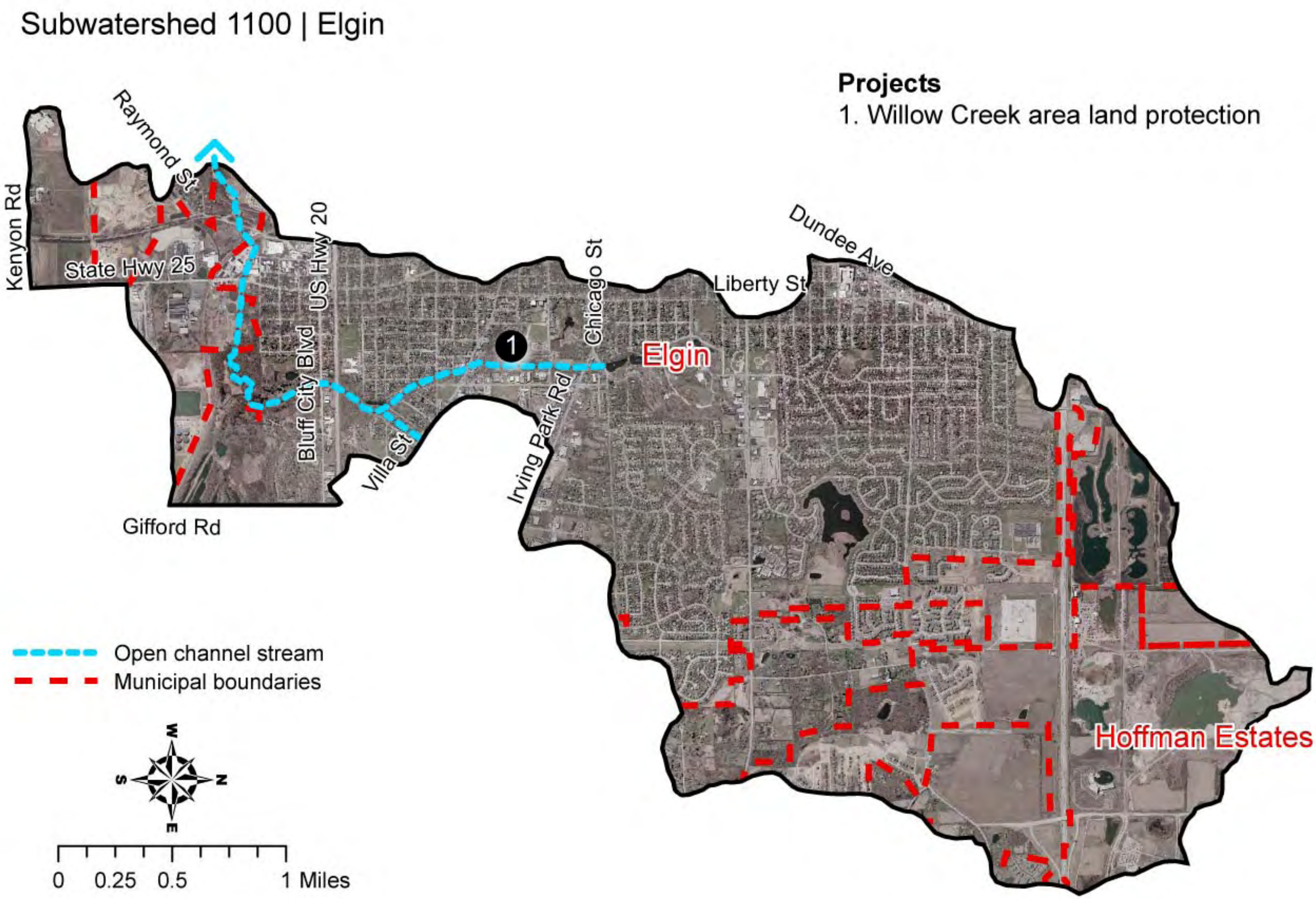
6.2.10. CONTAMINATION AND ILLICIT DISCHARGE

Runoff from industrial operations may be contributing pollutants to the creek. There are two older industrial areas in Subwatershed 900, one at Varsity Drive and Villa Street and the other along Ramona Avenue, that are potential sources. In Subwatershed 1100, the operations along Willard Avenue beside Willow Creek bear further examination. It is recommended that these areas be the chief foci of the City's illicit discharge elimination program within the Poplar Creek watershed and that they be inspected within the next five years.

[1] http://www.exeloncorp.com/ourcompanies/comed/comedres/energy_education/tree_and_vegetation_services/right_of_way_maintenance.htm

6.3. Project Locations — Subwatershed 900

6.4. Project Locations — Subwatershed 1100



6.5 Pollutant Reduction and Estimated Cost

		Treatment size	Unit	Incremental Reduction as Percentage of Subwatershed Load					
				BOD	TSS	Cl	TDS	O&G	FC*
1	Floodplain reconnection/WQ wetlands	892	ac	15.8%	19.5%	ND	ND	21.3%	19.5%
2	Stream cleanup	—	LF	—	—	—	—	—	—
3	Instream habitat improvement	—	LF	—	—	—	—	—	—
4	Undetained area retrofits	82	ac	10.8%	16.2%	ND	ND	10.1%	23.7%
5	Detention basin retrofits	118	ac	6.0%	3.2%	ND	ND	2.0%	0.0%
6	Right of way plantings (Bode to Rte 19)	—	ac	—	—	—	—	—	—
1	S1100 — Willow Cr. land protection			—	—	—	—	—	—
	Total (lbs/yr)*			**8,084**	**201,814**	—	**—**	**923**	**26,455**
				32.6%	**38.9%**	**ND**	**ND**	**33.4%**	**43.2%**

		Project size	Unit	Unit cost	Total cost	Funding	Responsibility	Priority
1	Floodplain reconnection/WQ wetlands	9	ac	$30,000	$270,000	C2000/IEPA	Elgin	—
2	Stream cleanup	1	event/yr	$1,500	$1,500	City/MWRD	PCWC	—
3	Instream habitat improvement practices	10	ea	$750	$7,500	Rolling Knolls	Elgin	—
4	Undetained area retrofits	2	ea	$50,000	$100,000	Local/IEPA	Elgin	—
5	Detention basin retrofits	4	ea	$50,000	$200,000	Local/IEPA	Elgin	—
6	Right of way plantings (Bode to Rte 19)	12	ac	$3,000	$36,000	Exelon/C2000	PCWC	—
1	S1100 — Willow Cr. land protection	50	ac		ND	Variety	TBD	—
	Total				**$615,000**			
7	School based education	—	—	—	—	School district	District U-46	—
8	Native landscaping ordinance		staff hours	$75	$15,000	Local	City	—
9	Redevelopment ordinance		staff hours	$75	$37,500	Local	City	—
10	Golf course Audubon certification	1	ea	$5,000	$5,000	Rolling Knolls	City/PCWC	—
	Total				**$52,500**			

*FC in millions of colonies per year.
IEPA = Illinois Environmental Protection Agency
Illicit discharge detection is not listed as it is part of NPDES requirements.
Priority rank by time of implementation: 1 = 2008; 2 = 2009 – 2010; 3 = 2011 – 2013. Percentages may not add to 100 due to rounding.

7. WATERSHED-WIDE MEASURES

7.1. Golf Course Management

There are five golf courses within the Poplar Creek watershed (Table 7-1), and all have segments of the main stem or tributaries on their property. Vegetative buffers present elsewhere along the stream frequently come to an end within the golf courses. Golf courses are also a potential source of water quality degradation, either by removal of habitat or by contribution of chemical pollutants, generally nutrients and pesticides/herbicides. As evidence of the physical impact on streams that golf courses can have, the 2002 NIPC stream inventory indicated that the reach (POP009) through Rolling Knolls Country Club in Elgin had the lowest instream habitat score of the *surveyed* reaches, the highest percentage of bank covered with mowed lawn, and narrowest vegetative buffers.

Table 7-1. Golf courses within the Poplar Creek watershed.

Name	Municipality	Operator	Subwatershed
Hilldale Golf Club	Hoffman Estates	Private	400
Poplar Creek CC	Hoffman Estates	Park District	500
Walnut Greens	Schaumburg	Park District	500
Streamwood Oaks	Streamwood	Village	600
Rolling Knolls CC	Elgin	Private	900

Source: NIPC 2001 land use file; NAVTEQ recreation point file v33; web search.

It is recommended that the chief municipal partners in the Poplar Creek Watershed Coalition as well as other members try to work with the management teams of these courses to certify them under the Audubon Cooperative Sanctuary Program,[1] an environmental certification program operated by Audubon International. The program calls for an evaluation of current management practices and the implementation of a flexible checklist of recommendations in six areas:

- Wildlife and Habitat Management
  - Enhance existing natural habitats and landscaping to promote wildlife and biodiversity conservation.
- Chemical Use Reduction and Safety
  - Ensure chemicals are stored, handled, applied, and disposed of safely.
  - Employ integrated pest management
- Water Conservation
  - Maximize irrigation efficiency, reduce irrigated acreage where possible, reuse water, incorporate drought-tolerant plant species, etc.
- Water Quality Management
  - Reduce potential nutrient or pesticide contamination of water sources.
  - Monitor water quality to verify results.
- Outreach and Education
  - Build support for environmental management program through communication, education, and outreach. Form a Resource Advisory Group.

Regional examples of Audubon certification include the Forest Preserve District of Cook County's courses, now managed by Billy Casper Golf, all ten of which have been certified under the Audubon program. One of them, Highland Woods, is within Hoffman Estates, but not within the Poplar Creek watershed. Audubon International provides a great deal of information showing that certification pays for itself in reduced labor and maintenance costs.[2] Certification also

[1] http://www.auduboninternational.org/programs/acss/

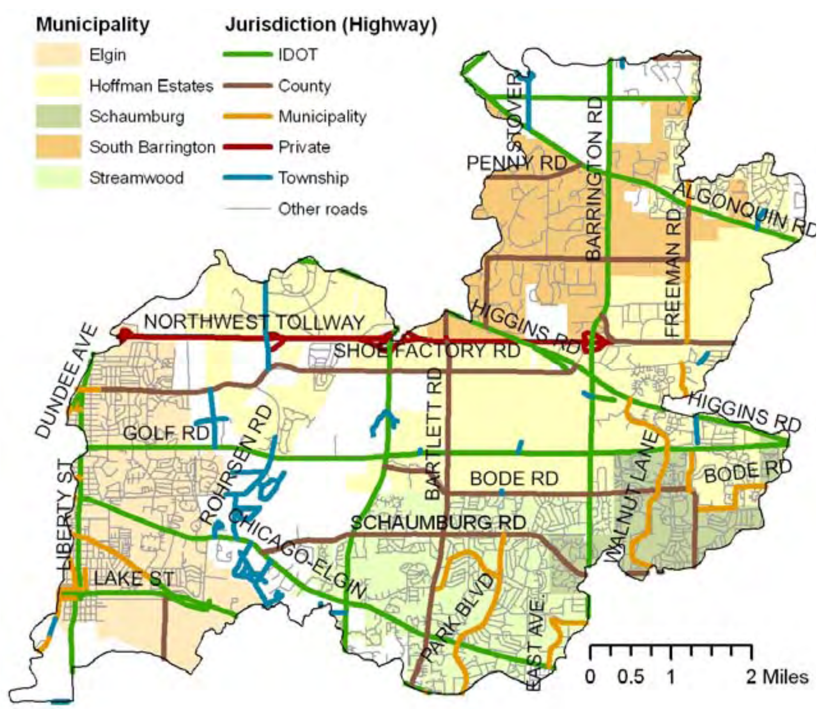
[2] Start-up costs are involved, however. Discussions with Billy Casper officials suggested that, on average, the cost for each golf course certified was approximately $1,500 and required 40–50 hours of staff time at the superintendent level. This seems surprisingly inexpensive.

provides a positive marketing benefit in the form of raising community awareness of golf course contributions to natural resource stewardship and natural landscape beauty.

7.2. Roadway Management

Local roads in municipal jurisdictions are swept from three to eight times per year. It is recommended in the subwatershed plans that all municipalities sweep roads under their jurisdiction at least eight times per year in hotspot subwatersheds but more where local buy-in is strongest.

Figure 7-1. Major municipalities and highway jurisdictions in Poplar Creek.



Source: Illinois Roadway Information System: Chicago Area Transportation Study file (2004). Other roads from Census 2000 TIGER/Line files.

Arterials — where most salt is applied, and probably where most automobile-generated pollutants originate — are swept less often (approximately 2 times per year) because they are generally under the jurisdiction of the state or county. As shown in Table 7-2, the lane mileage under other jurisdictions is extensive. While municipalities could take over these management responsibilities from the state or county, doing so could potentially expose them to increased liability. Assuming these responsibilities is not out of the question, however. The City of Elgin, for example, has established an intergovernmental agreement with the state to sweep and deice state roads within the City.

Table 7-2. Highway lane miles by jurisdiction by municipality in Poplar Creek watershed.

Municipality	County	IDOT	Municipal	Private (Toll)	Township	Total
Elgin	3.7	27.5	9.4	0.4		40.9
Hoff. Estates	14.3	40.9	11.1	17.0	4.1	87.4
Schaumburg	7.5	8.9	5.9			22.2
S. Barrington	10.7	13.1	0.1	0.3		24.3
Streamwood	15.4	16.3	12.9			44.6
Total	**51.6**	**106.6**	**39.3**	**17.7**	**4.1**	**219.4**

Source: Illinois Roadway Information System: Chicago Area Transportation Study file (2004).

There are at least two alternative approaches to increasing the frequency of sweeping on state and county roads. One would be for the other four major municipalities in Poplar Creek watershed — Hoffman Estates, Schaumburg, South Barrington, and Streamwood — to seek to perform sweeping and deicing on state and county roads through intergovernmental agreements, as Elgin has done. The other would be for the Illinois Department of Transportation (IDOT) and county highway departments to agree to increase street sweeping. The second, more policy-oriented approach is preferred. This is partly because it should save municipal staff the effort required to establish agreements with the county and state, but also because CMAP is looking to establish a stronger environmental protection orientation in transportation planning.[3] CMAP should work with IDOT and the county highway departments to establish a policy of increased street sweeping in the watersheds of impaired water bodies. In addition, it should undertake demonstration projects to reduce highway runoff such as the one proposed for the Northwest Tollway in the Subwatershed 400 Action Plan.

7.3. Agricultural Runoff Management

Agricultural land use within the Poplar Creek watershed has largely given way to suburban development as municipalities have expanded over the years to eliminate many farms, fields, and open space that once dominated this portion of northwestern Cook County. Here as elsewhere, farmers face great pressure at the urban–rural fringe as land values increase to render agricultural production either uncompetitive or undesirable compared to the option of selling. Presently, there are approximately 1,844 acres of land that remain in agricultural production. This represents just 6 percent of present-day land use within the watershed. Approximately 600 acres or 33% of this agricultural land, is found within the Poplar Creek Forest Preserve where lease rights with a tenant farmer are governed by a contract that extends through the 2007 growing season.

The current contract between the Forest Preserve District of Cook County (FPDCC) and a farmer required a conservation plan to be developed and implemented in consultation with the local USDA NRCS office. This bodes well for Poplar Creek because research shows that tenant farmers are much less likely to practice conservation than owner-operators given the former's short-term and often itinerant interest in the land. This plan recommends that filter strips and other conservation practices that aim to minimize nonpoint-source pollution be required if the FPDCC chooses to award a new contract in 2008. In the meantime, additional conservation opportunities will be studied for inclusion with any future rental agreement. It should be noted that the FPDCC will seek funding opportunities to restore all or portions of these fields currently in agricultural production. Such a strategy suggests that agricultural land use will likely continue to decline within the Poplar Creek Watershed and eventually cease to be a factor in any local plan to reduce nonpoint-source pollution.

7.4. Open Space Preservation

Open space preservation has a number of benefits in the context of watershed management. It can assure continued floodwater storage, protect wetlands, provide habitat in the stream corridor as well as provide for passage into and out of it through habitat connectivity, and of course ensures that land does not become a contributor to nonpoint source pollution and increased runoff. While the Poplar Creek watershed population is expected to grow by 12 percent or 11,340 people between 2000 and 2030, and a considerable amount of that will be accommodated through redevelopment, there are still opportunities for open space protection.

7.4.1. METHODOLOGY

Priorities for additional open space preservation were approached on a watershed-wide basis. The analysis concentrated on patches of agricultural and "vacant" land or wetlands in the NIPC land use

[3] Under the current surface transportation authorization (SAFETEA-LU), CMAP must develop mitigation strategies as part of the regional transportation plan.

inventory (2001, updated using 2005 aerial imagery) larger than five acres.[4] Four criteria are used to rank these areas:

- Intersecting a wetland;
- Intersecting the 100 year floodplain;
- Adjacent to a stream (within 100 feet); and
- Adjacent to preserved open space (within 100 feet).

Areas meeting all four criteria are considered to be first priority areas; those meeting three criteria are considered second priority; and those meeting less than three are combined into the category of other potential sites to protect. Weighting of ranking criteria is not applied to the prioritization scheme.

As the final step, parcel layers for Kane and Cook counties were overlaid on the priority map so that land use information could be associated with PIN numbers. This information is provided in Appendix C along with additional map information (see README). The tax-exempt parcels overlapping the priority land use areas, with the exception of those owned by churches, were then extracted and mapped.

7.4.2. RESULTS AND RECOMMENDATIONS

The results, shown in Figure 7-2, indicate that the number of first and second priority areas is relatively limited and that, toward the bottom of the watershed, many are already owned by government or nonprofit entities. Most of the priority areas are vacant/wetlands rather than farmland. However, the largest available (second) priority area is an approximately 160-acre farm just north of I-90 in an unincorporated area surrounded by South Barrington.

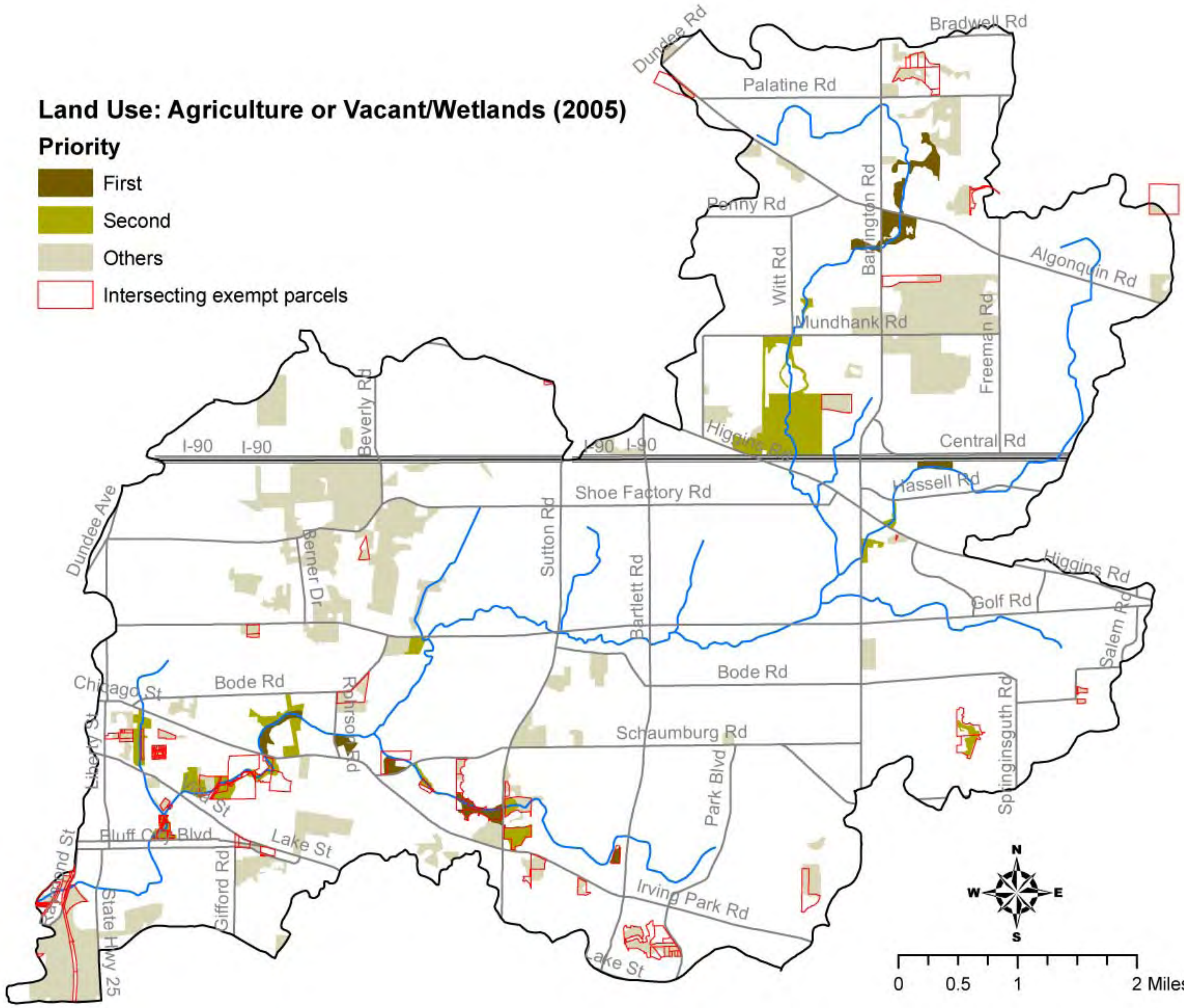
Techniques to protect these areas could include fee simple acquisition, easement purchase, or the acceptance of donated easements (either conservation or farmland protection). Potential lead organizations include:

- Municipalities and park districts;
- Forest Preserve District of Cook County;
- Fox Valley Land Foundation;
- Citizens for Conservation;
- The Conservation Foundation; and
- The Nature Conservancy.

Besides actions to conserve unprotected land, improved management may be needed on land already owned by municipalities or park districts. One of the tasks of the watershed coordinator (Section 8) should be to approach these agencies to discuss management options with them and promote management steps such as invasive species removal, wildlife habitat creation, and so forth.

[4] Because of this approach, the analysis did not consider unbuilt areas within other land use classifications, such as large open areas within institutional holdings or preserved areas within residential subdivisions. Furthermore, agricultural land within the forest preserves was not included.

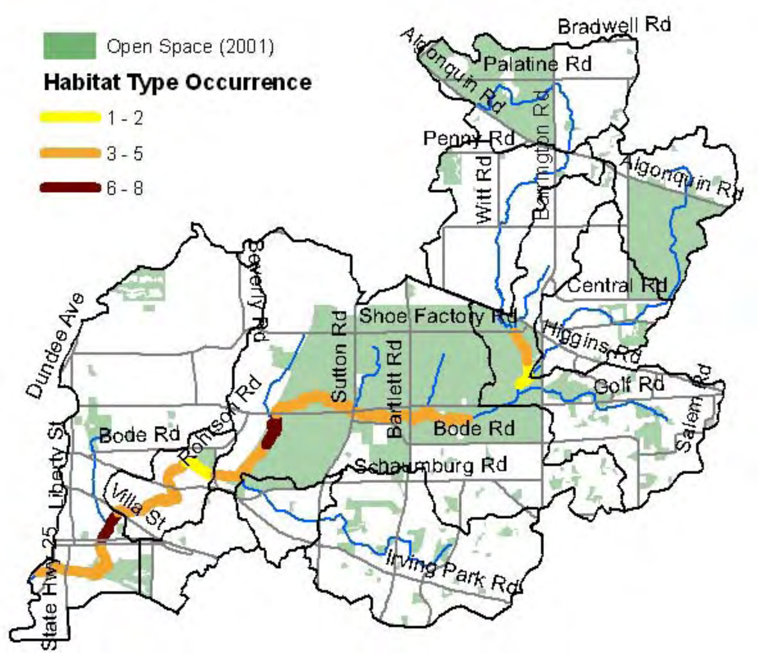
Figure 7-2. Open space areas in the Poplar Creek watershed ranked by conservation potential.



7.5. Instream Habitat Improvements

The 2002 NIPC stream inventory covered the main stem of Poplar Creek from near the mouth to Shoe Factory Road, about a half mile north of the confluences with the tributaries from Subwatersheds 400 and 500. It measured the presence of eight types of habitat by reach: undercut banks, pools over 28 inches deep, macrophytes, logs, overhanging vegetation, rootwads, boulders, and backwaters. Occurrences of these habitat types are mapped in Figure 7-3.

Figure 7-3. Occurrence rate of eight different instream habitat types by stream reach.



Source: NIPC Stream Inventory (2002). Remainder of stream network not assessed.

It is recommended that instream habitat practices be installed in reaches for which five or less habitat types were recorded in the survey, the highest priority being those with only 1–2 habitat type occurrences. This includes Reach 9 (POP009), which is entirely within Rolling Knolls Country Club just outside Elgin, and Reach 24 (POP024) and Reach 18 (POP018) in the Poplar Creek Forest Preserve. Rolling Knolls is discussed in the Subwatershed 900+1100 plan, where a set of actions depending on potential development outcomes is presented. It is expected that stream conditions are dynamic and changing — for example, a reach without logs in summer 2002 may have them now and vice versa — and it will therefore be necessary, as with any project planning, to resurvey the creek in the priority areas.

It is the Poplar Creek Forest Preserve (with the Forest Preserve District of Cook County as the expected implementer) that should be the chief target of instream habitat improvements, as the aquatic community is healthy through Subwatershed 900 and part of 1100 but has declined in Poplar Creek Forest Preserve (Section 2).

7.6. Subwatershed Restoration Analysis

While the previous section examined stream reaches that could benefit from small instream corrective measures, proposals for larger scale repair work would benefit from a watershed-wide prioritization. In order to focus available funds on the sections of Poplar Creek and its tributaries that could promise successful repair/restoration projects, a preliminary screening analysis was undertaken to highlight subwatersheds with the most potential for such projects. The assumption is, as in all of watershed planning, that factors at the subwatershed level determine the feasibility of instream and streamside repair projects. The weights chosen for this analysis therefore place the greatest emphasis on the subwatershed feasibility factors for stream repair versus what might be called "convenience" factors.

These feasibility factors include imperviousness, where 25 percent or less is considered to be "restorable"[5]; projected population change, which measures the future stability of the watershed; and age of development, which is used as a proxy for determining whether the stream is likely to still be adjusting to historic changes in hydrology with urbanization, a process typically requiring 25 to 30 or more years. Feasibility factors as a whole were given 70 percent of the total weighting. The remaining factors each received 10 percent of the weighting. These were stream network density, an index of the opportunities for projects per unit area; the size of the 100-year floodplain per unit area, a measure of the relative size of the stream corridor; and the number of stream miles in public ownership, which in the absence of parcel ownership information was proxied by open space. Scores for the convenience factors were based on quartiles.

Table 4-3. Factors affecting stream repair by subwatershed.

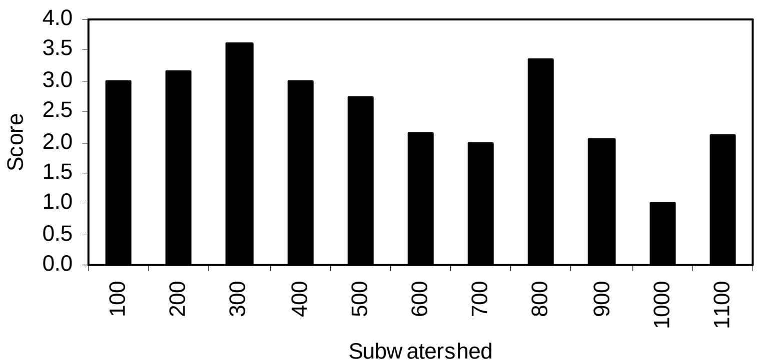
Subwatershed	Percent impervious	Population density chg (/mi^2)	Stream network density (mi/mi^2)	100 year floodplain (acres/ stream mile)	Median age of structure	Stream miles in public ownership
100	13%	–26	0.0013	121	25	1.3
200	19%	39	0.0015	44	26	0.0
300	17%	–88	0.0014	45	30	1.9
400	47%	–146	0.0018	51	30	0.9
500	28%	14	0.0016	77	30	3.5
600	29%	349	0.0009	35	32	1.2
700	16%	1,214	0.0021	28	14	0.3
800	20%	219	0.0012	49	29	6.9
900	34%	174	0.0023	70	18	0.3
1000	35%	1,690	0.0000	0	16	0.0
1100	29%	521	0.0007	72	55	0.8
Total	**25%**	**258**	**0.0012**	**60**	**29**	**17.2**
Score						
1	>25%	1,000	0.0010	39	<25	0.3
2		500	0.0014	49		0.9
3		250	0.0017	71		1.6
4	<25%	0	0.0023	121	>25	6.9
Weights						
100%	**23%**	**23%**	**10%**	**10%**	**23%**	**10%**

Source: Population density change calculated by intersection of NIPC 2030 population forecasts by quarter-section with USGS HUC 12 subwatersheds. Median age of structure is estimated as the median reported in Census 2000 plus six years: U.S. Census block group data intersected with USGS-defined subwatersheds. Open space from NIPC 2001 land use file. Percent impervious from Price 1993 by land use category in 2001 NIPC land use file. 100-year floodplains from FEMA Q3 data (1996).

The resulting scores show 300, 800, and 200 to be the top ranking subwatersheds (Figure 7-4). With the exception of 800, which is in the middle of the watershed, the headwaters subwatersheds tend to present the best opportunities for restoration. This is perhaps not surprising, as 200 and 300 show little or no growth and a low density development pattern. Subwatershed 800, while expected to experience moderate population change, is dominated by the Poplar Creek Forest Preserve. Negative hydrologic effects of this growth will probably be offset somewhat by the large expanse of forest preserve.

[5] Center for Watershed Protection. *Urban Stream Repair Practices.* Manual 6: Urban Subwatershed Restoration Manual Series.

Figure 7-4. Restorability scores by subwatershed.



7.7. Local Watershed Funding

Making watershed improvements is best thought of as a local investment in environmental quality that produces a stream of benefits for years to come. In some cases, the benefits are direct and financial, in the form of increased property values near a cleaner stream. In others, taking preventive steps now — like encouraging stewardship of water resources by the public through outreach and education — can stave off the need to take more expensive remedial measures later. An investment in water quality by local government can also help avoid the start of a formal, state-mandated regulatory process for setting a Total Maximum Daily Load (TMDL). This section of the *Poplar Creek Watershed Based Plan* addresses local funding for watershed-wide water quality protection.

7.7.1. USES OF FUNDS

Several potential uses for local watershed funds were considered:

(a) a pool for matching Section 319 or other funds for projects with benefits largely available to other municipalities downstream;

(b) a pool to meet costs for projects in the watershed with inflexible funding criteria (e.g., those carried out by the U.S. Army Corps of Engineers), for example allowing a project to go forward when local water quality, habitat, and aesthetic benefits are high but the benefit–cost ratio for the project is less than one;

(c) a watershed coordinator position to continue to lead the Poplar Creek Watershed Coalition and help implement the *Poplar Creek Watershed Based Plan*;

(d) a watershed educator to conduct outreach to businesses, residents, and schools; and

(e) contributions to the Fox River Study Group's (FRSG) and Illinois State Water Survey's effort to improve water quality monitoring in the Poplar Creek watershed.

Municipal officials in the PCWC affirmed that their village boards would be unwilling to have their contributions go toward improvements in another municipality, even if the common pool might be used to benefit the village in the future. Option (a) is therefore unlikely to occur, and option (b) suffers from the same problem. The PCWC felt options (c) and (d) would be most attractive to elected leaders, and officials that CMAP staff met with during the subwatershed planning process believed strongly that increased education about nonpoint source pollution would be helpful in the watershed. Making contributions to the FRSG remains a viable and important option, and several municipal staff persons in the PCWC have made note of the difficulty of appealing to elected officials if the source and magnitude of water quality problems in Poplar Creek cannot be quantified with greater certainty.

The priority step for the PCWC is to utilize the services of a watershed coordinator/educator, combining options (c) and (d) above. The ideal approach would be for the Friends of the Fox

River's Watershed Monitoring Network[6] to expand its work into Poplar Creek, as that nonprofit organization has substantial experience, capacity, and presence in the larger watershed. The Friends of the Fox River is interested in working within Poplar Creek should additional funding allow it to do so.

7.7.1.1. Current Outreach Effort

The watershed coordinator/educator can build on current municipal outreach efforts undertaken under the NPDES Stormwater program. The City of Elgin's efforts to meet the Public Education and Outreach component can be used as an example. They include four components including Distributed Paper Material, Speaking Engagements, Community Event and Other Public Outreach (sending material to specific entities such as businesses). Another best management practice is the City's Public Participation/ Involvement which also includes several aspects of education and outreach.

The City has utilized the local newspapers, its website (with links to related agencies), an annual open house, volunteer efforts, erosion control presentations (for staff, developers and contractors), a recycling program, a leaf collection program, "Do Not Dump" storm castings and buttons and its ordinances (especially stormwater) as educational tools. The highlights the City has emphasized in the past are the City's recycling program, the annual Public Works Open House/Spring Clean Up and the use of the "Do Not Dump – Drains to River" castings and buttons on all new storm sewer inlet structures.

7.7.2. SOURCES OF FUNDS

The expected cost of a watershed coordinator / watershed educator would be around $40,000 per year plus approximately 15 percent for fringe benefits ($46,000). It is recommended that an agency like the Forest Preserve District or the North Cook County Soil and Water Conservation District donate an office for the position. In order to set options (c) through (e) equal in terms of cost, we assume that annual contributions to the FRSG would total $46,000, regardless of the expected cost of monitoring.

Three alternative formulae for generating local funds were evaluated: a *pro rata* approach using the population of each municipality in the watershed, a *pro rata* approach using area, and equal contributions from the municipalities. A formula based on land use would come closest to distributing costs in proportion to the potential to generate non-point source pollution, but this approach appeared too complex and likely to be perceived as opaque.

The distribution of population and area suggests that only Elgin, Hoffman Estates, Schaumburg, South Barrington, and Streamwood should be considered potential contributors as the remaining communities have a marginal presence in the watershed. However, because Elgin already contributes heavily to the FRSG fund, the calculations here "waive" additional contributions by the city. Finally, based on its limited participation in the PCWC, it is unlikely that South Barrington would contribute to the fund and so is omitted here.

Table 4-5. Potential contributions of local watershed funds by selected municipalities in Poplar Creek watershed.

Municipality	By Population	By Area	Equal
Hoffman Estates	$13,590	$28,203	$15,333
Schaumburg	$8,576	$4,889	$15,333
Streamwood	$23,834	$12,909	$15,333
Total	**$46,000**	**$46,000**	**$46,000**

[6] http://www.friendsofthefoxriver.org/

While Schaumburg has a higher obligation under the equal payments scenario, it does split the recommended investment for Hoffman Estates and Streamwood more evenly, as the former has much more land and the latter much more population in Poplar Creek. PCWC members also suggested that elected officials would be more willing to make contributions if other villages were investing exactly what they were. It is therefore recommended that funding be raised through equal contributions from Hoffman Estates, Schaumburg, and Streamwood.

7.8. Fecal Contamination Reduction

As discussed in Section 2 (Water Quality Conclusions and Recommendations), there are many potential sources of fecal coliform, and the relative contribution from each remains unknown. This is problematic, particularly for IEPA, because determining the source of fecal contamination is important and necessary to development of effective control strategies. That said, source reduction is likely the most effective approach to reducing fecal contamination, and this in turn will depend on effective outreach and education campaigns.

7.8.1. SEPTIC INSPECTION

Failing or out-of-code septic systems are a potential source of fecal contamination. Lots with septic systems tend to be concentrated in the northeast part of the watershed, in South Barrington and Hoffman Estates. The median age of development in the northeastern subwatersheds (25–30 years) suggests that septic systems may be failing if they have not been replaced or at least adequately maintained. Most septic failures can be traced to improper maintenance by homeowners. While municipal ordinances may require property owners to correct failing septic systems and to submit documentation to the municipality (e.g., South Barrington Village Code 4-7-9), an enforcement action would be taken only in response to a complaint. Furthermore, this reactive approach does not tend to prevent failures from occurring in the first place.

It is recommended that ordinances be adopted by South Barrington requiring septic tank inspection and certification at the time of property transfer and when a building permit is issued for remodeling. The U.S. Environmental Protection Agency provides example ordinance language through its Office of Wetlands, Oceans, and Watersheds.[7] Beyond this, South Barrington and Hoffman Estates should encourage inspection by homeowners through public education. This can be accomplished inexpensively by including information on inserts in other municipal mailings (e.g., water or garbage service bills, newsletters, etc.) or in public service advertisements in telephone books.

7.8.2. PET WASTE

Reduction of fecal coliform contamination from pet waste is, again, largely addressed through outreach and education. This topic is discussed in the information and education chapter (Section 8). However, there is also an ordinance component. The major municipalities within the watershed have a substantially similar approach to regulating the removal of pet waste. Pet owners must pick up waste deposited by their pets on any property save that of the pet owner.

[7] *Source:* http://www.epa.gov/nps/ordinance/discharges.htm. See Washtenaw County, Michigan Regulation for Inspection of Residential Onsite Disposal Systems at Property Transfer.

Table 4-6. Pet waste ordinances by municipality.

	Ordinance number	Authorized penalty per offense
Elgin	7.04.080	>$50, >$75, >$100 each time
Hoffman Estates	7-6-10	$10–500
Schaumburg	Title 9, Ch. 92.30	Unclear
South Barrington	5-3-3	$20–250
Streamwood	4-2-9	$50–750

Source: Municode.com, Sterlingcodifiers.com

It is recommended that municipalities review their citation records for pet waste ordinances to determine whether they are being enforced adequately. It may also be appropriate to increase the fine nearer to the maximum authorized by ordinance. Furthermore, the park districts and City of Elgin Parks Department should review their facilities to ensure that signage is present to indicate that proper disposal of pet waste is required. In addition, the review should indicate whether placement of additional garbage cans and scooper bags in parks would improve compliance.

7.8.3. GOOSE MANAGEMENT

Reducing goose population density in the watershed is a difficult task, but they almost certainly make a significant contribution to fecal contamination. Part of the reason for the large number of Canada geese is the appeal of the suburban landscape, with open lawns attractive for feeding and water provided through stormwater ponds.[8] Indeed, "the Ameritech [now AT&T] campus in Hoffman Estates, with mowed turf grass leading to the pond's edge, is a prime example of this ideal spot for geese."[9] Goose management options can be classed broadly as habitat modification, aversion, and depredation.

[8] Nancy Shepherdson. "Wild and Messy." Chicago Wilderness Magazine. Winter 2002. http://chicagowildernessmag.org/issues/winter2002/wild_messy.html.
[9] Ibid.

The chief habitat modification is to plant a taller vegetative fringe around stormwater ponds, as is recommended in a number of the subwatershed plans as part of wet detention basin retrofit projects. Taller vegetation is thought to reduce the attractiveness of the pond for geese as it could harbor predators. In addition, having a sufficient vegetative buffer should reduce the amount of bacteria-laden runoff reaching the pond. Thus, as long as these projects are undertaken as specified, goose populations in their catchments should be reduced, as should fecal contamination. However, fecal load reductions from filtering of overland runoff and reduction in goose numbers cannot be calculated defensibly.

A variety of aversion tactics have been employed to frighten goose populations away from an area, such as noise and predator decoys. Generally speaking, geese adapt to these measures and cease to respond to them with fright. Keeping swans on the premises has also been attempted, but swans have proven to be aggressive toward geese only during their mating season. Finally, trained dogs can be used to scare off geese feeding or nesting at a site, and while this method is effective, it is not practicable at a watershed-wide scale.

While the Migratory Bird Treaty Act provides the Canada goose with certain legal protections, individual federal permits have been approved for land owners and public land managers to depredate nests and eggs to reduce population. As of August 2006, permits are no longer necessary as long as landowners/managers register online with the U.S. Fish and Wildlife Service.[10] There is no fee for the registration. Depredation can occur between March and June and a report of the number of nests/eggs destroyed must be made to the Service by October of each year. Subdivision common areas administered by homeowners associations are also eligible to operate under the depredation order.

[10] The website is https://epermits.fws.gov/eRCGR/geSI.aspx

Finally, it is possible to address goose droppings without addressing the goose population itself. The Wheaton Park District, for example, has purchased an all-terrain vacuum (Tennant 4300 ATLV Litter Vac) to collect goose droppings, which, according to report, promptly reduced the number of citizen complaints.[11] This approach may be fairly effective in targeted areas, so long as it is done frequently. The capital cost is about $30,000 per machine, and according to the manufacturer the equipment can clean an area about the size of a football field (1.3 acres) in a half-hour.

However, there does not appear to be sufficient evidence on the chief sources of fecal contamination to recommend active goose management measures beyond wet pond retrofits. This is not to say that depredation or vacuuming would be ineffective, only that their value may not outweigh their disadvantages (controversy or ethical disapproval and cost, respectively).

7.9. School-Based Education Program

Members of the Poplar Creek Watershed Coalition feel strongly about the need to enhance water quality and natural resource protection education in the schools. This section therefore describes the programs that have some potential for success in the Poplar Creek school districts and presents their expected costs. Available school-based education programs were evaluated for the elementary, middle, and high school levels for the two unified school districts — Barrington Community Unit District 220 and Illinois School District U-46 — that make up the majority of the Poplar Creek watershed. The programs reviewed have been implemented in many places across the nation and have proven track records in Illinois as well as a state coordinator of the programs.

[11] http://americancityandcounty.com/mag/government_city_battles_geese/

The school-based education strategy described here is still incipient. While a group of teachers within U-46 or D220 could come together and take the training for the education programs, it is crucial for the districts to make commitments at some level to using the programs. An important task of the watershed coordinator/educator, then, is to approach the districts, as well as individual teachers, to market the benefits of an increased commitment to water resources-based environmental education.

Table 4-7. Municipalities within the major unified school districts in Poplar Creek watershed.

Municipality	D220	U-46
Barrington Hills	•	
Bartlett		•
East Dundee		•
Elgin		•
Hanover Park		•
Hoffman Estates	•	•
Inverness	•	
Schaumburg		•
South Barrington	•	
South Elgin		•
Streamwood		•
Unincorporated	•	•

7.9.1. PROJECT WILD AQUATIC

Project WILD Aquatic is a K-12 curriculum that emphasizes aquatic wildlife and aquatic ecosystems. It is based on the more terrestrially-focused Project WILD. The curriculum is organized in topic units and is based on the Project WILD conceptual framework. The program is designed for integration into existing courses of study so that instructors may use one or many Project WILD Aquatic activities as well as, of course, the entire set of activities.

Each Project WILD Aquatic activity contains the information needed to conduct that activity including objectives, method, background information, a list of materials needed, procedures, evaluation suggestions, recommended grade levels, subject areas, duration, group size, setting, and key terms. A glossary is provided, as well as a cross-reference by topics and skills. The materials are provided with the cost of the training, which is rather minimal.

Illinois DNR coordinates the program at the state level.[12] At the local level, trainings are offered to groups of 15 or more at the Spring Valley Nature Center in Schaumburg for a fee of $25 per person, which includes materials as noted above.

7.9.2. ENVIROSCAPES

The EnviroScape series (www.enviroscapes.com) offers a number of models that provide hands-on learning experiences while demonstrating environmental pollution and impacts. Watershed/Nonpoint Source is the first in the EnviroScape series, and allows students to observe the effects of nonpoint source pollution in their watershed. This model teaches students how the combined effects of pollution from diffuse sources have an impact on water quality. EnviroScape Watershed/Nonpoint Source tracks pollution from the following nonpoint sources: residential areas, forestry areas, transportation, recreation, agriculture and construction. Industry is treated as a point source.

Pollution and runoff are visually apparent to students when rain falling over the landscape top carries soil (cocoa), chemicals (colored drink mixes) and oil (cocoa and water mixture) through a watershed to a body of water. Stormwater runoff and storm drain function are also addressed. The model emphasizes pollution prevention with a follow-up demonstration that shows how to prevent such pollution through the use of best management practices. It discusses NPS pollution and the steps the public can take to help prevent contamination. It also provides a pertinent backdrop to a discussion of overall watershed concepts.

Figure 7-5. Enviroscape model. From http://www.enviroscapes.com/.

EnviroScapes also partners with the Air and Waste Management Association to provide supporting curricula, the Environmental Resource Guides (ERG), to accompany the EnviroScape model. Each ERG includes approximately 15 lessons with stated educational objectives, background information, preparation instructions, and activities and extension activities that are designed to be integrated with general science, language arts, math, social studies and art curricula.

Each EnviroScape Watershed/Nonpoint Source unit costs $747 with an additional $29 for shipping and handling. There are 49 elementary schools in total within the Poplar Creek watershed. The nine elementary schools within the Barrington Community Unit District 220 can share one unit rotated between the schools. In

[12] Valerie Keener, Project WILD Administrator
Illinois Department of Natural Resources, Division of Education
Tel: (217) 785-0973, E-mail: valerie.keener@illinois.gov

Illinois School District U-46, there are forty elementary schools. Due to this large number of schools, with an average enrollment of 500 students per school, it would be advantageous to purchase four units so that each school may have sufficient time to utilize them in the classroom. In total, the costs for the units should be $3,104. It should be sufficient to purchase two ERG K-2 and two ERG 3-5 curricula to accompany the four EnviroScape units at a cost of $170 in total.

Figure 7-6. Example poster from Enviroscapes. From http://www.enviroscapes.com/.

While it will probably not be necessary to send teachers to training to implement the ERG curriculum, teachers will most likely need to be trained to lead demonstrations using the EnviroScape model. However, the material is not difficult to master and it should be possible for one teacher to train the rest in one session of a teacher work day.

In order to create an environment-conscious setting, we also plan to purchase educational posters from EnviroScape for the Poplar Creek middle schools. The set comes with nine environmental education posters would cost $300 for the eight middle schools in U-46 and two middle schools in D-220.

7.9.3. PROJECT WET (WATERSHED EDUCATION FOR TEACHERS)

Project WET is a national, supplemental environmental education program for grades K-12 (www.projectwet.org). It is sponsored in Illinois by the Illinois Department of Natural Resources. The activities cover such topics as water quality, water use, aquatic ecosystems, water conservation, water pollution prevention and groundwater, and are provided in a teacher activity guide. Unfortunately the program's implementation in Illinois has hit a barrier recently with disagreements between the Project WET administrators and Illinois DNR. Until the situation is resolved, Project WET will not be the first choice in environmental education programming. The information below describes the PCWC's preferred approach to utilizing the curriculum once the impasse is resolved.

Although the curriculum is suitable for grades K-12, it would be most beneficial to implement Project WET at the middle and high school level. It is recommended that the districts teach Project WET during one year in middle school and during two years in high school. As an example, the cost of the program is calculated assuming the program is implemented in the 7th, 9th and 11th grades.

Table 4-8. Students, classes, and approximate number of teachers by school district (2004).

		Middle School	
District	**Total Students**	**Total Classes**	**Teachers Needed**
U-46	3,001	120	30
D-220	720	29	7
Total	**3,721**	**149**	**37**
		High School	
District	**Total Students**	**Total Classes**	**Teachers Needed**
U-46	5,108	204	51
D-220	1,392	56	14
Total	**6,500**	**260**	**65**

Assumes average class size of 25 and that each certified teacher teaches four classes.

Each Project WET workshop is 4 hours long. To estimate the cost of the program to the districts, the table below uses the approximate hourly rate for the teachers in the district and the certification fee. The total cost of training is projected to be about $3,500 for D220 and $13,000 for U-46.

	D220	**U-46**
Approx. hourly rate	$40	$37
Hours of training needed	4	4
Teachers to be certified	21	81
Certification fee per teacher	$10	$10
Total	**$3,570**	**$12,798**

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8. IMPLEMENTATION, MONITORING, AND GOAL ACHIEVEMENT

8.1. Implementation Tracking

Keeping track of progress with actual implementation of BMP's recommended by the watershed plan will be the primary criterion for determining whether load reductions are being achieved. However, the PCWC is eschewing a logic model approach to tracking implementation. Given the short timeline of the plan (five years), the milestone for structural projects recommended in the subwatershed action plans is simple: ***at least one grant application per subwatershed should be developed to implement at least one of the projects each year following plan implementation.***

While it is expected that the Poplar Creek Watershed Coalition will continue to meet at least quarterly, an annual meeting that involves evaluation by the Chicago Metropolitan Agency for Planning is recommended to help make sure implementation is on track as well as to determine the need for watershed plan revision. This will allow tracking of implementation of the watershed wide measures. The milestone for the watershed wide measures is comparably simple: ***at least one of the recommended measures should be completed or at least in progress each year for each municipality.***

The schedules for project implementation are provided in the subwatershed plans. They are also reproduced in the table below (Section 8.3) for cross-comparison.

8.2. Load Reduction Tracking and Monitoring

The PCWC has not recommended monitoring of BMP implementation, i.e., influent/effluent concentrations. The recommended BMPs are all relatively well established and there is little to be gained by monitoring their pollutant removal performance. Therefore elements (h) and (i) are being collapsed into ambient water quality monitoring. Ambient water quality is, after all, the ultimate endpoint of concern.

As Table 8-1 shows, the proposed subwatershed projects do not meet the load reduction targets specified in Section 2. However, the reductions do not include the contributions from the watershed wide measures. In the case of fecal coliform, for example, source reduction as a watershed wide measure will have to provide 30% – 5.4% = 24.6% of the load reduction. In the case of chloride and TDS, for which no effective structural techniques have been identified, watershed wide measures will have to provide all of the load reductions.

It should be noted again that the average concentrations of pollutants (except for fecal coliform) in Poplar Creek are well within the ambient standards. The reduction targets are based chiefly on reducing the *maximum sampled concentration* down to the standard (with the exception, again, of fecal coliform). The targets that have been set are therefore a very high bar to leap. Finally, because this plan is a short-term strategy (five years), there will be the potential to review new opportunities for load reduction when the plan is revised.

Table 8-1. Summary of load reductions from subwatershed projects.

	Proposed load reductions	Total watershed load	Percent reduction	
			Proposed	Target
BOD	59,448	521,245	11.4%	28%
TSS	489,703	10,212,758	4.8%	7%
Cl	—	—	—	23%
TDS	—	—	—	28%
O&G	5,206	74,372	7.0%	
FC	93,158	1,714,139	5.4%	30%

The set of criteria recommended for determination of whether loading reductions are being achieved will ideally be varied and range from quantitative to qualitative. On the more quantitative end of the spectrum, water chemistry sample analysis will need to be studied to look for year-to-year change or a trend that might emerge over a longer time period. IEPA's sampling station and MWRDGC's sampling station, discussed in Chapter 2, will both continue to provide water chemistry data available to the public for review and comment. As discussed in Chapter 2, however, the relatively course resolution of the data and confounding variables such as annual variability in weather make it exceedingly difficult, if not impossible, to explain the causal factors thought responsible for any trend that might emerge.

In addition to the ongoing efforts by IEPA and MWRDGC as mentioned above and described elsewhere in this report, the IDNR is scheduled to resample Poplar Creek's fish and macroinvertebrate communities in either 2007 or 2008. The new assessment, a follow-up to a survey last conducted during the summer of 2002, will contribute to the Coalition's ability to detect change or trends over time.

The Fox River Study Group is also planning, pending funding, to bolster their modeling effort within the Upper Fox River Basin with additional monitoring within Poplar Creek[1]. Working on behalf of the FRSG, the Illinois State Water Survey proposes a new combination streamflow and ambient water quality monitoring station on the south branch of Poplar Creek in Streamwood. Another new ambient water quality monitoring station near the mouth of Poplar Creek in Elgin is proposed to include sampling of the dissolved oxygen regime. Both sites are will be designed to help with estimation of modeling coefficients for sediment oxygen demand and streambed analyses, analyzed for particle distribution, and nutrient and organic content. Over time, these monitoring stations should help quantify changes in water quality.

Capturing water quality samples from a discrete subwatershed such as the south branch of Poplar Creek provides a scale of resolution that will yield the additional advantage of generating data that can be related with the effects of more local problem sources and solutions (i.e., BMPs) alike.

8.3. Goal Achievement

This section indicates the degree to which the recommended projects and management measures achieve the goals and objectives advanced by the PCWC in Section 1. The column "ID" gives a unique identifier to each project by subwatershed and project number (e.g., Subwatershed 500 project 3 is 500.3). Whether a project is intended to meet a goal is indicated by an "X" under the goal column. The column "S" indicates the schedule of implementation, where 1 = 2008; 2 = 2009 – 2010; 3 = 2011 – 2013.

Table 8-2. Evaluation of goal achievement.

			Goal							
ID	**Subwatershed**	**S**	1	2	3	4	5	6	7	8
	400									
400.1	Bi-weekly sweeping	2		X						
400.2	Business park pond retrofit	2	X	X						
400.3	Hospital area wetlands	2	X	X						
400.4	Tollway drainage project	3		X						
400.5	Oil/grit traps in industrial park	1		X						
			Goal							
	500		1	2	3	4	5	6	7	8
500.1	Victoria Park wetland restor.	3	X	X			X		X	
500.2	Golf/Rt 72 catchbasin inserts	1		X						
500.3	HOA pond retrofits	1	X	X						
500.4	Dry pond retrofits	3	X	X						
500.5	Brookside Pond improvement	2	X	X						
500.6	S. Barring. pkng. lot improve.	2		X			X			

[1] Overview of Recommended Phase III Water Quality Monitoring: Fox River Watershed Investigation. Contract Report 2005-13. Prepared by the Illinois State Water Survey for the Fox River Study Group. December 2005.

ID	Subwatershed	S	Goal 1	2	3	4	5	6	7	8
500.7	Filter strip installation	1	X	X						
500.8	Increase sweeping to 8x/yr	1		X						
	600		1	2	3	4	5	6	7	8
600.1	Bi-weekly sweeping	1		X						
600.2	Shady Oaks restoration	2	X	X			X		X	
600.3	Kollar Pond improvement	—	X	X						
600.4	Dolphin Park ditch improve.	3		X						
600.5	HOA pond retrofits (5)	3	X	X						
600.6	Aquarius Park bank stabiliz.	3		X						
600.7	Dolphin Park bank stabiliz.	3		X						
600.8	Oil/grit trap in industrial area	1		X						
	900 and 1100		1	2	3	4	5	6	7	8
900.1	Floodplain/WQ wetlands	—	X	X						
900.2	Stream cleanup	—	X		X					
900.3	Instream habitat improvement	—	X							
900.4	Undetained area retrofits	—		X						
900.5	Detention basin retrofits	—	X	X						
900.6	Right of way plantings	—	X						X	
1100.1	Willow Creek land protection	—	X	X						
	Watershed Wide		1	2	3	4	5	6	7	8
WW.1	Watershed-wide ed/coordin.	—							X	
WW.2	Audubon cert. for golf courses	—	X	X						
WW.3	Improved roadway mgmt.	—		X						
WW.4	Septic system program	—						X		
WW.5	Pet waste program	—						X		
WW.6	Geese management	—		X						
WW.7	Natural landscaping ordinance	—						X		
WW.8	School based education	—							X	
WW.9	Watershed funding	—								X
WW.10	Open space protection	—				X				

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