CMAP

Blackberry Creek Watershed Action Plan

December 2011

ACKNOWLEDGEMENTS

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This plan was prepared for the Blackberry Creek Watershed Coalition that formed during the course of the planning process. The many contributors to this planning process include the Cities of Aurora, Batavia, and Yorkville; Villages of Elburn, Montgomery, North Aurora, and Sugar Grove; Kane County Development, Environment, Water Resources, Transportation, and Health Departments/Divisions and Forest Preserve District; Kendall County Planning and Transportation Departments and Forest Preserve District; Blackberry, Campton, and Sugar Grove Townships; Sugar Grove Water Authority; Kane-DuPage and Kendall County Soil & Water Conservation Districts; Waubonsee Community College; Cannonball Trail Civic League; Prestbury Citizens Association; Batavia, Fox Valley, Geneva, and Sugar Grove Park Districts; Fox River Study Group; Illinois Department of Natural Resources and State Water Survey; Sierra Club; Yorkville-Bristol Sanitary District; and local engineering and ecological restoration consultants.

Black and white line drawings courtesy of University of Wisconsin - Extension and Wisconsin Department of Natural Resources.

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NOTES

1. INTRODUCTION

"Without water, there would be no life on this planet. Water is the major environmental issue of the 21st century; all other concerns pale in comparison."
James Sipes, Sustainable Solutions for Water Resources, 2010.

The role of watershed planning is to resolve and prevent water quality problems using a "bottom-up" collaborative approach. A watershed is the area that drains to a common waterway, such as a stream, lake, estuary, wetland, or aquifer1 (Figure 1-1). The cumulative effect of our individual actions impacts our watersheds; therefore, water pollution prevention and ground-water protection is the shared responsibility of the general public (Figure 1-2).

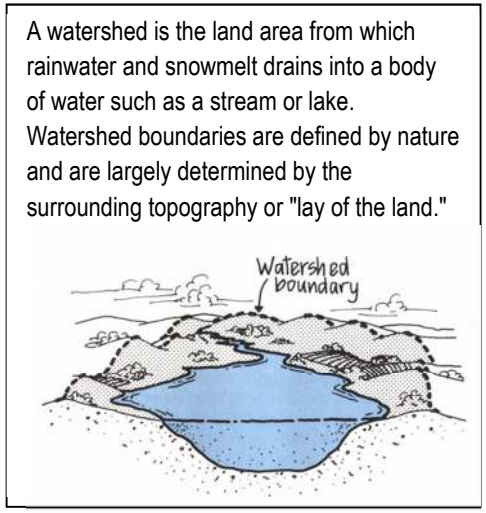


Figure 1-1. What is a watershed?

[1] "Watersheds," U.S. EPA, last modified October 3, 2011, http://water.epa.gov/type/watersheds/index.cfm (accessed Nov. 2, 2011).

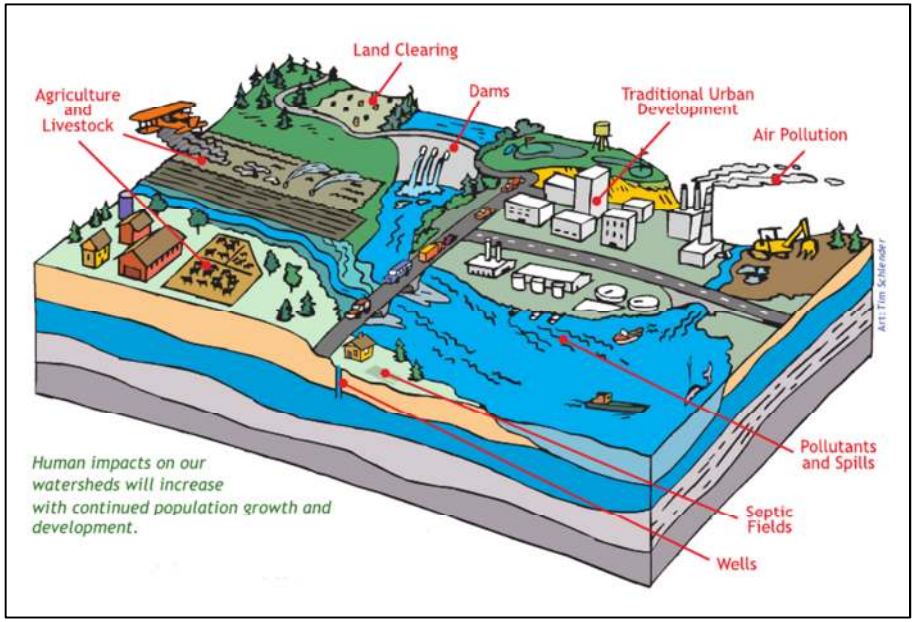


Figure 1-2. Potential human impacts on watersheds.
Source: Washington Dept. of Ecology

1.1 WATERSHED PLANNING OVERVIEW

The Blackberry Creek Watershed is located in south-central Kane and north-central Kendall Counties and has a drainage area of approximately 75 square miles (Figure 1-3). This watershed (Hydrologic Unit Code 0712000702) covers portions of the Cities of Aurora, Batavia, and Yorkville; the Villages of Campton Hills, Elburn, North Aurora, Sugar Grove, Montgomery, and Oswego;

and unincorporated areas in Kane and Kendall Counties primarily within the Townships of Campton, Blackberry, Batavia, Sugar Grove, Aurora, and Bristol. Small portions of Kaneville and Geneva Townships also fall within the watershed. The watershed is located on the urban fringe of the Chicago metropolitan area where Kane and Kendall Counties are two of the fastest growing counties in Illinois (Kendall is the fastest and Kane is the fifth in growth rates as compared to the rest of the state).[2] The total population in Blackberry Creek watershed is approximately 60,000.[3]

The Chicago Metropolitan Agency for Planning (CMAP), in its role as the delegated authority for the region's areawide water quality management plan, works with local units of government to outline management strategies for reducing point and nonpoint source pollution, protecting groundwater, and disposing of wastewater throughout the seven-county, northeastern Illinois region.[4,5] This is accomplished through

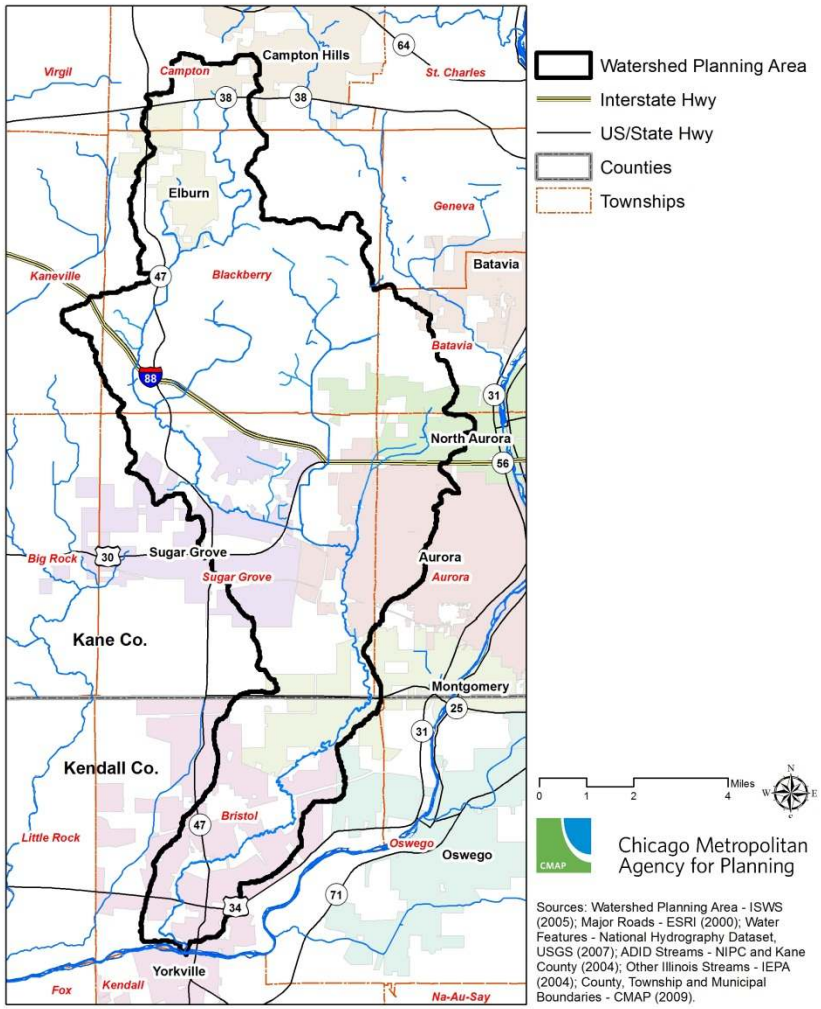


Figure 1-3. Municipalities, townships, and counties within the Blackberry Creek Watershed.

[2] Bureau of the Census. "2010 Census Summary File 1." *2010 Census*, Kane and Kendall Counties, Illinois. Washington, D.C.: Bureau of the Census, 2011. http://www2.census.gov/census_2010/04-Summary_ File_1 (accessed November 3, 2011).

[3] Ibid.

[4] "Chicago Metropolitan Agency for Planning," accessed November 2, 2011, http://www.cmap.illinois.aspx.

[5] One major feature of the Clean Water Act (P.L. 92-500) is the requirement that areawide plans be prepared for controlling water pollution, from all sources, in urban-industrial areas like northeastern Illinois. While authority for implementing the Clean Water Act rests with the USEPA, responsibility for preparing areawide plans has been assigned to states. The Northeastern Illinois Planning Commission (NIPC) became the delegated authority for developing this plan in 1975 and that responsibility has since been passed on to CMAP. Also, see *Areawide Water Quality Management Plan for Northeastern Illinois*. Chicago, IL: CMAP, 1979.

a collaborative watershed approach to planning that seeks to protect and/or remediate water quality.[6]

In 2010, CMAP entered into an agreement with the Illinois Environmental Protection Agency (EPA)[7] to complete three watershed-based plans within the Fox River basin, including the Blackberry Creek Watershed. Funding for these projects was provided by the Illinois EPA through Section 604(b) of the Clean Water Act.

1.1.1 Watershed-based Plan Components & Goals

The fundamental purpose of the watershed-based plan is to evaluate and recommend the best measures to help restore the beneficial uses in Blackberry Creek, with the long-term goal of improving conditions enough that Blackberry Creek can be removed from the Illinois Section 303(d) list.[8] Assessment of Blackberry Creek by Illinois EPA in 2010 resulted in "non-support" designation for primary contact.[9] Since the only identified cause of impairment in Blackberry Creek is fecal coliform, the focus will be on recommendations to reduce this cause as well as those that address the goals identified by the Blackberry Creek Watershed stakeholders.

The United States Environmental Protection Agency (U.S. EPA) has identified nine components that a watershed-based plan must incorporate:

1. Identify causes and sources of pollution that will need to be controlled to achieve pollutant load reductions estimated in the watershed plan.
2. Estimate pollutant reduction loads expected from following implementation of management measures described in #3 below.
3. Provide a description of the nonpoint source management measures that will need to be implemented to achieve load reductions estimated under #2 above and an identification of the critical areas where measures need to be implemented.
4. Estimate the amount of technical assistance, associated costs, potential funding sources, and parties that will be relied upon for plan implementation.
5. Develop a public information/education component designed to change social behavior.

[6] A watershed planning approach often addresses other related natural resource (e.g., open space, habitat, etc.) or built-environment (flooding, stormwater, etc.) management issues in a complementary fashion. In so doing, a watershed plan can be multi-objective.

[7] "Illinois Environmental Protection Agency: Bureau of Water," accessed November 2, 2011, http://www.epa.state.il.us/water/.

[8] State Section 303(d) lists feature information on waterbodies where one or more designated uses have been assessed and deemed impaired. The list identifies both potential causes and sources of impairment for the assessed designated use(s). See http://www.epa.state.il.us/water/tmdl/303d-list.html.

[9] "Primary contact use is defined as any recreational or other water use in which there is prolonged and intimate contact with the water [where the physical configuration of the water body permits it] involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing" (*Primary Contact*. *Ill. Adm. Code* 35, Subtitle C, Chapter 1, Part 301, Section 355. http://www.ipcb.state.il.us/documents/dsweb/Get/Document-33352/ [accessed November 3, 2011]).

6. Develop a plan implementation schedule.
7. Develop a description of interim, measureable milestones.
8. Identify indicators that can be used to determine whether pollutant loading reductions are being achieved over time.
9. Develop a monitoring component to evaluate the effectiveness of the implementation efforts over time.

The plan also addresses some of the regional criteria piloted in the Kishwaukee River Basin for which three watershed-based plans were completed by CMAP in 2008, as described below.[10]

1. Set target pollutant-load reductions for impaired waters taking into account both point- and nonpoint source pollution sources.
2. Consider groundwater protection from both water quality and water quantity perspectives.
3. Compare municipal codes and ordinances against the U.S. EPA-developed Water Quality Scorecard or other equivalent methods/tools.

[10] CMAP. *Upper Kishwaukee River Watershed Plan Technical Report*. Chicago, IL: CMAP, November 2008. http://www.cmap.illinois.gov/c/document_library/get_file?uuid=a98ddc94-28f5-4c1e-9baa-c421adee653e&groupId=20583 (accessed November 9, 2011).

1.1.2 Watershed Planning Process

Planning Partners

Stakeholder/Planning Participants: The planning group included people and organizations that have a stake in the development and implementation of the Blackberry Creek Watershed Action Plan. Participants strengthened the end result by bringing in new ideas and input and by increasing public understanding of problems and offering commitment to solutions. The Blackberry Creek Watershed planning participants encompassed a diverse membership that is representative of the various sectors in the study area. Stakeholders included representatives from local municipalities, counties, and townships; forest preserve and park districts; landowners; special interest groups; homeowners associations; businesses; and other citizens that live, work, or recreate in the watershed (Appendix A).

Watershed Coordinator: The role of the watershed coordinator was to serve as the local liaison for the identification and promotion of stakeholder involvement throughout the planning process. The Conservation Foundation (TCF), which served as the Blackberry Creek Watershed Coordinator, was established in 1972 as a not-for-profit land and watershed protection organization. TCF has been involved in planning coordination and technical assistance for a number of watershed plans

including Upper DuPage River, Aux Sable Creek, Lower DuPage River, Salt Creek, and Tyler Creek.[11]

Outreach Coordinator: The outreach coordinator served as the information outlet for the planning process using various mechanisms, including a dedicated website, articles and announcements in newsletters, and tours of sites within the watershed. The outreach coordinator for the Blackberry Creek Watershed Action Plan was the Fox River Ecosystem Partnership (FREP) which is a non-for-profit created in 1996, comprised of local governments, private businesses, not-for-profits, and landowners in the Fox River Basin. FREP's vision for the Fox River Basin "is to balance all the uses and demands on our natural resources while preserving and enhancing a healthy environment."[12]

Plan Development

As the project lead, CMAP facilitated and provided technical assistance throughout the watershed-based planning process. Among those responsibilities was leading monthly stakeholder meetings. These meetings directed the development of the watershed-based plan via stakeholder input, best professional judgment, and the requirements enumerated above. Additionally, CMAP compiled a comprehensive watershed resource inventory which includes the natural and man-made resources in the watersheds.

Plan Adoption

A watershed-based plan is an advisory document but serves as the primary means for addressing nonpoint source (NPS) pollution. After decades of investments in wastewater treatment and policies to address other point source discharges, nonpoint source pollution has emerged as the focal point nationwide for improving water quality and meeting the goals of the Clean Water Act. Following plan completion, stakeholders may champion plan implementation by supporting resolutions for plan adoption by the various organizations and governmental entities. CMAP and TCF staff will be available to make presentations to the boards of municipal, county, township, and other governing bodies. There is precedent for formal adoption of watershed plans, most notably the 1999 Blackberry Creek Watershed Management Plan as well as three watershed plans developed within the Kishwaukee River Basin in 2008. These plans were each adopted by resolution by the cities and counties involved.

With formal adoption, many activities can occur at the local level to protect and enhance water quality. Ordinances may need to be revised, while local funding may need to be committed to projects through normal budgeting processes. Given the difficult fiscal situation that many implementers face, the plan has to be sensitive to the need to minimize local funding contributions.

[11] "The Conservation Foundation," Conservation Foundation, accessed November 8, 2011, http://www.theconservationfoundation.org/.
[12] "Fox River Ecosystem Partnership," FREP, accessed November 8, 2011, http://foxriverecosystem.org/.

External funding is expected to cover some or most of the costs of projects in the short term implementation plan. It is CMAP's intent to help inform stakeholders of grant and other technical assistance opportunities and provide guidance in developing grant applications for implementing projects within the Blackberry Creek Watershed.

1.2 1999 Blackberry Creek Watershed Management Plan

Several studies and plans have been completed in the Blackberry Creek Watershed. Following a major flood event in July 1996, the Blackberry Creek Watershed Resource Committee was formed to develop a watershed management plan. Completed in 1999, recommendations of the Blackberry Creek Watershed Management Plan focused mainly on restoration of the stream network, prevention of problems created by urbanization in the watershed, and ongoing maintenance of stormwater management systems to reduce existing flooding problems.[13]

The 2011 Blackberry Creek Watershed Action Plan is distinct from the 1999 Plan in its increased focus on water quality instead of flood remediation. Goals and recommendations/strategies for this plan will aim to reduce and ultimately eliminate the cause of stream impairment identified by Illinois EPA. It is important to note that in the development of this plan, significant review of the 1999 Plan was conducted to avoid duplication and provide relevant updates. These updates will be explored in various sections of this plan.

1.2.1 Implementation of the 1999 Plan Recommendations

As a step towards implementation of the 1999 Plan, the Blackberry Creek Watershed Alternative Futures Analysis was completed in 2003. This study evaluated recommendations for land use and planning best management practices (BMPs) as well as stormwater management BMPs.[14] Additionally, the United States Geological Survey (USGS) completed a hydrologic study in 2005.[15]

Table 1-1 summarizes many of the recommendations from the 1999 Plan, with specific focus on water quality, that were implemented, are ongoing, or have unknown implementation status. The 1999 Plan recommendations were categorized under four main headings (General, Remediation/Restoration,

[13] Blackberry Creek Watershed Resource Planning Committee. *Blackberry Creek Watershed Management Plan*. Geneva, IL: Kane County Stormwater Management, 1999. http://www.co.kane.il.us/kcstorm/watershed_floodplain/BlackberryCreek/ (accessed December 29, 2011).

[14] Kane County Department of Environmental Management. *Blackberry Creek Watershed Alternative Futures Analysis, Executive Summary*. Geneva, IL: Kane County Department of Environmental Management, April 2004. http://www.co.kane.il.us/kcstorm/blackberry/ExecSummary.pdf (accessed November 9, 2011).

[15] USGS. *Hydrological Study Activity in the Blackberry Creek Watershed, Illinois*. Reston, VA: USGS. http://il.water.usgs.gov/proj/factsheets/ soong_fs.pdf (accessed November 9, 2011).

Prevention, and Maintenance/Ongoing) and specific actions were identified for four main groups, namely Municipalities and Counties, Park and Forest Preserve Districts, County Stormwater Committees, and Resource Agencies (federal, state, and regional). The "implementation status" in Table 1-1 represents information provided by the Blackberry Creek Watershed planning participants along with TCF and CMAP staff.

Based on the input provided by the Blackberry Creek Watershed planning participants, it seems that some recommendations in Table 1-1 are currently not implemented regionally throughout the watershed. However, it is clear that some communities have undertaken various actions that focus on water quality improvements. For example, the City of Aurora enacted a stormwater utility fee, and along with Kane County, utilizes fee-in-lieu for various water quality improvements activities, mostly in new development. Additionally, the Village of Montgomery has experimented with regional detention for subdivision developments.

These recommendations will be revisited in this planning cycle and potentially reintroduced as a greater understanding of implementation obstacles is obtained and addressed.

Zoning Code Analysis & Recommendations

As another step towards implementation of the 1999 Plan, the Conservation Design Forum (CDF) completed a Zoning Code Analysis in 2004 for the local governments in the Blackberry Creek Watershed. This analysis was accompanied by recommendations for ordinance language that aimed to reduce the impacts of stormwater and improve the quality of life in the Blackberry Creek Watershed.[16] The recommended language was classified into six main categories:

1. Alternative stormwater standards called for the use of biofiltration techniques to address surface runoff in addition to charging fees to provide incentives for reducing impervious cover.
2. Environmental standards addressed criteria for open space areas including identification of potential open space, allowable uses, buffer transitions, as well as the preparation of management plans and the institutionalization of revenue sources.

[16] Conservation Design Forum. *Blackberry Creek Watershed Zoning Code Analysis and Ordinance Language Recommendations*. Ann Arbor, MI: Conservation Design Forum, April 2004. http://foxriverecosystem.org/WatershedPlanning/Blackberry/Docs/OrdinanceFinalReport.pdf (accessed November 9, 2011).

Table 1-1.
Implementation Status of Water Quality-Related Recommendations in the 1999 Blackberry Creek Watershed Management Plan, as of 2011*

RECOMMENDATION	IMPLEMENTED PROJECT/ POLICY	PRIMARY IMPLEMENTER(S)	IMPLEMENTATION STATUS
GENERAL			
Legislation for Kendall Co. providing stormwater management authority	Same	Kane County	Completed: Kendall County Board passed a resolution establishing a Stormwater Planning Committee in 2009
Develop countywide stormwater management programs for Kane & Kendall Co.	Same	Kane County Kendall County	Programs developed and in place for Kane County http://www.co.kane.il.us/kcstorm/index.asp Ongoing in Kendall County (countywide stormwater management ordinance is expected to be adopted by Board in early 2012) (See #26 below for links to stormwater management ordinances & technical guidance documents)
Develop hydrologic & hydraulic computer models of the watershed	Same	Kane & Kendall Counties with resource agencies	Completed by Kane Co., Kendall Co., & U.S. Geological Survey (USGS) http://pubs.usgs.gov/sir/2005/5270/ http://pubs.usgs.gov/sir/2007/5141/
Prepare aerial photo-based 2-foot contour mapping; create photo mosaic of historical aerial photos	Same	Kane & Kendall Counties	Completed for Kane Co., available from Kane Co. GIS Dept.
Develop a detailed watershed plan for the Blackberry Creek Watershed (prepare more site-specific plans, incorporate Plan recommendations in local plans)	Aurora Countryside Vision Plan Orchard Road/ Blackberry Creek Corridor Plan Sugar Grove Park District Open Space Master Plan Yorkville Vision Plan Prestbury subdivision restoration plan	City of Aurora Village of Montgomery Sugar Grove Park District United City of Yorkville Prestbury Citizens Association	Completed in 2000: http://www.aurora-il.org/documents/planning/Countryside_Vision_Plan.pdf Completed in 2005: http://ci.montgomery.il.us/DocumentView.aspx?DID=130 Completed in 2009: http://www.sugargroveparkdistrict.org/pdf/EntireMasterPlan.pdf Completed the Yorkville Comprehensive Plan: http://yorkville.il.us/depts_commDev_CompPlan_2008Ref.php Completed
Establish a bi-county watershed advisory committee	Same	County stormwater committees, municipalities, counties, townships, districts, resource agencies	Currently no standing committee
Develop and implement public education programs	Yorkville NPDES	United City of Yorkville	Ongoing: Yorkville Stormwater Management Program, 2010 http://www.yorkville.il.us/documents/StormwaterManagementPlan2010.pdf

Table 1-1. (continued)
Implementation Status of Water Quality-Related Recommendations in the 1999 Blackberry Creek Watershed Management Plan, as of 2011*

RECOMMENDATION	IMPLEMENTED PROJECT/ POLICY	PRIMARY IMPLEMENTER(S)	IMPLEMENTATION STATUS
REMEDIATION/RESTORATION			
Develop guidelines for stream restoration	Alternative Futures Project	The Conservation Foundation (TCF)	Completed in 2003: http://www.co.kane.il.us/kcstorm/blackberry/
Identify demonstration projects for stream (& lake shore) restoration	Lake Run Habitat Restoration Project Lake Prestbury Shoreline Stabilization Project United Methodist Church of Sugar Grove site restoration	Kane Co. & FPD of Kane Co. Prestbury Citizens Association UMC	Completed a 319-funded project in 2006 which included stream channel restoration, stream re-meandering, & wetland restoration Completed a 319-funded project in 2010 2000
Encourage & assist riparian landowners in establishing & restoring natural stream (& lake) & wetland buffers	Windstone Subdivision Lake Riparian Restoration Waubonsee Wetland & Open Savanna Enhancement Yorkville Citywide Creek Restoration	Windstone Sudivision, Sugar Grove Waubonsee Community College United City of Yorkville	Completed a Conservation 2000-funded project in 2003 Completed a Conservation 2000-funded project in 2008 Ongoing: Army Corps of Engineers Rock Island District Blackberry Creek Ecosystem Restoration report and plan for Yorkville, IL (2003)
Identify & implement opportunities to restore natural stream & wetland conditions	Lake Run Habitat Restoration Project Prestbury Wetland Restoration Project Nelson Lake Marsh - Restoration & Education	Kane Co. & FPD of Kane Co. Prestbury Citizens Assoc. FPD of Kane Co.	Completed a 319-funded project in 2006 which included stream channel restoration, stream re-meandering, & wetland restoration Completed a wetland restoration project in 2007 Completed a Conservation 2000-funded project in 2008
Investigate the feasibility & desirability of removing the Blackberry Creek Dam	Same	U.S. Army Corps of Engineers	Ongoing: A peer-reviewed plan by USGS has been completed; approval of the final Feasibility Report for dam removal is scheduled for July 2012
Coordinate with Forest Preserve and Park District acquisition & development activities to achieve runoff control benefits	Same	Municipalities, counties, townships	Unknown
Encourage & support incentive programs to implement BMPs on agricultural lands	Same	Kane-DuPage SWCD, Kendall Co. SWCD, USDA-NRCS	Unknown
Identify & pursue opportunities for detention retrofitting	Same	Municipalities, counties	Unknown
Identify & pursue opportunities to construct detention basins in older developed areas	Cherry Hill Subdivision detention basin Orchard Rd. detention basins & wetlands	Cherry Hill subdivision City of Aurora	Unknown
Require detention or fee-in-lieu for redevelopment projects	Same	Municipalities, counties, county stormwater committees	Unknown
Pursue runoff reduction programs in existing development	Same	Municipalities, counties, townships, forest preserve/park districts	Unknown
Identify & publicize demonstration projects to facilitate Plan recommendations	Same	Municipalities, counties, forest preserve/park districts, county stormwater committees	Unknown

Table 1-1. (continued)
Implementation Status of Water Quality-Related Recommendations in the 1999 Blackberry Creek Watershed Management Plan, as of 2011*

RECOMMENDATION	IMPLEMENTED PROJECT/ POLICY	PRIMARY IMPLEMENTER(S)	IMPLEMENTATION STATUS
PREVENTION			
Prepare & adopt comprehensive watershed protection ordinances	Same	Kane County Kendall County	Kane County Stormwater Management Ordinance (SMO) adopted Nov. 2000, latest revision Nov. 2009;Technical Guidance Manual adopted Oct. 2001, latest revision Nov. 2009; Retention Best Management Practices adopted Nov. 2009 http://www.sterlingcodifiers.com/IL/Kane%20County/index.htm http://www.co.kane.il.us/kcstorm/ordinance/Technical_FINAL.pdf http://www.co.kane.il.us/kcstorm/ordinance/article16.pdf Ongoing: Kendall County Countywide SMO is expected to be adopted by County Board in early 2012 http://www.co.kendall.il.us/zoning/ordinances.htm
Prepare Advanced Identification of Wetlands (ADID)* studies	Inventory of wetlands throughout county	Kane County Kendall County	ADID study and Fen Identification and Recharge Area Mapping project completed in 2004 http://www.co.kane.il.us/kcstorm/adid/index.htm http://www.co.kane.il.us/kcstorm/fen/final_report.pdf Kendall County would like to conduct an ADID study, but dedicated supporting funds are no longer available from U.S. EPA
Facilitate appropriate regional detention	Same	Municipalities, counties, county stormwater committees	Unknown
Encourage site design measures to reduce increases in surface runoff volumes through the minimization & disconnection of impervious areas; utilization of natural drainage, native landscaping, & naturalized detention basins; and cluster development	United City of Yorkville: Stormwater Management Program Plan Subdivision Ordinance	United City of Yorkville	http://www.yorkville.il.us/documents/StormwaterManagementPlan2010.pdf http://www.yorkville.il.us/docs/Ordinance_Subdivision_Control.pdf
Develop a wetland bank within the Blackberry Creek Watershed	Same	County stormwater committees, park/ forest preserve districts	Addressed: Campton Township operates a Wetlands Bank approved by the U.S. Army Corps of Engineers
Ordinances and regulatory tools	United City of Yorkville: Stormwater Management Program Plan Subdivision Ordinance	United City of Yorkville	http://www.yorkville.il.us/documents/StormwaterManagementPlan2010.pdf http://www.yorkville.il.us/docs/Ordinance_Subdivision_Control.pdf
Acquire/restore 7 large wetland complexes identified by Wetlands Technical Team	2,500 acres of land purchased by Kane County Forest Preserve District	Forest preserve/ park districts, municipalities, counties, townships	Ongoing FPD of Kane County now owns several of the identified wetland sites
Pursue acquisition of all high quality wetlands in watershed	Same	Forest preserve & park districts, municipalities, counties, townships	Ongoing

Table 1-1. (continued)
Implementation Status of Water Quality-Related Recommendations in the 1999 Blackberry Creek Watershed Management Plan, as of 2011*

RECOMMENDATION	IMPLEMENTED PROJECT/ POLICY	PRIMARY IMPLEMENTER(S)	IMPLEMENTATION STATUS
MAINTENANCE / ONGOING			
Develop stream & wetland maintenance & management guidelines	Same	County stormwater committees, park/forest preserve districts	Unknown
Encourage & assist rural riparian landowners in appropriate stream & wetland maintenance & management		Counties, townships, drainage districts, park/forest preserve districts, county stormwater committees, SWCDs, NRCS	Unknown
Perform stream & wetland maintenance & management in urban areas	Coordinated management plan along creek Orchard Road/ Blackberry Creek Master Plan	United City of Yorkville Montgomery	http://www.yorkville.il.us/documents/Ord.2008-01WetlandProtectionRegulations.pdf http://ci.montgomery.il.us/DocumentView.aspx?DID=130
Identify & promote sites where appropriate stream & wetland maintenance practices are being used	Same	Municipalities, counties, townships, park/forest preserve districts, resource agencies	Unknown
Develop maintenance guidelines and mechanisms for constructed stormwater management systems	Same	County stormwater committees	Unknown
Maintain constructed stormwater management systems	Same	Municipalities, counties, county stormwater committees	Unknown
Develop a source control program to address nonpoint source pollution from developed areas	Part of ongoing public education programs	Counties, The Conservation Foundation (TCF)	Unknown

*Implementation information was provided by Blackberry Creek Watershed planning participants or derived from a 2004 implementation status report prepared by The Conservation Foundation. While stakeholder input was sought on the status of the recommended implementation activities, this list is by no means exhaustive of the many plans, programs, and projects likely implemented.

3. Landscape standards allowed for the integration of biofiltration[17] into parking and street side landscape as well as the expansion of tree and vegetation protection and management.
4. Parking requirements intended to update standards mainly to include parking credit programs and parking for non-motorized vehicles in addition to allowances for permeable surfaces.
5. Transportation requirements specified design standards for street width, stream crossings, bike and parking lanes, and the use of naturalized stormwater infiltration and conveyance systems.
6. Zoning/subdivision standards included site capacity analyses based on remaining developable land after removal of floodplains, streams, wetlands, and other undevelopable lands. These standards additionally recommended open space requirements that vary with development density, to be used for naturalized drainage; and for clustering to achieve the open space requirements along with density bonuses.

As part of this Blackberry Creek Watershed planning process, municipal representatives were asked to respond to a survey, the goal of which was to understand the extent to which the recommendations from the above study were adopted and the obstacles to adoption where they were not. There might be potential opportunities to incorporate more of the recommended language where local units of government are seeking to modify ordinances in the relevant areas. The survey instrument is provided in Appendix B. Below is a summary of the survey results received.

- Kane County:[18]
  - Alternative stormwater standards: Kane County adopted a countywide stormwater management ordinance in November 14, 2000. Many of the items suggested within the Blackberry Creek Alternative Futures Project have been implemented via this ordinance and have been required not only in unincorporated Kane County but within the corporate limits of numerous communities located in Kane County. Updates to this ordinance have been completed through the years, including the adoption of the Retention Best Management Practices of the Kane County Stormwater Management Technical Manual on November 10, 2009.
  - Environmental standards: Kane County has been on the forefront of identifying critical natural areas and resources within the watershed, working closely with the Forest Preserve District of Kane County and the adoption of the Kane County 2030 Resource Management Plan. Out of all the watersheds within Kane County, the Forest Preserve District owns more land within the Blackberry Creek watershed than any other watershed. Any developments

[17] Biofiltration is a soil filtration system that utilizes vegetation and mulch for the treatment of rainwater runoff.

[18] Kane County summary provided by Ken Anderson, Kane Co. Dept. of Facilities, Subdivision & Environmental Resources, December 2011.

that proceed within the Kane County subdivision development process are required to inventory the natural resources located within subject property and develop strategies to protect and enhance them.

- Landscape standards: Kane County requires the preservation of woodlands, prairies, wetlands, and geological features as part of the development process. This is a critical part of the subdivision ordinance and process as staff works with the developers of said land.
- Parking requirements: The Kane County Stormwater Management Ordinance encourages alternative stormwater management practices for parking areas.
- Transportation requirements: Kane County requires all Kane County Division of Transportation projects to comply with the Kane County Stormwater Management Ordinance. Transportation needs are evaluated by staff on a development by development process, which includes street width requirements and the like.
- Zoning/Subdivision standards: Kane County evaluates each development in accordance with the Kane County 2030 Resource Management Plan and Subdivision Regulations. Resource Management land planning is based on existing site conditions which includes developable land, floodplains, streams, wetlands, and other undevelopable lands. Kane County requires open space and development density to be sustainable. Clustering is encouraged to achieve the open space requirements along with density.

- Kendall County:[19]
  - Alternative stormwater standards: Kendall County is working to adopt a countywide Stormwater Ordinance which is currently out for final review by the surrounding counties and state agencies as of December 2011. Best Management Practices, as recommended within the Blackberry Creek Watershed Plan, will be reviewed and considered for incorporation into the countywide Kendall County Stormwater Ordinance.
  - Environmental standards: Since the adoption of Kendall County's Residential Planned Development Zoning in 2001, the County made it a high priority to identify natural areas and resources to preserve and protect as well as incorporate these while planning a subdivision development. Recommended language for environmental standards was incorporated into the County's Zoning Ordinance during the update in 2001. The exceptions are the recommendations for overlay districts as the County does not have such districts, and where conditions are placed on agricultural lands.
  - Landscape standards: Kendall County requires the preservation of mature woodlands, prairies, wetlands, and geological features as part of the development process. This is a critical part of the subdivision ordinance and process as staff works with developers on a proposed development.
  - Parking requirements: The Kendall County Zoning Ordinance encourages alternative stormwater management

[19] Kendall County summary provided by Angela Zubko, Kendall County Department of Planning, Building and Zoning, March 2011.

practices for parking areas as well as shared parking to reduce impervious area. Sections that reference bicycle parking are not currently relevant to the unincorporated parts of the county due to the absence of sidewalks and trails. The sections that address runoff treatment and aisle widths are incorporated in the county regulations. While the county regulations do not specifically allow for reduction of parking space requirements based on alternatives such as carpooling or proximity to transit, the ordinance allows for variances to the standards. Due to absence of downtown areas in the unincorporated parts of Kendall County, the requirements for parking structures and off-street parking are not relevant.

- Transportation requirements: Current county ordinance includes most of the items in this section while potential modification in the ordinance may include the sections pertaining to street widths and right of way. Kendall County continues to consider alternative widths of street right of ways on a case by case basis.
- Zoning/Subdivision standards: Current county ordinance includes most of the items in this section with the exception of incentives for infill as that is not currently relevant. Kendall County evaluates each development in accordance with existing County subdivision and zoning regulations. Land Planning is based on existing site conditions which includes developable land, floodplains, streams, wetlands, topography, and other undevelopable lands. Kendall County requires open space, secondary open space, and density to be sustainable. Clustering is encouraged to achieve the open space requirements along with density.

- North Aurora:[20]
  - Alternative stormwater standards: The Village adopted stormwater incentive fees based on the Kane County Ordinance. This was the only item that was incorporated from this section.
  - Environmental standards: Village code currently requires backup Special Service Areas to be established in all new subdivisions, which encompasses maintenance of common areas. Additionally, the Village has wetland regulations that follow the Kane County Ordinance.
  - Landscape standards: Currently, Village code includes requirements for parking lot landscaping, tree planting, and tree preservation.
  - Parking requirements: The code incorporates language that addresses parking lot aisle width, parking ratios for single family residences, and alternate paving material. The Village is currently revising the zoning ordinance and may incorporate the language that addresses joint parking and parking ratios for other sectors.
  - Transportation requirements: The road alignment language is in the current subdivision ordinance. This is the only item that was incorporated from this section.
  - Zoning/subdivision standards: The Village ordinance addresses infill incentives and prohibits the expansion of

[20] Update from the Village of North Aurora provided by Scott Buening, Community Development Department, March 2011.

non-conforming uses as per recommended language. Currently, a site capacity analysis is not incorporated in the regulations.

- Elburn:[21]
  To date, the Village of Elburn did not incorporate any of the recommended ordinance language. Within the next five years, the Village will be evaluating its zoning ordinance and there might be an opportunity to integrate recommendations that address water quality. Currently the real barrier to this approach is education on the subject matter, specifically to the development community.

- Montgomery:[22]
  - Alternative stormwater standards: The stormwater guidelines for the Village of Montgomery include allowances for native plantings.
  - Landscape standards: Current code incorporates tree preservation requirements for trees with at least 6-inch diameter.
  - Parking requirements: Parking rules for clinics state a required parking ratio of one parking spot for every 200 square feet. For offices, the ratio is one spot per 300 feet, while the ratio for shopping centers is one parking spot per 200 feet in developments less than 50,000 square feet; and one spot for every 250 square feet in developments more than 50,000 square feet. Additionally, the code reflects a requirement for two bicycle spaces as a minimum in industrial areas. Parking dimensions are 9'x18.5'.

The above ordinance modifications have been adopted after 2004.

1.3 WATERSHED CONCERNS

The Blackberry Creek Watershed planning participants identified the following concerns from their experiences living and working in the watershed, listed in no particular order:

- Loss of land from erosion/back pressure
- Flooding as a result of creek constraints such as bridge work
- Impacts of channel modification on water quality and quantity
- Impacts of homeowner association and golf course maintenance practices, with specific reference to the use of herbicides and pesticides
- Impacts on groundwater sources from additional pumping due to increased development
- The presence of a large amount of Canada geese along various parts of the creek
- The presence of floating foam spotted along a specific portion of the creek north of Aucutt Road
- Impact of the Blackberry Creek dam on habitat quality

[21] Update from the Village of Elburn provided by Erin Willrett, Village Administrator, October 2011.
[22] Update from the Village of Montgomery provided by Jerad Chipman, Planning Department, July 2011.

This plan attempted to address stakeholders concerns by providing recommendations that address the activities that may negatively impact water quality. For example, natural lawn care and sustainable landscape practices (Chapter 4) are options for homeowners and property managers to decrease the impacts of herbicides, pesticides, and the presence of geese; a water use conservation ordinance is a measure that local governments may adopt to reduce water consumption, specifically in groundwater-dependent communities, as a result of increased development. During the course of the planning process, stakeholders had the opportunity to address their concerns regarding the Blackberry Creek dam to representatives of the U.S. Army Corps of Engineers who are conducting a Blackberry Creek Fish Passage Project that aims to restore habitat quality and connectivity by removal of the dam.[23] Due to time constraints, a few of the concerns were not addressed and should be revisited at a future planning process.

1.4 WATERSHED GOALS

Drawing from the watershed concerns, the Blackberry Creek Watershed planning participants developed the following goals for the Watershed Action Plan:

1. **Reduce fecal coliform contributions** (an indicator of bacterial contamination)

   Objective: Inventory potential sources of fecal coliform

   Strategies:
   - Develop a list and accompanying map that identifies potential sources and locations of fecal coliform contributions based on literature review and other sources (e.g., stakeholders)
   - Develop recommendations at the policy (land use adjacent to water surfaces) and site-specific (BMPs) levels that aim to reduce the impact of the potential sources for fecal coliform contribution on the watershed
   - Develop a monitoring strategy that delineates the locations and sources of fecal coliform contributions with the goal of targeting said locations

   Evaluation Measures:
   - Number of potential source locations identified
   - Number of ordinances developed/adopted aiming to reduce above impacts

[23] Presentation available at: http://foxriverecosystem.org/Watershed Planning/Blackberry/Presentations/USACE-11-16-10.pdf.

2. **Reduce nutrient loadings and other emerging pollutant loadings**

Objectives:

- Identify potential sources of nutrients and pollutant loadings in the watershed
- Estimate future loadings using predictive models based on future land use
- Develop land use strategies that aim to mitigate estimated future loadings
- Promote awareness of impacts of property maintenance practices—especially the use of fertilizers, pesticides, and herbicides—on water quality

Strategies:

- Develop overlay ordinances for locations of potential sources of nutrient and pollutant loadings

Evaluation Measures:

- Number of ordinances adopted
- Improved Index of Biotic Integrity (IBI) and Macroinvertebrate Biotic Index (MBI) scores

3. **Minimize sedimentation, siltation, streambank, and streambed erosion**

Strategies:

- Develop ordinances and subdivision regulations that specify buffer zones- size, plantings, etc.

Evaluation Measures:

- number of ordinances or subdivision regulations developed and adopted by local governments

4. **Reduce risk of flooding through initiatives to improve water quality**

Strategies:

- Gain an understanding of capacity of existing stormwater infrastructure, identify gaps, and promote green infrastructure practices

Evaluation Measures:

- Number of BMPs implemented at the governmental level
- Number of programs for BMP implementation

5. **Protect groundwater resources**
(This is further discussed in Chapters 2 and 4)

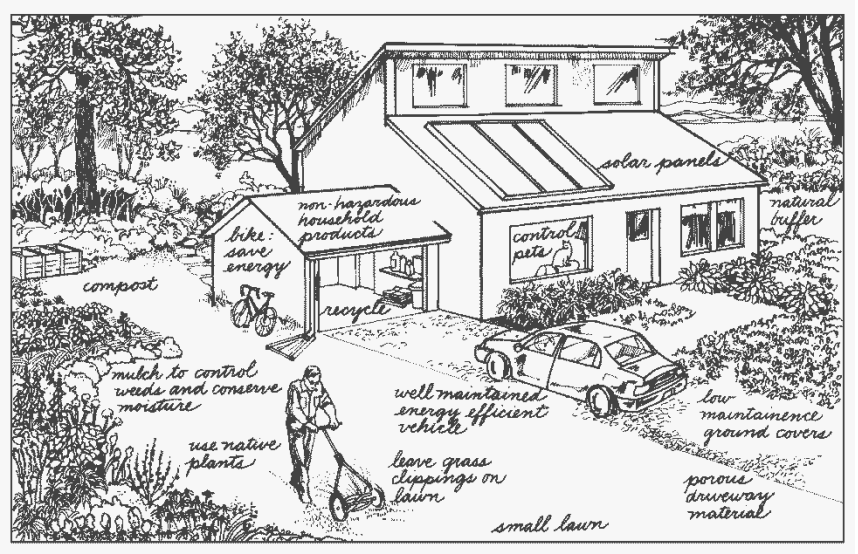
6. **Promote awareness of watershed resources and threats**

   Strategies:

   - Promote awareness, through educational campaigns, of impacts of lawn maintenance practices on streambanks (e.g. mowing to edge of creek may increase velocity of runoff which is a contributing factor to streambank erosion, sedimentation, and siltation)
   - Develop educational campaigns on BMPs for property owners

   Evaluation Measures:

   - number of publications developed targeted at property owners adjacent to creek or other waterbodies
   - Number of workshops, demonstration activities, and online resources made available to land owners



These goals, objectives, strategies, and evaluation measures form the backbone of the Blackberry Creek Watershed Action Plan and focus the process to reflect a preferred outcome. Plan recommendations (Chapters 4-6) articulate strategies that watershed partners are encouraged to undertake to achieve the desired condition of the watershed.

2. Watershed Resource Inventory and Assessment

2.1 Fox River Basin

The Fox River is the third largest tributary of the Illinois River stretching 185 miles (115 miles in Illinois) from its headwaters near Waukesha, Wisconsin, to its confluence with the Illinois River in Ottawa, Illinois (Figure 2-1). The Fox River Basin covers approximately 2,658 square miles of which 1,720 (65%) are in Illinois. The river basin includes portions of eleven Illinois counties including six that are the most populated in the state (Cook, DuPage, Kane, Lake, McHenry, and Will) and seven that are among the top ten fastest growing counties in Illinois (#1: Kendall, #2: Will, #3: Kane, #5: McHenry, #7: Grundy, #8: Lake, #9: DeKalb)[1]. An attraction for the population growth in the Fox River Basin is the abundance of recreational opportunities and high quality natural resources associated with the river and its tributaries. However, those same high quality resources are being lost or significantly impaired by historic land-use change and a type of development that is often inconsistent with sustainable land and water resources stewardship.

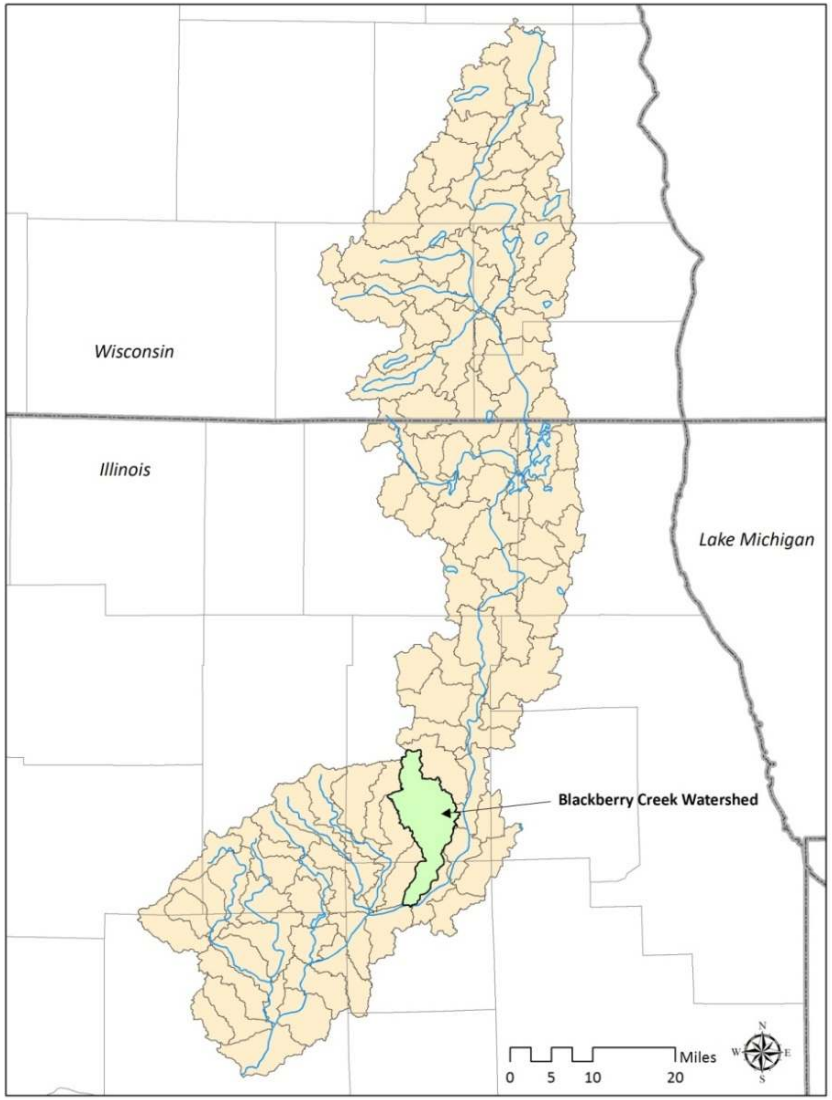


Figure 2-1. The Fox River Basin in Wisconsin and Illinois.

[1] Bureau of the Census, Population Division. "Population Estimates for the 100 Fastest Growing U.S. Counties in 2003: April 1, 2000 to July 1, 2004." *Population Estimates Program*, Table CO-EST2003-09 (April 14, 2005). http://www.census.gov/popest/counties/CO-EST2004-09.html (accessed November 3, 2011).

2.2 BLACKBERRY CREEK WATERSHED

Blackberry Creek is a major tributary of the Fox River. Its total length is 32 miles and it drains nearly 48,000 acres (75 square miles) (Figure 2-2). Lake Run and East Run are two primary tributaries that join Blackberry Creek before it enters the Fox River at the southernmost tip of the watershed in Yorkville. In the draft *2010 Illinois Integrated Water Quality Report* (Illinois EPA, 2010), Blackberry Creek was assessed and determined to be in full support for the aquatic life designated use and in nonsupport for the primary contact designated use (see section 3-2 in Chapter 3).[2] Primary contact refers to "*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.*"[3] Illinois EPA determined the cause of the primary contact nonsupport was due to fecal coliform (an indicator of bacterial contamination), but the source of this impairment was unknown.

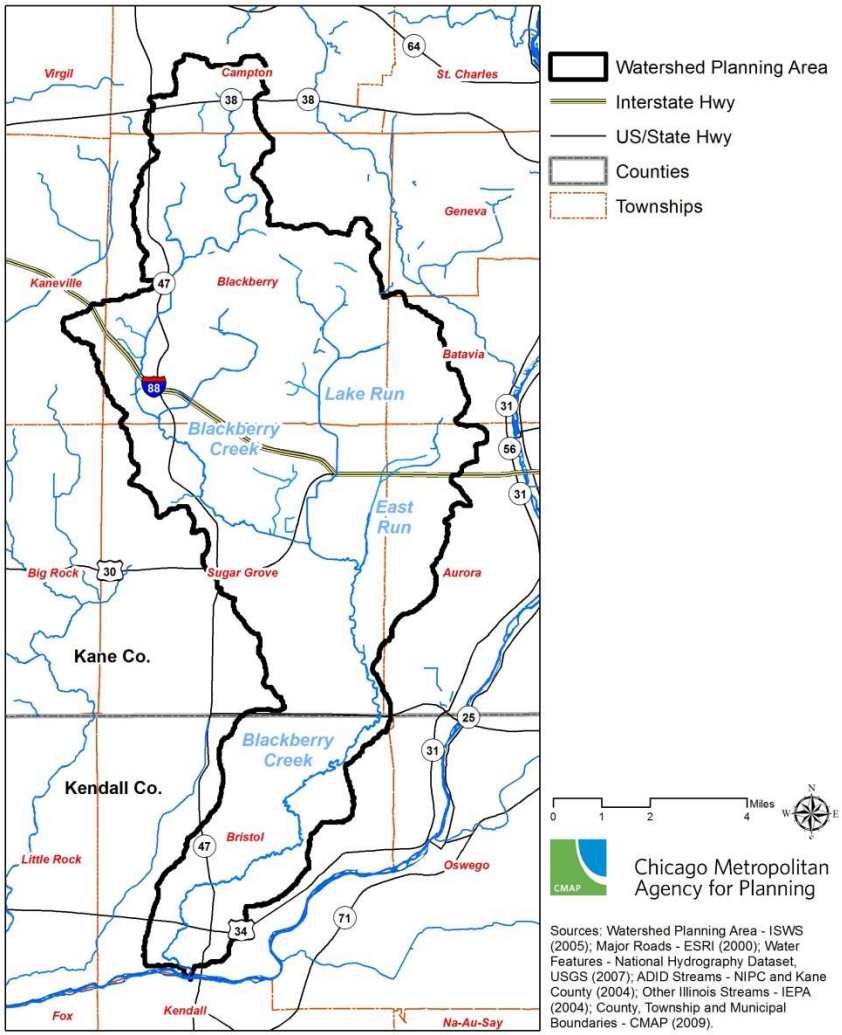


Figure 2-2. Stream network within the Blackberry Creek Watershed.

[2] IEPA. *Illinois Integrated Water Quality Report and Section 303(d) List - 2010 DRAFT, Volume I: Surface Water*. Springfield, IL: 2010. http://www.epa.state.il.us/water/tmdl/303d-list.html (accessed November 3, 2011).

[3] *Primary Contact*. *Ill. Adm. Code* 35, Subtitle C, Chapter 1, Part 301, Section 355. http://www.ipcb.state.il.us/documents/dsweb/Get/ Document-33352/ (accessed November 3, 2011).

The Blackberry Creek Watershed is a subwatershed of the Fox River Basin and thus contributes to the quality of the Fox River. The segment of the Fox River (DT-11) into which Blackberry Creek flows was also assessed by Illinois EPA and determined to be in nonsupport for aquatic life, fish consumption, and primary contact designated uses. The causes of impairment were sedimentation/siltation, total suspended solids, pH, total phosphorus, aquatic algae, PCBs, and fecal coliform. The sources of impairment were identified as contaminated sediments, dam/impoundment, urban runoff/storm sewers, municipal point source discharges, agriculture, and unknown sources. While this watershed-based plan will need to specifically address the fecal coliform impairment in Blackberry Creek, recommendations outlined in the plan will also provide a benefit to the Fox River, in so much that Blackberry Creek is a major tributary. These benefits include addressing nutrients (phosphorus and nitrogen) and sediment or total suspended solids. Sources of these pollutants include both urban and rural runoff.

For the purposes of this plan, the definition of pollution refers to any "man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of a water body."[4] The draft *2010 Illinois Integrated Water Quality Report* defines pollutants as "substances, chemical, materials or wastes and their components that are discharged into the water."[5]

For groundwater quality, a probabilistic monitoring network of community water supply (CWS) wells is monitored by Illinois EPA on a rotating basis. The draft 2010 *Integrated Report* indicates a range of good to fair to poor drinking water use support for the CWS ambient network wells within northeastern Illinois. Increasing chloride concentrations are one of the particular concerns in northeastern Illinois' sand and gravel and shallow bedrock aquifers. All of the communities in the watershed are dependent on groundwater or river water for their drinking water sources. Current and future water demand/supply issues are additional considerations, and local discussion of the issues will be of benefit to everyone.[6]

The physical conditions and cultural aspects of the watershed planning area must be assessed within the context of a watershed plan. Understanding and analyzing physical conditions help predict how activities within the watershed may improve water quality and groundwater resources. An examination of physical characteristics, including land use practices, specifically correlates to human and ecosystem well-being.

[4] *Federal Water Pollution Control Act. U.S.C.* 33 (1972), §1251 et seq. http://epw.senate.gov/water.pdf (accessed November 3, 2011).
[5] IEPA. *Illinois Integrated Water Quality Report and Section 303(d) List - 2010 DRAFT, Volume I: Surface Water*. Springfield, IL: 2010. http://www.epa.state.il.us/water/tmdl/303d-list.html (accessed November 3, 2011).
[6] CMAP. *Water 2050: Northeastern Illinois Regional Water Supply/Demand Plan*. Chicago, IL: CMAP, March 2010. http://www.cmap.illinois.gov/water-2050 (accessed November 3, 2011).

2.2.1 Land Use

Land use in the Blackberry Creek Watershed is diverse but predominantly agricultural (48%), mainly row crops with some pasture/hay areas (Table 2-1, Figures 2-3 and 2-4). Residential, commercial, institutional, and industrial uses are mostly located in the eight municipalities of the watershed with the exception of an industrial and residential strip near the intersection of Interstate Highway 88 and Route 47 in unincorporated Kane County. Along the main stem of Blackberry Creek, land use is mostly residential and open space with a few vacant sites. The Lake Run tributary flows mostly through Forest Preserve District of Kane County properties and unincorporated lands, while East Run flows through residential and open space in the Cities of Aurora and North Aurora. Land east of the East Run tributary shows the highest concentration of urban uses. Blackberry Creek enters the Fox River at the United City of Yorkville in Kendall County.

The majority of the open space acreage in the watershed is owned by the Forest Preserve District of Kane County, a few sites are owned or managed by the Illinois Department of Natural Resources (Illinois Nature Preserves Commission), and approximately 129 acres are owned by the Kendall County Forest Preserve District[7] (Figure 2-5). Additional open space in the watershed is held by Campton Hills Township and Waubonsee

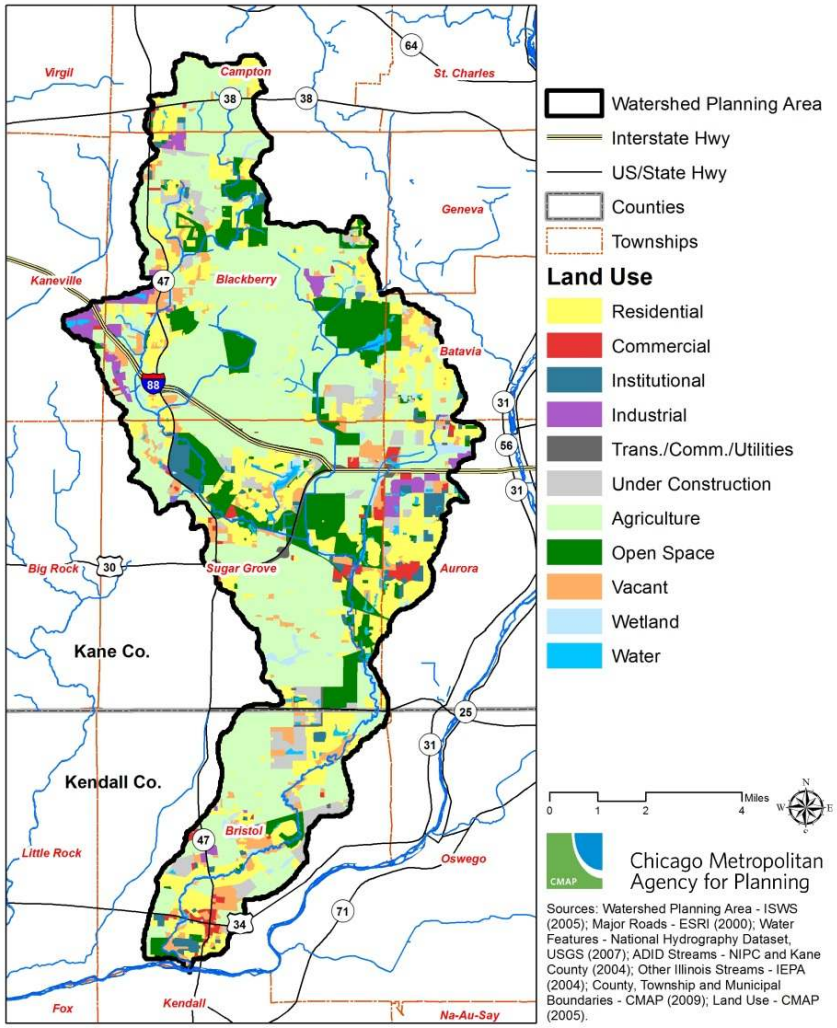


Figure 2-3. 2005 land use within the Blackberry Creek Watershed.

[7] Kendall County Forest Preserve District. *Master Plan*. Yorkville, IL: Kendall County FPD, May 2008. http://www.co.kendall.il.us/forest_preserve/mission.htm (accessed November 3, 2011).

Table 2-1.
2005 Land Use Distribution within the Blackberry Creek Watershed

Land Use Category	Total Area		% of Watershed
	acres	sq. miles	
Residential	9,047.7	14.1	18.9
Commercial	772.8	1.2	1.6
Institutional	1,019.4	1.6	2.1
Industrial	1,106.8	1.7	2.3
Transportation/ Communication/Utilities	607.6	0.9	1.3
Under Construction	2,293.6	3.6	4.8
Agriculture	22,987.3	35.9	48.1
Open Space	5,414.1	8.5	11.3
Vacant	2,858.1	4.5	6.0
Wetland	1,052.6	1.6	2.2
Water	636.8	1.0	1.3
Totals	47,796.9	74.7	100.0

Community College which is a major institutional facility that borders the creek in Sugar Grove.

Open space is defined by the Illinois Compiled Statutes as "those undeveloped or minimally developed lands that conserve and protect valuable natural features or processes."[8] Open space supports ecosystem diversity, enhances property values, contributes to a high quality of life, and is valuable in protecting water quality.

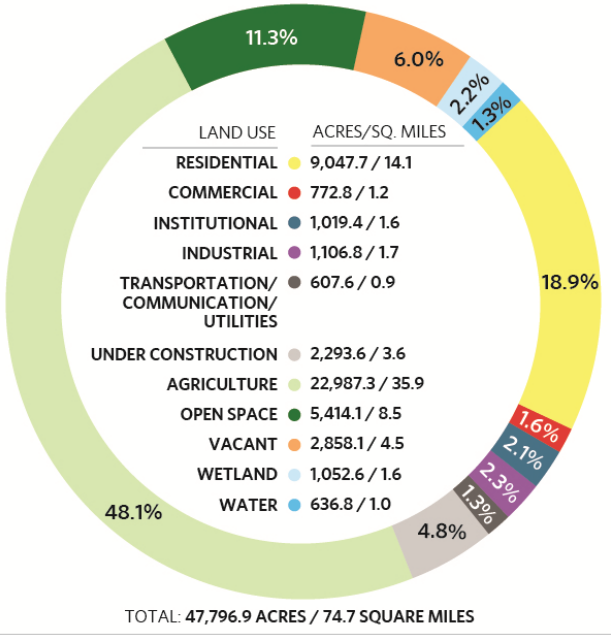


Figure 2-4. 2005 land use distribution within the Blackberry Creek Watershed.

[8] *Illinois Open Land Trust Act*. *Ill. Comp. Stat*. 525 (1999), § 33, Section 10. http://ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1740&ChapterID=44 (accessed December 28, 2011).

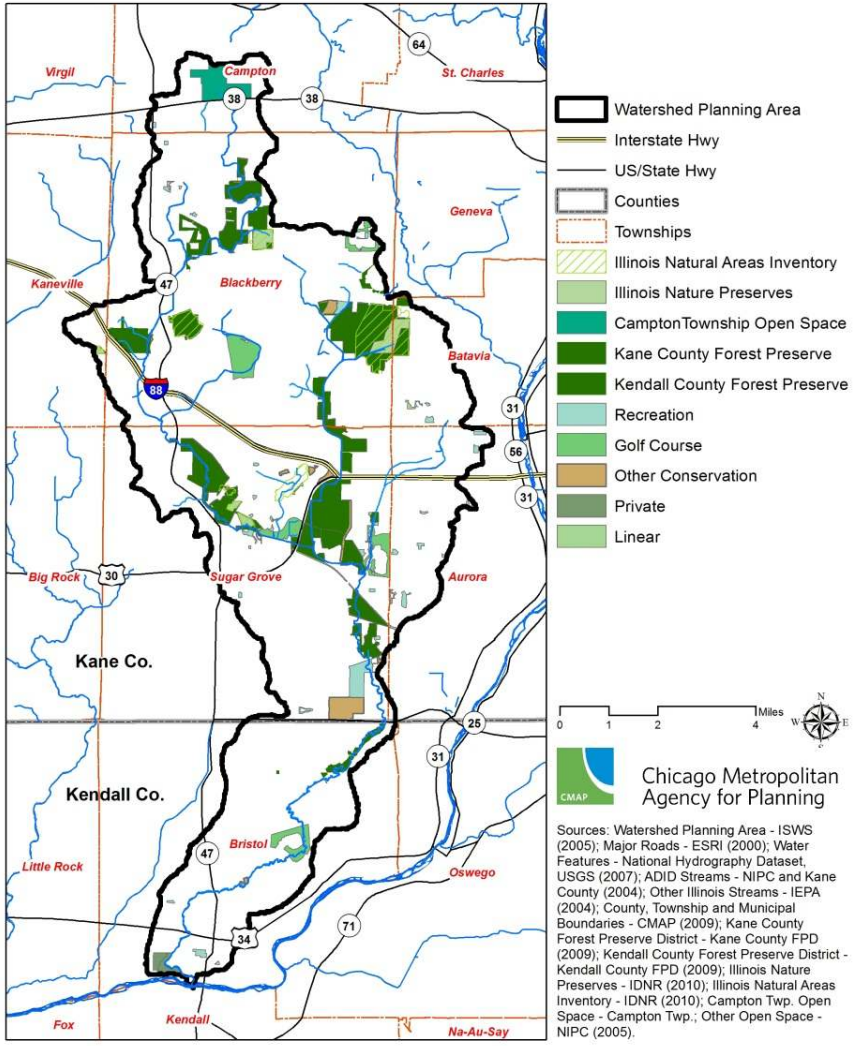


Figure 2-5. Open space lands and Natural Areas Inventory sites within the Blackberry Creek Watershed.

Figure 2-6. Nelson Lake Marsh, an Illinois Nature Preserve and Natural Areas Inventory site within Kane County in the Blackberry Creek Watershed.

Land Use Change Over Time

Review of the 1990 land use in the Kane County portion of the Blackberry Creek Watershed reveals a larger percentage of agricultural uses, approximately 71% as compared to the 2005 land use with 49% (Figure 2-7). On the other hand, residential uses made up a smaller percentage in 1990 (10%) than in 2005 (18%), from which we may infer that between 1990 and 2005, some agricultural lands were converted to the residential sector. The proportion of open space shows a slight increase between the two timeframes. (Note: No 1990 land use data for Kendall County was available for comparison.)

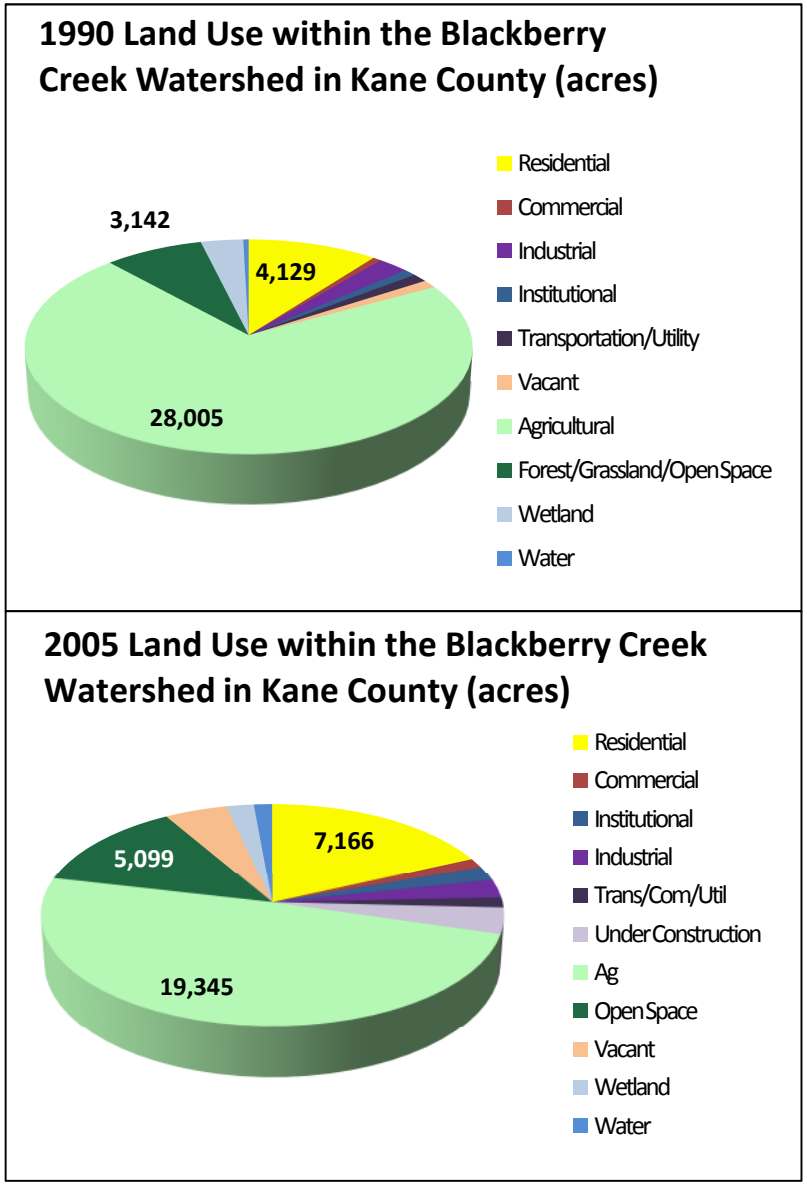


Figure 2-7. Land use change in the Kane County portion of the Blackberry Creek Watershed between 1990 and 2005.

For a qualitative sense of historic land-use change, Figure 2-9 shows the pre-settlement land cover within the Blackberry Creek Watershed as it existed in the early 1800s.[9] The pre-settlement land cover was primarily forest and prairie but also included bottomland, swamps (wetlands), cultural areas, and open water features. The significance of this coverage will be emphasized when deciding on projects, specifically projects selected for ecological restoration purposes.

Figure 2-8. A farmstead with a residential subdivision visible on the horizon in Kendall County within the Blackberry Creek Watershed (June 2008).

[9] "Land Cover of Illinois in the Early 1800's," Illinois Natural History Survey, accessed October 31, 2011, http://www.inhs.uiuc.edu/resources/gisresources.html.

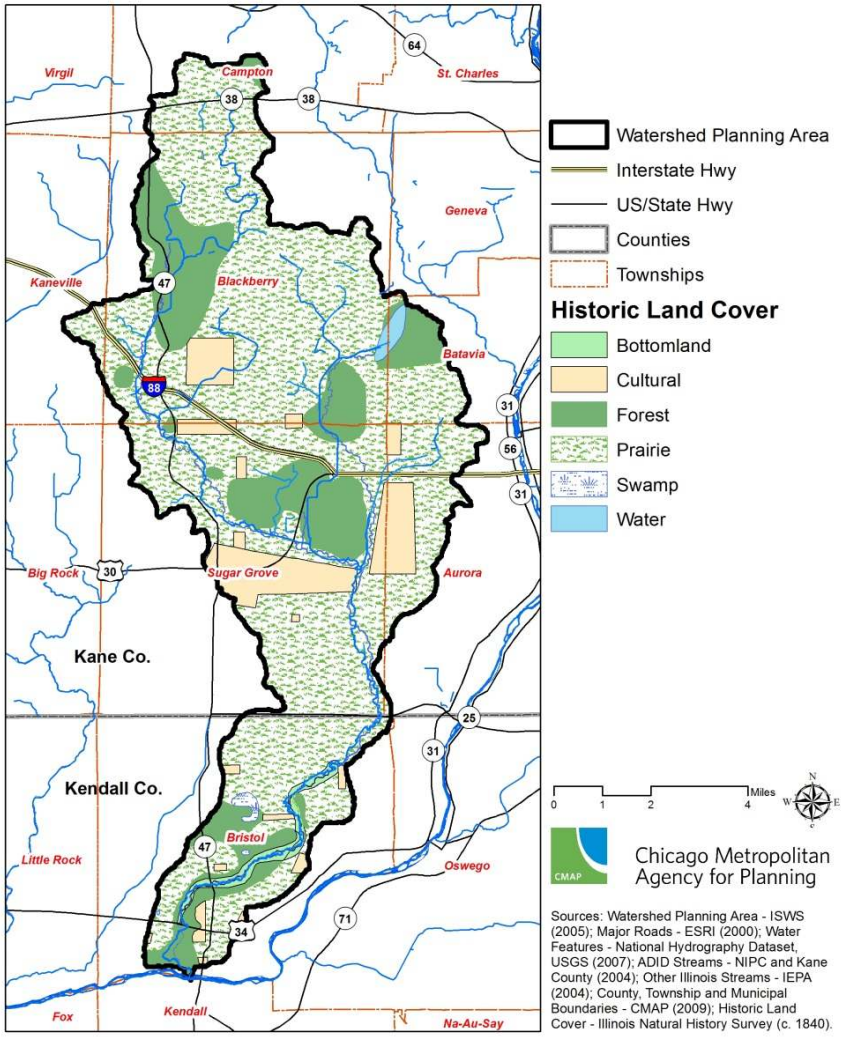


Figure 2-9. Historical land cover in the Blackberry Creek Watershed.

Forest Management Plans

The Illinois Department of Natural Resources (IDNR), Office of Resource Conservation, Division of Forestry, works with private landowners to reforest agricultural land and help with managing private woodlots. The Illinois Forestry Development Act (IFDA; 525 ILCS 15), funded in part by the U.S. Department of Agriculture – Forest Service, provides for this program. The IFDA created the Illinois Forestry Development Council, the Forestry Development Cost Share Program, and the Forestry Development Fund. Timber harvests in the State of Illinois are subject to a 4% harvest fee, and that money helps to fund the cost-share component of the program.[10]

Ten acres of woods is the minimum land-area requirement, eleven acres if a home is present on the property. The program requires a landowner to develop an IFDA-approved management plan. With passage of the IFDA, the Illinois Property Tax Code was amended in order to provide a tax incentive to timber growers. In counties with less than 3,000,000 residents (i.e., all Illinois counties other than Cook), any land being managed in the IFDA is considered as "other farmland." Thus, the land is valued at one-sixth of its equalized assessed value based on cropland. In northeastern Illinois, the program emphasizes exotic species removal and oak regeneration. Within the Blackberry Creek Watershed, there are two IFDA properties totaling 27 acres.

[10] IDNR. *Information Sheet: Illinois Forestry Development Act*. Springfield, IL: IDNR, June 2006. http://dnr.state.il.us/conservation/forestry/IFDA/ (accessed November 2, 2011).

2.2.2 Soils and Topography

Soils

For purposes of this watershed plan, hydrologic soils groups, hydric soils, and highly erodible soils will be discussed. It is important to consider these types of soil classifications as they relate to land use/change and water quality. The soils data are obtained from the Soil Survey Geographic (SSURGO) Database produced by the U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS).[11]

The Blackberry Creek Watershed is mostly made up of hydrologic soil group B (Table 2-2 and Figure 2-10). Table 2-3 further describes these soils. Group B soils tend to have 10- 20% clay and 50- 90% sand, and generally have moderately low runoff potential when thoroughly wet and are generally considered well-drained soils.[12] An extensive area of C soils is located east of the Lake Run tributary. More of the watershed in Kendall County is covered by Group B/D. This is a dual hydrologic soil group whose classification is based on drainage, saturated hydraulic conductivity, and depth of the water table. Soils in Group D have high runoff potential when thoroughly wet and typically have more than 40% clay and less than 50% sand. While the two soil groups (B and D) appear vastly different, their dual classification stems from the potential presence of a water table within 24 inches of the surface which may lead to decreased soil drainage.

Soil group C is the predominant soil class at an area in the eastern portion of the watershed. When thoroughly wet, soils in this group have moderately high runoff potential (i.e., slow infiltration rates). Such soils are generally composed of moderately fine to fine textures and consist of a layer that impedes downward movement of water. Group C soils typically have 20- 40% clay and less than 50% sand. The above information on soil conditions is important for BMP selection and land use recommendations.

Table 2-2.
Hydrologic Soil Groups in the Blackberry Creek Watershed

Hydrologic Soil Group	Area (acres)	% of Watershed
A	1,314.8	2.8
A/D	196.9	0.4
B	32,576.7	68.2
B/D	7,460.3	15.6
C	4,787.8	10.0
C/D	377.5	0.8
D	222.7	0.5
Unclassified	860.1	1.8

[11] USDA-NRCS, Soil Survey Staff. *Soil Survey Geographic (SSURGO) Database*. Kane and Kendall Counties, Illinois. Washington, D.C. http://soildatamart.nrcs.usda.gov (accessed September 14, 2011).
[12] USDA NRCS. *National Engineering Handbook*. Washington, D.C.: USDA NRCS, January 2009. http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/water/manage/?&cid=stelprdb1043063 (accessed November 3, 2011).

Table 2-3.
Characteristics of Hydrologic Soil Groups

Hydrologic Soil Group Classification	Definition
A	Soils have a low runoff potential when thoroughly wet. Water is transmitted freely through the soil.
A/D	The first letter applies to the drained condition and the second to the undrained condition.
B	Soils have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded.
B/D	The first letter applies to the drained condition and the second to the undrained condition.
C	Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted.
C/D	The first letter applies to the drained condition and the second to the undrained condition.
D	Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted.

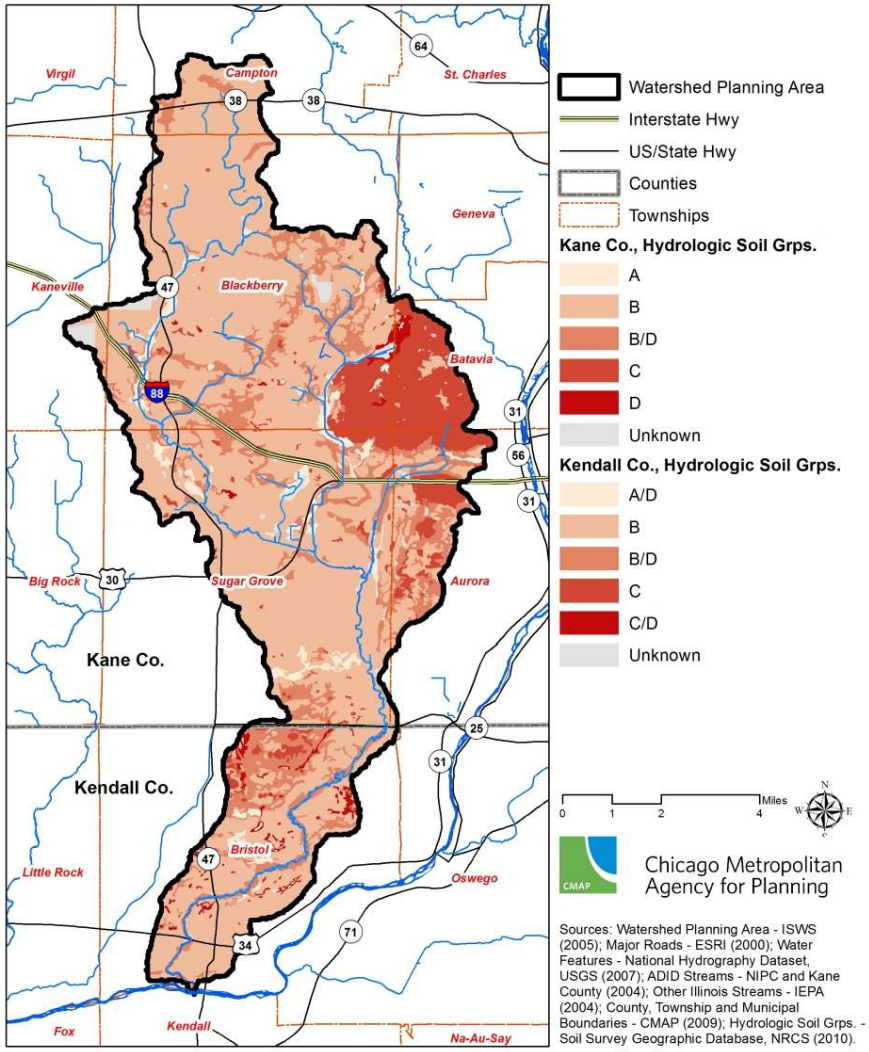


Figure 2-10. Hydrologic soil groups within the Blackberry Creek Watershed.

Hydric soils are those that are developed under sufficiently wet conditions such as flooding, ponding, or saturation for a long enough time period to support the growth and regeneration of hydrophytic vegetation, plants that grow partly or wholly in water. Thus, hydric soils are one indicator of the historic presence of wetlands, and among other matters, are useful in guiding wetland restoration efforts. Figure 2-11 shows soils that either completely satisfy the characteristics of hydric soils ("All hydric") or meet some but not all of the criteria and have the potential for hydric inclusion ("Partially hydric"). Soils can also be classified as "Not hydric," not meeting the hydric soils criteria described above, or "Unknown," lacking sufficient information with which to make a classification. Table 2-4 shows the percent composition of the watershed by area for each of these hydric soil classes.

Table 2-4.
Hydric Soil Acreage in the Blackberry Creek Watershed

Hydric Soil Class	Area (acres)	% of Watershed
All hydric	15,344.5	32.1
Not hydric	27,828.7	58.2
Partially hydric	3,763.6	7.9
Unknown	860.1	1.8

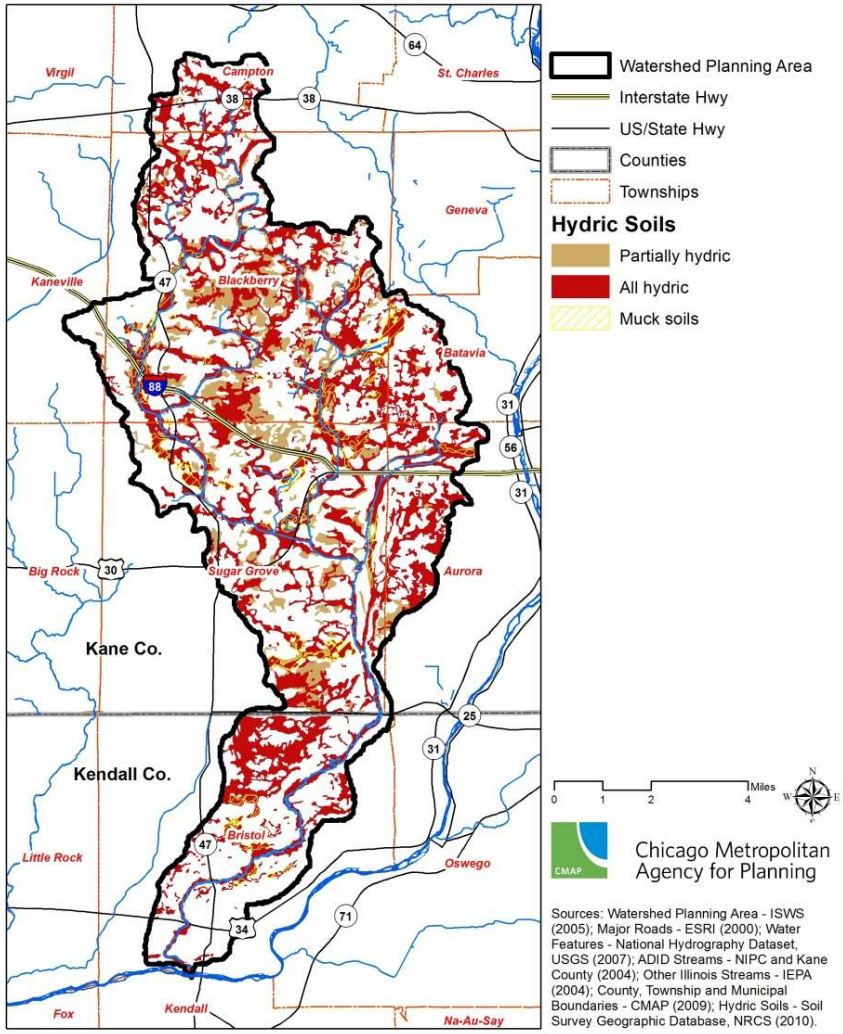


Figure 2-11. Hydric soils within the Blackberry Creek Watershed.

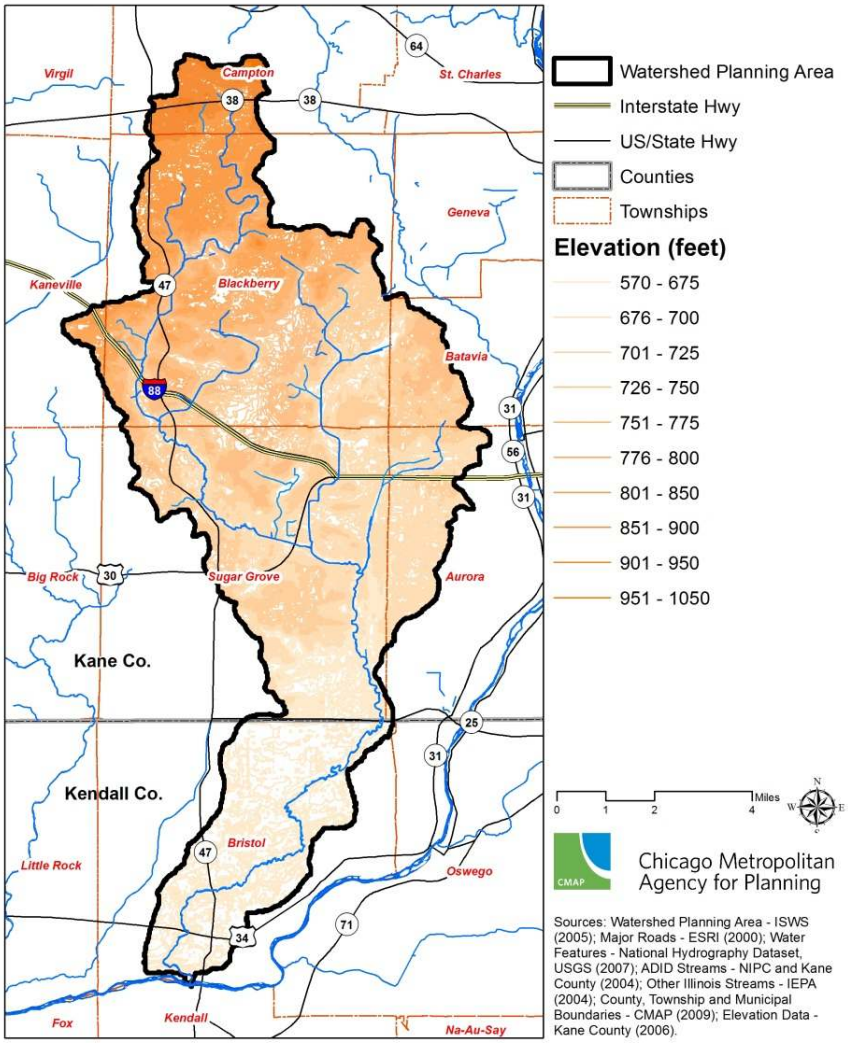


Figure 2-12. Topography within the Blackberry Creek Watershed.

Topography

The elevation in the watershed planning area ranges from 1,016 feet to 570 feet[13] (Figure 2-12). The highest elevations and steepest slopes in the watershed are at the headwaters of Blackberry Creek in the Campton Hills area. The elevation gradually decreases as the creek nears its entry into the Fox River, in the southernmost part of the watershed in Yorkville. The majority of the watershed is relatively flat, evident in the small difference between the maximum and minimum elevations across the watershed (446 feet).

2.2.3 Agriculture in the Watershed

Watershed-level statistics do not exist for agricultural land management and practices in the Blackberry Creek Watershed.[14] However, limited county-level statistics are available through the U.S. Department of Agriculture's 2007 Census of Agriculture. Kane County is 57% agricultural, while Kendall County is 81% agricultural by land area. Of this, for each county respectively, 60% and 61% is planted in corn and 24% and 27% in soy.[15] See

[13] CMAP. "Two Foot Topographic Contours." Kane and Kendall Counties, Illinois, 2006.

[14] Thomas Ryterske, NRCS Illinois District Conservationist, e-mail message to author(s), June 27, 2011.

[15] USDA NASS. "County Summary Highlights: 2007." *2007 Census of Agriculture*, Illinois State and County Data, Volume 1, Geographic Area Series, Part 13, Chapter 2, Table 1, Report No. AC-07-A-13. Washington, D.C.: USDA NASS, December 2009. http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Illinois/index.asp (accessed August 31, 2011).

Figure 2-13 for the distribution of agricultural land throughout this watershed, a total of 3,880 acres.[16] Although row crop agriculture is the predominant agricultural land use in Kane and Kendall Counties, there is also a small amount of animal agriculture. Kane and Kendall Counties account for 0.48% and 0.30% of all livestock in Illinois, respectively, with 203,183 head combined.[17] Figure 2-14 shows the distribution of land used for livestock and equestrian purposes in the Blackberry Creek Watershed, a total of 348 acres.[18]

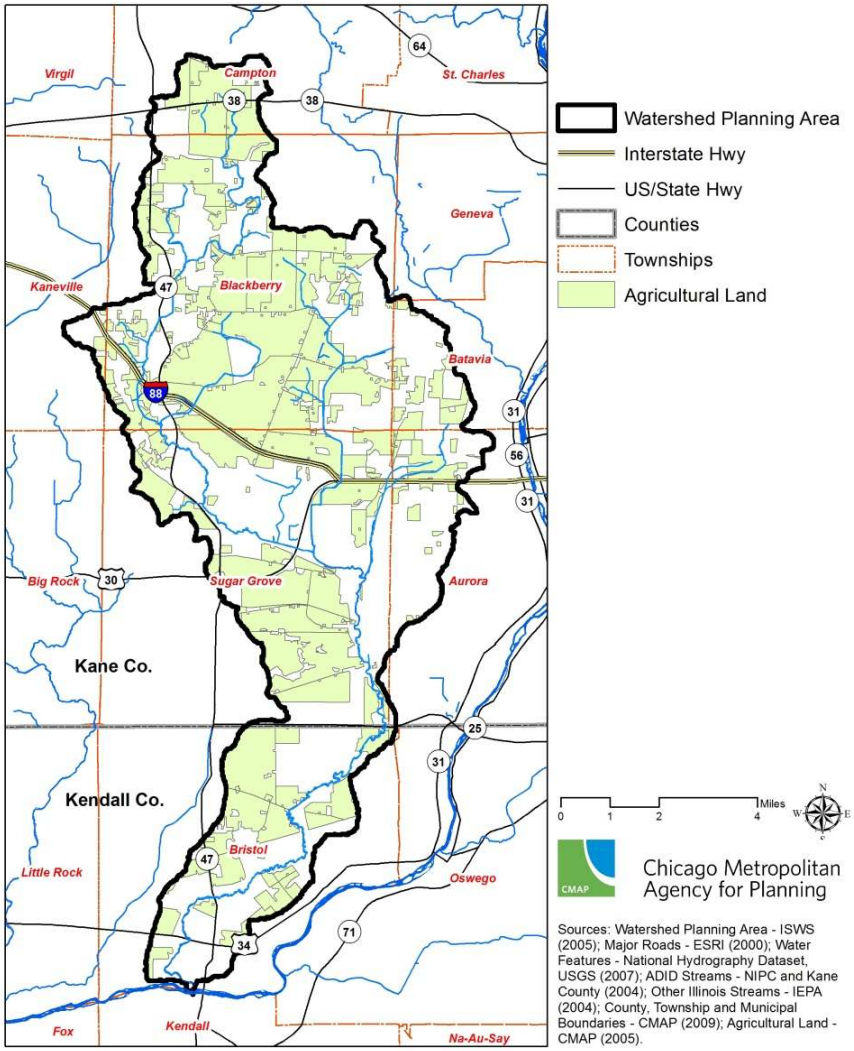


Figure 2-13. All agricultural land use within the Blackberry Creek Watershed.

[16] NIPC. *Land Use Inventory*. Chicago, IL: CMAP, 2005. http://www.cmap.illinois.gov/land-use-inventory (accessed September 14, 2011).
[17] Ibid 16.
[18] Ibid 16.

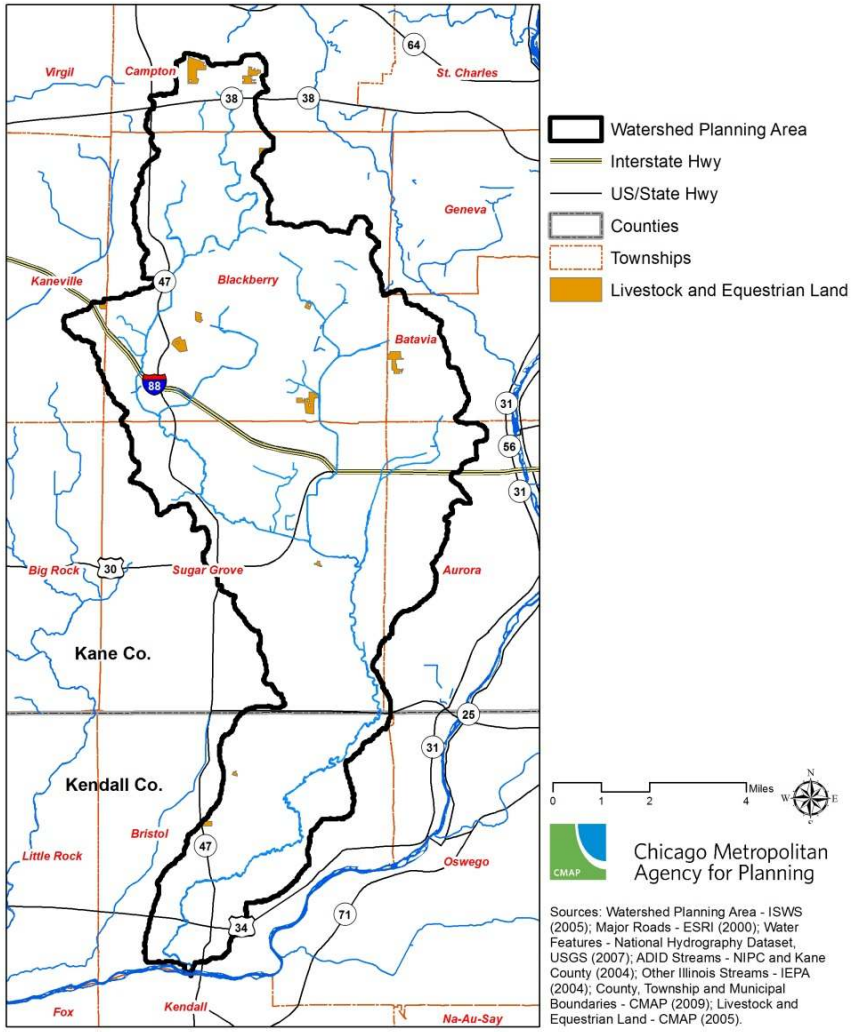


Figure 2-14. Livestock and equestrian land use within the Blackberry Creek Watershed (minimum parcel size delineated was 2.5 acres).

The Census of Agriculture also collects information on selected agricultural practices. Some of these practices are relevant to the discussion of agricultural impacts to water quality. For Kane and Kendall Counties respectively, a significant number of farmers employ practices to reduce environmental impact from agricultural activities on their farm: 33% and 35% of farms used some form of conservation practice for crop production, and 9% and 5% of farms practiced rotational or management intensive grazing; however, no farms in either county grazed livestock on an animal unit month (AUM) basis.[19] Conservation practices include any of the several projects or management practices, like conservation tillage or nutrient management planning, described in the National Resource Conservation Service (NRCS) Illinois *Field Office Technical Guide* (FOTG) that are detailed more thoroughly below.[20] Rotational or management-intensive grazing both involves systematically moving livestock herds throughout available grazing lands according to a plan that is designed to most efficiently encourage forage growth and livestock health.

[19] USDA NASS. "Selected Practices: 2007." *2007 Census of Agriculture*, Illinois State and County Data, Volume 1, Geographic Area Series, Part 13, Chapter 2, Table 44, Report No. AC-07-A-13. Washington, D.C.: USDA NASS, December 2009. http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Illinois/index.asp (accessed August 31, 2011). An AUM is the amount of forage necessary to sustain an animal for a month, varying by the type of animal. An AUM accounting system can be used to calculate the required grazing area for a herd, which informs appropriate stocking densities and timing of rotations when farmers are developing grazing patterns.

[20] USDA-NRCS. *Field Office Technical Guide*. Kane and Kendall Counties, Illinois. Washington, D.C.: USDA NRCS, 2011. http://efotg.sc.egov.usda.gov/efotg_locator.aspx?map (accessed September 13, 2011).

For Kane County specifically, farmers most often use the following conservation practices: residue management (strip-, no- or mulch-tillage); nutrient management planning (monitoring soil nutrient levels and applying fertilizers only in needed amounts); and integrated pest management (using pest-resistant crop varieties, rotating crops and targeting areas for pesticide that exceed defined damage thresholds).[21]

In addition, 0.4% of agricultural land in both Kane and Kendall Counties is enrolled in the Conservation Reserve (CRP), Wetlands Reserve (WRP), Farmable Wetlands, or Conservation Reserve Enhancement Program (CREP) based on the Census.[22] Statewide, 3.3% of agricultural land is enrolled in one of these programs.[23] These are voluntary programs for agricultural landowners that provide assistance and incentives to farmers for conserving natural resources on private lands. CRP offers payments to farmers to establish environmentally beneficial plant cover on eligible croplands. The Wetlands Reserve and Farmable Wetlands programs both focus on wetlands, and in the first case, help farmers to protect or restore wetlands on their property, and in the second, enable farmers to prevent degradation of wetlands on land enrolled in CRP. Finally, CREP combines CRP resources with tribal, state, and federal authorities for a community-based approach to conservation issues on private lands locally.

Agricultural irrigation can also have direct consequences for water resources given its consumptive nature. Irrigation in Illinois is used to a more limited extent than in other regions. In Kane County, 1.5% of farmland is irrigated, while 1.2% of farmland is irrigated in Kendall County.[24] For comparison, 6.1% of agricultural land is irrigated nationally, while in Illinois, 1.8% of farmland is irrigated.[25] However, a water demand study commissioned by CMAP found that total water withdrawals for agricultural irrigation in northeastern Illinois are not

[21] Thomas Ryterske, NRCS Illinois District Conservationist, email message to author(s), June 27, 2011.

[22] USDA NASS. "Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2007 and 2002." *2007 Census of Agriculture*, Illinois State and County Data, Volume 1, Geographic Area Series, Part 13, Chapter 2, Table 8, Report No. AC-07-A-13. Washington, D.C.: USDA NASS, December 2009. http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Illinois/index.asp (accessed August 31, 2011).

[23] USDA NASS. "Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2007 and 2002." *2007 Census of Agriculture*, Illinois State and County Data, Volume 1, Geographic Area Series, Part 13, Chapter 2, Table 8, Report No. AC-07-A-13. Washington, D.C.: USDA NASS, December 2009. http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Illinois/index.asp (accessed August 31, 2011).

[24] USDA NASS. "Irrigation: 2007 and 2002." *2007 Census of Agriculture*, Illinois State and County Data, Volume 1, Geographic Area Series, Part 13, Chapter 2, Table 10, Report No. AC-07-A-13. Washington, D.C.: USDA NASS, December 2009. http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Illinois/index.asp (accessed August 31, 2011).

[25] USDA NASS. "Irrigation: 2007 and 2002." *2007 Census of Agriculture*, United States Summary and State Data, Volume 1, Geographic Area Series, Part 51, Chapter 2, Table 10 Report No. AC-07-A-51. Washington, D.C.: USDA NASS, December 2009. http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_US_State_Level/index.asp (accessed September 13, 2011).

insignificant.[26] Total water withdrawal in 2005 for Kane and Kendall Counties combined was 73.5 million gallons per day (MGD).[27] For the same counties and year, total water withdrawal for cropland irrigation was 3.07 MGD combined, while estimated water use for livestock was 0.47 MGD combined.[28] Cropland irrigation and livestock water use therefore respectively accounted for 4% and 0.6% of total water withdrawals in 2005 for Kane and Kendall Counties combined.

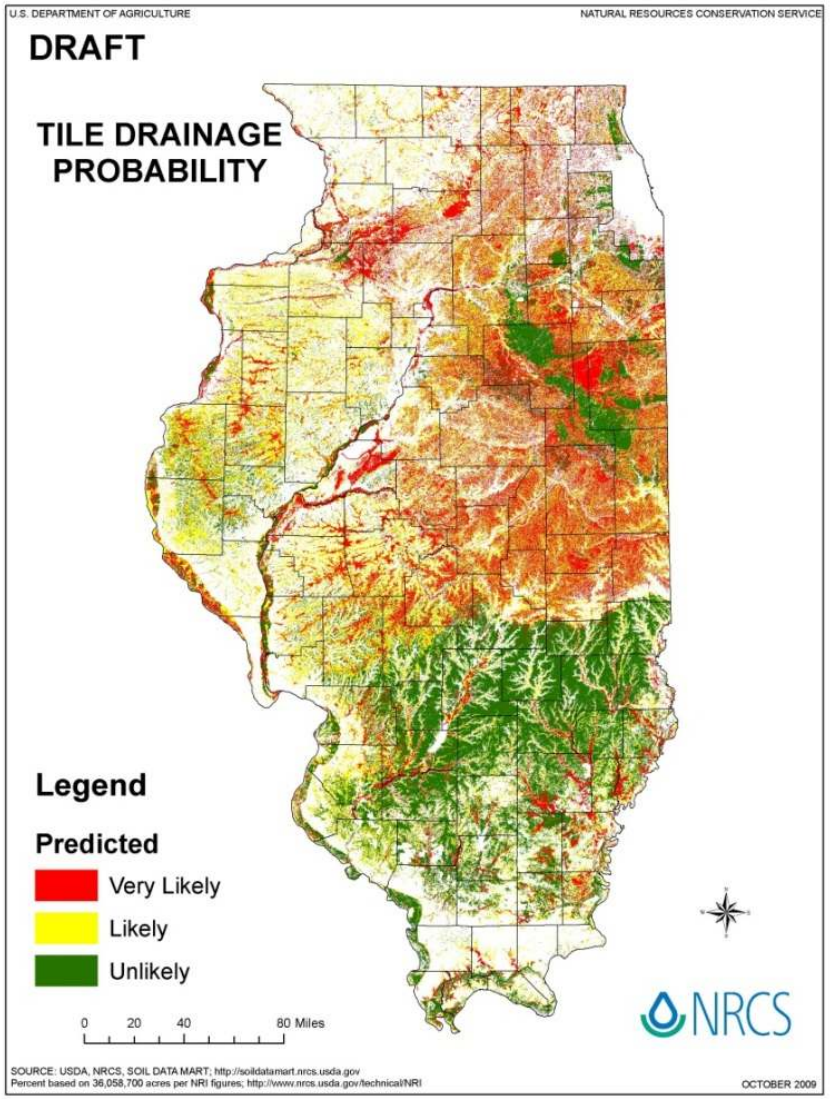


Figure 2-15. Tile drainage probabilities for Illinois.
(Source: USDA NRCS, 2011)

[26] Southern Illinois University, Department of Geography and Environmental Resources. *Regional Water Demand Scenarios for Northeastern Illinois: 2005-2050*, by B. Dziegielewski and F.J. Chowdhury. Chicago, IL: CMAP, 2008. http://www.cmap.illinois.gov/regional-water-supply-planning (accessed September 15, 2011).

[27] Southern Illinois University, Department of Geography and Environmental Resources. *Regional Water Demand Scenarios for Northeastern Illinois: 2005-2050*, by B. Dziegielewski and F.J. Chowdhury. Chicago, IL: CMAP, 2008. http://www.cmap.illinois.gov/regional-water-supply-planning (accessed September 15, 2011).

[28] Southern Illinois University, Department of Geography and Environmental Resources. *Regional Water Demand Scenarios for Northeastern Illinois: 2005-2050*, by B. Dziegielewski and F.J. Chowdhury. Chicago, IL: CMAP, 2008. http://www.cmap.illinois.gov/regional-water-supply-planning (accessed September 15, 2011).

Agriculture in turn is affected by prevalent biophysical conditions in the Blackberry Creek Watershed. Soil conditions in particular provide an indication of the hydrological character of land in the watershed, especially with regard to the likely extent of tile drainage on agricultural lands. The location and extent of hydric soils and hydrologic soil groups within this watershed, as well as the definitions of these terms, were discussed earlier in this Resource Inventory. Such soil characteristics inform the overall drainage ability of agricultural lands; however, the extent of subsurface drainage is not well-documented at either national or local levels.[29] Below, drainage classes determined by NRCS are used to estimate the extent of tile drainage in Blackberry Creek Watershed. At a statewide level, however, NRCS has performed a similar analysis based on the interpretation of soil groups. Figure 2-15 features the results of this analysis by NRCS, depicting the probability of tile drainage for agricultural lands throughout the state of Illinois.[30] Based on this figure, most agricultural lands in Kane and Kendall Counties are either "Likely" or "Very Likely" to have tile drainage.

The likely extent of tile drainage in the Blackberry Creek Watershed is estimated here based on soil drainage classes. NRCS recognizes seven natural drainage classes describing the frequency and duration of wet periods for various soils. The drainage class for soil features is obtained from the SSURGO dataset (Soil Survey Geographic Database).[31] These classes are Excessively Drained, Somewhat Excessively Drained, Well Drained, Moderately Well Drained, Somewhat Poorly Drained, Poorly Drained and Very Poorly Drained.[32] The last three drainage classes indicate soils which limit or exclude crop growth unless artificially drained. Soils in the Somewhat Poorly Drained, Poorly Drained, or Very Poorly Drained drainage class occur on 48% of the agricultural land in the Blackberry Creek Watershed. These areas can be taken as an approximation of the likely extent of artificial drainage on currently farmed agricultural lands, given that crop growth on these lands would be severely impacted or even impossible without artificial drainage. The extent of soils with these drainage classes is depicted in Figure 2-16.

Some of these poorly drained areas were likely once wetland areas which are now farmed. There are nine sites identified as "Wetlands Being Farmed" in the NIPC 2005 Land Use Inventory on agricultural lands within Blackberry Creek Watershed (Figure 2-17).[33] Officially, a farmed wetland is a wetland that has been

[29] World Resources Institute. *Assessing U.S. Farm Drainage: Can GIS Lead to Better Estimates of Subsurface Drainage Extent?* By Z. Sugg. Washington, D.C.: World Resources Institute 2007. http://pdf.wri.org/assessing_farm_drainage.pdf (accessed September 21, 2011).

[30] "Illinois Suite of Maps: Potential Tile Drainage Extent," USDA NRCS last modified April 11, 2011, accessed September 21, 2011, http://www.il.nrcs.usda.gov/technical/soils/Suite_Maps.html.

[31] USDA-NRCS, Soil Survey Staff. *Soil Survey Geographic (SSURGO) Database*. Kane and Kendall Counties, Illinois. Washington, D.C. http://soildatamart.nrcs.usda.gov (accessed September 14, 2011).

[32] Soil Conservation Service, Soil Survey Staff. *Soil Survey Manual*. USDA Handbook 18. Washington, D.C.: USDA NRCS, 1993. http://soils.usda.gov/technical/manual/ (accessed September 14, 2011).

[33] NIPC. *Land Use Inventory*. Chicago, IL: CMAP, 2005. http://www.cmap.illinois.gov/land-use-inventory (accessed September 14, 2011).

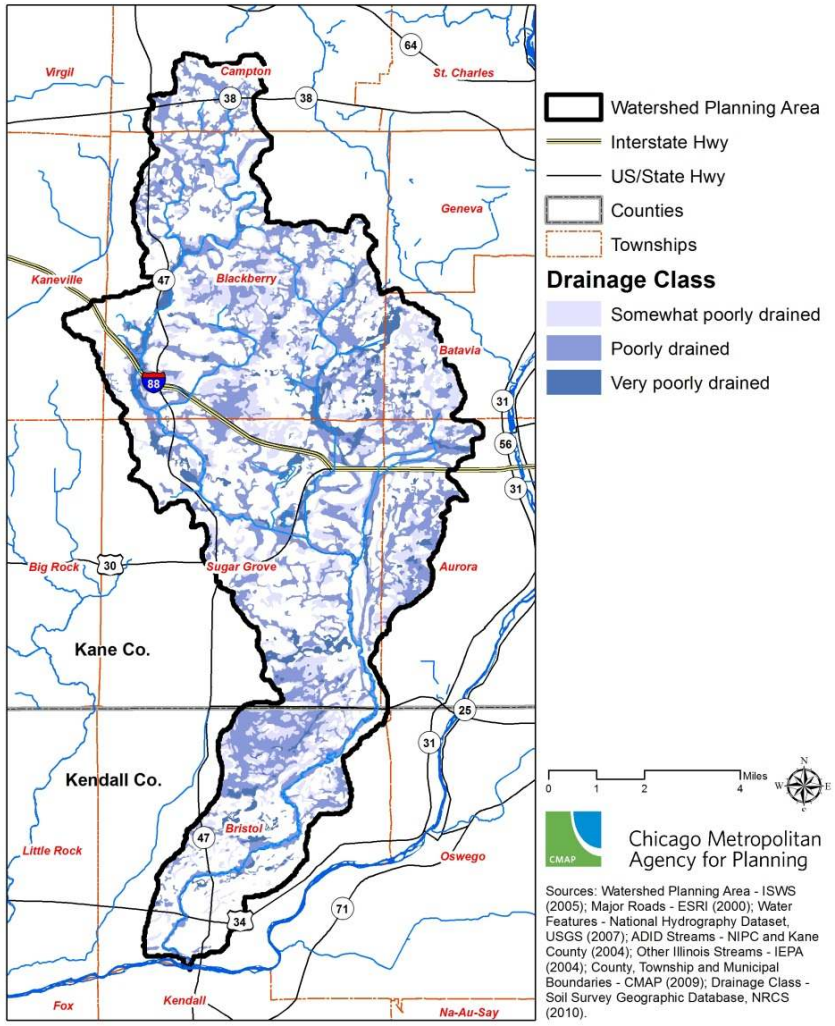


Figure 2-16. Somewhat poorly, poorly, and very poorly drained soils within the Blackberry Creek Watershed.

modified to produce agricultural goods that also meets certain hydrologic conditions.[34] The NIPC classification, however, might not meet these criteria. "Wetlands Being Farmed" were identified for the NIPC 2005 Land Use Inventory from any features in the National Wetlands Inventory that are greater than 2.5 acres, on agricultural lands, and verified to be an existing wetland through aerial photography.[35] Farmed wetlands meeting the federal definition are often still wet enough to act as valuable wetland habitats that are subject to Swampbuster, the Wetland Conservation provision in the Farm Bill; and Clean Water Act Section 404, which regulates the management of wetland areas. Consequently, these nine sites with the NIPC "Wetlands Being Farmed" classification might be potential BMP implementation sites for wetland restoration given sufficient interest and ability on the part of these private landowners. Additionally, they might require further investigation to determine whether they meet the federal Farmed Wetlands classification.

[34] "Highly Erodible Land and Wetland Conservation." *Code of Federal Regulations*. Title 7, Part 12 (1996). http://edocket.access.gpo.gov/cfr_2011/janqtr/pdf/7cfr12.2.pdf (accessed September 14, 2011).
[35] David Clark, Senior Analyst for CMAP, e-mail message to author(s), September 14, 2011.

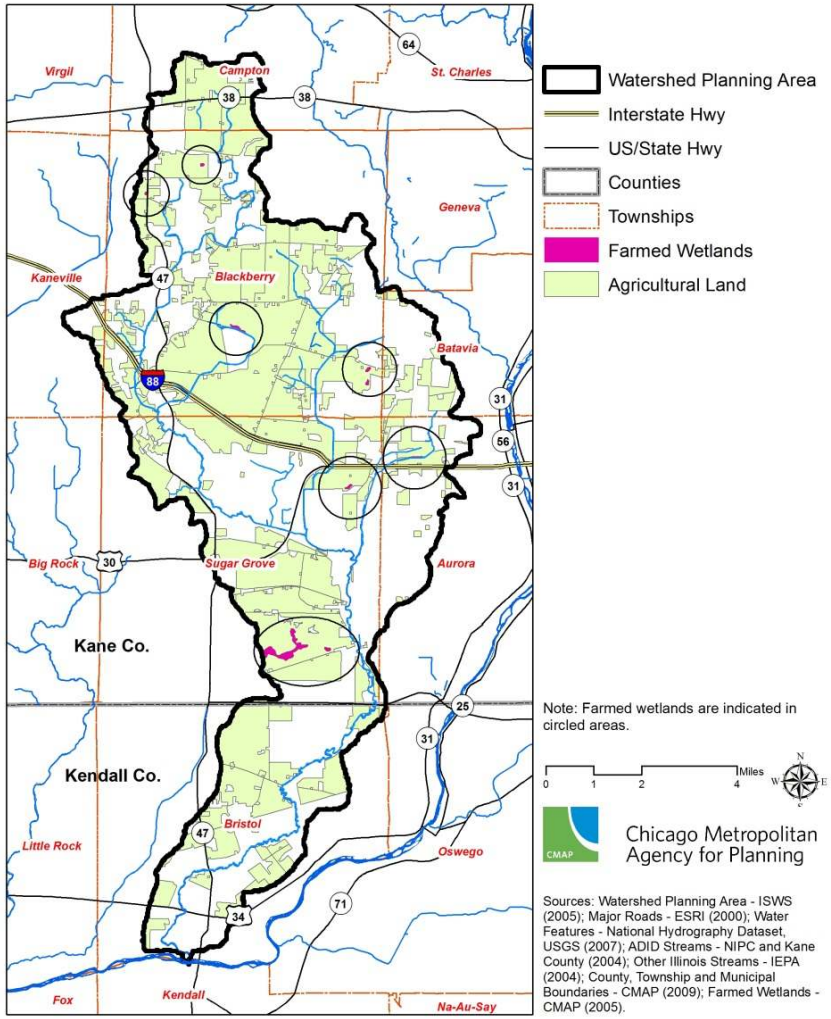


Figure 2-17. Farmed wetlands within the Blackberry Creek Watershed.

The SSURGO dataset from NRCS also includes information about the distribution of highly erodible lands (HEL). Highly erodible lands are those most vulnerable to significant amounts of erosion and are identified according to a specific set of criteria defined in the Code of Federal Regulations. See Figure 2-18 for the distribution of HEL lands throughout the watershed planning areas. For the Blackberry Creek Watershed, 6% of the total land area is highly erodible, while 12% of all agricultural land is highly erodible. Soil surveys identify HEL soil units based on the erodibility index of the soil.[36] The erodibility index is calculated by dividing the potential average annual rate of erosion for each soil by the maximum annual rate of soil erosion that could occur without causing a decline in long-term productivity (also called the T level).[37] Erosion in turn is calculated according to the Universal Soil Loss Equation (USLE), which includes factors like rainfall and runoff (R); the degree to which the soil resists erosion (K); and a formula measuring slope length and steepness (LS).[38]

[36] "Identification of highly erodible lands criteria." *Code of Federal Regulations*. Title 7, Part 12 (2011). http://frwebgate3.access.gpo.gov/cgi-bin/PDFgate.cgi?WAISdocID=pEGmgU/11/2/0&WAISaction=retrieve (accessed October 3, 2011).

[37] "Identification of highly erodible lands criteria." *Code of Federal Regulations*. Title 7, Part 12 (2011). http://frwebgate3.access.gpo.gov/cgi-bin/PDFgate.cgi?WAISdocID=pEGmgU/11/2/0&WAISaction=retrieve (accessed October 3, 2011).

[38] "Identification of highly erodible lands criteria." *Code of Federal Regulations*. Title 7, Part 12 (2011). http://frwebgate3.access.gpo.gov/cgi-bin/PDFgate.cgi?WAISdocID=pEGmgU/11/2/0&WAISaction=retrieve (accessed October 3, 2011).

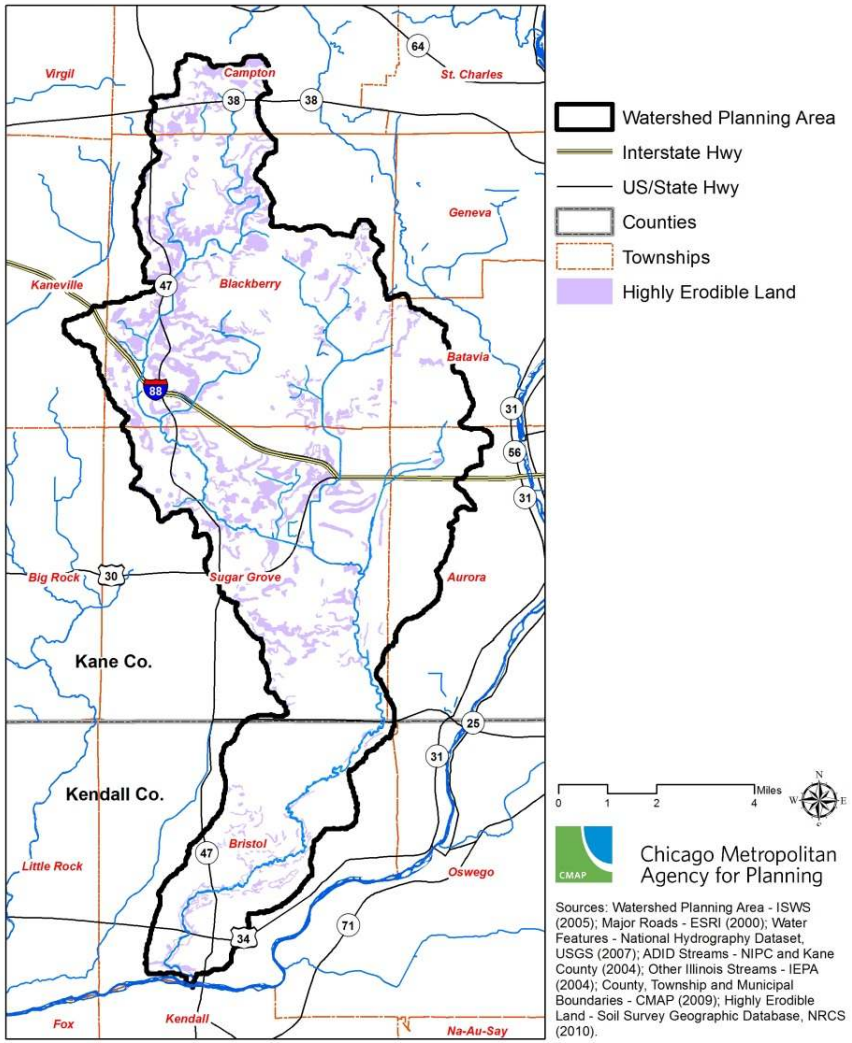


Figure 2-18. Highly erodible land within the Blackberry Creek Watershed.

Like wetlands, HEL lands are the focus of specific NRCS conservation efforts. For example, the Highly Erodible Land Conservation Compliance Provisions in the Food Security Act of 1985 require that under certain circumstances, farmers producing agricultural goods on lands deemed highly erodible lands must use a USDA-approved conservation system.[39] In addition, this Act established a stricter provision called Sodbuster requiring that under certain circumstances, farmers cultivating HEL lands must adopt a conservation system that reduces erosion to the T level.[40] Violations of either provision can result in the loss of some or all USDA program benefits to the farmer. Any HEL lands currently being farmed in Blackberry Creek Watershed might be subject to these provisions, if these lands satisfy the criteria used to determine applicability of these provisions to specific properties.

Finally, some agricultural managers in the watershed have biosolids applied to their farmland as a nutrient source. As a nutrient source, use of biosolids represents one component of a

[39] "Highly Erodible Land Conservation Compliance Provisions," USDA NRCS, accessed October 3, 2011, http://www.nrcs.usda.gov/wps/portal/nrcs/detail/?ss=16&navtype=SUBNAVIGATION&cid=nrcs143_008440&navid=100170150000000&pnavid=1000000000000000&position=Welcome.Html&ttype=detail&pname=Highly%20Erodible%20Land%20Conservation%20Compliance%20Provisions%20|%20NRCS.

[40] "Highly Erodible Land Conservation Compliance Provisions," USDA NRCS, accessed October 3, 2011, http://www.nrcs.usda.gov/wps/portal/nrcs/detail/?ss=16&navtype=SUBNAVIGATION&cid=nrcs143_008440&navid=100170150000000&pnavid=1000000000000000&position=Welcome.Html&ttype=detail&pname=Highly%20Erodible%20Land%20Conservation%20Compliance%20Provisions%20|%20NRCS.

nutrient management strategy.[41] Treatment of human waste generates a considerable amount of effluent and sludge that then requires proper disposal. Sewage effluent, otherwise known as reclaimed wastewater, is regulated under the National Pollutant Discharge Elimination System (NPDES) program of the Clean Water Act and is typically discharged to local waterways. The solid product of conventional waste treatment, sludge, is processed further into biosolids and regulated under a combination of both federal and state laws. Biosolids are processed for eventual application to cropland as a fertilizer, burial in a landfill, or incineration.

Once processed appropriately for land application, biosolids can safely provide nutrients to support plant growth and enrich soils. Processing of sewage sludge into biosolids eliminates or reduces potential risks that are inherent to waste products; namely exposure to pathogens. Based on different levels of processing (and expense), biosolids are identified as either Class A or B, categories that are defined in federal regulations.[42] Class A biosolids, which benefit from more energy intensive processing (i.e., "cooking" at higher temperatures for a longer period of time), contain no detectible levels of pathogens. Potential applicators of Class A biosolids are required to apply for permits to demonstrate that these stringent standards have been met. Class B biosolids are processed at lower temperatures and thus still contain detectible levels of pathogens but which do not persist once land-applied. Nonetheless, there are buffer requirements, public access rules, application rate standards, and crop harvest restrictions on applicator permits for lands to which Class B biosolids are applied.[43]

In Illinois specifically, approximately 375,000 to 400,000 tons of biosolids are applied as fertilizer each year.[44] "Projects for the land application of sludge that has been determined to be non-hazardous and non-toxic" are regulated under state law (35 ILAC 391), while "any person who prepares sewage sludge that is applied to the land,…any person who applies sewage sludge to the land,…sewage sludge applied to the land, and…the land on which sewage sludge is applied" are subject to the federal rules found in 40 CFR Part 503.[45,46] A state-operating permit must be

[41] "Water: Sewage Sludge (Biosolids)," U.S. EPA, last updated September 29, 2011, accessed December 13, 2011, http://water.epa.gov/scitech/wastetech/biosolids/biosolids_index.cfm.

[42] "Standards for the Use or Disposal of Sewage Sludge." Code of Federal Regulations. Title 40, Part 530 (1999). http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr;rgn=div5;view=text;node=40%3A30.0.1.2.41;idno=40;sid=7a57bd51143b1b42b10b84977c3fc012;cc=ecfr (accessed December 13, 2011).

[43] "Water: Sewage Sludge (Biosolids), Frequently Asked Questions," U.S. EPA, last updated September 29, 2011, accessed December 13, 2011, http://water.epa.gov/polwaste/wastewater/treatment/biosolids/genqa.cfm.

[44] Jeff Hutton, Environmental Protection Specialist, IEPA, *personal communication*.

[45] "Standards for the Use or Disposal of Sewage Sludge." Code of Federal Regulations. Title 40, Part 530 (1999). http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr;rgn=div5;view=text;node=40%3A30.0.1.2.41;idno=40;sid=7a57bd51143b1b42b10b84977c3fc012;cc=ecfr (accessed December 13, 2011).

[46] *Design Criteria for Sludge Application on Land*. *Ill. Adm. Code* 35, Part 391. http://www.ilga.gov/commission/jcar/admincode/035/03500391sections.html (accessed December 13, 2011).

obtained by both the generators (typically publicly owned wastewater treatment operators) and large applicators of biosolids. Applicators must also document and track metals that are present in the quantity of biosolids applied (i.e., loads) on a per field basis over time, following either federal or state regulations, whichever is stricter (e.g., setbacks from wells or surface bodies of water). Together, these regulations are designed to provide sufficient protection from runoff contamination. See 35 ILAC 391.403 or 40 CFR Part 503 Subpart B for specific buffer areas that might apply to areas to which sludge and biosolids are applied.[47,48]

In addition, the Illinois Emergency Management Agency defines the permissible amount of radium in sewage sludge and biosolids under 32 ILAC 330.40(d). Radium is naturally occurring in some groundwater sourced from the deep-bedrock aquifer and must therefore be removed via a treatment process that produces drinking water meeting Safe Drinking Water standards. Waste that results from treating source water to potable standards is then typically routed to a wastewater treatment plant. When that wastewater contains radium, it will concentrate in the sludge and thus in biosolids, much like iron and other metals will. In addition to maximum permitted concentrations, state law (35 ILAC 391) had previously limited the increase of radium in soil as a result of land application of sludge and biosolids to 0.1 picocuries per gram (pCi/g). However, 32 ILAC 330.40(d), passed in February 2011, increases this limit to 1.0 pCi/g for applicators using materials with concentrations of radioactivity lower than those specified in the law.[49] Sludge/biosolids containing greater than the threshold amount of radium permitted for land application are then required to be disposed of (very expensively) as hazardous waste.

[47] *Application Buffer Area*. *Ill. Adm. Code* 35, Part 391, Section 403. http://www.ilga.gov/commission/jcar/admincode/035/035003910D04030R.html (accessed December 15, 2011).

[48] "Land Application." Code of Federal Regulations. Title 40, Part 530, Subpart B (1999). http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr;rgn=div5;view=text;node=40%3A30.0.1.2.41;idno=40;sid=7a57bd51143b1b42b10b84977c3fc012;cc=ecfr#40:30.0.1.2.41.2 (accessed December 15, 2011).

[49] *License Exemption—Radioactive Materials Other Than Source Materials*. *Ill. Adm. Code* 32, Part 330, Section 40. http://www.ilga.gov/commission/jcar/admincode/032/032003300A00400R.html (accessed December 15, 2011).

2.2.4 Wetlands

Based on the U.S. Fish & Wildlife Service 1979 National Wetlands Inventory, 2005 NIPC Land Use Inventory, and Kane County Advanced Identification of Aquatic Resources study, there are approximately 6,283 acres of wetlands in the Blackberry Creek Watershed, accounting for just over 13% of the total watershed area.

Kane County's Advanced Identification of Aquatic Resources (ADID) study, completed in August 2004, [50] was a cooperative effort between federal, state, and local agencies including the Northeastern Illinois Planning Commission (now the Chicago Metropolitan Agency for Planning), U.S. Fish and Wildlife Service - Chicago Illinois Field Office, U.S. Environmental Protection Agency - Region 5, and Kane County Department of Environmental Management. This study inventoried, evaluated, and mapped high quality wetland and stream resources in the county with the primary purpose of identifying wetlands and streams unsuitable for dredging and filling because they are of particular high quality. One application of this data is to inform planning purposes such as zoning, permitting, and land acquisition decisions along with watershed planning. As of 2004, Kane County had 27,368 acres of wetlands covering 8.2% of the total land area. This is most likely only a small portion of the wetlands that existed in pre-settlement. Furthermore, of the remaining 8.2% of wetland acreage, most have been degraded in some fashion.

Figure 2-19 includes two ADID components for this plan: wetlands and streams. Among the ADID wetlands, there are three types of wetlands and streams. The first type is "High Habitat Value Wetlands and High Quality Streams" as they have been identified as having high quality wildlife habitat, high floristic quality, or high quality aquatic habitat. This group is considered "unmitigatable" due to the complex biological systems and functions they provide and it is stated that they cannot be "successfully recreated within a reasonable time frame using existing mitigation methods." The second is "High Functional Value wetlands" as they provide water quality and stormwater storage benefits to the county. The third type is simply called "Other Wetlands and Streams." This last type includes all other wetlands and streams not included in the first two types either because they were not thoroughly evaluated or they were evaluated but did not meet the criteria for high habitat value or high functional value. This last type also includes all headwater streams.

Issued in 2001, the Kane County Stormwater Ordinance afforded isolated wetlands, including fens, special protection. In 2004, Kane County commissioned a study on fens given concern that adequate protection measures were not in place.[51] Fens are

[50] NIPC, U.S. Fish and Wildlife Service and U.S. EPA. *Advanced Identification (ADID) Study, Kane County, Illinois Final Report*. Chicago, IL: USACE Chicago District, August 2004. http://www.lrc.usace.army.mil/co-r/pdf/KaneADIDReport.pdf (accessed November 7, 2011).

[51] Christopher B. Burke Engineering West, Ltd. *Kane County Fen Identification and Recharge Area Mapping Project Final Report*. Geneva, IL: Kane County

unique and valuable natural resources because they can act as local groundwater recharge areas, particularly when they have permeable soils overlying geologic deposits conducive to the transport of groundwater. A fen is defined by the report as "…a wetland dominated by calciphilic hydrophytes growing on organic or mineral soils with high organic contents that are alluvial or colluvial in nature and are dominated at the surface by sapric or muck materials or have a mucky mineral surface and have groundwater conditions that are neutral or calcareous with the dominance of base cations and anions including bicarbonate and/or sulfate." [52] For this study, researchers evaluated ADID wetland features to identify those which contained fen vegetation. Based on this evaluation, the actual presence of fens was then determined through field observations, along with the recharge potential of existing fens.

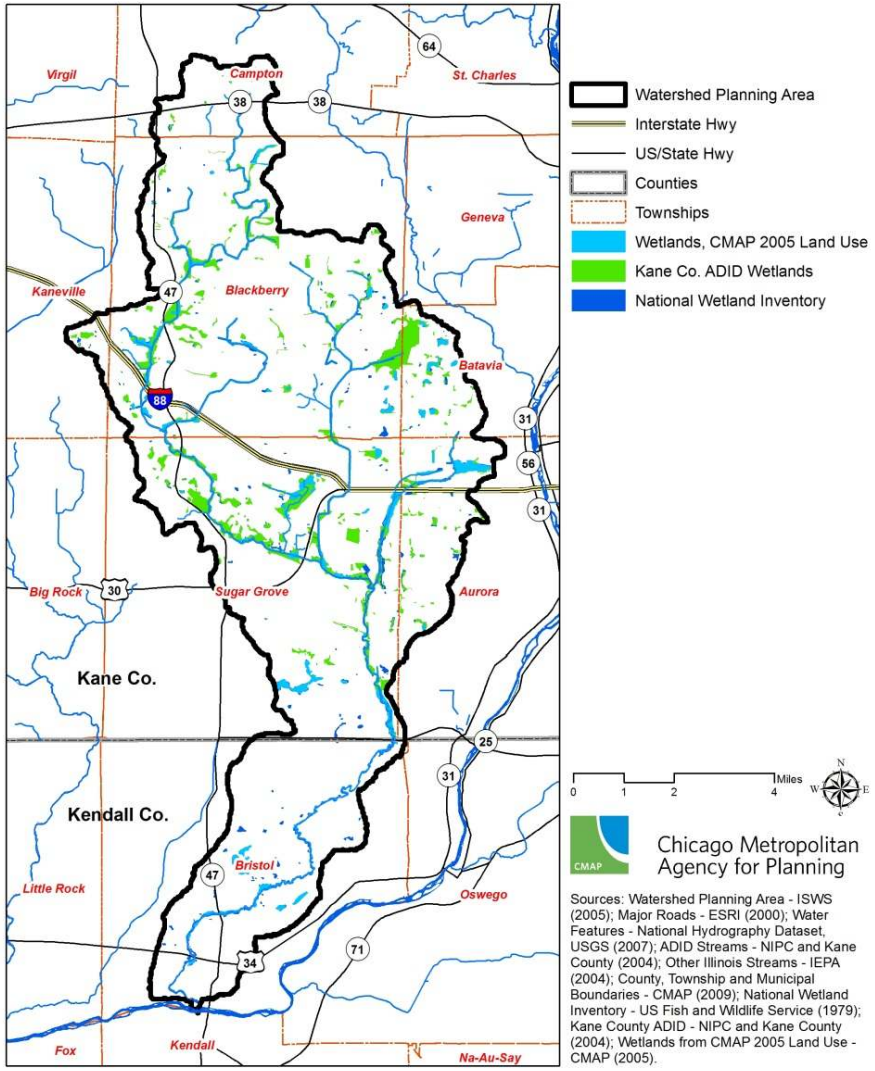


Figure 2-19. Wetlands within the Blackberry Creek Watershed.

Department of Environmental Management, September 2004. http://www.co.kane.il.us/kcstorm/fen/final_report.pdf (accessed October 15, 2011).

[52] Christopher B. Burke Engineering West, Ltd. *Kane County Fen Identification and Recharge Area Mapping Project Final Report*. Geneva, IL: Kane County Department of Environmental Management, September 2004. http://www.co.kane.il.us/kcstorm/fen/final_report.pdf (accessed October 15, 2011).

In 2002, the United City of Yorkville retained a consultant to conduct an ecological assessment of 2.8 mile long corridor along Blackberry Creek from the Fox River north to Route 47. While the 1979 National Wetlands Inventory did map the wetlands along this corridor, primarily as "palustrine, broad-leaved forested wetland this is temporarily flooded" (PFO1A), the ecological assessment revealed the existence of numerous fens, some high-quality, and discharge wetlands.[53] The consultant recommended that the City adopt measures to allow for the protection and preservation of the fens, discharge wetlands, and floodplain terrace woodlands in this corridor, such as through the establishment of a natural area easement. Toward that end, in 2008 the City passed a "Wetland Protection Regulation for Water Quality and Stormwater Management Benefits" ordinance that provides for the preservation of the remaining "isolated waters" (including fens) within Yorkville.[54]

2.2.5 Floodplains and Floodways

Floodplain and floodway data are sourced from Federal Emergency Management Agency (FEMA). A floodplain is defined as "any land area susceptible to being inundated by flood waters from any source." However areas that aren't directly adjacent to a body of water are often flooded in heavy storms. For example, the 100-year floodplain or base flood encompasses an area of land that has a 1-in-100 chance of being flooded or exceeded within any given year. Whereas the 500-year floodplain has a 1-in-500 chance of being flooded or exceeded within any given year. If a natural floodplain is developed for any other use, such use becomes susceptible to flooding. This results in property and crop damage and degraded water quality. Therefore, floodplains and their relationship to land use should be considered in a watershed plan as well as any other type of land-use planning

Floodways are defined by the National Flood Insurance Program as "the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height." Floodways are a subset of the 100-year floodplain in Figure 2-20 and carry the deeper, faster moving water during a flood event. Table 2-5 shows the acreages

[53] *Blackberry Creek Corridor Ecological Assessment*. Prepared by Conservation Design Forum for United City of Yorkville. 2002.
[54] http://www.yorkville.il.us/documents/Ord.2008-01WetlandProtection Regulations.pdf

and percentages within the watershed planning area comprising the 100-year floodplain and the 500-year floodplain.[55,56]

Table 2-5.
Floodplain Acreage within the Blackberry Creek Watershed

Floodplain	Area (acres)	% of Watershed
100-year	4,681.4	9.8
500-year	713.1	1.5

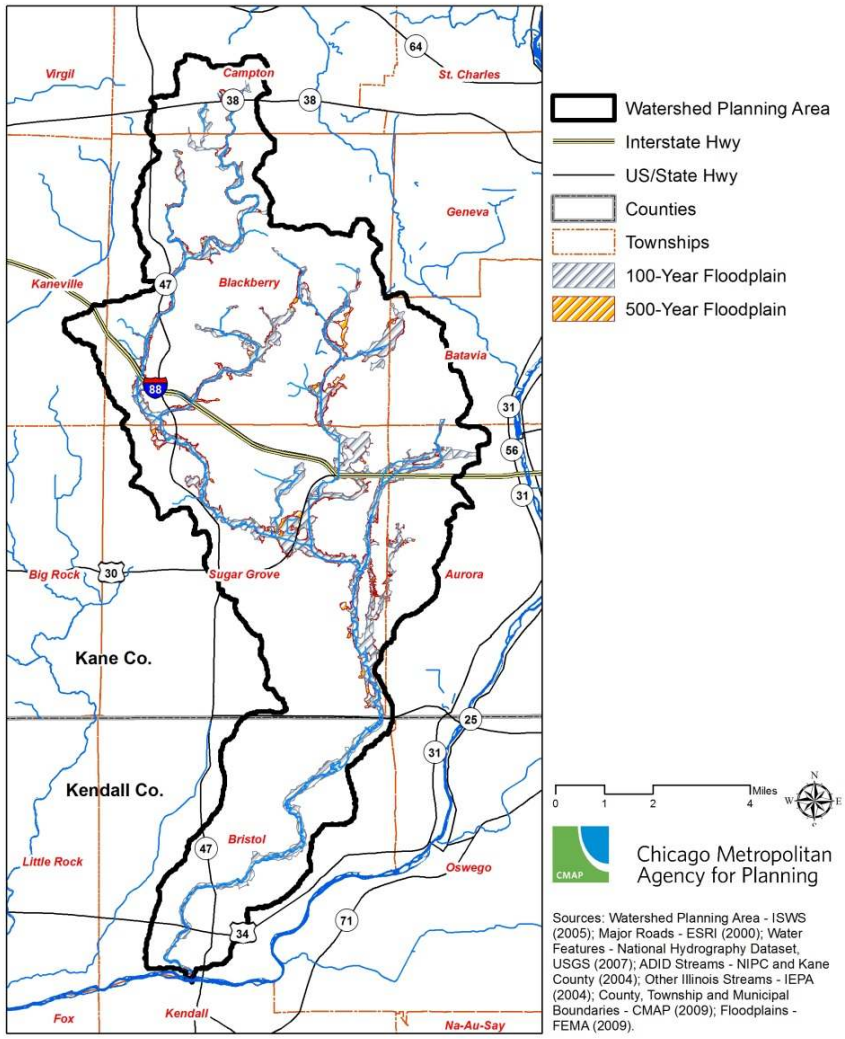


Figure 2-20. 100- and 500-year floodplains within the Blackberry Creek Watershed.

[55] "Base Flood," FEMA, last modified August 11, 2010, accessed November 3, 2011, http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/base_flood.shtm. A 100 year floodplain is described as a "flood having one percent chance of being equaled or exceeded in any given year."

[56] "Base Flood," FEMA, last modified August 11, 2010, accessed November 3, 2011, http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/base_flood.shtm. A 500 year floodplain is a flood having 0.2% chance of flooding within any given year.

2.2.6 Groundwater

Groundwater Geology

In Kane County, materials from the Quaternary geological period (2.6 million years ago to the present) overlie older Paleozoic bedrock, primarily Silurian limestone and dolomite or Ordovician shale.[57] The Cambrian-Ordovician bedrock forms a deep aquifer system, typically 800 to 1,500 feet deep, throughout the entire region that is heavily developed for groundwater pumping.[58] Quaternary materials are also a source of groundwater, forming shallow aquifers from which wells pump water. Quaternary materials include sand, gravel, peat and floodplain alluvium. The sand and gravel in Quaternary materials act as aquifers when they are saturated with water because their porosity and hydraulic conductivity are high, allowing water to flow freely.[59]

[57] Mehnert, Edward. "Groundwater Flow Modeling as a Tool to Understand Watershed Geology: Blackberry Creek Watershed, Kane and Kendall Counties, Illinois." *Circular 576*, Champaign, IL: ISGS, 2010. http://www.isgs.uiuc.edu/maps-data-pub/publications/monthly/jun-10-pubs.shtml (accessed November 3, 2011).

[58] "Center for Groundwater Science: Northeastern Illinois," ISWS, accessed October 26, 2011, http://www.isws.illinois.edu/gws/ neillinois.asp.

[59] ISGS. "Kane County Water Resources Investigations: Final Report on Geologic Investigations," by William S. Dey, Alec M. Davis, B. Brandon Curry, Donald A. Keefer and Curt C. Abert. *ISGS Open File Series,* 2007-7. Champaign, IL: ISGS, 2007. http://library.isgs.uiuc.edu/Pubs/pdfs/ofs/ 2007/ofs2007-07.pdf (accessed November 3, 2011).

Well Setbacks

Community well systems (CWS) are subject to the Illinois Groundwater Protection Act (IGPA, P.A. 85-0863). Passed in 1987, IPGA emphasizes the comprehensive management of groundwater resources by requiring the implementation of practices and policies that protect groundwater through prevention-oriented approaches.[60] Among these approaches, IGPA guides federal, state and local government in setting groundwater protection policies; assessing the quality and quantity of groundwater resources being utilized; and establishing groundwater quality standards.

One concrete action required by IGPA is that municipalities establish setback zones for CWS wells. Well setback zones help to prevent contamination of groundwater resources with pollution by restricting certain land uses within the setback zone. Industrial, commercial, municipal, agricultural or residential land uses might be restricted by a setback zone given their possible contribution to pollution that might contaminate groundwater. Under IGPA, a 200 or 400 foot minimum setback zone is mandated for CWS wells, depending on the sensitivity of a

[60] *Illinois Groundwater Protection Act*. *Ill. Comp. Stat*. 415 (1987), § 55. http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1595&ChapAct=415%A0ILCS%A055/&ChapterID=36&ChapterName=ENVIRONMENTAL%20SAFETY&ActName=Illinois%20Groundwater%20Protection%20Act(accessed October 12, 2011).

particular well to possible contamination.[61] The 400 foot setback zone is specified for wells deemed "vulnerable" to contamination based on the depth or character of the aquifer supplying the well. IGPA empowers municipalities to adopt more stringent ordinances to protect groundwater resources. For well setback zones, municipalities can voluntarily adopt ordinances requiring a maximum setback zone of 1,000 feet around certain eligible wells.[62]

Well setback zones have been depicted for CWS wells in the Blackberry Creek Watershed (Figure 2-21). A 400 foot setback is shown for all shallow wells, which are more susceptible to contamination, while a 200 foot setback is shown for deep wells, which are less susceptible to contamination. Maximum well setback zones are shown in the same figure. Well locations were obtained from the Illinois EPA for CWS wells tapping both shallow and deep aquifers.[63]

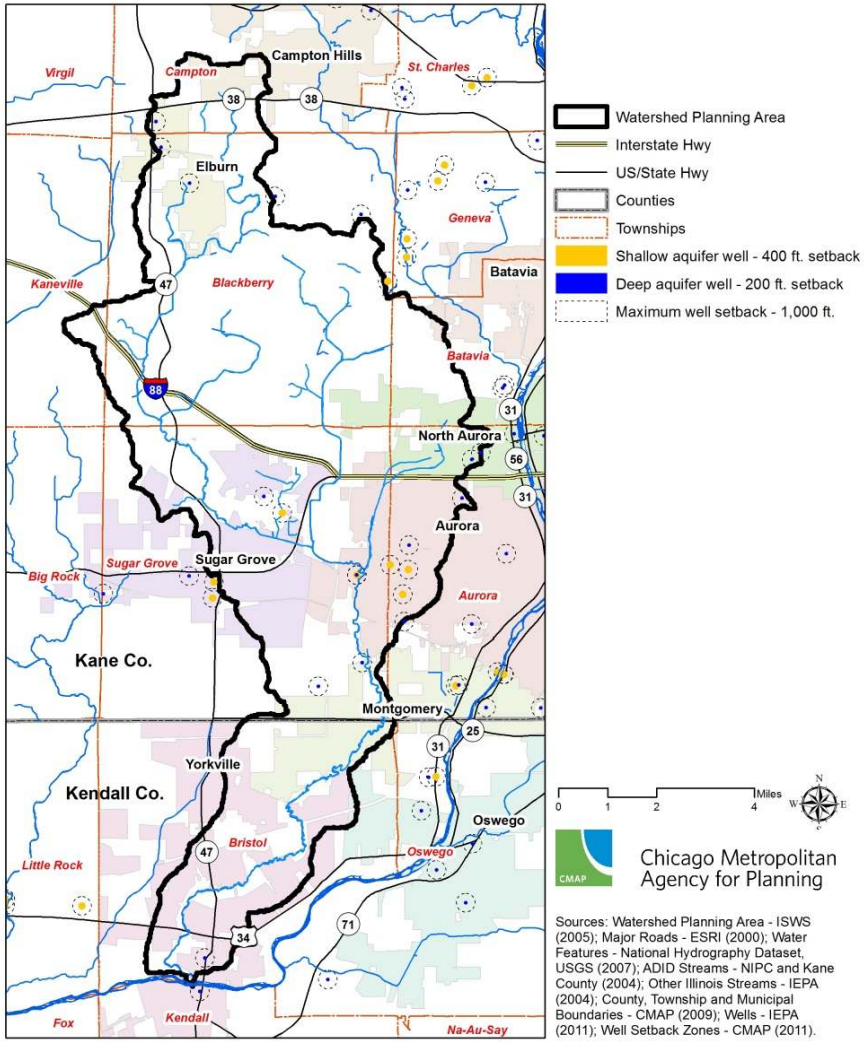


Figure 2-21. Community water supply well minimum and maximum setback zones.

[61] *Illinois Groundwater Protection Act*. *Ill. Comp. Stat*. 415 (1987), § 55. http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=1595&ChapAct=415%A0ILCS%A055/&ChapterID=36&ChapterName=ENVIRONMENTAL%20SAFETY&ActName=Illinois%20Groundwater%20Protection%20Act(accessed October 12, 2011).

[62] "Maximum Setback Zones," IEPA, accessed October 12, 2011, http://www.epa.state.il.us/water/groundwater/maximum-setback-zones/.

[63] Wade Boring, Manager Geographic Analysis, Illinois Environmental Protection Agency (IEPA), e-mail message to author(s), July 22, 2011.

Regional Groundwater Investigations

Regional water supply planning, which got underway in 2006, culminated with the publication of *Water 2050: Northeastern Illinois Water Supply/Demand Plan* in March 2010.[64] Water 2050 is informed by the most detailed water demand study every conducted for the region.[65] Additionally, the work of the Illinois State Water Survey quantified the impacts of regional water demand scenarios on the deep-bedrock aquifer underlying the eleven-county planning area, shallow aquifer system beneath the Fox River Basin, and the Fox River itself.

With regional population projected to grow 38% by 2050, demand scenarios indicate growth in water use ranging from 36 – 64% under business-as-usual scenarios.[66] Given the new and enhanced understanding of regional water supply sources and their relatively finite or constrained nature, such growth in water demand is not thought to be sustainable. For example, at current withdrawal rates, the deep-bedrock aquifer is being mined. And overpumping of the shallow aquifer is beginning to capture streamflow where it has been studied in the Fox River Basin; a phenomenon that is projected to get worse as population and demand increases through time. In order to avoid supply / demand imbalances and offer some protection to other users of water (e.g., aquatic ecosystems), implementing the promise of *Water 2050* has the potential to keep water demand relatively flat – 7% growth – as compared to projected population growth.[67]

On the groundwater quality side of the resource management challenge, IEPA has concluded that the state's groundwater quality is being degraded.[68] In concert with that conclusion and as discussed in the water quality chapter, chloride concentrations are trending upwards in shallow wells throughout the six-county region. Thus, there are ample reasons for groundwater-dependent communities and private-well owners to work collaboratively and recommend that measures be implemented to improve protection (i.e., quality) and conservation (i.e., quantity) of local groundwater resources.

[64] CMAP. *Northeastern Illinois Regional Water Supply/Demand Plan*. Chicago, IL: CMAP, March 2010. http://www.cmap.illinois.gov/water-2050 (accessed November 8, 2011).
[65] Southern Illinois University, Department of Geography and Environmental Resources. *Regional Water Demand Scenarios for Northeastern Illinois: 2005-2050*, by B. Dziegielewski and F.J. Chowdhury. Chicago, IL: CMAP, 2008.
[66] Ibid 65.
[67] CMAP. *Northeastern Illinois Regional Water Supply/Demand Plan*. Chicago, IL: CMAP, March 2010. http://www.cmap.illinois.gov/water-2050 (accessed November 8, 2011), pg. 90. For example, although population increased in the City of Seattle, WA from 1990 to 2004, water demand during the same period still decreased.
[68] IEPA. *Illinois Integrated Water Quality Report and Section 303(d) List DRAFT, Volume II: Groundwater*. Springfield, IL: IEPA, 2010. http://www.epa.state.il.us/water/tmdl/303d-list.html (accessed September 15, 2011).

Kane County Groundwater Investigations

At the county level, the Kane County 2030 Land Resource Management Plan identified providing a sustainable water supply as one of the three major challenges facing the county through the year 2030. The population of Kane County is projected to increase more than 70 percent from the year 2000 population of 404,000 to over 718,000 by the year 2030. Lake Michigan water will not be available to Kane County due to legal and economic constraints. That leaves the shallow aquifer, deep aquifer and the Fox River as the future water sources for the county. Previous scientific studies offered only a qualitative understanding of the geology and hydrogeology of the county and scattered observations that were inadequate for water supply planning. Shallow aquifer withdrawals were close to exceeding sustainable yields in the eastern portions of the county and deep aquifer yields have long exceeded the sustainable supply in the region. The limitations of inland surface water supplies were also in question.

Therefore, Kane County entered into a contract in 2002 with the Illinois State Water Survey (ISWS) and Illinois State Geological Survey (ISGS) to conduct scientific investigations and prepare computer models and reports on the future availability of drinking water for Kane County. Preliminary results were completed by 2007, and the final reports and models were delivered in 2009.[69] The results are intended to allow the 30 municipalities and other water providers within the County to collectively plan and manage their future drinking water supplies based on a level of science unsurpassed by any other county in the State of Illinois. To that end, the County joined the five-county Northwest Water Planning Alliance (NWPA) in September 2010 to continue the process of cooperative planning for future water supplies, not only with the municipalities and water providers within the county, but also with neighboring counties and municipalities.

A series of surface water, geology, and groundwater investigations were conducted, including streamflow analysis and modeling, mapping of groundwater levels, mapping and modeling of near-surface geology, analysis and trends in deep groundwater quality, assessment of shallow groundwater quantity, and computer modeling of groundwater flow. See the following three sections for specific information on shallow aquifers, aquifer sensitivity, and well capture zones in Kane County derived by these studies.

[69] "Water Resources Investigations for Kane County, Illinois," ISWS, accessed November 8, 2011, http://www.isws.illinois.edu/gws/ kaneco/kaneco.asp.

Shallow Aquifers

Many of the Quaternary aquifer systems previously described are major, meaning in this region that they yield pumped water at a rate of at least 70 gallons per minute.[70] These major aquifers, mapped for Kane County by the Illinois State Geological survey, are pictured in Figure 2-22. The St. Charles and Kaneville formations are the predominant major aquifers in the Kane County portion of the watershed planning area. (Data processing and mapping is incomplete but in process for the Kendall County portion of the watershed.)

Aquifer Sensitivity

Certain areas in the watershed are more vulnerable than others to aquifer contamination from sources at or near the land surface. While such aquifer they are nonetheless vulnerable to land use activity.[71] Classification of sensitivity ranges from Unit A-E with "A" having the highest potential for contamination and "E" having the lowest (Table 2-6). Each classification is qualified by two characteristics: proximity to or distance from the land surface and the degree of aquifer thickness. Sensitivity to contamination increases the closer the aquifer is to the land surface and with greater aquifer thickness.

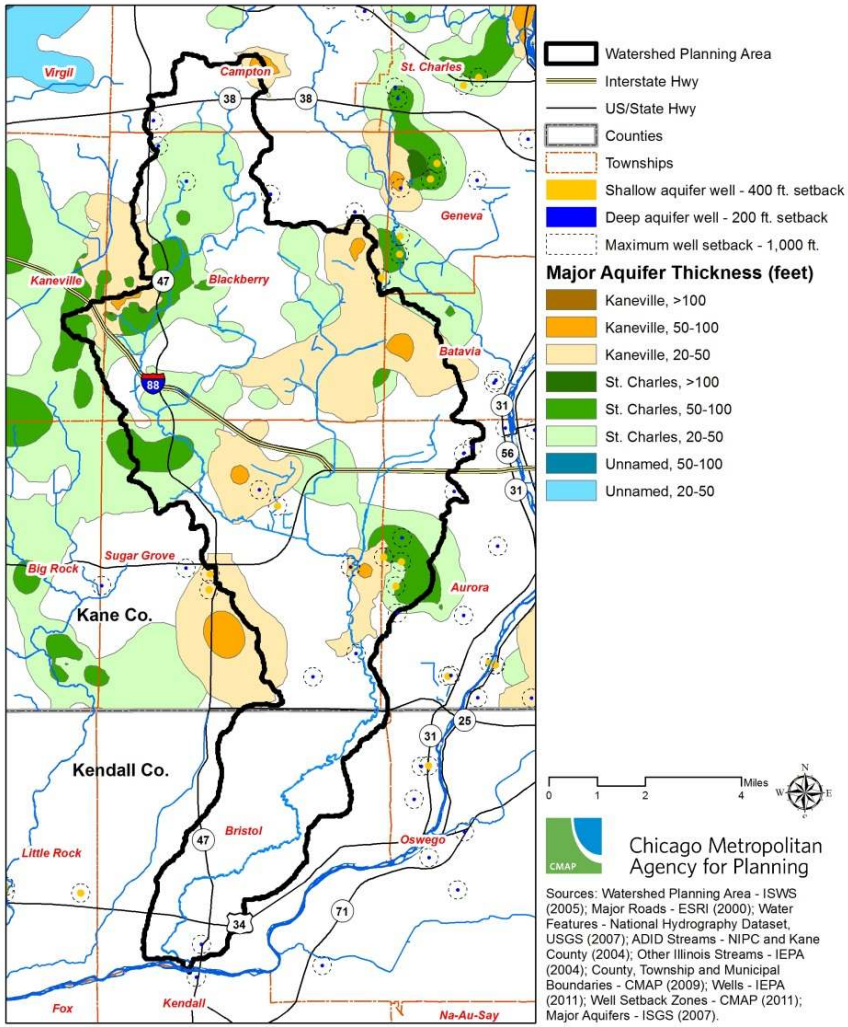


Figure 2-22. Major aquifers in the Kane County portion of the Blackberry Creek Watershed.

[70] "Water Resources Investigations for Kane County, Illinois," ISWS, accessed November 8, 2011, http://www.isws.illinois.edu/gws/kaneco/kaneco.asp.
[71] ISGS. "Kane County Water Resources Investigations: Final Report on Geologic Investigations," by William S. Dey, Alec M. Davis, B. Brandon Curry, Donald A. Keefer and Curt C. Abert. *ISGS Open File Series,* 2007-7. Champaign, IL: ISGS, 2007. http://library.isgs.uiuc.edu/Pubs/pdfs/ofs/2007/ofs2007-07.pdf (accessed November 3, 2011).

This plan calls attention to two map unit classes: Units A and B. These areas have the highest potential for contamination due to the presence of sand and gravel deposits that allow for contaminants to move rapidly through to either the aquifer and/or nearby streams via shallow groundwater flow. The Unit A class is defined as "areas where the upper surface of the aquifer is within 20 feet of the land surface and with sand and gravel or high-permeability bedrock aquifers greater than 20 feet thick."[72] The Unit A class (High Potential for Aquifer Contamination) represents the area that is the most sensitive to contamination. The Unit B class (Moderately High Potential for Aquifer Contamination) should also be considered for planning purposes. While aquifers within the Unit B class are less thick than those classed under Unit A, they are similarly close to the land surface as Unit A aquifers and thus, as vulnerable to contamination based on that metric alone.

Table 2-6 describes the continuum of Unit classes while Figure 2-23 illustrates the pattern of their distribution throughout the Kane County portion of the watershed. (Data processing and mapping is incomplete but in process for the Kendall County portion of the watershed.)

Table 2-6.
Aquifer Classification and Sensitivity to Contamination

Map Unit	Potential for Contamination	Aquifer Description
A1	**High**	Aquifers are greater than 50 feet thick and are within 5 feet of the land surface.
A2	**High**	Aquifers are greater than 50 feet thick and are between 5 and 20 feet below the land surface
A3	**High**	Aquifers are between 20 and 50 feet thick and are within 5 feet of the land surface.
A4	**High**	Aquifers are between 20 and 50 feet thick and are between 5 and 20 feet below the land surface.
B1	**Moderately High**	Sand and gravel aquifers are between 5 and 20 feet thick, or high-permeability bedrock aquifers are between 15 and 20 feet thick, and either aquifer type is within 5 feet of the land surface.
B2	**Moderately High**	Sand and gravel aquifers are between 5 and 20 feet thick, or high-permeability bedrock aquifers are between 15 and 20 feet thick, and either aquifer type is between 5 and 20 feet below the land surface.
C1	**Moderate**	Aquifers are greater than 50 feet thick and are between 20 and 50 feet below the land surface.
C2	**Moderate**	Aquifers are between 20 and 50 feet thick and are between 20 and 50 feet below the land surface.
C3	**Moderate**	Sand and gravel aquifers are between 5 and 20 feet thick, or high-permeability bedrock aquifers are between 15 and 20 feet thick, and either aquifer type is between 20 and 50 feet below the land surface.
D1	**Moderately Low**	Aquifers are greater than 50 feet thick and are between 50 and 100 feet below the land surface.
D2	**Moderately Low**	Aquifers are between 20 and 50 feet thick and are between 50 and 100 feet below the land surface.
D3	**Moderately Low**	Sand and gravel aquifers are between 5 and 20 feet thick or high-permeability bedrock aquifers are between 15 and 20 feet thick and either aquifer type is between 50 and 100 feet below the land surface.
E1	**Low**	Sand and gravel or high-permeability bedrock aquifers are not present within 100 feet of the land surface.

[72] ISGS. "Kane County Water Resources Investigations: Final Report on Geologic Investigations," by William S. Dey, Alec M. Davis, B. Brandon Curry, Donald A. Keefer and Curt C. Abert. *ISGS Open File Series,* 2007-7. Champaign, IL: ISGS, 2007. http://library.isgs.uiuc.edu/Pubs/pdfs/ofs/2007/ofs2007-07.pdf (accessed November 3, 2011).

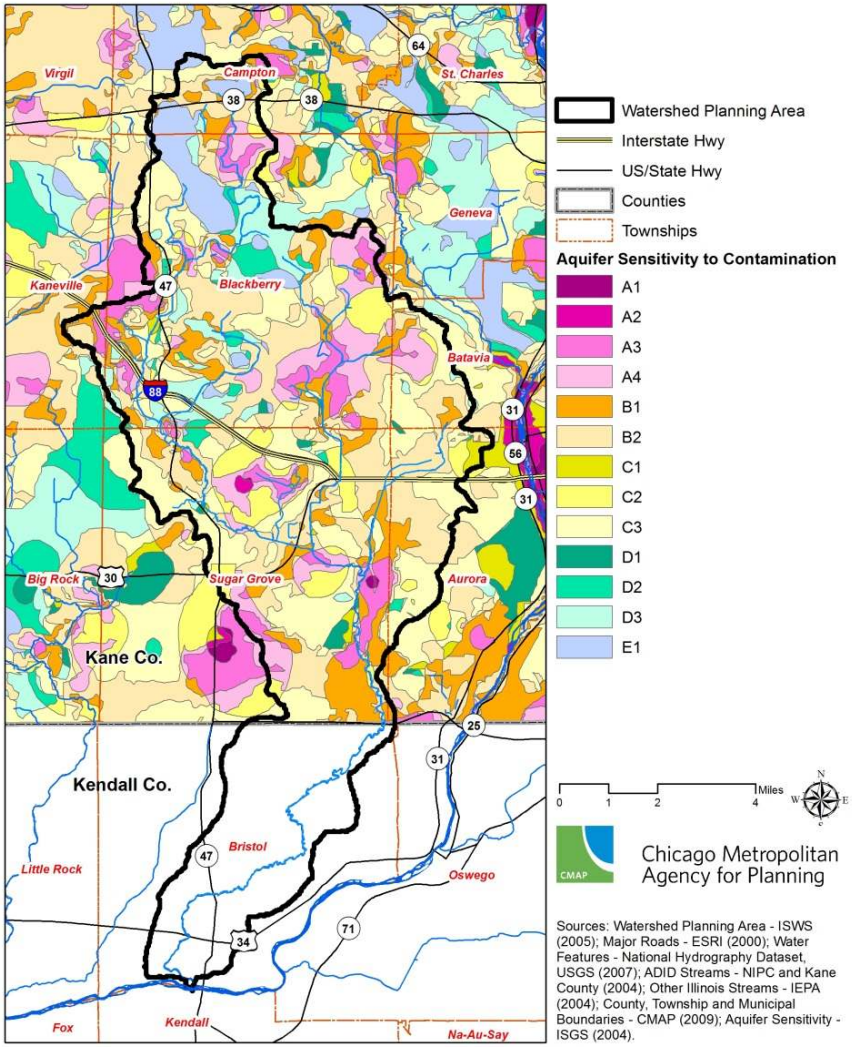


Figure 2-23. Aquifer sensitivity in the Kane County portion of the Blackberry Creek Watershed.

Well Capture Zones

The Illinois State Water Survey studied groundwater flow in Kane County and has delineated "capture zones" associated with high-capacity shallow wells.[73] While the idea of a capture zone is depicted two-dimensionally in Figure 2-24, it is in fact a three-dimensional phenomenon. A capture zone is that portion of the subsurface where groundwater will flow toward the open interval of a well. Thus, a capture zone is a contributing area beneath the earth's surface to a well's output of pumped groundwater.

Capture zones are defined in terms of travel time for groundwater to move from its place within the aquifer to the well for subsequent pumping up to the earth's surface. Figure 2-24 depicts five-year and twenty-year capture zones for public water supply wells within the Kane County portion of the Blackberry Creek Watershed that are pumping at a rate of 100,000 gallons per day or greater.

For purposes of planning and management, the significance of understanding the groundwater contribution areas to public water supply wells rests with prevention and/or preparedness efforts related to contamination and the estimated time it will

[73] ISWS. *Kane County Water Resource Investigations: Simulation of Groundwater Flow in Kane County and Northeastern Illinois*, by Meyer, S.C., G.S. Roadcap, Y-F Lin, D.D. Walker. Survey Contract Report 2009-07. Champaign, IL: ISWS, 2009. http://www.isws.illinois.edu/gws/simugwfneil.asp (accessed December 29, 2011).

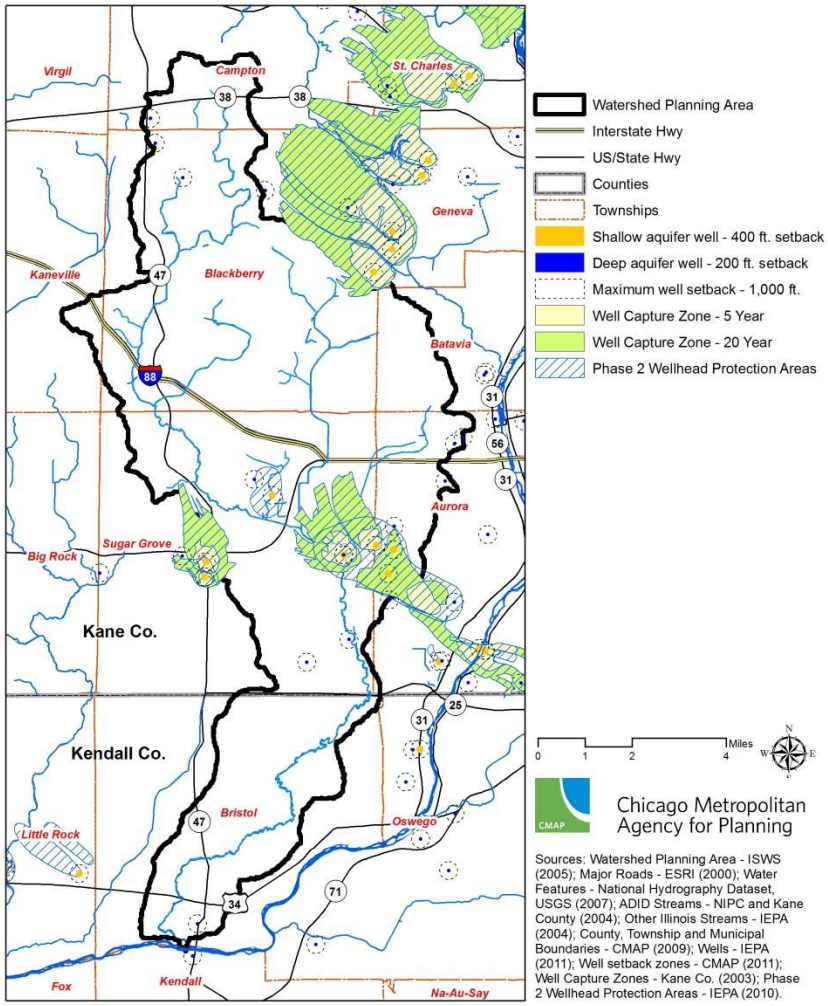


Figure 2-24. 5- and 20-year wellhead capture zones for community water supply wells in the Kane County portion of the Blackberry Creek Watershed.

take for contaminants to reach a public water supply should they ever enter the aquifer. This information when combined with knowledge of aquifer sensitivity data, could inform zoning and land-use decisions that should be driven by the need to protect source water for public drinking water supplies from incompatible land use. Similarly, this information can inform development of wellhead protection programs, one of many recommendations of this plan.

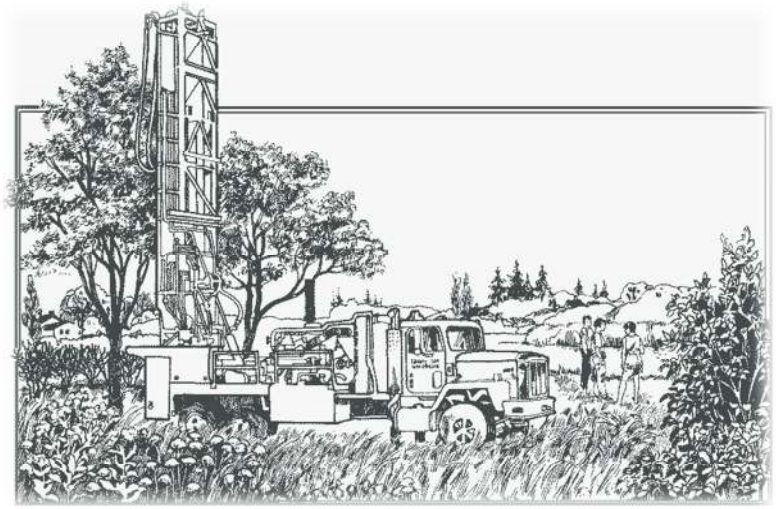
Kendall County Groundwater Studies

The previous sections describe research surrounding groundwater resources in Kane County. However, the Illinois State Water Survey (ISWS) and Illinois State Geological Survey (ISGS) are currently completing modeling investigations and mapping that will provide technical information and support for the overall sustainable management and protection of Kendall County's groundwater resources.

ISWS is providing an assessment of long-term groundwater availability from deep and shallow aquifers, along with documentation of water levels and water quality in selected deep and shallow wells in the county to serve as benchmarks for future comparison of groundwater conditions.[74]

[74] ISWS. *Groundwater Studies for Water Resource Planning in Kendall County, IL*, by Lin, Yu-Feng, Randall A. Locke, II, Walt Kelly and Scott C. Meyer. Champaign, IL: ISWS, in preparation. http://www.isws.illinois.edu/gws/gwstudknklco.asp (accessed October 21, 2011).

ISGS is completing a 3-D hydrogeologic mapping project for Kendall County. The project is producing a computerized 3-D hydrogeologic map of aquifers and non-aquifers within the unconsolidated and major bedrock formations of the county. From this 3-D map, a set of derivative maps will be developed to show the depth and distribution of various aquifer and non-aquifer deposits, the uncertainty associated with these deposit maps, the vulnerability of shallow aquifers to contamination, and the potential for recharge to shallow aquifers.[75]



[75] Donald Keefer, Senior Hydrogeologist, ISGS, personal communication to the author(s), September 2011.

2.2.7 Leaking Underground Storage Tanks

The Illinois Environmental Protection Agency (EPA) has identified 30 leaking underground storage tank (LUST) sites within the watershed planning area (Figure 2-25). LUST sites are located in or near Elburn, Sugar Grove, North Aurora, Aurora, Yorkville, and unincorporated areas.[76]

As the name suggests, LUST sites are areas contaminated from leaks, spills, and overfills that occurred while underground tanks were in use. Contamination is typically related to gasoline, diesel fuel, and other hazardous substances which pose a threat to groundwater, soil, streams and rivers, and lakes.

Groundwater is the source of drinking water for the watershed planning area. As such, it is important to remediate LUST sites, especially those located within sensitive aquifer areas identified in Figure 2-23 above. Additionally, LUST sites located near the Fox River, lakes, Blackberry Creek, and tributary streams should also receive remediation priority. Funding for site remediation is available through Illinois EPA through its Underground Storage Tank fund.[77]

[76] The LUST map is based on available data obtained from the IEPA; however, updates to this dataset are recommended. As an example, an Environmental Assessment (EA) was developed for a site located north of Edgewood Road, between the Crystal Lake and McHenry Stations within the Village of Prairie Grove. The EA was developed as part of the proposed Union Pacific Northwest Line Upgrade Project.

[77] "Leaking Underground Storage Tank Program," IEPA, accessed November 2, 2011, http://www.epa.state.il.us/land/lust/index.html.

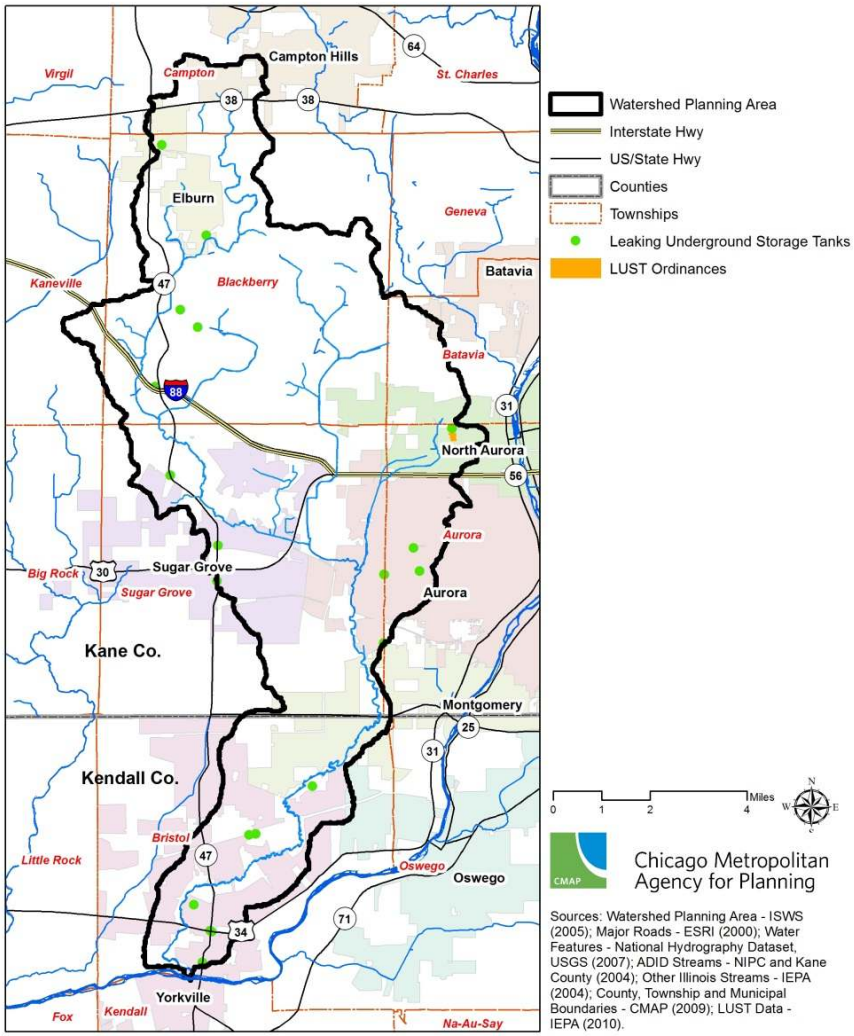


Figure 2-25. Leaking underground storage tank locations within the Blackberry Creek Watershed.

2.2.8 Dams

Congress authorized the U.S. Army Corps of Engineers (USACE) to create a nation-wide inventory of dams in 1972. Today, the National Inventory of Dams (the Inventory) is a database maintained by USACE that contains information on dams throughout the nation meeting certain criteria. Dams included in the Inventory are those that meet one or more of the following classifications: high hazard (i.e., loss of life is likely in the event of dam failure); significant hazard (i.e., loss of life or damage to property or the environment is possible in the event of dam failure); greater than or equal to 25 feet in height and 15 acre-feet in storage; or greater than or equal to 50 acre-feet in storage and 6 feet in height.[78] All dams meeting these criteria are eligible for inclusion in the Inventory, yet in reality, data collection is subject to financial limitations, particularly for those dams unregulated by state or federal agencies.[79]

Due to security concerns regarding dam hazard information, the Inventory is not available for download by the general public, but can be acquired by government agencies like CMAP. However, although Inventory records for dams in the watershed planning area were obtained, USACE has acknowledged reports of error in

[78] "CorpsMaps National Inventory of Dams," USACE, last modified January 15, 2009, accessed October 12, 2011, http://geo.usace.army.mil/pgis/f?p=397:1:8757593860658286::NO.

[79] "CorpsMaps National Inventory of Dams," USACE, last modified January 15, 2009, accessed October 12, 2011, http://geo.usace.army.mil/pgis/f?p=397:1:8757593860658286::NO.

the geographic coordinates for dams in the state of Illinois.[80] Dam locations were therefore impossible to map for this watershed planning area. The Illinois Department of Natural Resources Office of Water Resources, which maintains information on dams in the state, is aware of this problem, but with limited funding available for data collection, is not currently able to correct the error.[81] While mapping was not possible, the dimensions and number of dams in the Inventory for Illinois are correct. According to this information, there are five dams on Blackberry Creek in Kane County ranging in height from 9 to 15 feet and in storage from 2 to 71 acre-feet.[82]

In addition, Kane County staff provided a spatial data layer on dams in Kane County. However, this layer has not been updated for several years and may contain dams that have since been removed.[83]

[80] Rebecca Ragon, USACE staff, e-mail message to author(s), August 4, 2011.
[81] Paul Mauer, IDNR Senior Dam Safety Engineer, e-mail message to author(s), August 24, 2011.
[82] USACE. *National Inventory of Dams*. Dataset obtained through non-disclosure agreement between USACE and CMAP, July 22, 2011.
[83] Jason Vertracht, Kane County GIS Analyst, e-mail message to author(s), July 20, 2011.

2.2.9 National Pollutant Discharge Elimination System (NPDES)

Permittees

Authorized under amendments made to the Clean Water Act in 1987, the U.S. Environmental Protection Agency (U.S. EPA) uses permits issued through the National Pollutant Discharge Elimination System (NPDES) to manage pollution to water bodies from a variety of point sources. Point sources regulated through NPDES include wastewater treatment plants, industrial dischargers, concentrated animal feeding operations (CAFOs), combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), and urban stormwater runoff.[84] The NPDES program plays a key role in restoring water quality since it sets discharge limits, requires monitoring and reporting requirements, and limits discharge of specific pollutants including BOD, total suspended solids, ammonia nitrogen, fecal coliform, dissolved oxygen, and phosphorus. There are four NPDES permittees in the watershed, three classified as "non-major" (Feltes Sand and Gravel, Fisherman's Inn, Fox Valley Park District – Blackberry Aquatic Center) and one classified as "major" (Yorkville-Bristol Sanitary District). Locations are shown in Figure 2-26.

[84] "NPDES Permit Program Basics," U.S. EPA, last modified January 4, 2011, accessed October 12, 2011, http://cfpub.epa.gov/npdes/home.cfm?program_id=45.

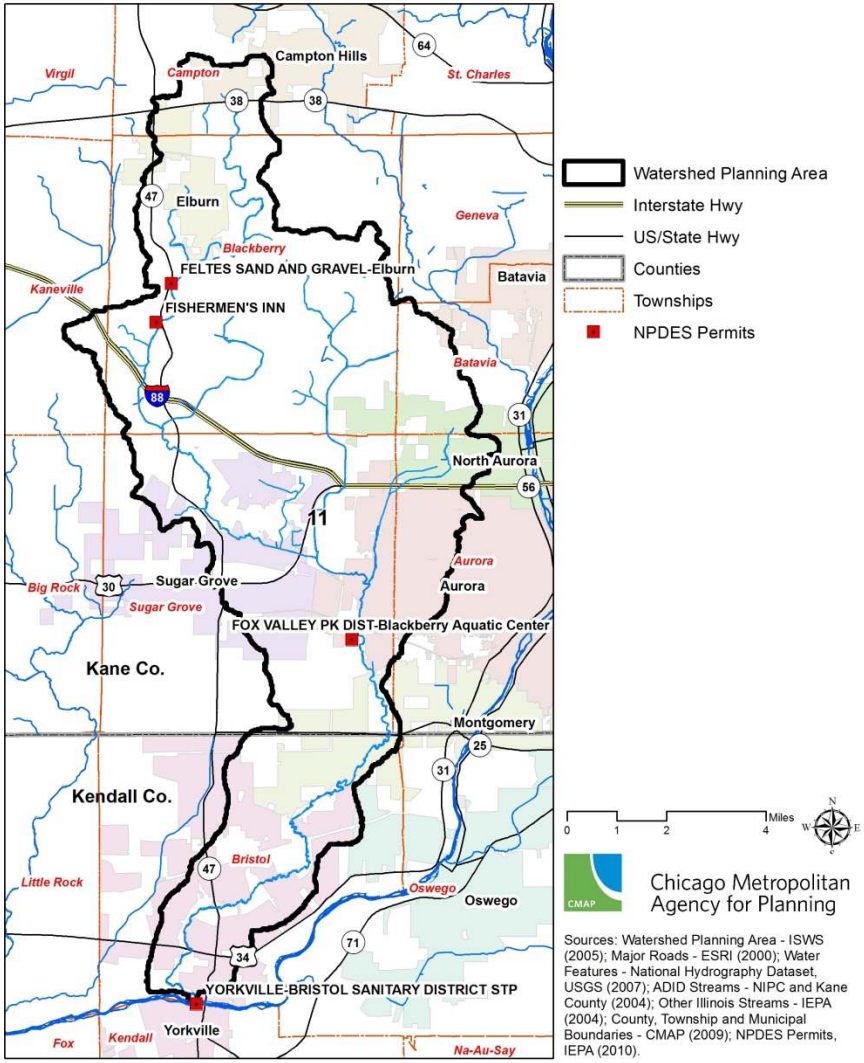


Figure 2-26. NPDES permittees within the Blackberry Creek Watershed.

NPDES Stormwater Program

The stormwater component of the NPDES Program was implemented in two phases. Phase I of this program was implemented in 1990 and applies to medium and large municipal storm sewer systems, as well as certain counties with populations of 100,000 or more. Phase II was implemented in 2003 and expands the scope of storm sewer systems which are subject to NPDES.[85] Phase II applies to small municipal separate storm sewers (MS4s) including smaller construction or industrial sites that are owned and operated in urbanized areas.[86] Industrial sites or construction activities that disturb one or more acres of land must obtain an NPDES permit before construction activities begin.[87]

Under the terms of Phase II permits, industrial, construction, and MS4 Phase II permittees are required to implement certain practices that control pollution in stormwater runoff. To prevent the contamination of stormwater runoff, industrial and construction permittees must develop a stormwater pollution prevention plan (SWPPP), while MS4 permittees must develop a

[85] "NPDES Stormwater Program," U.S. EPA, last modified January 4, 2011, accessed October 13, 2011, http://cfpub.epa.gov/npdes/home.cfm?program_id=6.

[86] "NPDES Stormwater Program," U.S. EPA, last modified January 4, 2011, accessed October 13, 2011, http://cfpub.epa.gov/npdes/home.cfm?program_id=6.

[87] U.S. EPA. "Stormwater Phase II Final Rule: An Overview." *EPA Report No. 833-F-00-001*. Washington, D.C.: U.S. EPA, 2005. http://www.epa.gov/npdes/pubs/fact2-0.pdf (accessed October 12, 2011).

similar stormwater management program (SWMP). Stormwater runoff carrying pollutants from impervious surfaces can degrade water quality when discharged untreated into local rivers and streams, as is often the case. Programs like Phase II that encourage planning and implementation on a watershed basis are therefore vital for protecting water quality from stormwater runoff from both large and small separate stormwater sewer systems, as well as industrial and construction sites.

The following information focuses on the Phase II permit status of municipalities in the watershed planning area. As part of an integrated approach to stormwater pollution prevention, MS4 pollution prevention plans must address the following six minimum control measures:[88]

1) Public education and outreach,
2) Public participation and involvement,
3) Illicit discharge detention and elimination,
4) Construction site runoff control,
5) Post-construction runoff control, and
6) Proper maintenance of pollution prevention controls.

The NPDES Phase II permittees that comply with these control measures within the Blackberry Creek Watershed are listed in Table 2-7.

Table 2-7.
MS4 Permittee Information for the Blackberry Creek Watershed

Unit of Local Government	MS4 Permittee?	Permit Number	Date of Original Permit Issuance	Date of Permit Expiration
MUNICIPALITIES				
Aurora	Yes	ILR400283	9/20/2004	3/31/2014
Batavia	Yes	ILR400288	9/20/2004	3/31/2014
Campton Hills	No	---	---	---
Elburn	Yes	ILR400507	9/21/2004	3/31/2014
Montgomery	Yes	ILR400390	9/27/2004	3/31/2014
North Aurora	Yes	ILR400401	5/23/2005	3/31/2014
Oswego	Yes	ILR400415	10/4/2004	3/31/2014
Sugar Grove	Yes	ILR400516	10/6/2004	3/31/2014
Yorkville	Yes	ILR400554	10/12/2004	3/31/2014
TOWNSHIPS				
Aurora Twp	Yes	ILR400005	3/22/2005	
Batavia Twp	Yes	ILR400009	N/A	
Blackberry Twp	Yes	ILR400486	9/20/2004	
Bristol Twp	Yes	ILR400018	3/21/2005	
Campton Twp	Yes	ILR400483	10/19/2004	
Geneva Twp	Yes	ILR400056	5/11/2005	
Kaneville Twp	No	---	---	
Sugar Grove Twp	Yes	ILR400136	10/6/2004	
COUNTIES				
Kane County	Yes	ILR400259	9/23/2004	
Kendall County	Yes	ILR400261	9/23/2004	

[88] U.S. EPA. "Stormwater Phase II Final Rule: An Overview." *EPA Report No. 833-F-00-001*. Washington, D.C.: U.S. EPA, 2005. http://www.epa.gov/npdes/pubs/fact2-0.pdf (accessed October 12, 2011).

2.2.10 Physical Stream Conditions: 2002 NIPC Stream Inventory

The Northeastern Illinois Planning Commission (NIPC), in cooperation with the Fox River Ecosystem Partnership (FREP), conducted a stream inventory project on several streams within the Fox River Basin in 2002, including Blackberry Creek and its Lake Run tributary within Kane County. The goal of the inventory was to provide stream assessment information for use in watershed-based plan development.[89]

The inventory documented several elements including channel conditions (bank erosion, channel dimensions, bank vegetation), hydraulic structures (e.g., bridges, culverts), point discharges (e.g., pipes, ditches), substrate composition (e.g., gravel, sand, clay), water quality indicators (filamentous algae, oil and grease), types of fish habitat, observations of aquatic plants and animals, and land use/land cover and vegetation types within the stream corridor. The NIPC stream inventory work utilized a field data form (Stream Inventory Report Form, SIRF) modified from, and followed the same stream assessment methodology utilized by, the Lake County Stormwater Management Commission.

For the field work, the stream was divided into approximate 1,500 – 2,500 foot sections or "reaches" based on relative homogeneity within a reach (e.g., sinuosity, adjacent land use/cover) and identifiable beginning and end points (e.g., road crossings) as initially determined from aerial photos. The stream was always waded in an upstream direction. One SIRF was filled out for each reach. At the beginning and end of each reach, a GPS waypoint and representative photo were taken. A photo and GPS waypoint were also taken at each hydraulic structure, point discharge, debris blockage, and areas exhibiting a high degree of erosion. At three representative locations in each reach, measurements of bank height, bank slope, water depth, and top and bottom channel width were recorded along with a GPS waypoint. All GPS waypoint and photo numbers were recorded on the SIRF. Formal macroinvertebrate and fish surveys were not conducted, though the interns did make note of any aquatic or terrestrial organisms they observed.

On a weekly basis, the interns would download the digital photos and GPS waypoints and enter the field data into a database. This data was used for mapping several key stream condition aspects, descriptions of which follow below.

Streambank Erosion

While erosion is a natural process, it can be greatly accelerated by changes in hydrology associated with urbanization. Streambank erosion can contribute a large amount of sediment that then settles in slower moving reaches of the stream, negatively impacting aquatic habitat and overall stream health. Eroding banks also lead to losses of stream corridor habitat. The degrees of streambank erosion shown on Figure 2-28 reflect both the overall prevalence of erosion (proportion of the reach

[89] NIPC. *Implementation of the Fox River Watershed Management Plan, Phase 1*. Chicago, IL: CMAP, 2004.

experiencing bank erosion) and the height of the banks. "Low" erosion was indicated by moderately stable banks with infrequent, small areas of erosion mostly healed over, with 5-33% of the reach having areas of erosion. "Moderate" erosion was indicated by moderately unstable banks with 33-66% of the reach having areas of erosion and with high erosion potential during floods. "High" erosion was evidenced by unstable banks with many eroded areas, frequent "raw" areas along straight sections as well as bends, obvious bank sloughing, and 66-100% of the reach exhibiting erosional scars.

Some degree of erosion was present in all the assessed reaches of Blackberry Creek (Figure 2-28). A high degree of erosion was present along several reaches on Lake Run and all the Blackberry Creek reaches downstream of East Run.

Figure 2-27. An area of high streambank erosion along Blackberry Creek in Hannaford Woods Forest Preserve near Sugar Grove during a 2002 stream assessment.

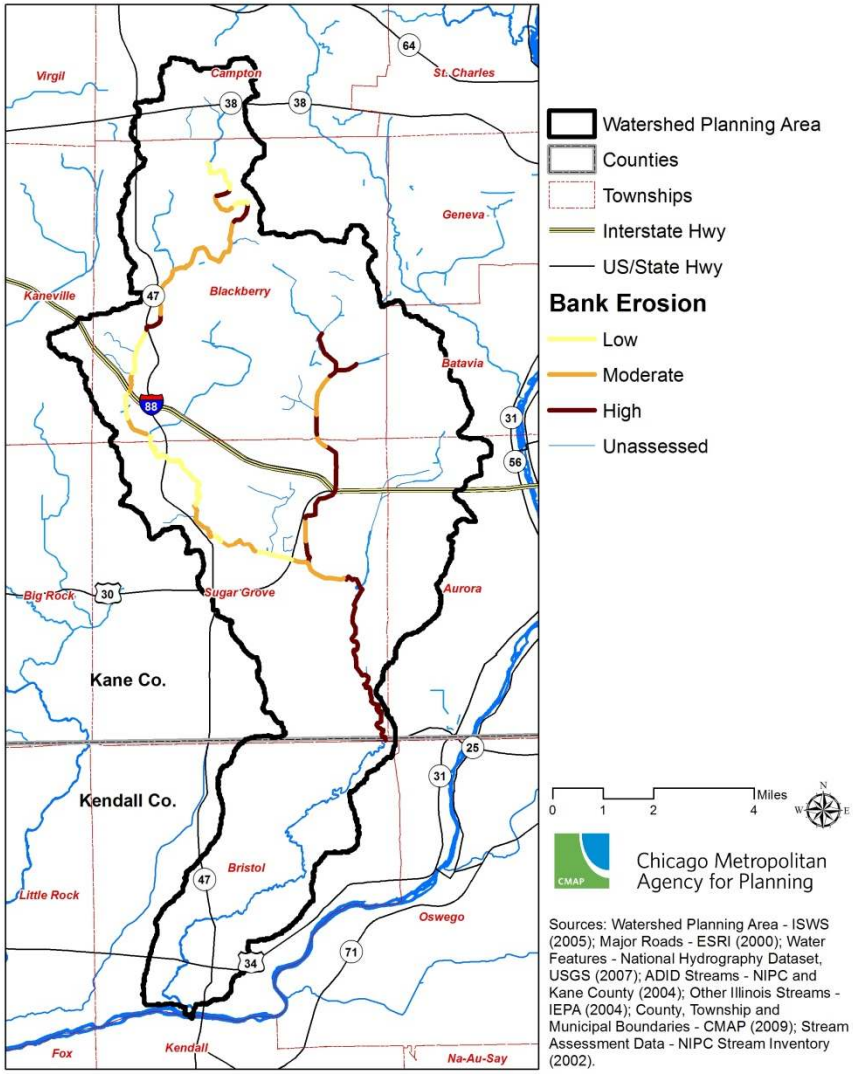


Figure 2-28. Assessed reaches of Blackberry Creek and Lake Run exhibiting a low, moderate, or high degree of streambank erosion, based on a 2002 assessment of stream conditions.

Sediment Accumulation

Stream channels that are stable have a balance between aggradation (deposition/accumulation on the streambed of additional materials transported from upstream) and degradation (removal of streambed materials caused by the erosional force of water flow). Aggradation is evidenced by silt deposits in pools, embedded riffles, mid-channel bars and islands, enlargement of point bars, and deposition in areas above the streambank.

Figure 2-30 shows the degree of sediment accumulation in the assessed reaches of Blackberry Creek, with the highest levels in several reaches of the Lake Run tributary.

Figure 2-29. An example of a mid-channel island.

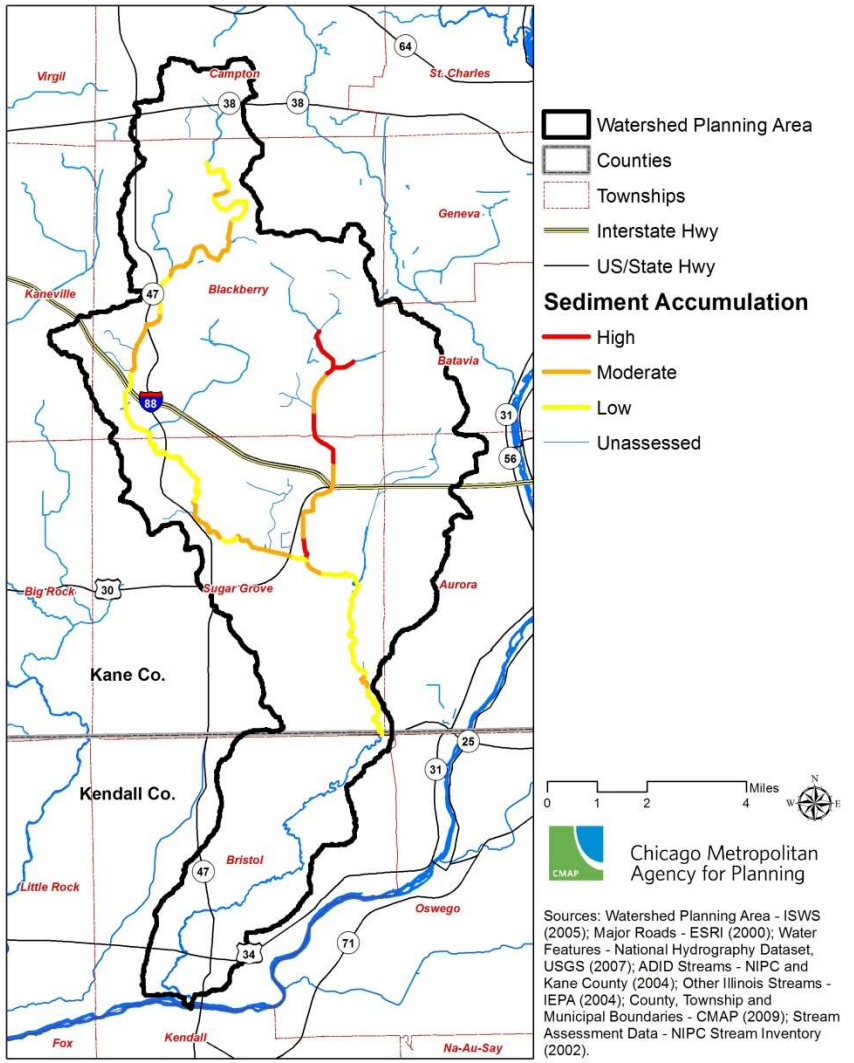


Figure 2-30. Assessed reaches of Blackberry Creek exhibiting low to high sediment accumulation, based on a 2002 assessment of stream conditions.

Substrate Stability

Highly stable substrates are indicated by the ability to walk in the stream without sinking and typically indicate a gravelly stream bottom. Substrate stability is usually high in natural streams but varies from high stability in riffle areas to lower stability in areas of slower moving water (pools) between riffles. High stability substrate areas are necessary for supporting a variety of fish and aquatic insects. Low to no substrate stability is evidenced in areas with moderate to high silt deposits. These can be the result of soil erosion from upstream land surfaces, streambank erosion, and where the stream passes through naturally soft organic soils. Figure 2-31 shows the degree of substrate stability in the assessed reaches of Blackberry Creek.

Hydraulic Structures

Numerous hydraulic structures (e.g., bridges, railways, culverts, low head dams, weirs) were documented crossing Blackberry Creek (Figures 2-32, 2-33). Hydraulic structures can alter stream hydrology (including exacerbating local flooding), impact the stability of the stream, and prevent fish migration. Thus, these locations indicate where projects could potentially be conducted to improve fish migration; repair, replace, or modify culverts or bridges; and/or stabilize the surrounding stream channel and streambanks. As the Blackberry Creek Watershed becomes more urbanized and transportation networks expand, the number of stream crossings is likely to increase. Thus the design of new

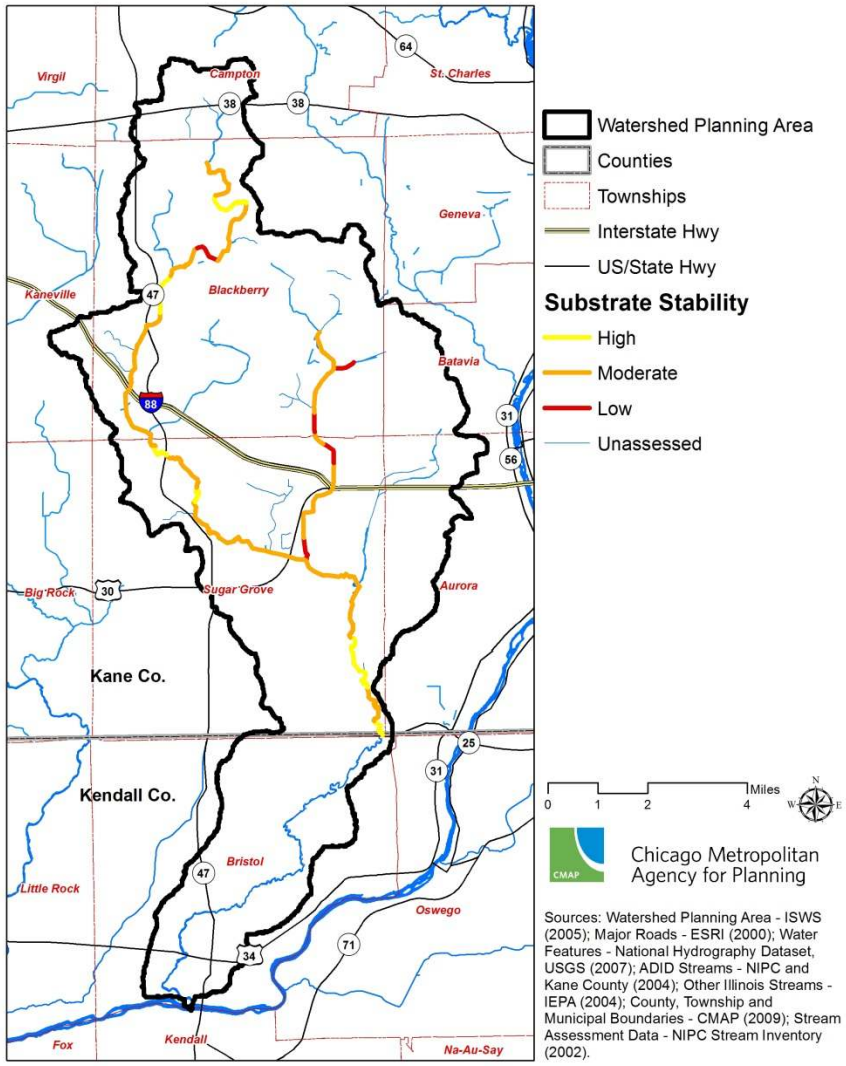


Figure 2-31. Assessed reaches of Blackberry Creek exhibiting low to high substrate stability, based on a 2002 assessment of stream conditions.

bridges and culverts also will be important to minimize local flooding impacts, erosion problems, and habitat degradation.

Figure 2-32. Examples of a few of the types of hydraulic structures observed crossing Blackberry Creek during a 2002 stream assessment.

At least one such project has occurred since the 2002 stream assessment. The twin box culverts under the railroad tracks in Sugar Grove Township west of Orchard Road and North of Prairie Street that restricted flows and exacerbated flooding in the Cherry Hill subdivision have been replaced with a trestle.[90] Currently, the Illinois Department of Transportation (IDOT) is conducting a drainage study as part of an Illinois Route 47

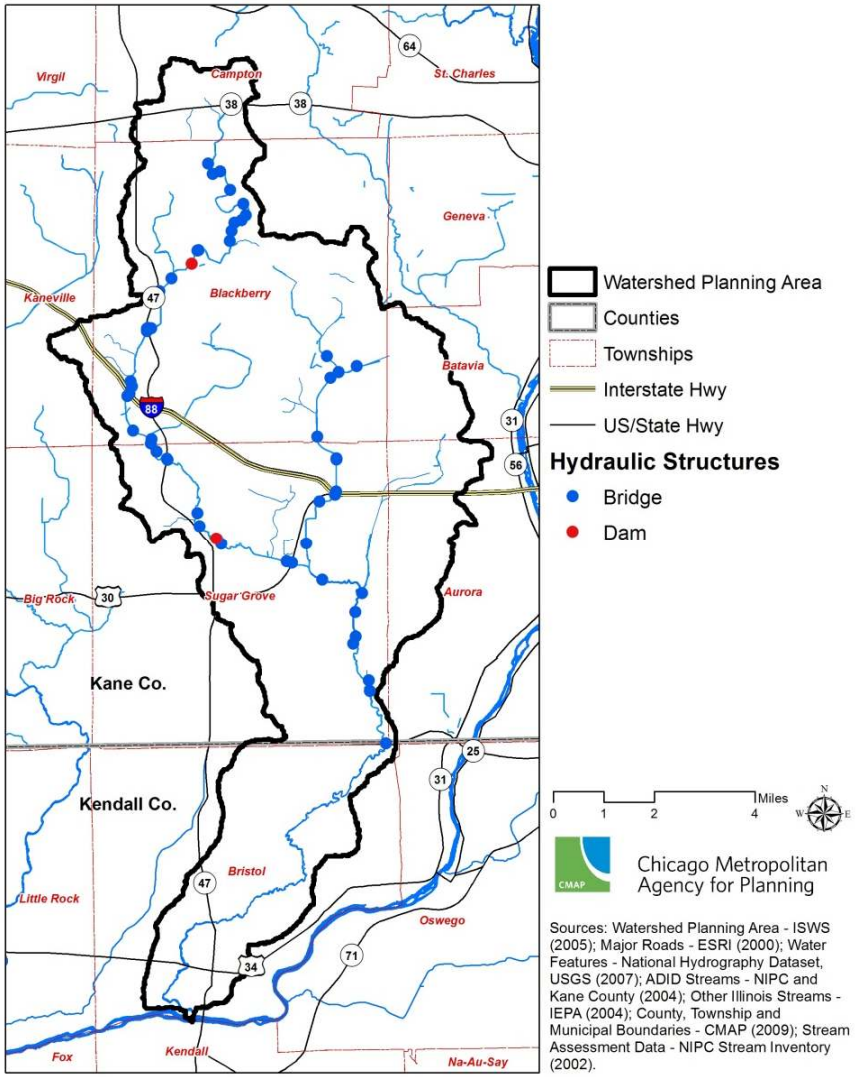


Figure 2-33. Hydraulic structure locations along assessed reaches of Blackberry Creek network documented during a 2002 stream assessment.

[90] Michels, J., personal communication to the author(s), Nov. 2011.

Improvement Study from Kennedy Road in Yorkville north to Cross Street in Sugar Grove. Along with transportation, drainage, and stormwater storage considerations, opportunities for incorporating best management practices for water quality protection will be considered and incorporated as much as possible.[91]

Discharge Locations

Numerous locations where water discharges into Blackberry Creek were documented. These included various pipes (e.g., storm sewer outfalls, agricultural drain tiles, sump pump drains) (Figure 2-34) as well as open channels, swales, gullies, and other significant tributaries. Dimensions of the discharges were recorded as well as comments regarding flow, odors, sheens, and color or turbidity. Figure 2-35 displays the general types and locations of discharges observed along the assessed reaches of Blackberry Creek during the 2002 stream inventory.

Figure 2-34. Examples of a few of the types of pipes observed discharging to Blackberry Creek during a 2002 stream assessment.

Available Stream Assessment Information

The detailed reach information is available for community members to use to help identify and prioritize streambank stabilization projects along the Kane County reaches of Blackberry Creek. A similar stream assessment effort is recommended for Blackberry Creek in Kendall County as well as the East Run, Hughes Creek, and other tributaries in Kane County.

[91] This information originated from discussions at the Drainage Coordination Meeting in Yorkville, IL facilitated by IDOT and attended by author(s) on June, 21, 2011. For more information, see http://www.dot.il.gov/yorkvilletosugargrove/index.html.

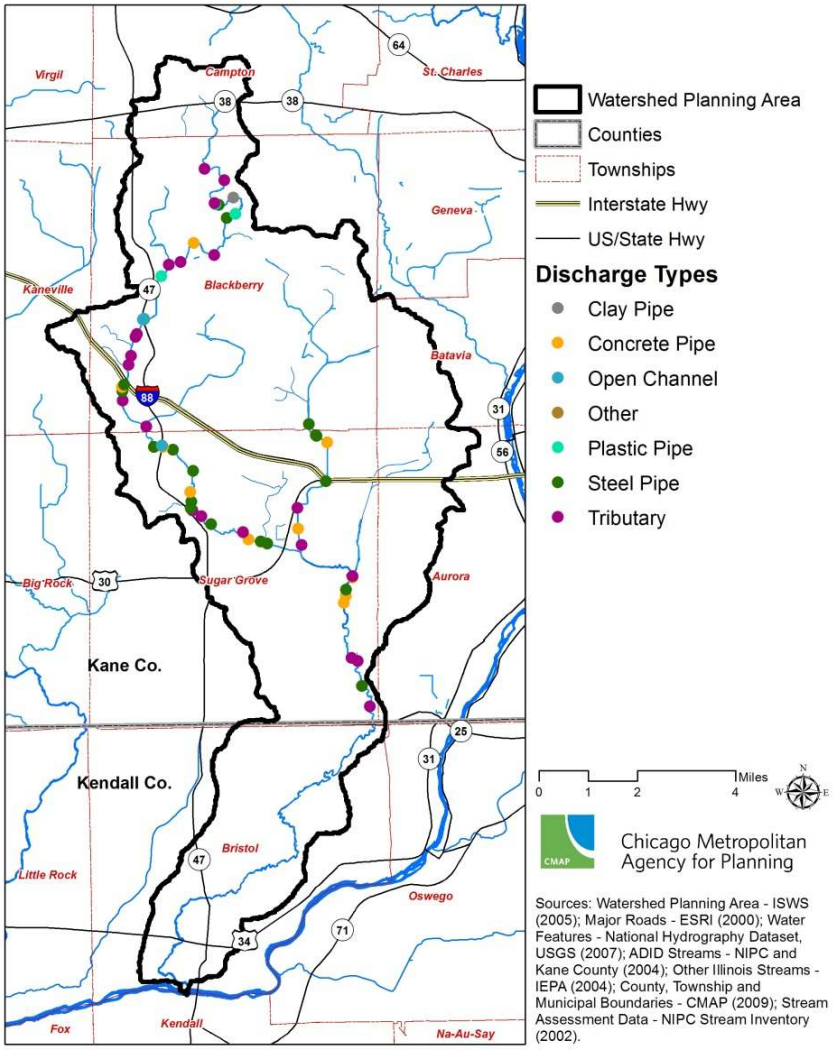


Figure 2-35. Discharge locations along assessed reaches of the Blackberry Creek network documented during a 2002 assessment.

2.2.11 Additional Watershed Resource Data Availability Status

Throughout this watershed planning process, CMAP and partners worked together to provide the plan with the most up to date available data. However there were some data that were not available at the time the plan was produced. This data may be available for future planning processes. Table 2-8 summaries the requested but unavailable data.

Table 2-8.
Unavailable Data for the Blackberry Creek Watershed

DATA REQUEST	CURRENT STATUS
Depressional storage locations and opportunities	Data not available
Description of man-made drainage networks (field tiles, storm sewers)	Data not available
Supplemental stream assessment(s)	Data not available
Septic system inspection data	Data not available
Total length of drainage ditches, length of ditch erosion, length of ditch bed erosion, length of sediment accumulation, length of debris jams, length of needed buffers	Data not available

3. WATER QUALITY

3.1 INTEGRATED WATER QUALITY REPORT

The Illinois Integrated Water Quality Report and Section 303(d) List (the Integrated Report) comprises a primary source of information on the status of stream, lake, and groundwater health and identifying potential causes and sources of impairment for which watershed planning initiatives can work to address. This document is prepared every two years by the Illinois Environmental Protection Agency (EPA), with the most recent Integrated Report issued in 2010. The basic purpose of the Integrated Report is to provide information to the federal government (U.S. EPA) and the citizens of Illinois on the condition of the state's surface and groundwaters. This fulfills requirements of Sections 305(b), 303(d), and 314 of the federal Clean Water Act and the Water Quality Planning and Management regulation at 40 CFR Part 130 for the State of Illinois.[1] The Integrated Report seeks to assess the extent to which waterbodies support a set of recognized "designated uses." The designated uses assessed by Illinois EPA for streams and lakes include aquatic life, fish consumption, primary contact (swimming), secondary contact (boating, fishing), public and food processing water supply, and aesthetic quality. The degree of support (attainment) of a designated use in a particular stream segment or lake is determined by analyzing various types of information including biological, physiochemical, physical habitat, and toxicity data. For groundwater, the degree of use support is based primarily on chemical monitoring of community water supply wells. The data are compared against specific water quality standards set by the Illinois Pollution Control Board (IPCB) to protect each designated use. Illinois EPA is responsible for developing scientifically based water quality standards and proposing them to the IPCB for adoption into states rules and regulations. While most of Illinois' water quality standards are numeric, some standards (such as temperature) utilize narrative language.

Through their assessment, Illinois EPA determines whether a waterbody falls into one of two use-support levels for each designated use: "Fully Supporting" or "Not Supporting." Fully Supporting means that the designated use is attained; Illinois EPA also refers to this status as "Good" resource quality for that particular designated use. Not Supporting means the designated use is not attained. If a designated use is not attained, the quality of the resource is further determined to be "Fair" or "Poor" depending on the degree to which the use is not attained. Designated uses that are determined to be Not Supporting are called "impaired" uses (Table 3-1). Any waters found to be not fully supporting of any one of its designated uses are also called impaired and placed on the "303(d) List" of impaired waters.

[1] IEPA. *Illinois Integrated Water Quality Report and Section 303(d) List - 2010 DRAFT, Volume I: Surface Water*. Springfield, IL: IEPA, 2010. http://www.epa.state.il.us/water/tmdl/303d-list.html (accessed September 15, 2011).

For each impaired use in each assessed waterbody, Illinois EPA attempts to identify potential causes and sources of the impairment.

Table 3-1.
Levels of Designated Use Attainment

Level of Use Support	General Resource Quality	Relationship to Water Quality standard	Impaired?
Fully Supporting	**Good**	**Meets standard**	**No**
Not Supporting	**Fair**	**Does not meet standard**	**Yes**
Not Supporting	**Poor**	**Does not meet standard**	**Yes**

Improving the condition of impaired waters and ultimately removing such waters from the 303(d) List is a main objective of watershed planning efforts like that for the Blackberry Creek Watershed. The following sections summarize the available information from the 2010 Integrated Report relevant to these efforts.

3.2 Surface Water Quality

3.2.1 Stream Quality

For assessment purposes, Illinois EPA has divided Blackberry Creek into two segments: DTD-02 and DTD-03. DTD-02, the downstream segment, begins at the mouth of Blackberry Creek at the Fox River and extends upstream to where the Lake Run tributary enters Blackberry Creek near Sugar Grove. DTD-03, the upstream segment, begins just upstream of the Lake Run tributary confluence and extends upstream into Blackberry Creek's headwaters in Campton Township (Figure 3-1). Segments DTD-02 and DTD-3 were assessed for the Aquatic Life designated use and determined to be Fully Supporting. DTD-02 also was assessed for the Primary Contact designated use and determined to be Not Supporting. For Blackberry Creek's other designated uses, neither segment was assessed for Fish Consumption, Secondary Contact, or Aesthetic Quality.

The Fox River also is monitored and assessed by Illinois EPA, divided into several assessment units. Blackberry Creek flows into Fox River segment DT-11, and thus watershed runoff from the Blackberry Creek Watershed in part influences the quality of the Fox River. Segment DT-11 was assessed for Aquatic Life, Fish Consumption, and Primary Contact and determined to be Not Supporting for each of these designated uses.

Tables 3-2, 3-3, and 3-4 summarize the designated uses, assessment status, and impairment status of Blackberry Creek segments DTD-02 and DTD-03 and Fox River segment DT-11, respectively.

The sections that follow examine Blackberry Creek's assessed designated uses in more detail, including how Illinois EPA defines the designated use, the standard for each, and the assessment data with which the impairment determination was made.

Table 3-2.
Assessment Status of Blackberry Creek Segment DTD-02

Designated Use	Assessed in 2010 Integrated Report?	Impaired? (on 303(d) List)
Aquatic Life	**Yes**	**No**
Fish Consumption	**No**	**---**
Primary Contact	**Yes**	**Yes**
Secondary Contact	**No**	**---**
Aesthetic Quality	**No**	**---**

Table 3-3.
Assessment Status of Blackberry Creek Segment DTD-03

Designated Use	Assessed in 2010 Integrated Report?	Impaired? (on 303(d) List)
Aquatic Life	**Yes**	**No**
Fish Consumption	**No**	**---**
Primary Contact	**No**	**---**
Secondary Contact	**No**	**---**
Aesthetic Quality	**No**	**---**

Table 3-4.
Assessment Status of Fox River Segment DT-11

Designated Use	Assessed in 2010 Integrated Report?	Impaired? (on 303(d) List)
Aquatic Life	**Yes**	**Yes**
Fish Consumption	**Yes**	**Yes**
Primary Contact	**Yes**	**Yes**
Secondary Contact	**No**	**---**
Aesthetic Quality	**No**	**---**

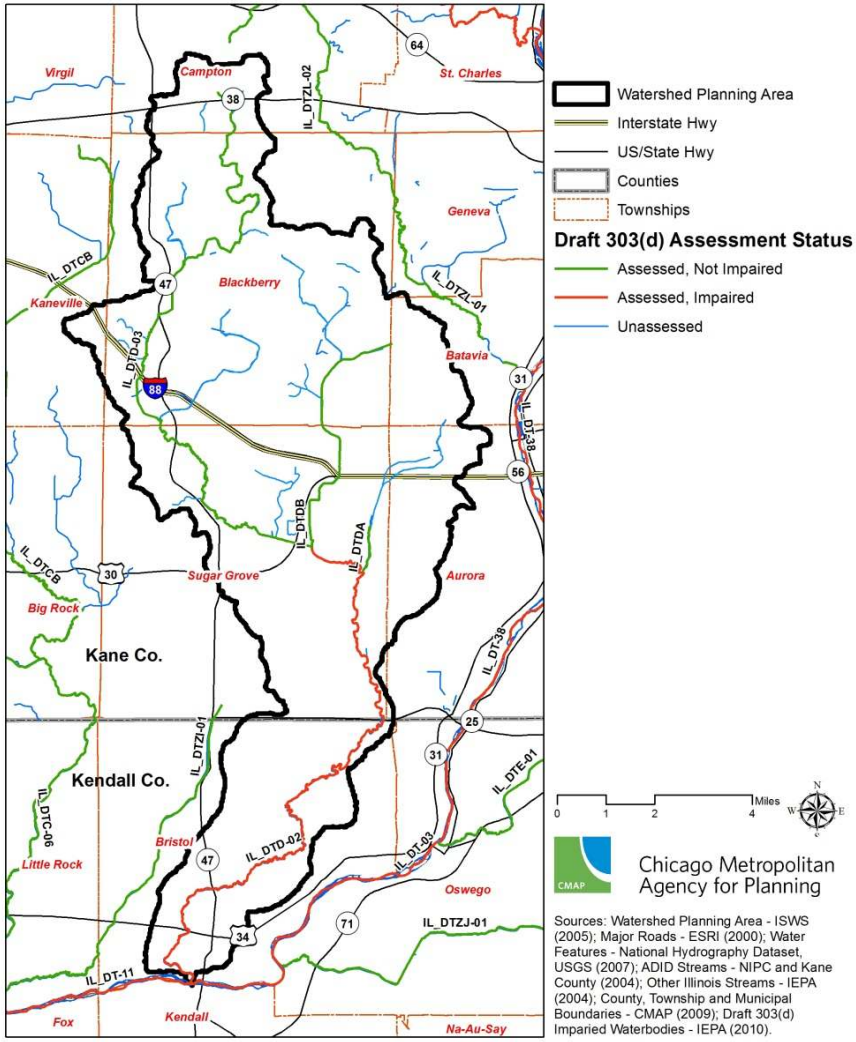


Figure 3-1. Blackberry Creek and Fox River assessment and impairment status.

Aquatic Life Designated Use Assessment

Illinois EPA relies on biological information, water chemistry data, and physical-habitat information to determine the extent to which a stream supports aquatic life. Primarily, three biological indices are used in assessing stream quality: the fish Index of Biotic Integrity (fIBI), the new macroinvertebrate Index of Biotic Integrity (mIBI), and the Macroinvertebrate Biotic Index (MBI). The indices are based on attributes of the fish or macroinvertebrate (e.g., aquatic insects, mussels) population including the number and types of species present; food, habitat, and fish spawning preferences; and tolerance to habitat and water quality degradation. Fish IBI scores range from 1 to 60, mIBI scores range from 0 to 100, and MBI scores range from 0 to 11. For each index, higher scores indicate better stream quality. Illinois EPA uses a detailed decision matrix combining the biological indices scores with water chemistry data and habitat information to determine the level of aquatic life use support. One of the habitat information sources is another index, the Qualitative Habitat Evaluation Index, QHEI. The QHEI evaluates habitat corresponding to the physical features that affect fish and other biotic communities. The index ranks the conditions of six factors: substrate, instream cover, channel morphology, riparian and streambank conditions, pool and riffle quality, and steam gradient. QHEI scores range from 0 to 100 where higher scores indicate better quality habitat. (Note: See Tables C-1 through C-5 in Illinois EPA's 2010 Integrated Report for detailed information on the assessment criteria for aquatic life use attainment.)

Blackberry Creek segments DTD-02 and DTD-03 were both assessed by Illinois EPA as fully supporting of the aquatic life use designation. Index scores that helped inform the assessment are shown in Table 3-5. While the fIBI scores indicated moderate impairment and the mIBI scores indicated no impairment, because neither the water chemistry nor habitat data indicated a potential for impairment, these segments were considered to be Fully Supporting (good resource quality) for aquatic life use.

Table 3-5.
Fish, Macroinvertebrate, and Habitat Index Scores for Blackberry Creek

Biological Indicator	DTD-02	DTD-03	IEPA Impairment Level Indicated
Fish Index of Biotic Integrity (fIBI)	**27**	**34**	**Moderate Impairment**
Macroinvertebrate Index of Biotic Integrity (mIBI)	**66.8**	**51.5**	**No Impairment**
Qualitative Habitat Evaluation Index (QHEI)	**50.5**	**48.5**	**---**

See additional discussion of the fIBI and QHEI scores under the Illinois DNR section below.

Fish Assemblages and Stream Conditions

In cooperation with Illinois EPA, the Illinois Department of Natural Resources (DNR) has conducted three surveys of fish populations and stream conditions in the Fox River Watershed, contributing to Illinois EPA's assessment of aquatic life use. Following is a summary of IDNR's fish community sampling portion of the most recent survey in 2007, with comparison to results from the 1997 and 2002 surveys, for Blackberry Creek.

In 2007, the Illinois DNR completed an analysis of the fish assemblages and stream conditions of the Fox River and several of its tributaries.[2] Results from this study for Blackberry Creek are summarized in Table 3-6.

During the 2007 sampling efforts, only 11 fish species were collected at Blackberry Creek station DTD-02, in part due to elevated water levels, with many generalist feeders and two intolerant species collected. Habitat was poor, contributing to the relatively low fIBI score of 27. At station DTD-03, 18 fish species were collected, with primarily generalist and one intolerant species, yielding a fIBI score of 34. Habitat again was a limiting factor. Illinois DNR noted that habitat conditions in DTD-03 were considered typical for low gradient, previously channelized stream channels, with minimal habitat features present such as riffles and pools.

Illinois DNR noted that the fIBI scores for Blackberry Creek are low when compared to other, similar sized streams in the area (e.g., Ferson Creek fIBI = 48, QHEI = 83). Besides poor stream habitat, the presence of a large dam near the mouth of Blackberry Creek, which isolates the creek from the Fox River, possibly limits fish recruitment from this relatively high quality section of the Fox. With no dam in place, it is likely that fIBI scores would be greater since additional fish species would be able to migrate up Blackberry Creek from the Fox River.

Table 3-6.
Fish Abundance and Index Scores for Blackberry Creek, 2007

Sampling Station	Total # of Fish	Total # of Fish Species	fIBI Score	QHEI Score
DTD-02	**160**	**11**	**27**	**50.5**
DTD-03	**501**	**18**	**34**	**48.8**

Blackberry Creek station DTD-02 also was sampled during the 1996 and 2002 Fox River Basin Survey. Table 3-7 presents the fIBI scores for each of these years, revealing a decline over time. This may be in part attributed to large flood of 1996 that severely affected the creek, as well as several recent drought years. Increasing urban development also may have contributed to the deterioration of water quality.

[2] IDNR, Division of Fisheries. *Fish Assemblages and Stream Condition in the Fox River Basin: Spatial and Temporal Trends, 1996- 2007*, by Stephen M. Pescitelli and Robert C. Rung. Plano, IL: IDNR, 2009. http://www.ifishillinois.org/science/streams/2007%20Fox%20Survey%20Final%20Report.pdf (accessed November 8, 2011).

Table 3-7.
Fish IBI Scores for Blackberry Creek, 1996-2007

Sampling Station	1996	2002	2007
DTD-02	**37**	**31**	**27**

The above analysis confirms the concern regarding aquatic quality stated by the Blackberry Creek Watershed Stakeholder Group, especially as associated with the Blackberry Creek dam at River Road. In addition to removal of non-functioning dams, the Illinois DNR report recommends reduction or mitigation of the effects of urbanization to maintain fish communities.

Biological Stream Rating

The Illinois Wildlife Action Plan[3] provides a plan of action to address the needs of wildlife populations that are declining and presents a targeted approach to the enhancement and conservation of habitat – including aquatic organisms and their habitats. To help establish baseline stream conditions against which change promoted by implementation of the Illinois Wildlife Action Plan could be measured, an updated Biological Stream Rating System process based on several aquatic taxonomic groups (fish, mussels, crustaceans, aquatic plants) was initiated by Illinois DNR in 2006. Through this assessment process, a stream segment is assigned a diversity rating as well as an integrity rating on a scale of A through E, with A being the highest and E the lowest rating. Diversity simply measures the number of different species present in a stream from the various groups of organisms (taxa). Integrity measures the biological intactness of a stream relative to an undisturbed or less disturbed reference stream. Diversity and integrity are scored separately because it is possible to have a highly intact community that is not very biologically diverse. (Note: any A-E stream ratings made using the older, outdated Biological Stream Rating System cannot be compared to today's A-E ratings.)

High quality stream segments may also meet requirements to be designated as a Biologically Significant Stream (BSS). These are unique resources in Illinois where emphasis should be placed on protecting the biological communities in the stream reach. Thus, activities in the upstream watershed that impact stream health become even more important to consider.

Using the Illinois Biological Stream Rating Tool,[4] Blackberry Creek has a B diversity rating from its mouth upstream to the confluence of East Run, a C diversity rating from its confluence with East Run upstream to its confluence with Hughes Creek, and a D rating from its confluence with Hughes Creek upstream to its headwaters in Campton Township. Blackberry Creek's integrity was rated B from its mouth upstream to its confluence

[3] IDNR. *The Illinois Comprehensive Wildlife Conservation Plan and Strategy*. Version 1.0. Springfield, IL: 2005. http://dnr.state.il.us/orc/wildliferesources/theplan/final/Illinois_final_report.pdf (accessed November 8, 2011).

[4] "Biological Stream Ratings for Diversity, Integrity and Significance: Mapping Tool," IDNR, accessed November 7, 2011, http://dnr.state.il.us/orc/biostrmratings/.

with East Run, C between its confluence with East Run and Lake Run, B from its confluence with Lake Run upstream to it confluence with Hughes Creek, and C from its confluence with Hughes Creek to its headwaters. Blackberry Creek is rated a Biologically Significant Stream (BSS) from its mouth upstream to its confluence with East Run (Figure 3-2).

Other Studies

Illinois Natural History Survey

During 2005 and 2006, the Illinois Natural History Survey (INHS) conducted an assessment of the conditions of select streams and other aquatic resources on for the Forest Preserve District of Kane County.[5] Blackberry Creek within the Hannaford Woods Forest Preserve near Sugar Grove was among the streams assessed, whereby samples were collected to evaluate the diversity of species and their tolerance to pollution. Illinois DNR's Critical Trends Assessment Program protocols were followed. Samples were evaluated using the following indices:

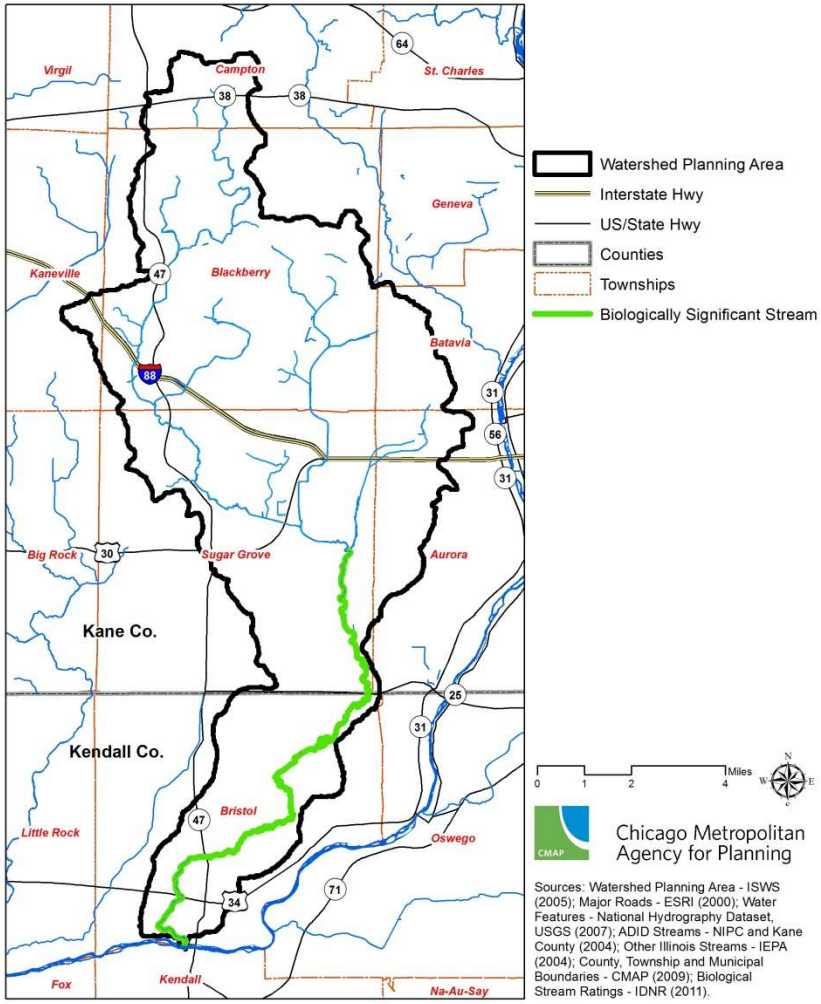


Figure 3-2. Blackberry Creek is classified as a biologically significant stream from its mouth at the Fox River upstream to its confluence with East Run.

[5] Illinois Natural History Survey. *Condition of Streams and Other Aquatic Resources in Kane County Forest Preserve District Parcels*, by R. Edward DeWalt. Champaign, IL: February 7, 2007. http://ctap.inhs.uiuc.edu/publications/DeWalt_Kane_Co._Report_2.7.07.pdf (accessed November 7, 2011).

EPT Taxonomic Richness (EPT): This refers to sampling for Ephemenoptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). This protocol is used as an indicator of stream conditions as these families of aquatic insects are known to exhibit a wide range of tolerance to pollution and overall stream disturbance. Higher numbers indicate better stream quality.

Hilsenhoff Biotic Index (HBI): This is another indicator of water quality in streams that assesses the presence of insects, amphipods, and isopods; and assigns pollution tolerance values to determine the severity of stream disturbance. Higher numbers indicate less tolerance to pollution and thus poorer stream quality.[6]

Habitat Quality Index (HQI): This index measures the abundance of species supported by the unique conditions in a stream. It is considered a more robust indicator for stream water quality than HBI. Higher scores correlate with better stream conditions.[7]

The results of the INHS assessment are summarized in Figures 3-3, 3-4, and 3-5. The scores from Blackberry Creek were compared against data collected from 17 streams of "highest remaining quality" (reference streams) in the Grand Prairie Natural Division of Illinois.[8] Qualitative categories were developed using the 50th percentile as the cutoff for entry into "Excellent" and one, two, or three standard deviations from that value for "Good," "Fair," and "Poor" categories.

For EPT Taxonomic Richness, Blackberry Creek showed moderate numbers of taxa and ranked as Fair with a score of 15. The HBI score of 4.32 suggests that Blackberry Creek in this location had a macroinvertebrate community which was intolerant of pollution or overall stream disturbance and thus excellent stream conditions. The HQI score of 109 placed the creek in the Fair category.

A formula was used to develop an average score, the Overall Quality Index (OQI). Because the HQI is known to be not as sensitive to degradation as EPT and HQI, its contribution to the OQI was given less weight. The resulting OQI score of 2.6 placed Blackberry Creek in the Fair category.

[6] Wisconsin Department of Natural Resources. *Using a Biotic Index to Evaluate Water Quality in a Stream*, by William L. Hilsenhoff. Technical Bulletin. Madison, WI: 1982. http://digicoll.library.wisc.edu/cgi-bin/EcoNatRes/EcoNatRes-idx?type=header;pview=hide;id=EcoNatRes.DNRBull132 (accessed November 8, 2011).

[7] Ibid 6.

[8] Brandi M. Sangunett, *Reference Conditions of Streams in the Grand Prairie Natural Division of Illinois* (Master's thesis, University of Illinois at Urbana-Champaign, 2005).

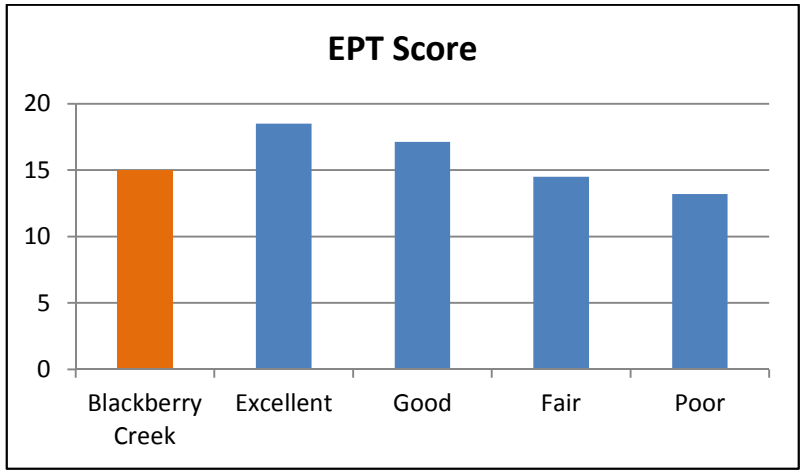


Figure 3-3. EPT Taxonomic Richness score of 15 places Blackberry Creek at Hannaford Woods Forest Preserve in the Fair stream quality category in relation to Grand Prairie Natural Division of Illinois reference streams. (Source: DeWalt 2007)

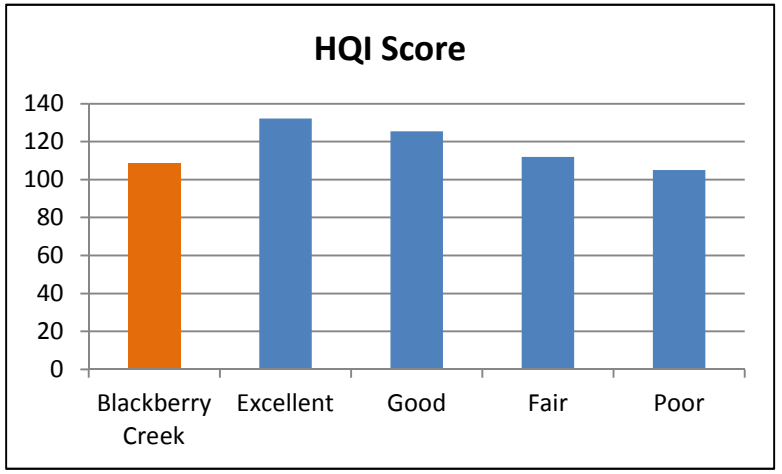


Figure 3-5. Habitat Quality Index (HQI) score of 109 places Blackberry Creek at Hannaford Woods Forest Preserve in the Fair stream quality category in relation to Grand Prairie Natural Division of Illinois reference streams. (Source: DeWalt 2007)

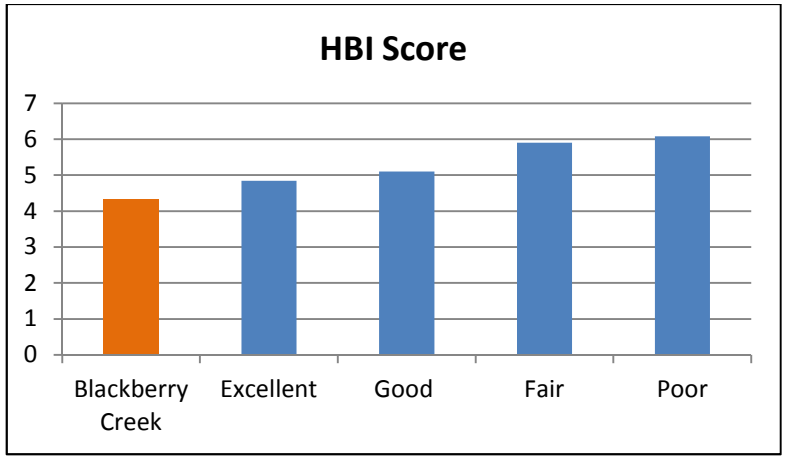


Figure 3-4. Hilsenhoff Biotic Index (HBI) score of 4.32 places Blackberry Creek at Hannaford Woods Forest Preserve in the Excellent stream quality category in relation to Grand Prairie Natural Division of Illinois reference streams. (Source: DeWalt 2007)

Primary Contact Designated Use Assessment

Primary contact as defined in Illinois' water quality standards is "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" (35 Ill. Adm. Code 301.355).[9] Illinois EPA uses fecal coliform bacteria data to determine whether or not a stream is supporting this designated use. Fecal coliform is a type of bacteria that is generally found in human and animal feces.[10]

To assess primary contact use, Illinois EPA uses all fecal coliform bacteria data from water samples collected in May through October over the most recent five year period (thus 2004 through 2008 for the 2010 Integrated Report). Geometric means and individual measurements are compared to the fecal coliform concentration thresholds shown in Table 3-8 and 3-9.[11]

Table 3-8.
Guidelines for Assessing Primary Contact Designated Use in Illinois Streams and Inland Lakes

Degree of Use Support	Standard
Fully Supporting (Good)	**No exceedances of the fecal coliform bacteria standard in the last five years and the geometric mean of all fecal coliform bacteria observations <200/100 mL, and <10% of all observations exceed 400/100 mL**
Not Supporting (Fair)	**One exceedance of the fecal coliform bacteria standard in the last five years (when sufficient data is available to assess the standard)** ***OR*** **The geometric mean of all fecal coliform bacteria observations in the last five years <200/100 ml, and >10% of all observations in the last five years exceed 400/100 mL** ***OR*** **The geometric mean of all fecal coliform bacteria observations in the last five years >200/100 mL, and <25% of all observations in the last five years exceed 400/100 mL**
Not Supporting (Poor)	**More than one exceedance of the fecal coliform bacteria standard in the last five years (when sufficient data is available to assess the standard)** ***OR*** **The geometric mean of all fecal coliform bacteria observations in the last five years >200/100 mL, and >25% of all observations in the last five years exceed 400/100 mL**

[9] IEPA. *Illinois Integrated Water Quality Report and Section 303(d) List DRAFT, Volume I: Surface Water*. Springfield, IL: IEPA, 2010. http://www.epa.state.il.us/water/tmdl/303d-list.html (accessed September 15, 2011).
[10] "Monitoring and Assessment: Fecal Bacteria," U.S. EPA, last modified June 29, 2011, accessed August 15, 2011, http://water.epa.gov/type/rsl/monitoring/vms511.cfm.
[11] Ibid 9.

Table 3-9.
Guidelines for Identifying Potential Causes of Impairment of Primary Contact Use in Illinois Streams and Inland Lakes

Potential Cause	Basis for Identifying Cause – Numeric Standard*
Fecal Coliform	**Geometric mean of a least five fecal coliform bacteria observations collected over not more than 30 days during May through October >200/100mL or >10% of all such fecal coliform bacteria observations exceed 400/100 mL** ***OR*** **Geometric mean of all fecal coliform bacteria observations (minimum of five samples) collected during May through October >200/100mL or >10% of all fecal coliform bacteria observations exceed 400/100 mL**

Fecal coliform data on which the assessment of Blackberry Creek segment DTD-02 was based was collected by Illinois EPA as weel as the Illinois State Water Survey (ISWS) on behalf of the Fox River Study Group (FRSG).[12] Table 3-10 summarizes the results of the Illinois EPA and FRSG fecal coliform data in relation to the state water quality standard.

Given these results, the Integrated Report denotes Blackberry Creek segment DTD-02 as Not Supporting (Poor) for the primary contact designated use. When considering the FRSG data, a 17 percent reduction in the geometric mean for fecal coliform is needed to meet the standard of 200/100 mL, while a 14 percent reduction is required to meet the standard for the percentage of samples over 400/100 mL. Blackberry Creek Watershed stakeholders have chosen to set a 17% target pollutant-load reduction for the geometric mean fecal coliform concentration based on the above water-quality standard and observed data.

Table 3-10.
Illinois EPA and Fox River Study Group Fecal Coliform Data for Blackberry Creek Segment DTD-02 in Relation to Illinois Water Quality Standards

Illinois Water Quality Standards		Data Collected by IEPA	Data Collected for FRSG	Reduction Needed
Geometric Mean (#/100 mL)	**200**	**134**	**242**	**0% and 17%, respectively**
% of Samples >400/100 mL	**10%**	**20%**	**24%**	**10% and 14%, respectively**

As stated previously, the upstream segment of Blackberry Creek (segment DTD-03) was not formally assessed by Illinois EPA for primary contact use.

[12] Howard Essig, IEPA, email message to author(s), January 31, 2011. Preliminary monitoring data for the Fox River, collected by Illinois State Water Survey on behalf of Fox River Study Group, 2011.

Potential Sources of Fecal Coliform Impairment

While this assessment demonstrates that fecal coliform is a cause of impairment for primary contact use (and the only known cause of impairment in Blackberry Creek), the specific sources of fecal coliform affecting this stream segment were cited by Illinois EPA as "Source Unknown," possibly due to the absence of watershed specific information (such as watershed land use) available to the assessor. However, for other streams within the Fox River Basin with impaired primary contact use due to fecal coliform (e.g., Ferson Creek), Illinois EPA has specified potential fecal coliform sources under the general categories of Urban Runoff/Storm Sewers, and Runoff from Forest/Grassland/Parkland – which also exist in the Blackberry Creek Watershed. Other potential sources of fecal coliform contamination include leakage from failing septic systems, improper application of Class B biosolids, and improper storage or disposal of manure.

It is important to note that runoff from forests, grasslands, and parks contains a naturally-occurring, background level of fecal coliform because wildlife are a component of both natural and manmade landscapes. This plan does not recommend wildlife eradication, although some fecal coliform contamination from wildlife can certainly be reduced. For example, establishing buffers of native vegetation along streams and around detention basins can help discourage overabundant populations of Canada geese as well as filter runoff before it reaches these waterways. Rather, the emphasis in this plan is on human-managed fecal coliform sources. For forests, grasslands, and parks, this likely means waste which pet owners fail to pick up.

Runoff is the nonpoint source mechanism by which fecal coliform contamination arrives in nearby water bodies. Urban runoff carries fecal coliform and other pollutants and can be a source of contamination when it empties into storm sewers before it is either discharged directly into streams or lakes. The volume of urban runoff is determined by the amount of impervious surface area (e.g., parking lots, rooftops, streets). As impervious surface area increases, the amount of runoff from urban areas also generally increases, while at the same time water quality generally decreases. Water flowing over impervious urban surfaces picks up fecal coliform from pet waste, in addition to picking up a variety of other pollutants including soil particles, oil and toxic chemicals from cars, road salts, and pesticide and nutrient runoff from lawns and gardens. Similarly, runoff from forests, grasslands, and parks can be source of contamination because it carries fecal coliform from pets, livestock, or wildlife. Failing septic systems in both urban and rural areas can also contaminate water with fecal coliform from water running off of failing septic system locations. Small livestock operators may face challenges in properly storing and disposing of manure. All of these sources, however—impervious surface cover; forests, grasslands, and parks; areas with failing septic systems; and small livestock operations—are spatially dispersed throughout the watershed. Given the limited spatial resolution of data collected, Illinois EPA data cannot determine the specific location(s) from which fecal coliform may be entering the stream system.

This plan will include recommendations that address runoff generally and aim to increase stormwater infiltration to limit these sources of current and future fecal coliform contamination. Additionally, this plan will include recommendations to address proper septic tank maintenance to limit potential fecal coliform contamination from failing septic systems. This plan will also offer suggestions for best management systems for manure management and composting, and building a marketing network for composted manure.

Nutrient & Sediment Data

In addition to the fecal coliform data used for stream assessment in the 2010 Integrated Report, Illinois EPA and the Illinois State Water Survey (ISWS) have also collected data in Blackberry Creek for total nitrogen (TN), total phosphorus (TP) and total suspended solids (TSS). While TP, sedimentation/siltation, and TSS are identified causes of impairment in the mainstem Fox River (segment DT-11) below the mouth of Blackberry Creek, neither nutrients nor sediment are implicated as causes of any use impairment within Blackberry Creek. Furthermore, the State of Illinois has yet to set water quality standards associated with nutrients in streams and rivers, except for phosphorus at points where streams enter a lake or reservoir greater than 20 surface acres in size.[13] This particular water quality standard does not apply to Blackberry Creek. However, for water quality parameters for which there are no numeric water quality standards, U.S. EPA does offer statistically-derived water quality guidelines for parts of the country termed "Ecoregions".[14] These guidelines are for use by states in developing water quality standards consistent with section 303(c) of the Clean Water Act and represent the 25th percentile of observed water quality measurements for samples collected in this region. The 25th percentile is the value at which 25% of sample values are below this value and 75% are above it. Blackberry Creek lies within Level III Subecoregion 54 (the "Central Corn Belt Plains") in northern Illinois and belongs to the larger Ecoregion VI, the "Corn Belt and Northern Great Plains." The TN guideline for streams and rivers in Subecoregion 54 is presented in Table 3-11 along with the observed mean TN concentration calculated for Blackberry Creek. The TP and TSS guidelines come from similarly-derived statistical guidelines that are issued by Illinois EPA and recommended for streams and rivers in Illinois.[15] These guidelines also are noted in Table 3-11 along with the observed mean concentrations found in Blackberry Creek.

[13] *Phosphorus*. *Ill. Adm. Code* 35, Subtitle C, Chapter 1, Part 302 Subpart B, Section 205. http://water.epa.gov/scitech/swguidance/standards/wqslibrary/upload/2006_09_05_standards_wqslibrary_il_il_5_c302.pdf (accessed September 7, 2011).

[14] U.S. EPA. *Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion VII*. Report no. EPA 822-B-00-018. Washington, D.C.: U.S. EPA, 2000. http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/2007_09_27_criteria_nutrient_ecoregions_rivers_rivers_7.pdf (accessed September 29, 2011).

[15] IEPA. *Illinois Integrated Water Quality Report and Section 303(d) List DRAFT, Volume I: Surface Water*. Springfield, IL: IEPA, 2010. http://www.epa.state.il.us/water/tmdl/303d-list.html (accessed September 15, 2011).

Table 3-11.
Average Nutrient and Suspended Solids Concentrations in Blackberry Creek and Guidelines for Aquatic Quality [16]

Pollutant	Flow Weighted Mean Concentration	Guidelines for Aquatic Quality in Illinois Streams
Total Nitrogen (TN)	**2.82 mg/L**	**2.46 mg/L**
Total Phosphorus (TP)	**0.19 mg/L**	**0.61 mg/L**
Total Suspended Solids (TSS)	**32.12 mg/L**	**116 mg/L**

Given that neither nutrients nor sediment are identified causes of impairment in Blackberry Creek, watershed stakeholders saw no reason to set a threshold for acceptable nutrient or sediment concentrations. Therefore, establishing target load reductions for nutrients or sediment was not pursued. Nonetheless, stakeholders agreed that working to minimize nutrient and sediment contributions to Blackberry Creek and consequently the Fox River was appropriate and desirable.

[16] Ibid 15.

3.2.2 Lake Quality

There are several lakes and ponds within the Blackberry Creek Watershed, although the majority of them are stormwater detention basins with no known lake quality data. Publicly-owned lakes for which water quality data are available include Jericho Lake and Lake Gregory.

Jericho Lake

This lake is located within the Fox Valley Park District's Jericho Lake Park, southwest of Orchard and Jericho Roads. Morphometric information is provided in Table 3-12. Jericho Lake was originally a sand and gravel quarry, mined between 1957 and the early 1970s.[17] The lake was opened to the public in 1981 and is used for fishing, canoeing, aesthetic enjoyment, and educational activities. It lies within the Blackberry Creek floodplain, and while there are no inflowing or outflowing streams, a channel connects at the lake's southwest corner connects it with the creek. Flow is in or out of the lake depending on water levels in the lake and creek.[18]

[17] Illinois DNR, Div. of Fisheries. *Lake Management Plan: Jericho Lake,* by V. Santucci. Springfield, IL: IDNR, 2009.
[18] Yoder, P., Fox Valley Park District, personal communication, 1989.

Table 3-12.
Jericho Lake Morphometric Data[19]

Surface Area	**20.9 acres**
Maximum Depth	**26.2 feet**
Average Depth	**14.6 feet**
Volume	**305.1 acre-feet**
Shoreline Length	**0.9 miles**
Maximum Fetch	**1,340 feet NW-SE**

Jericho Lake was monitored on one date in August 1989 and on five dates between May and October 1995 under Illinois EPA's Lake Water Quality Assessment Program.[20],[21] Similar to other steep-sided, gravel pit lakes in the northeastern Illinois region, water quality indicators were good, classifying Jericho Lake as mesotrophic (moderate nutrient levels). Secchi disk transparency averaged 72 inches, associated with low suspended sediment and algal turbidity. Near-surface total phosphorus averaged 0.016 mg/L, near-bottom total phosphorus averaged 0.028 mg/L, and

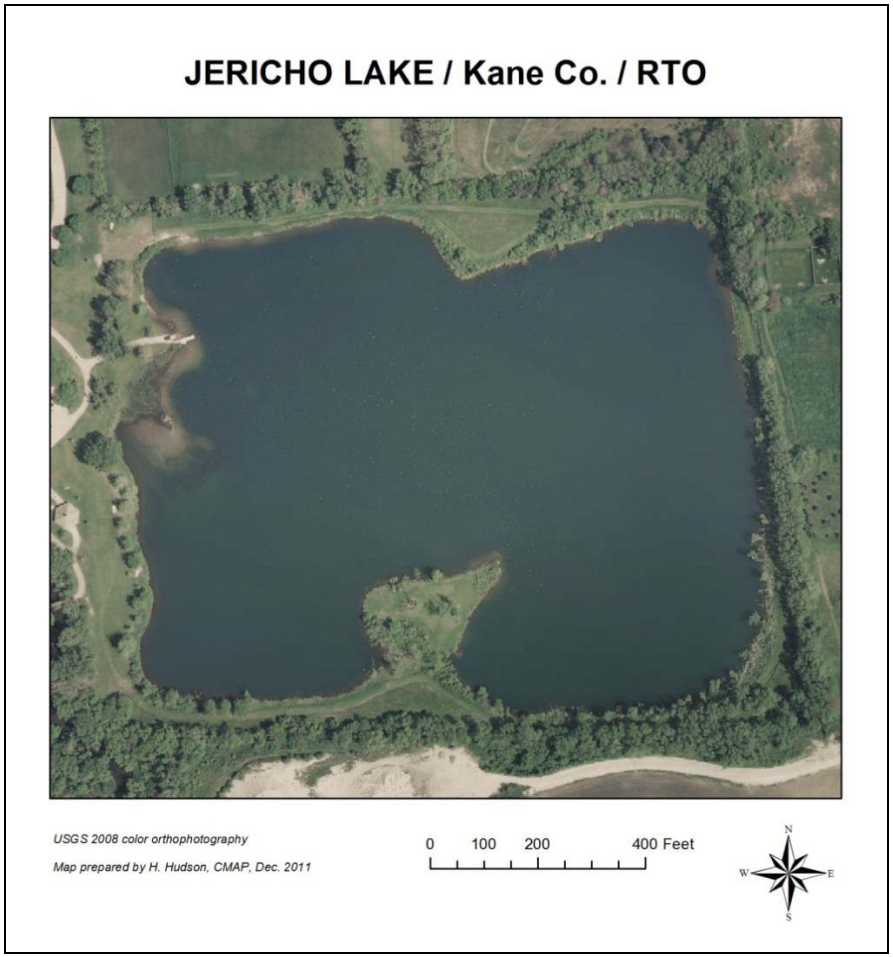


Figure 3-6. Aerial view of Jericho Lake.

[19] Illinois DNR, Div. of Fisheries. *Lake Management Plan: Jericho Lake,* by V. Santucci. Springfield, IL: IDNR, 2009
[20] Hudson, H., J. Clark, R. Kirschner. 1990. *Lake Water Quality Assessment Program, 1989: Northeastern Illinois Lakes.* Prepared by Northeastern Illinois Planning Commission for Illinois EPA. Chicago, IL.
[21] Hudson, H. 1996. *Lake Water Quality Assessment Program, 1995: Northeastern Illinois Lakes.* Prepared by Northeastern Illinois Planning Commission for Illinois EPA. Chicago, IL.

nitrate+nitrite and ammonia nitrogen concentrations were generally below detection. Chlorophyll *a* levels were also low, averaging 12.4 ug/L, indicating low phytoplankton (microscopic, "free-floating" algae) numbers. Dissolved oxygen concentrations were adequate throughout the sampling season to support aquatic life. Conductivity averaged 401 μmhos/cm. Water chemistry conditions 15 years ago, however, may be somewhat different than today due to periodic flooding from Blackberry Creek and land use changes upstream.

The latest Illinois Department of Natural Resources (DNR) fisheries survey was conducted in September 2008 and indicated that Jericho Lake supports a fish community with high abundance and species richness (580 individual fish representing 14 species). Gizzard shad, bluegill, and largemouth bass were the most abundant species. Periodic flooding from Blackberry Creek introduced the gizzard shad as well as green sunfish and yellow bass. These species are abundant enough to affect the growth and condition of the other sport species such as largemouth bass and bluegill.[22]

During fish sampling, Illinois DNR observed that about 5% of the lake's surface area contained submersed or floating leaved aquatic plants. The nonnative, invasive species Eurasian watermilfoil (*Myriophyllum spicatum*) made up 95% of the plant community, while the native American pondplant (*Potamogeton nodosus*) comprised the remaining 5% of the overall plant population.[23]

Lake Gregory

This is a long, narrow, excavated lake located adjacent to Blackberry Creek within the Fox Valley Park District's Blackberry Farm park facility. Constructed in 1963, it functions as a water feature, provides stormwater detention for the surrounding park, and offers catch-and-release fishing. In addition to stormwater inputs, the lake also receives some of its water via groundwater.[24] Morphometric information is provided in Table 3-13.

Table 3-13.
Lake Gregory Morphometric Data[25]

Surface Area	**7.2 acre**
Maximum Depth	**8.4 feet**
Average Depth	**5.4 feet**
Volume	**38.9 acre-feet**
Shoreline Length	**0.86 miles**
Maximum Fetch	**1,050 feet N-S**

[22] Illinois DNR, Div. of Fisheries. *Lake Management Plan: Jericho Lake,* by V. Santucci. Springfield, IL: IDNR, 2009.

[23] Ibid 22.

[24] Yoder, P., Fox Valley Park District, personal communication, 1993.

[25] Illinois DNR, Div. of Fisheries. *Lake Gregory: Public Cooperative Lake Fish Survey Report.* Springfield, IL: IDNR, 2008.

Lake Gregory was monitored on one date in August 1992 as part of Illinois EPA's Lake Water Quality Assessment Program.[26] Data collected that day revealed low Secchi disk transparency of 16 inches associated with high suspended sediment and algal turbidity (TSS = 24 mg/l, VSS = 11 mg/l, chlorophyll *a* = 64.08 ug/L). Dissolved oxygen levels were adequate to support aquatic life. Conductivity measured 559 µmhos/cm. In September 2007, Illinois DNR staff recorded a moderately low Secchi transparency of 30 inches and a similar conductivity of 543 µmhos/cm.

The most recent Illinois DNR fisheries survey was conducted in September 2007 and indicated that Lake Gregory supports a fish community with high abundance and moderate species richness (354 individual fish representing 9 species and 1 hybrid sunfish group). Bluegill, gizzard shad, and largemouth bass were the most abundant species. Common carp were moderately abundant. Overall, the fisheries biologist indicated that the sport fish community (largemouth bass, bluegill, common carp) should support good fishing. The other fish species present were in low enough numbers to prevent them from causing serious problems to the sport fish community.[27]

Figure 3-7. Aerial view of Lake Gregory.

[26] Hudson, H., K. Soulliere, T. Gray. 1993. *Lake Water Quality Assessment Program, 1992: Northeastern Illinois Lakes.* Prepared by Northeastern Illinois Planning Commission for Illinois EPA. Chicago, IL.
[27] Ibid 25.

During fish sampling, Illinois DNR staff estimated that 5% of the lake's surface area contained submersed or floating leaved aquatic plants, all native species. American pondplant (*Potamogeton nodosus*) made up 90% of the plant community, followed by sago pondplant (*Stukenia pectinata*) and emergent smartweed species (*Polygonum* spp.).[28]

3.3 GROUNDWATER QUALITY

Groundwater quality data were obtained from Illinois EPA for community water supply (CWS) wells tapping both sand and gravel and shallow bedrock aquifers serving the Blackberry Creek Watershed.[29] These data reflect raw water samples, collected prior to treatment/distribution by the water supply operator. (Routine operator sampling is most frequently performed only for treated drinking water.) Since the 1980s, Illinois EPA has sampled all CWS wells at least once for baseline raw water quality data, while a subset of 350 wells are sampled every two years as part of the Ambient Monitoring Network.[30] Table 3-14 presents the mean concentration, standard deviation, minimum observed value, maximum observed value, and number of observations for each inorganic contaminant among wells in this watershed for which data are available. This table also lists the Maximum Contaminant Levels (MCL) or Secondary Maximum Contaminant Levels (SMCL) as applies to each contaminant presented here.[31] MCL standards are enforced drinking water regulations, while SMCL standards are recommended levels for preserving aesthetic characteristics of drinking water like appearance, smell, and taste.

Chlorides in particular have become a groundwater quality concern given a persistent trend of rising chloride concentrations in shallow wells throughout the region.[32] However, chlorides do not pose a threat to human health, although they can impart an undesirable salty taste to drinking water at high levels. Consequently, chloride currently has an SMCL of 250 mg/L (equivalent to parts per million, or ppm).[33] Road salt, septic-system effluent, and water-softener brine waste are major sources of chlorides in urban areas. A recent study found chloride concentrations to be increasing in shallow public wells in the western and southern counties surrounding Chicago. Among shallow public wells in this area, 43% were found to be increasing at a rate greater than 1 mg/L of chloride per year and an additional 15% were found to be increasing at a rate greater than

[28] Illinois DNR, Div. of Fisheries. *Lake Gregory: Public Cooperative Lake Fish Survey Report.* Springfield, IL: IDNR, 2008.
[29] Wade Boring, Manager Geographic Analysis, Illinois Environmental Protection Agency (IEPA), e-mail message to author(s), July 22, 2011.
[30] Ibid 29.
[31] *Primary Drinking Water Standards*. *Ill. Adm. Code* 35, Part 611. http://www.ipcb.state.il.us/documents/dsweb/Get/Document-27419/ (accessed November 14, 2011).
32 Kelly, Walter R. "Long-Term Trends in Chloride Concentrations in Shallow Aquifers near Chicago." Ground Water Vol. 46, No. 5: (September–October 2008): 772–781.
[33] *Primary Drinking Water Standards*. *Ill. Adm. Code* 35, Part 611. http://www.ipcb.state.il.us/documents/dsweb/Get/Document-27419/ (accessed November 14, 2011).

Table 3-14.
Groundwater Quality Standards and Statistics for Inorganic Contaminants in Community Water Supply Wells Sampled within the Blackberry Creek Watershed.

CONTAMINANT	UNITS	STANDARD TYPE	STANDARD LEVEL	MEAN	MINIMUM	MAXIMUM	STANDARD DEVIATION	NUMBER OF OBSERVATIONS
Antimony	ppb	MCL	6	0.00	0.00	0.00	0.00	5
Arsenic	ppb	MCL	10	0.27	0.00	1.70	0.59	9
Barium	ppb	MCL	2,000	92.00	46.00	190.00	59.72	9
Beryllium	ppb	MCL	4	0.00	0.00	0.00	0.00	9
Cadmium	ppb	MCL	5	0.00	0.00	0.00	0.00	9
Chloride	ppm	SMCL	250	49.09	32.00	93.70	17.77	9
Chromium	ppb	MCL	100	0.00	0.00	0.00	0.00	9
Cyanide	ppb	MCL	200	0.00	0.00	0.00	0.00	9
Fluoride	ppb	MCL	4,000	0.42	0.14	0.84	0.23	9
Iron	ppb	SMCL	300	1,079.56	58.00	3,000.00	1,197.08	9
Manganese	ppb	SMCL	50	18.78	0.00	100.00	32.99	9
Mercury	ppb	MCL	2	0.00	0.00	0.00	0.00	9
Nitrate	ppm	MCL	10	0.02	0.00	0.09	0.04	9
Selenium	ppb	MCL	50	0.00	0.00	0.00	0.00	9
Sodium	ppm	No MCL or SMCL	—	40.44	18.00	57.00	13.06	9
Sulfate	ppm	SMCL	250	91.83	69.00	138.00	19.70	9
Thallium	ppb	MCL	2	0.00	0.00	0.00	0.00	5
Zinc	ppb	SMCL	5,000	0.44	0.00	4.00	1.33	9

4 mg/L of chloride per year.[34] Figure 3-8 from the same study shows mean chloride concentrations for public wells in northeastern Illinois by county for the period 1900 to 2005.[35] The majority of these measurements do not exceed the current SMCL of 250 mg/L, but are much higher than 10 mg/L, the median chloride concentration for Chicago-area wells in 1960.[36,37] For Blackberry Creek, the data presented here show a mean of 49 mg/L, similarly reflecting the regional trend. Finally, the Illinois State Water Survey intends to release a report in early 2012 that depicts chloride concentrations in shallow wells (< 250 ft.) sampled in northern Kendall County.[38]

As stated previously, the MCL and SMCL values presented with data for raw well water samples in Table 3-14 are drinking water standards (i.e., finished water for distribution). However, a complex set of water quality standards also apply specifically to in-situ groundwater in Illinois.[39] Groundwater quality data are compared only with drinking water standards in this document (rather than with the more complex groundwater standards) because they are more straightforward, allowing for the abbreviated comparison included here.

Illinois EPA also collects data on organic contaminants. Table 3-15 presents the mean concentration, standard deviation, minimum observed value, maximum observed value, and number of observations for each organic contaminant analyzed. No synthetic organic contaminants (SOCs) were detected in any of the wells in this watershed planning area.[40] The only volatile organic contaminant (VOC) detection occurred for dichloro-methane. In particular, there were no detections of a special class of VOCs called carcinogenic VOCs (CVOCs). Data presented here for all VOCs are for raw water samples, as for inorganic contaminants above. Unlike for inorganic contaminants, however, finished drinking-water samples are likely to have similar VOC levels as raw water samples because conventional water treatment does nothing to remove them. A new law passed in Illinois in 2010, P.A. 96-1366/ SB 3070 or the MCL Prevention Law, oversees concentrations of CVOC's in finished drinking water.[41] The six CVOCs affected by this law are benzene, carbon tetrachloride, 1,2-dichlorethane, tetrachloro-ethylene, trichloroethylene and vinyl chloride. The MCL Prevention Law is designed to prevent concentrations of these

[34] Kelly, Walter R. "Long-Term Trends in Chloride Concentrations in Shallow Aquifers near Chicago." Ground Water Vol. 46, No. 5: (September–October 2008): 772–781.
[35] Figure obtained from Walter R. Kelly, Groundwater Geochemist, Illinois State Water Survey (ISWS), email message to author(s), August 25, 2011.
[36] *Primary Drinking Water Standards*. *Ill. Adm. Code* 35, Part 611. http://www.ipcb.state.il.us/documents/dsweb/Get/Document-27419/ (accessed November 14, 2011).
[37] Kelly, Walter R. "Long-Term Trends in Chloride Concentrations in Shallow Aquifers near Chicago." Ground Water Vol. 46, No. 5: (September–October 2008): 772–781.
[38] Walt Kelly, ISWS, personal communication, December 22, 2011.
[39] *Groundwater Quality*. *Ill. Adm. Code* 35, Part 620. http://www.ipcb.state.il.us/documents/dsweb/Get/Document-33425/ (accessed November 14, 2011).
[40] Wade Boring, Manager Geographic Analysis, Illinois Environmental Protection Agency (IEPA), email message to author(s), July 22, 2011.
[41] *EPA—Carcinogenic Compounds*. *Ill. Comp. Stat*. 810 (2010), § 5/1-101. http://ilga.gov/legislation/BillStatus.asp?DocTypeID=SB&DocNum=3070&GAID=10&SessionID=76&LegID=50631 (accessed September 15, 2011).

CVOCs in public water supplies from reaching regulated MCLs. The law requires that if facilities detect one of the CVOCs regulated by this law at a concentration of 50% or more of that CVOC's MCL in finished drinking water, then under certain circumstances, that facility must submit a response plan to prevent exceedence of the MCL, and to lower the concentration of the CVOC below its detectable limit.[42] Compliance with this law is not explored with regard to the sample data in Table 3-15 for two reasons. First, raw rather than finished water sample data are presented, and the VOC standards do not apply to these raw water samples. Second, even for finished water samples, there is complexity involved in Illinois EPA's interpretation of standards in making a compliance determination.

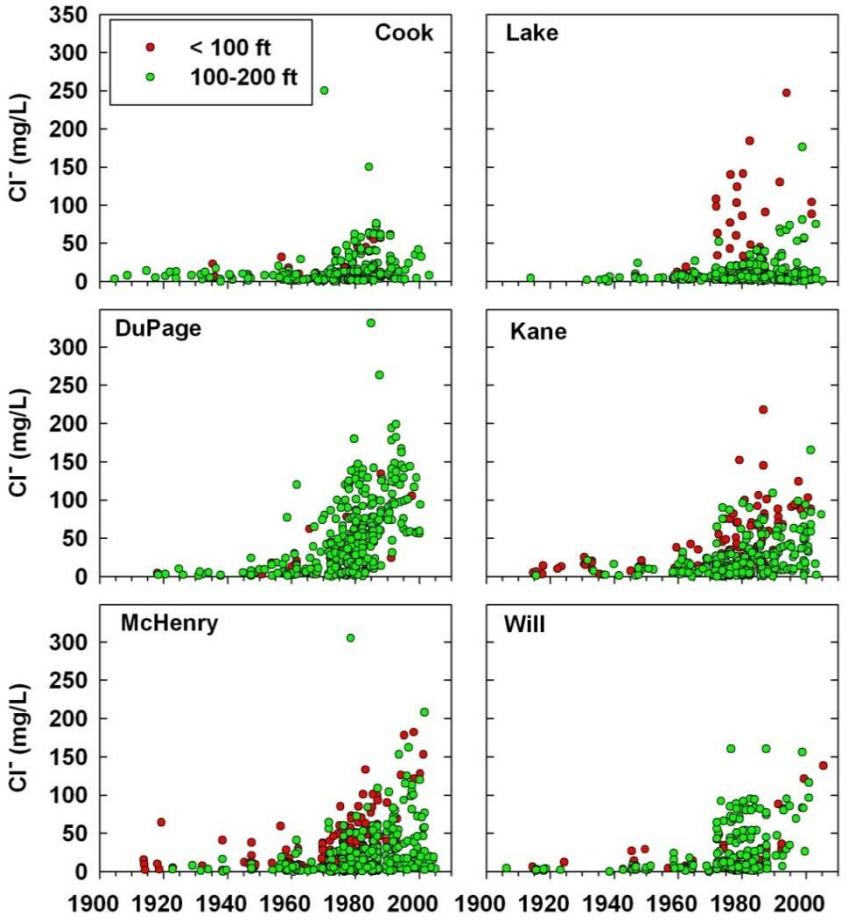


Figure 3-8. Chloride concentrations for community water supply wells in northeastern Illinois by county, 1900-2000.[1]

[42] *EPA—Carcinogenic Compounds*. *Ill. Comp. Stat*. 810 (2010), § 5/1-101. http://ilga.gov/legislation/BillStatus.asp?DocTypeID=SB&DocNum=3070&GAID=10&SessionID=76&LegID=50631 (accessed September 15, 2011).

Table 3-15.
Groundwater Quality Standards and Statistics for Volatile Organic Contaminants in Community Water Supply Wells Sampled within the Blackberry Creek Watershed

CONTAMINANT	UNITS	MCL STANDARD LEVEL	MEAN	MINIMUM	MAXIMUM	STANDARD DEVIATION	NUMBER OF OBSERVATIONS	SUBJECT TO MCL PREVENTION LAW
1,1,1-Trichloroethane	ppb	200	0	0	0	0	8	
1,1,1-Trichloroethane	ppb	200	0	0	0	0	8	
1,1-Dichloroethylene	ppb	7	0	0	0	0	8	
1,2,4-Trichlorobenzene	ppb	70	0	0	0	0	8	
1,2-Dichloroethane	ppb	5	0	0	0	0	8	Yes
1,2-Dichloropropane	ppb	5	0	0	0	0	8	
Benzene	ppb	5	0	0	0	0	8	Yes
Carbon Tetrachloride	ppb	5	0	0	0	0	8	Yes
Chlorobenzene	ppb	100	0	0	0	0	8	
Chloromethane	ppb	No MCL	0	0	0	0	8	
Cis-1,2-Dichloroethylene	ppb	70	0	0	0	0	8	
Dichloromethane	ppb	5	2.94	0	12	4.94	8	
Ethylbenzene	ppb	700	0	0	0	0	8	
Methyl Tert-Butyl Ether	ppb	No MCL	0	0	0	0	5	
O-Dichlorobenzene	ppb	600	0	0	0	0	8	
P-Dichlorobenzene	ppb	75	0	0	0	0	8	
Styrene	ppb	100	0	0	0	0	8	
Tetrachloroethylene	ppb	5	0	0	0	0	8	Yes
Toluene	ppb	1,000	0	0	0	0	8	
Trans-1,2-Dichloroethylene	ppb	100	0	0	0	0	8	
Trichloroethylene	ppb	5	0	0	0	0	8	Yes
Vinyl Chloride	ppb	2	0	0	0	0	8	Yes
Xylenes (total)	ppb	10,000	0	0	0	0	8	

3.4 Fecal Coliform Critical Areas Analysis

The preceding discussion has provided an overall characterization of water quality conditions in the Blackberry Creek Watershed. The following discussion now focuses on critical areas and modeling results at a subwatershed (subbasin) level to help inform localized plan implementation activities. Critical areas are defined as those subbasins within the watershed for which a source of contamination for a given impairment is present at a concentration relatively higher than that found in the watershed in general.[43] Prioritizing recommended projects and policies for implementation is generally performed according to the financial ability and political will of the implementer, as well as the impact that a given recommendation will have on the ground, likely in that order. By helping to identify areas within a watershed which are thought to generate a disproportionately high pollutant load, identifying critical areas gives stakeholders another tool for prioritizing recommended projects and policies based on the relative need for mitigation throughout the watershed. While pollutant load reductions demonstrate the mitigation capacity of a particular project or policy, critical areas on the other hand demonstrate those locations within the watershed which are likely most in need of attention. A project or policy could potentially result in a large pollutant load reduction, signaling a large impairment mitigation capacity, but might be implemented in an area within the watershed which is relatively unimpaired compared with other subwatersheds. If, however, stakeholders must choose among a larger set of possible project or policy options due to realistic financial or planning constraints, such a scenario might not result in the most efficient use of time, money, and energy in implementing plan recommendations on the ground. This fecal coliform critical areas analysis is therefore presented as an additional decision-making tool which stakeholders may use to further prioritize projects and policies aimed at mitigating fecal coliform contamination, following the top prioritization of those most likely to be successfully implemented in the short term.

The Fecal Coliform Critical Areas Analysis was performed for the Blackberry Creek Watershed given the stakeholders' choice to establish target load reductions for fecal coliform. We utilized the same subbasin delineations that the Illinois State Water Survey has been using in their Blackberry Creek hydrologic simulation modeling work.[44]

Four general, potential sources of fecal coliform contributions were considered in this analysis: the amount of urban stormwater runoff, the amount of pet waste, the number of failing septic systems, and the presence of manure from livestock agriculture. Recall that no specific fecal coliform contamination data related to these sources exists at a subwatershed or even

[43] CMAP and IEPA. *Guidance for Developing Watershed Action Plans in Illinois*. Chicago, IL: CMAP, 2007. http://www.epa.state.il.us/water/watershed/publications/watershed-guidance.pdf (accessed August 15, 2011).

[44] ISWS. *Fox River Watershed Investigation, Phase II: Hydrologic and Water Quality Simulation Models, Part 2: Blackberry and Poplar Creek HSPF Models, Calibration and Initial Simulation Results*. Champaign, IL: ISWS, 2007. http://www.isws.illinois.edu/pubdoc/CR/ISWSCR2007-04.pdf (accessed November 8, 2011). Prepared for Fox River Study Group.

watershed level. Therefore, this analysis instead quantifies metrics for proxies that indicate relative levels of likely sources of fecal coliform contamination and for which data exists that can be summarized at a subwatershed level. These proxies include the percent impervious area (a proxy for urban runoff); population density (a proxy for number of pets and therefore amount of pet waste); the number of septic systems (a proxy for the potential number of failing septic systems); and the percent agricultural area for livestock purposes (a proxy for the presence of livestock manure). Because this analysis focuses on proxies rather than on observed fecal coliform data, the high, medium, and low groupings for each proxy indicate the potential, relative amount of fecal coliform contribution from each subbasin and should not be taken as an absolute measure. Communities located within those subbasins that indicate a higher potential for fecal coliform contributions could be targeted for implementation of various program and policy opportunities.

3.4.1 Percent Impervious Cover

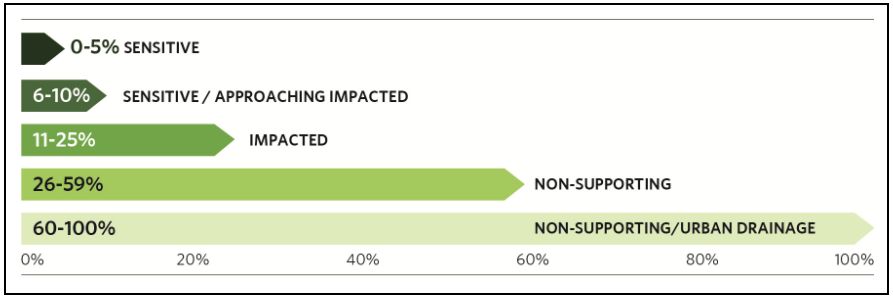
Current (2001) imperviousness was determined using the National Land Cover Dataset, which includes an imperviousness component.[45] Cell values in this layer represent the fraction of imperviousness for that cell. This layer was converted to actual impervious area per grid cell by multiplying the fraction of imperviousness of the cell by the area of the cell. The impervious area grid cells were then summed within each subbasin. Finally, the impervious area in each subbasin was divided by that subbasin's total area to calculate percent impervious area. In order to set reasonable expectations for stream quality indicators over broad ranges of subwatershed impervious cover, the Chesapeake Stormwater Network (CSN) has developed an Impervious Cover Model (ICM) which correlates the percent impervious cover within a subbasin with stream quality.[46] The general ranges of percent imperviousness and the associated stream health classification are shown in Table 3-16. Many studies have documented that as the percent impervious area in a watershed increases, stream quality tends to decrease. We utilized CSN's classifications in our analysis, the results of which are displayed in Figure 3-9.

Within the Blackberry Creek Watershed, 14 subbasins fall into the sensitive streams classification, five are in the "approaching impacted" streams category, and eight fall into the impacted streams category. Table 3-18 lists the subbasins that are impacted, along with the primary local jurisdiction(s) located within that subbasin.

[45] USGS Multi-Resolution Land Characteristics Consortium (MRLC). *National Land Cover Dataset*. Sioux Falls, SD: USGS MRLC, 2001. http://www.mrlc.gov/index.php (accessed August 15, 2011).

[46] Chesapeake Stormwater Network. *The Reformulated Impervious Cover Model: Implications for Stream Classification, Subwatershed Management and Permitting, Version 1.0.* Technical Bulletin No. 3. CSN, 2008. http://www.chesapeakestormwater.net/all-things-stormwater/tag/technical-bulletin (accessed September 15, 2011).

Table 3-16.
Stream Health Classifications for Ranges of Percent Impervious Cover within a Watershed



Source: Modified from Chesapeake Stormwater Network [47]

Table 3-17.
Land Use Categories and Associated Runoff Coefficients Used in Future Land Use Imperviousness Analysis

Land Use Category	Impervious Runoff Coefficients
Low density residential	**0.285**
Medium density residential	**0.285**
High density residential	**0.514**
Commercial	**0.562**
Office/industrial park	**0.659**
Institutional	**0.280**
Industrial	**0.759**

Future projected imperviousness also was estimated to identify those subbasins most likely to increase in impervious cover in association with future development, potentially leading to greater risk of degraded stream health. This analysis derives from the future land uses specified in municipal and county comprehensive planning maps. These comprehensive planning maps were georeferenced in ArcGIS to enable digitizing. Comprehensive plans used in this analysis include those from Campton Hills, Elburn, Batavia, Sugar Grove, Aurora, Montgomery, Kane County, Oswego, and Yorkville. All developed land uses—those excluding open space, agriculture, agricultural residential and waterbodies—were digitized and assigned to one of seven simplified land use categories for this analysis. These land use categories were then associated with a fraction of impervious surface area because different types of land uses have different amounts of impervious cover.[48] See Table 3-17 for land use categories and impervious runoff coefficients used in this analysis. Given ambiguity among comprehensive plans regarding precise definitions of low and medium density residential housing, the average of the coefficients for low and medium density residential land uses was calculated and applied to both of these land use types.

[47] Ibid 46.

[48] Wayne County, MI, Rouge Program Office. *Determination of Impervious Area and Directly Connected Impervious Area*, by Ed Kluitenberg. Wayne County, MI: Rouge Program Office, 1994. www.rougeriver.com/pdfs/modeling/RPO-MOD-SR35.pdf (accessed August 9, 2011).

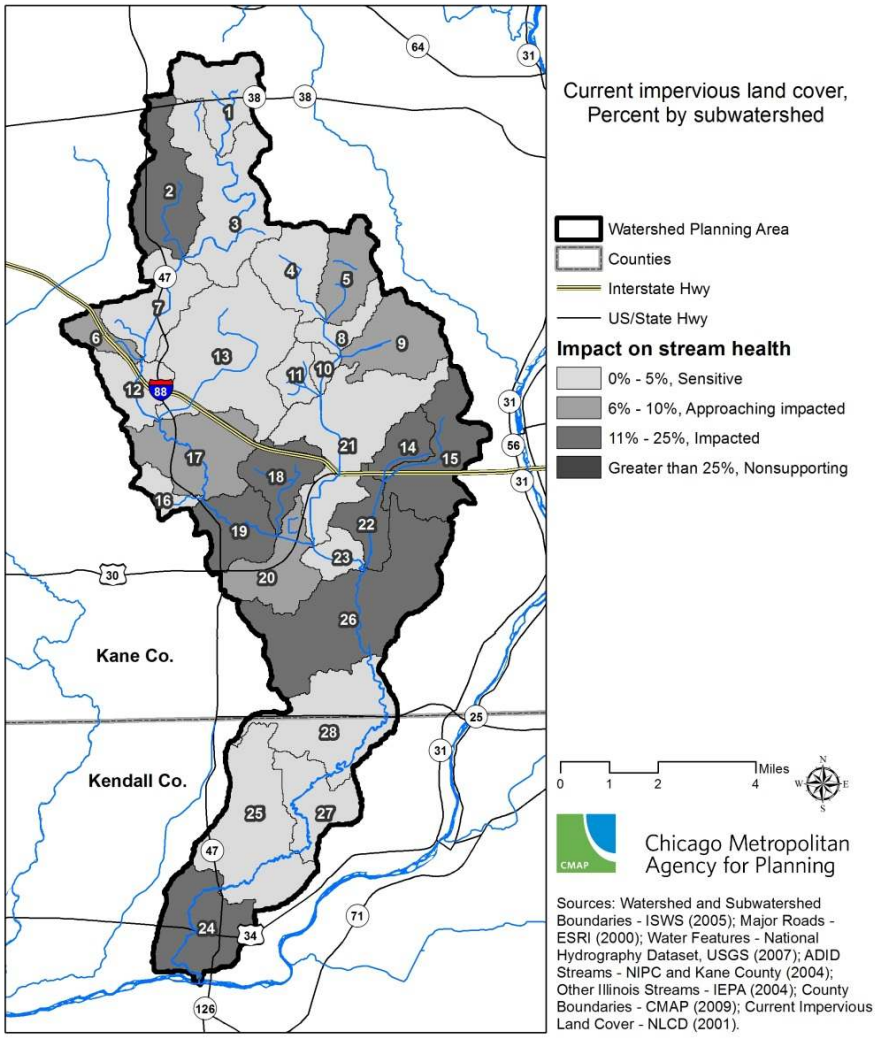


Figure 3-9. Current impervious land cover, percent by subbasin.

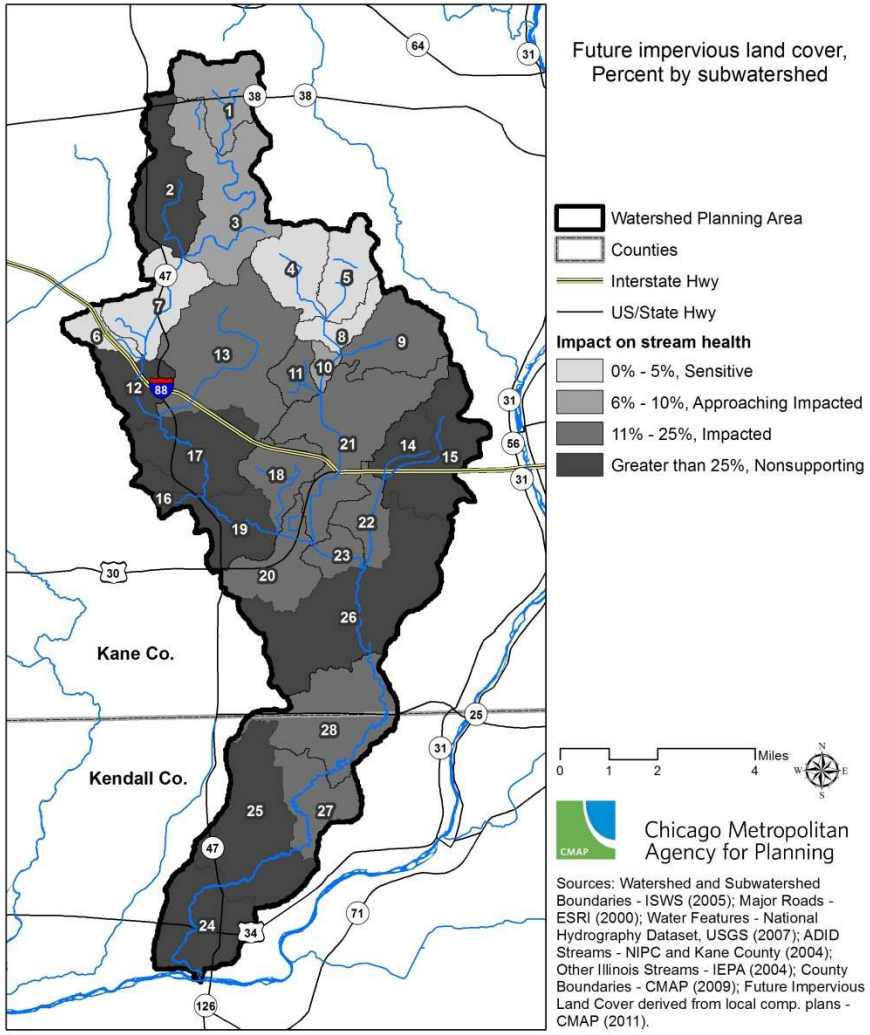


Figure 3-10. Future projected impervious land cover, percent by subbasin.

The digitized future land use features were then clipped to the Blackberry Creek Watershed boundary and intersected with the 28 Blackberry Creek Watershed subbasins. Once intersected, the fraction of impervious land cover could be multiplied by the area for each of the digitized future land use features within each subbasin to give the actual impervious land cover for that future land use feature. The areas of impervious land cover for each of these features was then summed within each subbasin and divided by that subbasin's total area to give the percent. Figure 3-10 displays the results of the projected future imperviousness analyses.

Some notes on the assumptions made in this analysis are necessary here. Because different types of developed land uses are associated with different amounts of impervious land cover, the future imperviousness results cannot necessarily be readily inferred from a qualitative comparison with existing land cover or comprehensive plan maps. For example, a given subbasin might have both open space and industrial land uses, but its projected imperviousness might still be impacted with regard to stream health because industrial land uses are associated with a greater fraction of impervious land cover than other developed land uses such as residential housing. This is why comprehensive plan maps were georeferenced and digitized to perform a quantitative analysis. Also, this analysis of projected imperviousness is not intended as a literal characterization of on-the-ground development over the next several years. Because the analysis was performed by manually georeferencing and digitizing comprehensive plan PDF files, there is some uncertainty (i.e., generalization) built into the resulting map. Changes in impervious land cover cannot be determined on a parcel by parcel basis from this analysis, which is why the results are summarized by subbasin and presented as a percentage of subbasin total area rather than as a concrete number of acres of future impervious land cover. Rather these results are intended only to identify those subbasins that are *most likely* to become impacted or nonsupporting in the future with regard to impervious land cover's impact on stream health.

With these caveats in mind, Table 3-18 presents the stream health category for each of the 28 subbasins, indicating from and to which category each subwatershed is projected to change. Consequently, critical areas for imperviousness are identified to be those subwatersheds moving from the Sensitive or Approaching Impacted categories to the Impacted or Non-supporting categories. In the Blackberry Creek Watershed, this includes subbasins 9, 11, 12, 13, 16, 17, 20, 21, 23, 25, 27 and 28.

These analyses indicate that by developing, adopting, and implementing various planning and design codes and guidelines to reduce effective imperviousness in new development, as well as through stormwater conveyance and storage retrofits within already built environments, watershed communities can begin to positively affect stream health.

Table 3-18.
Current and Projected Stream Health based on the Percent Imperviousness within 28 Subbasins of the Blackberry Creek Watershed

SUBBASIN #	PRIMARY LOCAL JURISDICTIONS	CURRENT (2001) STREAM HEALTH CATEGORY	FUTURE PROJECTED STREAM HEALTH CATEGORY
1	Campton Hills/Unicorp. Campton Twp.	Sensitive	Sensitive / Approaching Impacted
2	Elburn/Unincorp. Blackberry Twp.	Impacted	Nonsupporting
3	Elburn/Unincorp. Blackberry Twp.	Sensitive	Sensitive / Approaching Impacted
4	Unincorp. Blackberry Twp.	Sensitive	Sensitive
5	Unincorp. Blackberry Twp.	Sensitive / Approaching Impacted	Sensitive
6	Unincorp. Kaneville & Blackberry Twps.	Sensitive / Approaching Impacted	Sensitive
7	Unincorp. Blackberry Twp.	Sensitive	Sensitive
8	Unincorp. Blackberry Twp.	Sensitive	Sensitive
9	Unincorp. Batavia & Blackberry Twps./Batavia	Sensitive / Approaching Impacted	Impacted
10	Unincorp. Blackberry Twp.	Sensitive	Sensitive / Approaching Impacted
11	Unincorp. Blackberry Twp.	Sensitive	Impacted
12	Unincorp. Blackberry Twp.	Sensitive	Nonsupporting
13	Unincorp. Blackberry Twp.	Sensitive	Impacted
14	North Aurora/Aurora/Unincorp. Batavia & Aurora Twps.	Impacted	Nonsupporting
15	North Aurora/Aurora/Unincorp. Batavia & Aurora Twps.	Impacted	Nonsupporting
16	Sugar Grove/Unincorp. Sugar Grove Twp.	Sensitive	Nonsupporting
17	Sugar Grove/Unincorp. Sugar Grove Twp.	Sensitive / Approaching Impacted	Nonsupporting
18	Sugar Grove/Unincorp. Sugar Grove Twp.	Impacted	Impacted
19	Sugar Grove/Unincorp. Sugar Grove Twp.	Impacted	Nonsupporting
20	Sugar Grove/Unincorp. Sugar Grove Twp.	Sensitive / Approaching Impacted	Impacted
21	North Aurora/Aurora/Unincorp. Blacberry, Batavia, & Sugar Grove Twps./Sugar Grove	Sensitive	Impacted
22	Aurora/Unincorp. Sugar Grove Twp.	Impacted	Impacted
23	Aurora/Unincorp. Sugar Grove Twp.	Sensitive	Impacted
24	Yorkville/Unincorp. Bristol Twp.	Impacted	Nonsupporting
25	Yorkville/Unincorp. Bristol Twp.	Sensitive	Nonsupporting
26	Aurora/Sugar Grove/Unincorp. Sugar Grove Twp.	Impacted	Nonsupporting
27	Yorkville/Montgomery/Unincorp. Bristol Twp./Oswego	Sensitive	Impacted
28	Montgomery/Unincorp. Sugar Grove & Bristol Twps.	Sensitive	Impacted

3.4.2 Population Density & Pet Waste

As noted, pet waste was also considered as a potential source of fecal coliform. While there is a national pet ownership dataset for the United States, there are no subwatershed, watershed, county, or state level datasets on pet populations.[49] Therefore, 2010 population data from the U.S. Census Bureau was used to calculate human population density in each subbasin, based on the assumption that pet population density scales proportionally with human population density.[50] The importance of urbanization to stream health has been investigated previously and broadly supports the assumption for this analysis that urban areas contribute a significant amount of fecal coliform to waterbodies receiving urban runoff. In addition to impacts from the amount of impervious area, higher population densities are correlated to the potentially lower quality of stream health, of which fecal coliform concentrations are one determinant. For example, one study found lower values for the Index of Biotic Integrity (IBI) in urban areas when compared with rural areas, indicating that urban areas tend to be associated more often with lower stream aquatic health, an impact caused in part by fecal coliform contamination.[51,52]

Figure 3-11 displays the results of this analysis. Dreher defines population density thresholds for rural (fewer than 0.46 people/acre), urbanizing (0.46 to 1.56 people/acre) and urban (more than 1.56 people/acre) watersheds.[53] Adopting Dreher's thresholds, there are 10 urban subbasins within the Blackberry Creek Watershed with the highest population densities. These subbasins likely have relatively higher pet populations given our assumption that pet population scales with human population. Beyond this assumption, these population density thresholds do not allow us any definitive conclusions about fecal coliform contamination directly, but rather suggest that the urban subbasins contribute more pollutants to runoff from certain sources, including fecal coliform.

Subbasins showing the highest population densities encompass Aurora, Elburn, Montgomery, Sugar Grove, Yorkville, and unincorporated areas. If these municipalities (or Kane and Kendall Counties for the unincorporated areas) do not already have pet waste pickup ordinances, then enacting such a policy in

[49] "U.S. Pet Ownership & Demographics Sourcebook," AVMA, accessed September 15, 2011, http://www.avma.org/reference/marketstats/sourcebook.asp.

[50] Bureau of the Census. "2010 Census Summary File 1." *2010 Census*, Kane and Kendall Counties, Illinois. Washington, D.C.: Bureau of the Census, 2011. http://www2.census.gov/census_2010/04-Summary_File_1 (accessed November 3, 2011).

[51] Dreher, Dennis W. "Watershed Urbanization Impacts on Stream Quality in ortheastern Illinois." In *Assessing the Cumulative Impacts of Watershed Development on Aquatic Ecosystems and Water Quality*. Chicago, IL: Northeastern Illinois Planning Commission, 1996.

[52] Fitzpatrick, F.A., M.A. Harris , T.L. Arnold , and K.D. Richards. "Urbanization Influences on Aquatic Communities in Northeastern Illinois Streams." *Journal of the American Water Resources Association (JAWRA)*, Vol. 40, No. 2 (2000): 461-475.

[53] Ibid 51.

local codes or ordinances should be a priority for these areas. Promoting a new policy such as this will then require an outreach and education campaign to raise awareness of the issue and the social benefits of pet waste pickup.

3.4.3 Septic Systems

A septic system analysis was also completed on the subbasin level. This estimate was calculated from 1990 U.S. Census data for the number of septic systems within the watershed.[54] Septic systems numbers from 1990 were summed within each subbasin and then updated by multiplying by the fraction of population change between 1990 and 2010.[55] Subbasins were then identified as low, medium, or high priority with regard to septic system density (systems per acre). While only failing septic systems are a possible source of fecal coliform contamination, a uniform failure rate was assumed throughout the watershed. Therefore, areas with a higher density of septic systems overall are also likely to have a higher density of failing septic systems. As Figure 3-12 shows, a significant portion of the watershed was

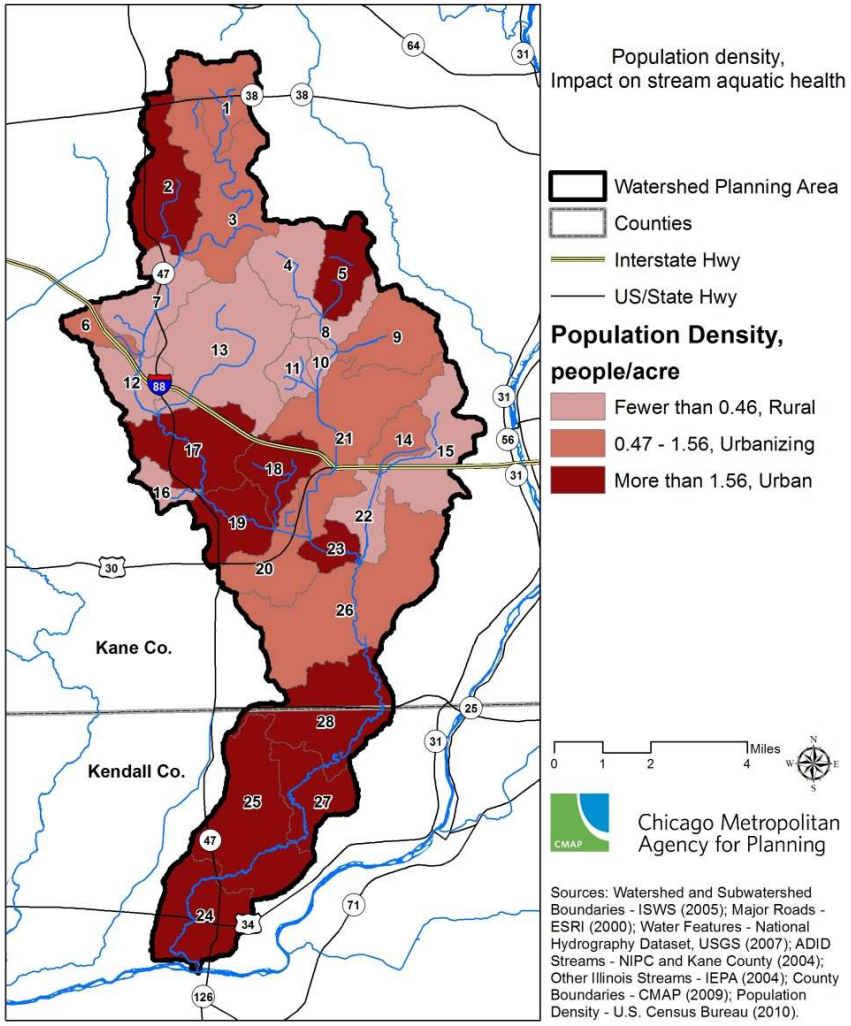


Figure 3-11. Population density by subbasin.

[54] Bureau of the Census. "1990 Census Summary File 3." *1990 Census*, Table H024, Sewage Disposal, Kane and Kendall Counties, Illinois. Washington, D.C.: Bureau of the Census, 1990. http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml (accessed November 3, 2011).

[55] Bureau of the Census. "2010 Census Summary File 1." *2010 Census*, Kane County, Illinois. Washington, D.C.: Bureau of the Census, 2011. http://www2.census.gov/census_2010/04-Summary_File_1 (accessed November 3, 2011).

determined by this analysis to utilize septic systems rather than municipal sewers. The subbasins that are identified as high priority encompass primarily unincorporated areas, Campton Hills, Elburn, Montgomery, and Yorkville. If these municipalities (and Kane and Kendall Counties for the unincorporated areas) do not already require or at least encourage regular septic system inspection and maintenance, then developing technical assistance programs and/or enacting policy in local codes or ordinances would be an appropriate and timely priority for these areas.

3.4.4 Livestock Operations

Finally, agricultural runoff from livestock and horse manure was considered as a possible source of fecal coliform. Agricultural areas used for livestock and equestrian purposes were identified from the 2005 NIPC Land Use Inventory.[56] (See the Watershed Resource Inventory chapter for the location of all agricultural land throughout Blackberry Creek Watershed.) Agricultural areas utilized for livestock and equestrian purposes were summed within each subbasin and then divided by the total subbasin area to calculate the percent of livestock and equestrian agricultural area. Figure 3-13 shows the percent agricultural land use in each subbasin for livestock and equestrian purposes.

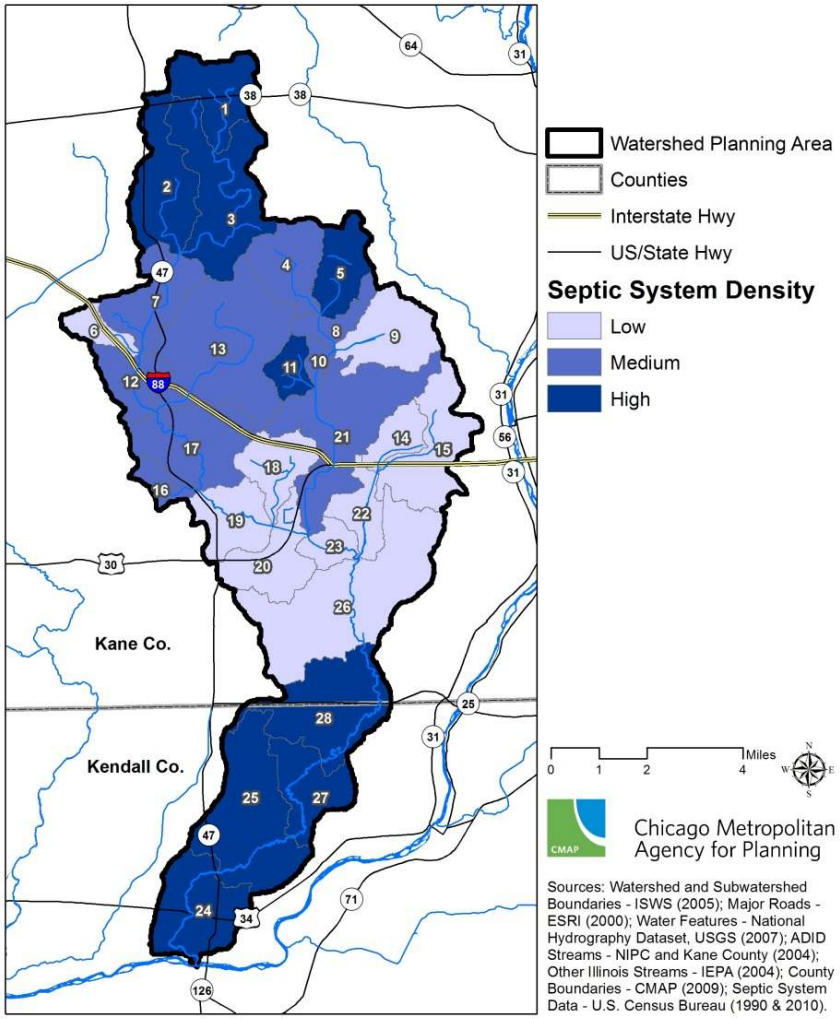


Figure 3-12. Relative septic system density by subbasin.

[56] NIPC. Land Use Inventory. Chicago, IL: CMAP, 2005. http://www.cmap.illinois.gov/land-use-inventory (accessed September 14, 2011).

Subbasin 1 has the greatest amount of livestock and equestrian agricultural land use with 8.3%. In addition, subbasins 9, 11, and 19 have more than 2% livestock and equestrian land use. These subbasins encompass primarily unincorporated areas, Campton Hills, and Sugar Grove. If such efforts are not already in place, landowners in these areas should be contacted and encouraged by local agencies to adopt manure management plans. Information, education, and technical assistance programs could also be provided.

3.5 L-THIA MODELING

Model results are useful because they can help to identify potential sources of impairments. Model results for fecal coliform concentrations among the subbasins within the Blackberry Creek Watershed might provide insight when compared with the results of the fecal coliform critical areas analysis, for example, if an area modeled to have high fecal coliform also is identified as a fecal coliform critical area based on the proxies investigated. Similarly, although nutrients and sediment in Blackberry Creek are not found to impair any designated uses, model results for nutrients and sediment loading help to present a comprehensive view of potential water quality issues throughout the Blackberry Creek Watershed.

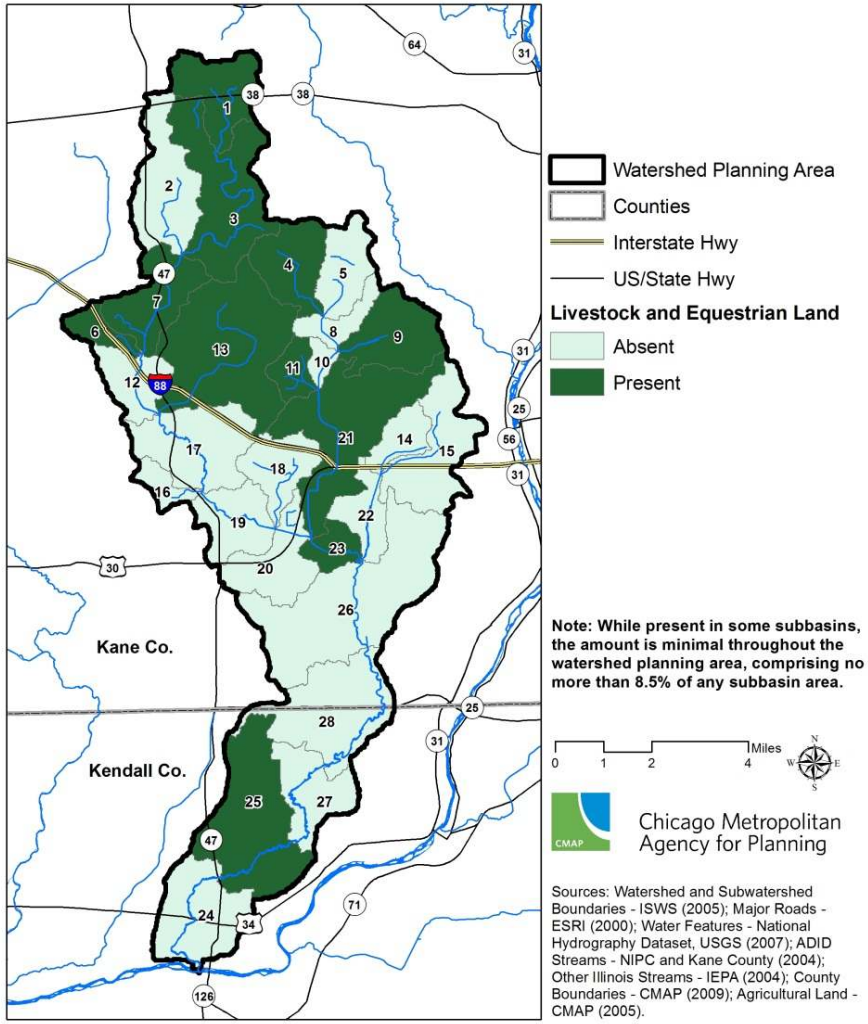


Figure 3-13. Livestock and equestrian land use presence by subbasin.

A Long-Term Hydrologic Impact Analysis (L-THIA) model was run at a subbasin level for Blackberry Creek. L-THIA predicts runoff volume, runoff depth, and nonpoint source pollutant loadings based on the land use and the hydrologic soil group on which this land use is occurring. L-THIA uses observed, long-term climate data at a county level to model precipitation events. Nonpoint source pollutants modeled by L-THIA include total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS), and fecal coliform (FC). L-THIA estimates runoff volume and nonpoint source pollutant loadings based on event mean concentrations (EMC) specific to unique combinations of land uses and pollutant types.[57] EMC values are determined by taking water quality measurements at various points in time during a runoff event and averaging these measurements by the flow rates corresponding to the sample concentrations. The default EMC values used in the L-THIA model are based on a study by the Texas Natural Resource Conservation Commission.[58] L-THIA uses EMC values to calculate total annual pollutant loadings by multiplying the total annual runoff depth for a land use by the area of that land use, as well as by the appropriate EMC value and converting units when necessary.

[57] "How L-THIA Estimate[s] NPS Pollutant Loadings using Event Mean Concentration," Purdue University, accessed November 7, 2011, https://engineering.purdue.edu/mapserve/LTHIA7/lthianew/documnt/how_lthia_estimate_nps_using_emc.htm.

[58] Texas Natural Resource Conservation Commission. *Characterization of Nonpoint Sources and Loadings to the Corpus Christi Bay National Estuary Program Study Area*, by Charles Baird and Marshall Jennings. Report No. CCBNEP-05. Corpus Christi, TX: Texas Natural Resource Conservation Commission, 1996. http://www.cbbep.org/publications/virtuallibrary/ccbnep05.pdf (accessed August 15, 2011).

To assess relative contributions of pollutants among the 28 subbasins within the Blackberry Creek Watershed, average annual loadings from L-THIA were converted to unit-area loads, meaning that the total load for each pollutant is divided by the subbasin area to calculate pounds of pollutant per acre. Unit area loads provide a more meaningful point of comparison than average annual loads because they account for varying area size among subbasins. Larger subbasins are expected to contribute more pollutants overall as a function of their greater area, but if the unit area load for a subbasin is still larger than others after dividing by its area, then that subbasin's pollutant contribution is assumed to be disproportionately large.

3.5.1 Fecal Coliform Loading

Figure 3-14 depicts the relative unit area loads for fecal coliform by subbasin within the Blackberry Creek Watershed. This figure can be compared qualitatively with the critical areas identified through the previous analysis to assess which sources of fecal coliform contamination might be most likely based on the geographic overlap of likely sources (critical areas) with likely high unit area loads (L-THIA results). While some fecal coliform likely does originate from all the source groups discussed in this plan, the areas in this map with the highest unit area loads (subbasins 1, 4, 6, 10, 13, 14, 15, 16, and 21) overlap with the livestock and septic system proxies to a greater extent than with the imperviousness or pet waste proxies, suggesting that livestock waste and failing septic systems might contribute more

to fecal coliform contamination in this watershed than urban runoff.

It is important to note that the results presented here for fecal coliform are conservative, since the L-THIA model likely underestimates fecal coliform loading. Fecal coliform loading is calculated using an EMC, as are loadings of the other NPS compounds; that is, a constant in units of bacteria per volume is multiplied by the total volume of water passing over a particular land use. As such, the loadings modeled by L-THIA constitute only nonpoint sources of contamination, including those for fecal coliform. The L-THIA model employed here uses minimum EMC values for fecal coliform that are derived from the existing literature. Therefore, model outputs will be low compared to other forms of estimation that use maximums or averages.[59] For purposes of this plan, the nonpoint source component of fecal coliform contamination is more relevant, since wastewater treatment plant point sources must disinfect effluent during period where sample counts determine a stream's use attainment or impairment status.

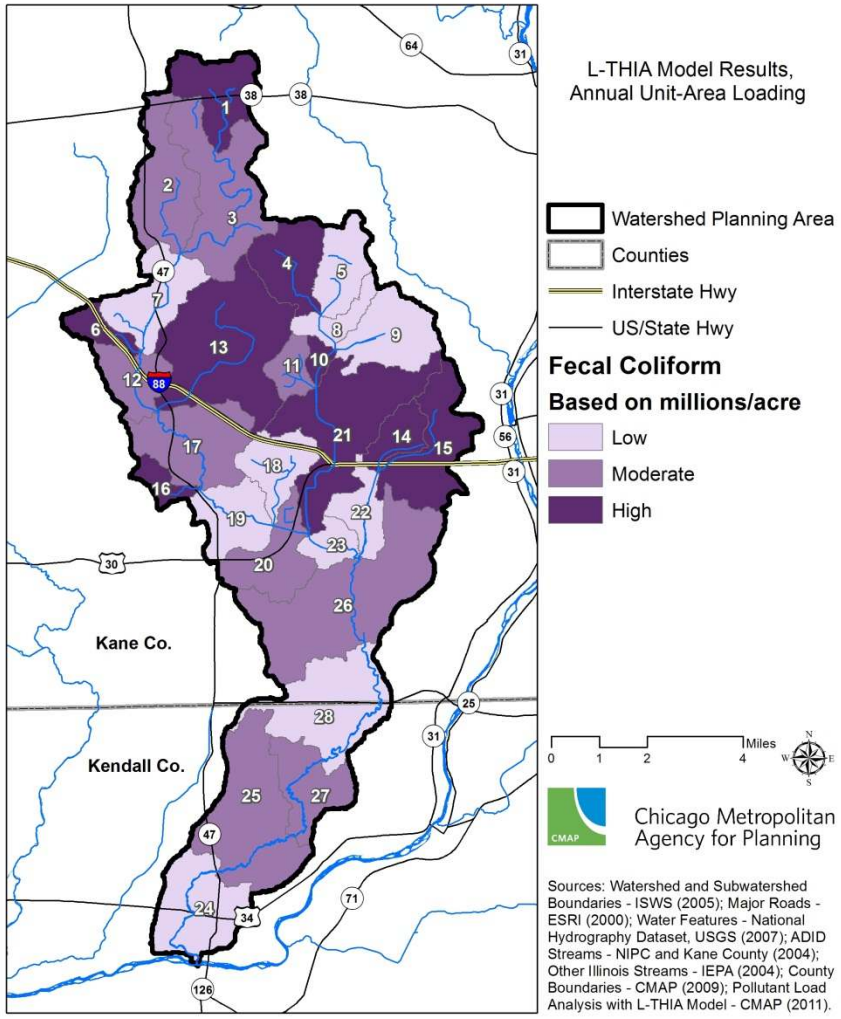


Figure 3-14. Relative unit area load for fecal coliform by subbasin.

[59] Larry Theller, GIS specialist, Purdue University Department of Agricultural and Biological Engineering, email to author(s), September 21, 2011.

3.5.2 Nutrient & Sediment Loading

Nitrogen, phosphorus and sediment are displayed spatially in the aggregate. Bundling these pollutants is intuitive because they likely share a common source. For example, agricultural land uses and turfgrass lawns in urban areas can both lead to disproportionately large loadings of all three of these pollutants. If a subbasin has a high nitrogen unit area load, it likely also has high phosphorus and sediment unit area loads. Therefore only one map is displayed rather than three. The method for aggregating these metrics is detailed below and is similar to the general process employed in identifying critical areas above. This method has been applied to bundle factors contributing to water quality in other watershed planning documents as well.[60,61] Nitrogen, phosphorus, and sediment are displayed spatially in the aggregate. Bundling these pollutants is intuitive because they likely share a common source. For example, agricultural land uses, and nonnative turf-grass lawns in urban areas, can lead to disproportionately large loadings of all three of these pollutants. If a subwatershed has a high nitrogen unit area load, it likely also has high phosphorus and sediment unit area loads. Therefore only one map is displayed rather than three. The method for aggregating these metrics is detailed below and is similar to the general process employed in identifying critical areas above. This method has been applied to bundle factors contributing to water quality in other watershed planning documents as well.[62,63] To view TN, TP, and TSS in the aggregate, each subbasin received three scores, one for each pollutant's unit-area load. Scores were based on ranking the subbasins from the lowest unit area pollutant load to the highest. A score of one for each pollutant corresponded to the subbasin with the lowest unit-area load, while a score of 28 corresponded to the subbasin with the highest unit area load. The aggregated total rank for each subbasin was calculated by summing the three ranks for each individual pollutant. Subbasins with the highest total rankings were then recognized to have disproportionately high unit area loads across several pollutants. Here, as in the critical areas analysis, the scores delineating the subbasins into high, medium, and low unit-area loading groups should be taken as a relative rather than an absolute measure. Figure 3-15 shows the overall scores for nutrients and sediment among subbasins based on unit-area loads within the Blackberry Creek Watershed.

[60] Mill Creek Subwatershed Stakeholder Advisory Group. *Mill Creek Subwatershed Management Plan*, by Elizabeth Riggs. Ann Arbor, MI: Huron River Watershed Council, 2006. http://www.michigan.gov/documents/deq/ess-nps-wmp-mill-creek_209206_7.pdf (accessed August 18, 2011).

[61] White River Resource Conservation & Design, Inc. *Defining Critical Areas: Hogan Creek Watershed Project, Upper Anderson River Watershed Project and Tanners Creek Watershed Project*, by Kris Vance. PowerPoint presentation. Salem, IN: White River Resource Conservation & Design, Inc., 2011. https://engineering.purdue.edu/watersheds/webinars/IWLA2011/CriticalAreas/DefiningCriticalAreasVance.pdf (accessed August 18, 2011).

[62] Mill Creek Subwatershed Stakeholder Advisory Group. *Mill Creek Subwatershed Management Plan*, by Elizabeth Riggs. Ann Arbor, MI: Huron River Watershed Council, 2006. http://www.michigan.gov/documents/deq/ess-nps-wmp-mill-creek_209206_7.pdf (accessed August 18, 2011).

[63] White River Resource Conservation & Design, Inc. *Defining Critical Areas: Hogan Creek Watershed Project, Upper Anderson River Watershed Project and Tanners Creek Watershed Project*, by Kris Vance. PowerPoint presentation. Salem, IN: White River Resource Conservation & Design, Inc., 2011. https://engineering.purdue.edu/watersheds/webinars/IWLA2011/CriticalAreas/DefiningCriticalAreasVance.pdf (accessed August 18, 2011).

The L-THIA model results for TN, TP, and TSS when viewed in the aggregate show subbasins 1, 4, 10, 12, 13, 14, 15, 16, and 21 to generate the highest unit-area loads. These subbasins overlap in large part with the subbasins that have the highest percentages of total agricultural land (Figure 3-16) and agricultural land for livestock or equestrian purposes by area (Figure 3-13).

Agricultural activities in this watershed are therefore indicated for generating a disproportionately large contribution of the nutrient and sediment loads in Blackberry Creek as predicted by L-THIA. However, more investigation into the sources of nutrient and sediment runoff is warranted, particularly into the dynamics of subbasins 14, 15, and 21. These three subbasins possess some degree of agricultural land use, but agriculture is by no means dominant. They also possess no agricultural land for livestock or equestrian purposes. If these subbasins do demonstrate high unit area loads as suggested by L-THIA, there might be factors in addition to agriculture contributing to these disproportionately high loads. In particular, subbasins 14 and 15 are both between 11% and 25% impervious, indicating that stream health might be impacted by impervious surface cover, so

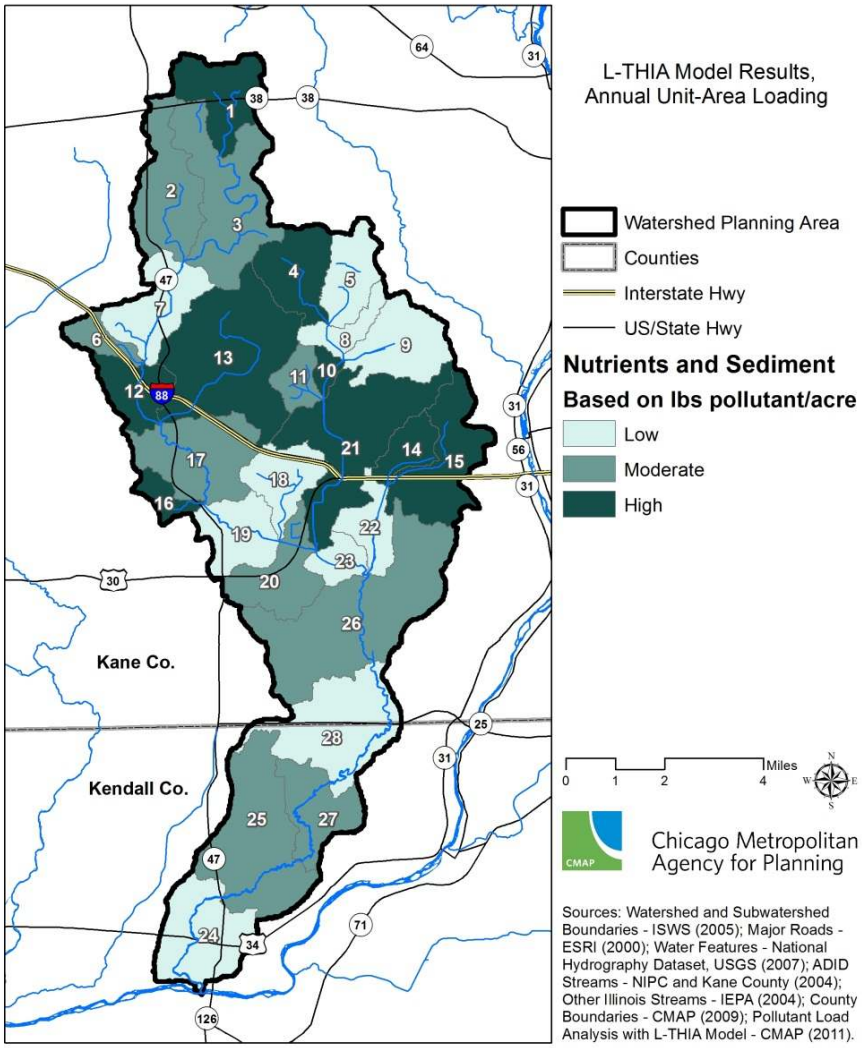


Figure 3-15. Relative unit area load for nutrients and sediment by subbasin.

nutrient and sediment runoff from urban surfaces might be a more important factor in these areas.

Ideally, monitoring data should be collected at a higher spatial resolution throughout the watershed. Such data can be used in conjunction with model results to inform identification of pollutant sources at a subbasin level to guide nutrient and sediment runoff mitigation efforts. In the meantime, L-THIA model results are instructive in terms of where emphasis should be placed to reduce sediment and nutrient runoff.

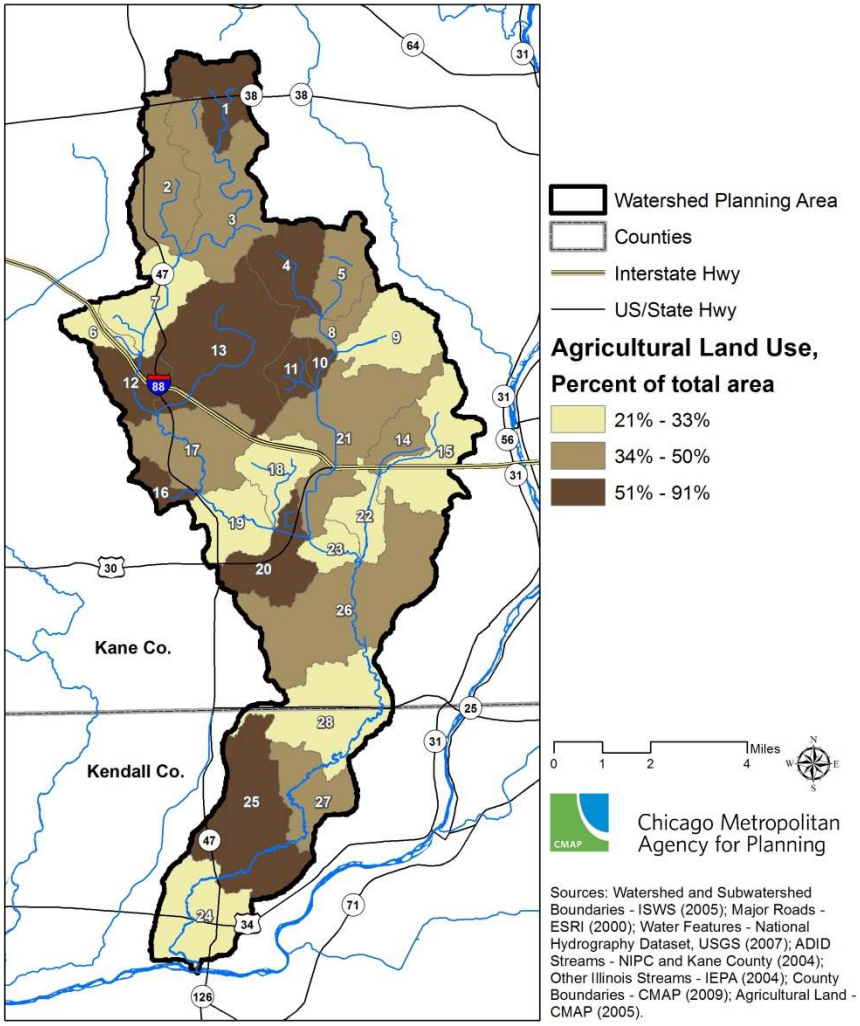


Figure 3-16. Agricultural land use, percent by subbasin.

4. Water Resource Policy and Planning Recommendations

Non-structural controls, such as policy and planning/ programming activities, play an important role in addressing fecal coliform reduction through an increased emphasis on potential sources. This chapter explores the use of the Green Infrastructure Framework to develop watershed-wide policy recommendations for improving water quality. The focus of this approach is to explore policies that address land-use decisions impacting water resources. A review of existing policies pertinent to water resources was conducted to provide a better context for framing recommendations. The policy and planning/ programming recommendations, summarized at Table 4-1 with highlights of specific items located at the end of the chapter, are designed to be incorporated within existing codes, ordinances, and programs of local governments in the watershed where possible.

4.1 Green Infrastructure Framework

A green infrastructure approach to water quality protection is defined by a range of natural and built systems that can occur at the regional, community, and site scales.[1] At the regional scale, green infrastructure refers to a network of connected open space

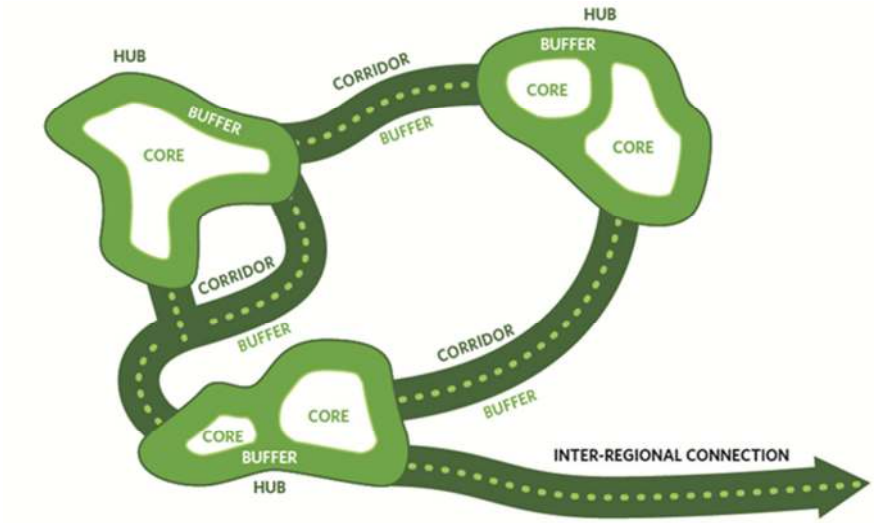


Figure 4-1. The green infrastructure network concept.
(Modified from U.S. EPA.)

and natural lands and waters that provide important environmental functions. This network includes large complexes or hubs of remnant woodlands, prairies, wetlands, lakes, and other natural areas as well as corridors connecting these natural communities to provide buffers and opportunities for habitat connectivity.[2] At the community and neighborhood scales, green infrastructure incorporates design approaches such as compact, mixed-use developments, urban forestry, reductions in surface parking, and other strategies that reduce impervious surfaces. At the site scale, green infrastructure is manifested by practices that

[1] "Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales," U.S. EPA, last modified November 4, 2011, accessed November 8, 2011, http://www.epa.gov/smartgrowth/water_scorecard.htm.

[2] Chicago Wilderness. *Chicago Wilderness Green Infrastructure Vision: Final Report*. Chicago, IL: Chicago Wilderness, 2004. http://www.chicagowilderness.org/GIV.php (accessed November 8, 2011).

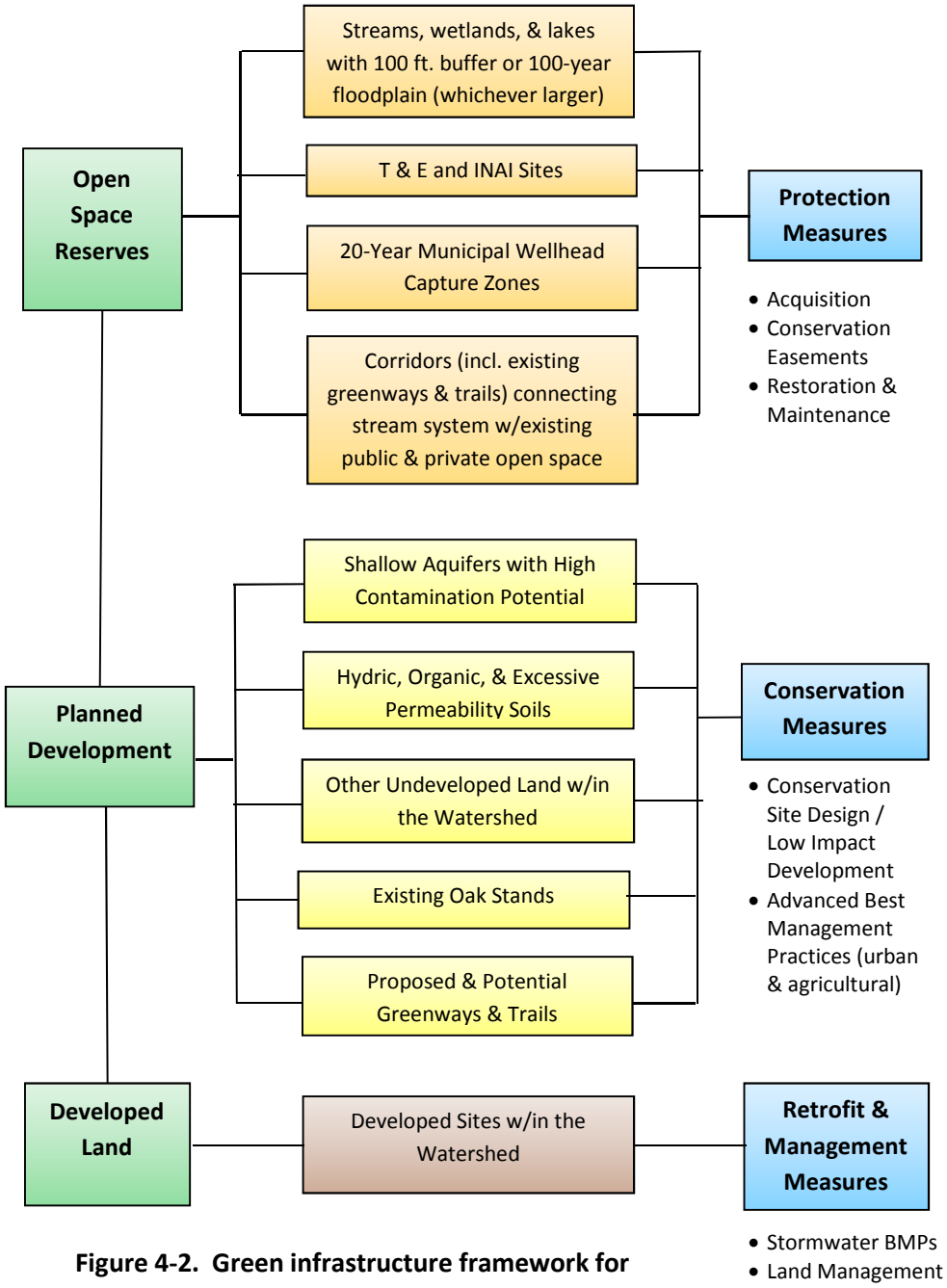


Figure 4-2. Green infrastructure framework for protecting water resources.

retain, infiltrate, and allow for evapotranspiration of stormwater bretain, infiltrate, and allow for evapotranspiration by mimicking natural systems.

The Green Infrastructure Framework for Blackberry Creek details the types of activities that may maintain and enhance water quality if undertaken by various stakeholders, primarily local governments (Figure 4-2). Under this framework, lands in the watershed fall into three main categories: Open Space Reserves, Planned Development, and Developed Land.

4.1.1 Open Space Reserves

In this category, an interconnected network of hubs and corridors are proposed for inclusion in an open space protection program that encompasses ecologically sensitive lands. The goal of this network is to assure continued flood water storage, protect wetlands, provide habitat in the stream corridor and preserve ecosystem functions that society values,[3] while minimizing stormwater run-off and non-point source pollution. The hubs are composed of currently protected public and private open space and proposed open space to be connected by the stream network and existing greenways and trails. Ideally, and to provide the highest ecological functions, these lands are preserved and restored to native land cover wherever possible and realistic.

[3] Benedict, M.A. and E.T. McMahon. *Green Infrastructure: Smart Conservation for the 21st Century*. Arlington, VA: The Conservation Fund, 2002. http://www.conservationfund.org/sites/default/files/GI_SC21C.pdf (accessed November 21, 2011).

To delineate the Open Space Reserves, an overlay of various resources that are supportive of the stream network and the overall water quality (see Chapter 2- Watershed Resource Inventory and Assessment) was mapped. The data that were analyzed to create this category include the Blackberry Creek Stream network, Threatened and Endangered Species and the Illinois Natural Areas Inventory sites, Phase II Wellhead Protection Areas, and Greenways and Trails Corridors.

Streams, Wetlands, Lakes, 100-year Floodplain

The stream network includes the stream itself, high habitat value and high functional value wetlands, and lakes. Ensuring the connectivity of and buffer establishment around these waterbodies will ensure better water quality and habitat preservation. An undeveloped floodplain helps contain flooding, aids in the absorption and filtration of water, and helps to minimize erosion and siltation in the waterway.

Threatened & Endangered Species (T & E Sites)

There are 52 species in Kane County, 20 in Kendall County, that are either classified as state endangered or threatened.[4] "Endangered" is defined as an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.[5] "Threatened" is defined as an animal or plant likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Within the watershed, there are several areas identified by IDNR that possibly contain threatened or endangered species. Due to their importance as indicators of functioning ecosystems, T & E sites should be preserved as part of the Open Space Reserves. Information on T & E sites can be obtained from the Illinois Department of Natural Resources for further planning purposes.

Illinois Natural Areas Inventory Sites

Illinois Natural Areas Inventory (INAI) sites are locations of significant natural resources identified by the Illinois Department of Natural Resources. These sites may contain natural communities, specific habitat for state-listed species, unique geological features, unusual concentrations of flora and fauna, and high quality streams.[6] INAI information is used to "guide and support land acquisition and protection programs by all levels of government as well as by private landowners and conservation organizations."[7] Six of the eight INAI sites[8] within

[4] "Illinois Threatened and Endangered Species by County," Illinois Department of Natural Resources, accessed November 8, 2011, http://dnr.state.il.us/ORC/list_tande_bycounty.pdf

[5] "Endangered Species Glossary," U.S. Fish & Wildlife Service, last modified October 12, 2011, accessed November 8, 2011, http://www.fws.gov/midwest/endangered/glossary/index.html.

[6] "Protecting Nature's Treasures," Illinois Nature Preserves Commission, accessed November 4, 2011, http://dnr.state.il.us/inpc/.

[7] "Illinois Natural Areas Inventory," Illinois Natural History Survey, accessed November 8, 2011, http://www.inhs.illinois.edu/research/inai/.

the Blackberry Creek Watershed in Kane County are in properties within the Kane County Forest Preserve District. Three of these six sites are designated as Illinois Nature Preserves. Of the remaining three sites, two have an unknown protection status, Carson Marsh and the segment where Blackberry Creek enters the Fox River in Kendall County. The Carson Marsh site is privately-owned and lies in the Prestbury Subdivision. Both sites present an opportunity for restoration and connectivity in the green infrastructure network. Protection opportunities include inclusion in the Illinois Nature Preserves network or participation in conservation easement programs being offered through the land trust agencies that operate in the area, e.g. The Conservation Foundation and Corlands. These programs generally include tax benefits for property owners as an incentive to protect land for perpetuity.

Greenways & Trails

Greenways may differ widely in location and function, they may be land-based or water-based, may range from narrow corridors of undeveloped landscape to wide corridors that incorporate diverse natural and cultural features, may incorporate both public and private property; nonetheless, an effective greenway network offers a multitude of ecological and recreational benefits. Greenways that run along stream corridors will improve and sustain hydrological functions. Regional trails, on the other hand, tend to be multi-jurisdictional facilities that offer recreational opportunities and transportation uses, and connect communities throughout the region.[9] For the Open Space Reserve, greenways and trails may serve as the corridors connecting the hubs of existing and proposed open space. The 2009 Northeastern Illinois Regional Greenways and Trails Plan depicts existing and proposed greenways and trails. Data from this plan was used to determine the Open Space Reserve in the Green Infrastructure Framework.

The lands identified in Figure 4-3 are the result of an overlay of the above data layers with consideration to connectivity to existing, legally protected open space[10], as illustrated. Some of the identified lands coincide with currently developed areas which might present obstacles to open space preservation. For a more refined analysis at the parcel level to identify protection opportunities, the Open Space Reserve can be considered in the context of agricultural and vacant/wetland sites from the CMAP 2005 Land Use Inventory. Preliminary analysis indicates that there are 103 parcels in the Kane County and 18 parcels in the Kendall County segments of the watershed that may present open space protection opportunities. Counties, municipalities, and townships are encouraged to conduct this analysis at the local scale using more accurate and updated parcel data.

[8] INAI sites in Kane County: Bliss Woods Marsh, Carson Marsh, Johnson Mound, Lakin Hill Prairie, Nelson Lake Marsh, Bliss Woods, Blackberry Maples Marsh, and the segment where Blackberry Creek enters the Fox River.

[9] CMAP. *Northeastern Illinois Regional Greenways and Trails Plan*. Chicago, IL: CMAP, 2009. http://www.cmap.illinois.gov/bike-ped/greenways-and-trails (accessed December 29, 2011).

[10] The existing open space layer is an overlay of Forest Preserve District properties, Park District properties, and other privately owned open space.

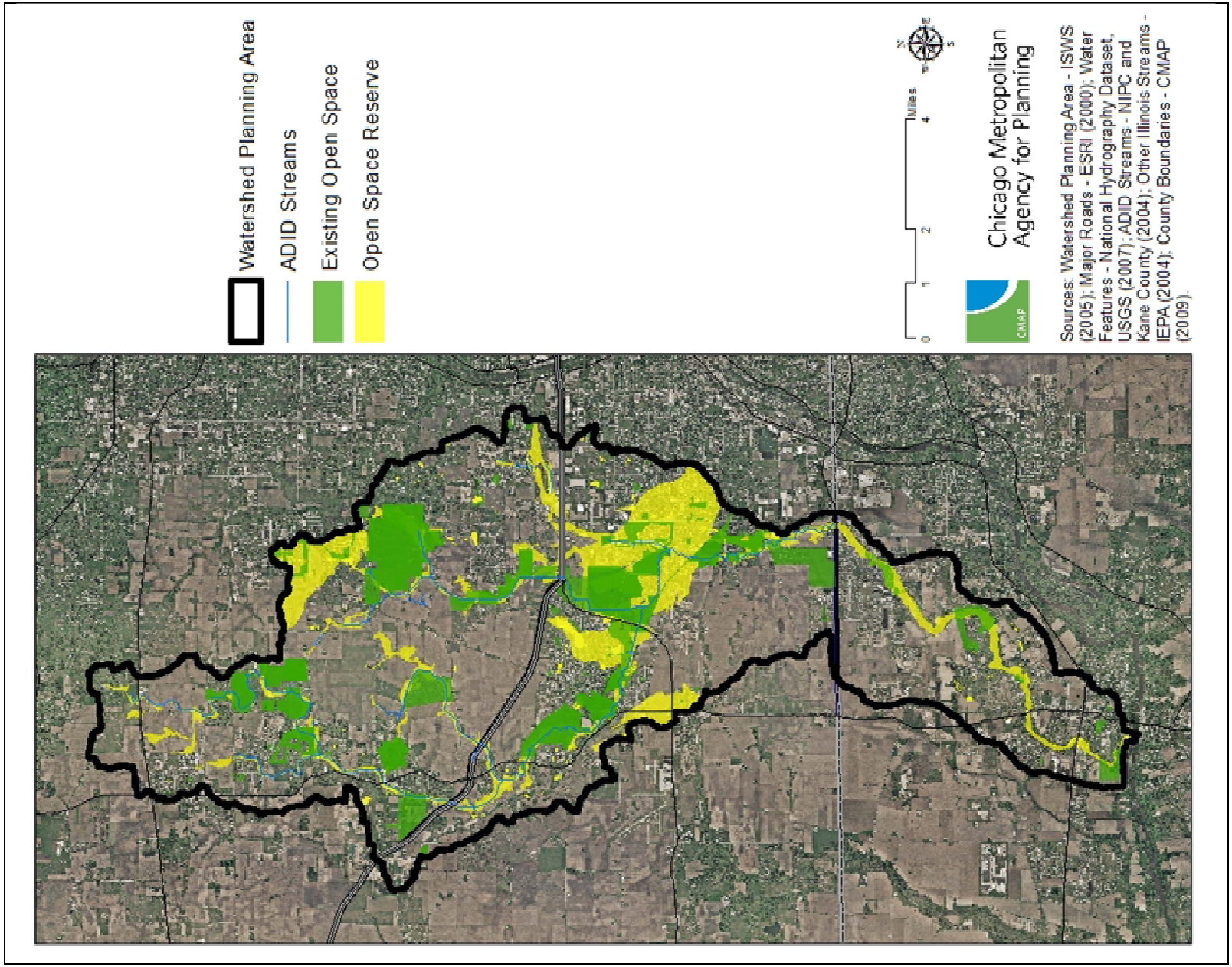


Figure 4-3. Open space reserve vision for the Blackberry Creek Watershed.

4.1.2 Planned Development

This category includes currently undeveloped land with certain characteristics that is zoned for future development. Planned Development includes developable land that falls in one or more of the following distinctions: hydric, organic, and excessive permeability soil locations; shallow aquifers with high contamination potential, existing oak stands, and proposed/potential greenways and trails.

Hydric, Organic, & Excessive Permeability Soils

See Chapter 2: Watershed Resource Inventory, for a description of the above soil groups.

Shallow Aquifers with High Contamination Potential

Recharges areas in this layer include the USGS recharge areas discussed in the Resource Inventory and fen recharge areas.[11] Recharge areas are important for water quality and water quantity as they are the primary points where water enters the ground to replenish the aquifers. Since the majority of the communities in the watershed rely on groundwater, this category also includes the High Sensitivity Aquifer Areas (A1-A4) as defined by Kane County[12] to expand the recommended coverage of conservation measures in the Blackberry Creek Watershed.

Existing Oak Stands

Oak trees stabilize the soil with their root systems, conserve energy, foster air quality by producing oxygen and removing air pollution, and provide food and a natural habitat for wildlife. They also increase property values, add interest to urban landscapes, and provide welcome shade for humans and animals. Oak trees are unique in that they support a higher diversity of insects and birds than any other tree species and cannot easily be replaced once damaged or destroyed. Despite these valuable attributes, there has been a significant decline in the number of oak trees/groves/stands in the northeastern Illinois region over time. This may be attributed to residential development, invasive species and a lack of an integrated approach to protecting and maintaining oak stands. While this is an important category for the stakeholder group, information on oak stands is currently insufficient. Governmental units in the watershed may wish to form a partnership to conduct an inventory of oak trees in collaboration with entities such as the Morton Arboretum.

[11] As defined by 2004 Kane County Identification and Recharge Area Mapping Project . ISGS. "Kane County Water Resources Investigations: Final Report on Geologic Investigations," by William S. Dey, Alec M. Davis, B. Brandon Curry, Donald A. Keefer and Curt C. Abert. *ISGS Open File Series,* 2007-7. Champaign, IL: ISGS, 2007. http://library.isgs.uiuc.edu/Pubs/pdfs/ofs/2007/ofs2007-07.pdf (accessed November 3, 2011).

[12] Ibid. The Unit A class is defined as "areas where the upper surface of the aquifer is within 20 feet of the land surface and with sand and gravel or high-permeability bedrock aquifers greater than 20 feet thick." The Unit A class (High Potential for Aquifer Contamination) represents the area that is the most sensitive to contamination.

4.1.3 Developed Land

This category represents the developed areas in the watershed where protection and restoration measures may be appropriate. These include implementing new stormwater management practices in areas not currently served by such practices, as well as retrofitting existing BMPs to improve their water quality benefits.

4.2 Code and Ordinance Review

Kane and Kendall Counties are two of the fastest growing counties in Illinois and continued urban growth is expected in these counties and in the Blackberry Creek Watershed. Research has shown a positive correlation between percentage impervious cover in a watershed and concentrations of nutrients, sediment, and trace metals in surface waters.[13] Thus, as impervious cover increases, surface water quality is negatively impacted. Therefore, it is important to understand how current development regulations and ordinances help shape the communities in the Blackberry Creek watershed and their impact on water quality. Gaining a better comprehension of status of local policies is critical for outlining policy recommendations. To facilitate this understanding, an assessment of local codes was conducted to compare existing regulations using the "Code and Ordinance Worksheet" (COW) developed by the Center for Watershed Protection (Appendix C).[14] The worksheet provides an evaluation of development rules by assigning points on how well current rules agree with model development principles. The three categories for which points are assigned are Residential Streets and Parking Lots, Lot Development, and Conservation of Natural Areas. The "model" score for the worksheet is 100. Points are awarded when a development rule agrees with site specific planning benchmarks that directly or indirectly relate to stormwater management.

Municipal and county representatives within the watershed were asked to complete the worksheet for their respective units of government. A majority of the governmental units within the Blackberry Creek Watershed completed a COW; however, some concern was expressed by stakeholders regarding the practicality of the model development principles, specifically for development in unincorporated areas. It is important to note that while CWP sets a high standard for development regulation, the intent behind this review is to seek opportunities to reduce effective impervious cover to protect stream health and reduce future flooding. Governmental representatives are encouraged to explore locally appropriate rules that are more protective of water resources, particularly in future development.

[13] The Center for Watershed Protection. *Impacts of Impervious Cover on Aquatic Systems*. Mansfield, CT: University of Connecticut, 2003. http://clear.uconn.edu/projects/TMDL/library/papers/Schueler_2003.pdf (accessed November 8, 2011).

[14] "Better Site Design Publications," Center for Watershed Protection, accessed December 20, 2011, http://www.cwp.org/documents/cat_view/77-better-site-design-publications.html.

4.2.1 Residential Streets & Parking Lots

From an analysis of the responses of the various governmental entities, the category that contrasted the most from the model principles was Residential Streets and Parking Lots (Figure 4-4). Within this category, scores ranged from 8 to 27 out of 40 possible points, averaging 17 which is 23 points less than the model score as compared to 16 points difference between the average and the model score for the Lot Development and 10 points for the Conservation of Natural Areas categories. The scoring for this category focused on principles related to reduced road lengths and widths, reduced surface parking, increased use of landscaping and pervious surfaces for stormwater retention, among others. Respondents articulated the need for flexibility in existing ordinances, specifically subdivision codes, and the inclusion of language that promotes BMPs. Impediments to use of model principles within current regulations include requirements for access to emergency vehicles and the location of water/sewer lines under parkways rather than paved roadways, both of which necessitate wider streets.

Local governments may further address this category by adopting ordinances that incentivize shared parking in developments, decreased dimensions of residential driveways and parking areas, use of bioretention for on-site stormwater treatment, and development design that minimizes roads widths and lengths. Increasing flexibility in development design, i.e. removing prescribed street dimensions in ordinances may allow for narrower streets and reduced impervious surfaces. Where

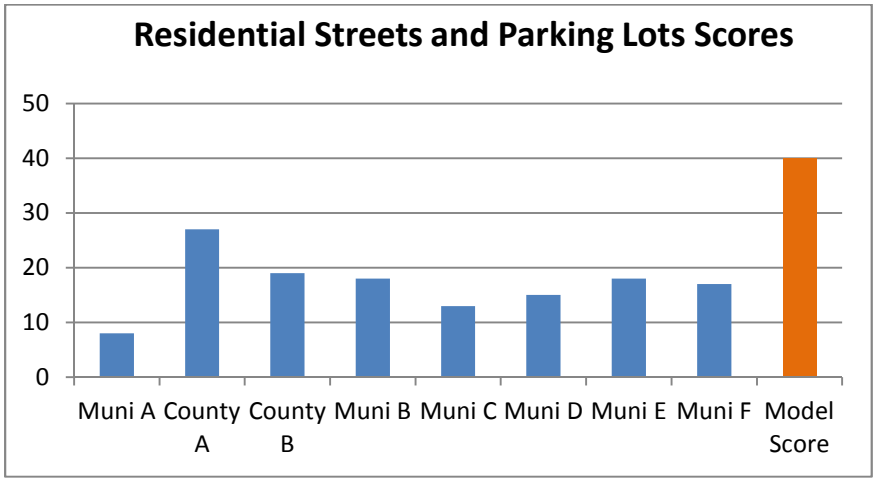


Figure 4-4. Results of governmental response to "Streets and Parking Lots" analysis.

possible, parking requirements should match level of demand[15], allow flexible arrangements to meet parking standards, and provide flexibility to reduce parking in exchange for specific actions that reduce parking demands on site[16] e.g. improved accessibility to transit or other alternative transportation options such as car-share.[17]

[15] For more information on parking management see "Parking Management Strategy Report Summary," CMAP, accessed December 20, 2011, http://www.cmap.illinois.gov/strategy-papers/parking.

[16] "Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scale," U.S. EPA, last modified November 17, 2011, accessed December 20, 2011, http://www.epa.gov/smartgrowth/water_scorecard.htm.

[17] For more information on car-sharing, see "Car Sharing Strategy Report," CMAP, accessed December 20, 2011, http://www.cmap.illinois.gov/strategy-papers/car-sharing.

Access for emergency vehicles within narrow street designs has been successfully addressed in various parts of the country and standards for such street designs are available from sources such as the American Association of State Highway and Transportation Officials (AASHTO)[18] and the Institute of Transportation Engineers (ITE).[19]

4.2.2 Lot Development

The lot development category focused on principles related to development density, lot size/shape, driveways/sidewalks, and open space management. Within this category, scores ranged from 10 to 30 out of 36 possible points, 20 being the average score (Figure 4-5). Respondents stated that most of the existing zoning ordinances allow flexibility in lot development and open space design whereas subdivision regulations had more specifics on setbacks, driveways, and sidewalks that may not allow the incorporation of the model principles.

As in the residential streets and parking lots category, ordinance updates that include allowances for stormwater management BMPs and reduction in impervious cover may decrease the speed and increase the filtration of run-off prior to entering waterways. Additionally, reduced setbacks, smaller lots, and cluster development designs that maximize open space are additional measures that governmental entities can encourage within existing regulations (e.g., via density bonuses) to decrease overall impervious cover.

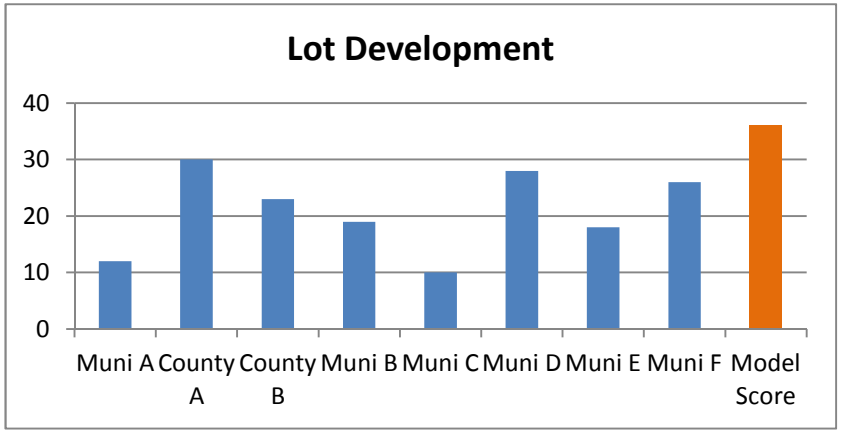


Figure 4-5. Results of governmental response to "Lot Development" analysis.

From a regional perspective, local governments are encouraged to adopt policies and incentives to direct development to areas that have existing infrastructure such as water and sewer. This approach may reduce the overall development footprint in a watershed by maximizing use of existing sites. Additionally, compact, mixed use, and transit-oriented developments should be encouraged where possible to avoid loss of agricultural lands, increase conservation opportunities, and reduce degradation of

[18] AASHTO. *The Policy on Geometric Design of Streets and Highway*. Washington, D.C.: AASHTO, 2011.
[19] Lerner-Lam, Eva, Stephen P. Celniker, Gary W. Halbert, Chester Chellman and Sherry Ryan. "Traffic Engineering for Neo-Traditional Neighborhood Design." *ITE* (January 1992): 17–25.

streams and wetlands due to encroaching development and stormwater run-off.[20]

4.2.3 Conservation of Natural Lands

The conservation of natural areas category highlighted stream buffer maintenance, tree conservation, incentives for land conservation, treatment of stormwater prior to discharge from outfalls, and limitations on development within the 100-year floodplain. Scores ranged from 6 to 21 out of 24 possible points, with an average of 14 points (Figure 4-6). Again, a majority of the respondents stated that local codes regarding the protection of existing natural areas and the incorporation of open space into new development are relatively in line with the model principles, although there are some disparities. Potential areas of improvement include adjustments in ordinances relating to stream buffers, stormwater outfalls, and tree conservation.

Improvements in this category could focus on long term protection, management, and restoration of natural areas and habitats from future development. Local governmental units may wish to consider mandatory no-development buffer codes for critical areas such as wetlands, floodplains, lakes, streams, and rivers. Such areas may serve dual functions of providing recreational areas while reducing stormwater run-off.

To enhance the urban tree canopy, local governments are encouraged to adopt programs for tree protection and maintenance on public properties and rights-of-way, in addition to preserving trees on private property and requiring replacement when trees are removed or damaged during development.

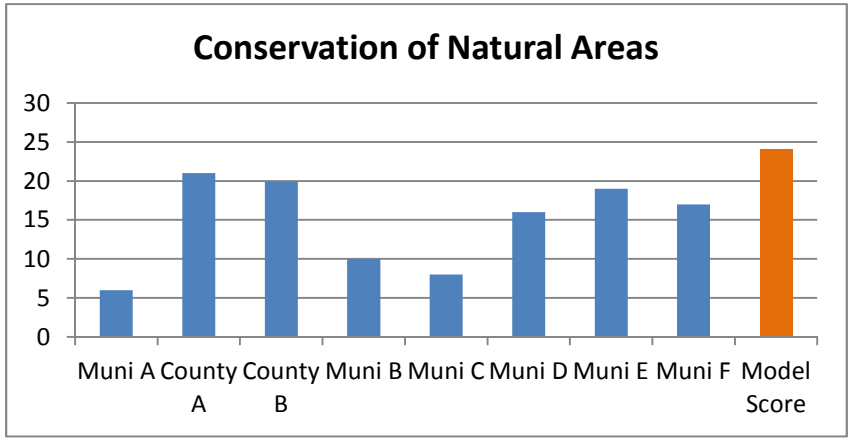


Figure 4-6. Results of governmental response to "Conservation of Natural Areas" analysis.

[20] "GO TO 2040 Comprehensive Regional Plan," CMAP, accessed December 20, 2011, http://www.cmap.illinois.gov/2040/main.

4.3 POLICY AND PLANNING RECOMMENDATIONS

The Green Infrastructure Framework is the organizing principle for the policy and planning recommendations for the Blackberry Creek Watershed. Policy recommendations are for units of local governments that have regulatory authority over land use, i.e., municipalities and counties. Implementation of planning and programming recommendations is best achieved through collaborative efforts between governmental entities, including Forest Preserves and Park Districts, Soil and Water Conservation Districts, environmental non-profit organizations, landowners, commercial properties owners/operators, and others.
Table 4-1 is a summary of policies and planning/programming activities classified by categories of the Green Infrastructure Framework. The review of codes and ordinances identified opportunities for including or modifying policies to further address water quality and quantity. These polices, along with planning/programming activities, are highlighted below.

4.3.1 Policy Recommendations

Open Space Reserves

While significant parts of the Blackberry Creek Watershed Open Space Reserves are in public ownership[21], there are many opportunities for additional protection and conservation of lands that may have considerable ecological benefits for the watershed. Priority should be given to interconnections between the currently protected lands or hubs, to form a continuous network, preferably using Blackberry Creek 100-year floodplain as the connector. Where this is not possible, existing greenways and trails should be utilized for making the necessary connections. Direct acquisition, conservation easements, and purchase/transfer of development rights may be the most effective means of open space protection for lands in this category. Forest Preserve Districts, Park Districts, and land trust agencies may be the most suitable bodies to acquire and/or preserve lands in the Open Space Reserves.

Open Space Protection Ordinances

Model ordinances for the conservation of open space generally specify base density, i.e. number of dwelling units per acre permitted under the residential zoning category; acreage of open space left in natural, undisturbed or re-vegetated condition; and setbacks, among other development criteria. Such ordinances

[21]These lands are mostly owned by the Illinois Department of Natural Resources and the Kane and Kendall Counties Forest Preserve Districts.

usually require minimum open space acreage based on densities. For example, in a development where the density is 1 dwelling/acre the open space requirement may be 35% of the buildable area. In some ordinances, the open space is required to be contiguous with specific guidelines on use and management.[22]

Farmland Preservation Ordinances

Farmland preservation is mostly accomplished through emphasis on minimum acreage, such as 10 or 20 acre lots. When this approach is adopted, it is important to insure that a majority of the lot is dedicated to agricultural uses. Buffers that separate agricultural uses from nonagricultural activities are also specified, 100 feet or more, with maintenance responsibilities tied to the nonagricultural developer. In the event that farmland is subdivided, ordinances generally require a specific percentage of land be placed in a conservation easement or other deed restriction that prohibits development for residential purposes.[23] In 2001, the Kane County Board adopted the Kane County Agricultural Conservation Easement and the Farmland Protection Program to, among other reasons, protect water supply, floodplains, and promote responsibly managed growth patterns.[24] Kane County does not address farmland preservation from a zoning perspective, rather implements a Purchase of Development Rights program in which a public agency purchases easements on farmlands to permanently restrict development potential.[25] This has been successful and communities in the watershed are encouraged to adopt a similar approach.

Planned Development

Because sites in the Planned Development category are yet to be developed, there is an opportunity to incorporate advanced conservation planning strategies including land preservation, and conservation site design/low impact development (LID) practices. LID is a land development approach for managing stormwater that emphasizes maintaining natural flow paths, preserving and restoring stream buffers, preserving highly permeable soils, reforestation and native landscaping, reducing impervious surface cover, rain water harvesting, and reducing setbacks and

[22] For more information, see "Model Ordinances to Protect Local Resources," U.S. EPA, last modified November 27, 2006, http://www.epa.gov/owow/NPS/ordinance/mol3.htm#topofpage; *Development Requirements*. *Calvert County, MD, County Code*, Article 5. http://www.epa.gov/owow/NPS/ordinance/documents/calvertcty.pdf (accessed December 29, 2011); and *Open Space Community*. *Livingston County, MI, County Code*, Article 14. http://www.epa.gov/owow/NPS/ordinance/documents/calvertcty.pdf (accessed December 29, 2011).

[23] For more information, see "Farmland Preservation Ordinances from Maine," Maine State Planning Office, accessed December 29, 2011, http://www.maine.gov/spo/landuse/techassist/ag_ordinances.htm.

[24] Adopting and Implementing the Kane County Agricultural Conservation Easement and Farmland Protection Program. *Kane County, IL, County Code*, Ordinance No. 01-67. http://www.openlands.org/farmland-protection/toolshed/helpful-documents/doc_view/368-kane-county-agricultural-conservation-easement-and-farmland-protection-ordinance.html (accessed December 29, 2011).

[25] CMAP. *Agricultural Preservation Strategy Report*. Chicago, IL: CMAP, 2008. http://www.cmap.illinois.gov/strategy-papers/agricultural-preservation (accessed December 29, 2011).

frontages. The objective of LID design is to reduce surface run-off and pollutant loading through on-site stormwater retention. This is a proactive approach that reduces future impact of built areas while striving to maintain a natural movement of water throughout the watershed. Additional water quality benefits may result from reducing the development footprint by focusing on clustered development designs to create compact, walkable and mixed use neighborhoods. This may allow for greater protection of contiguous open space and natural drainage.[26]

Developed Land

Redevelopment or infill development in the watershed may present great opportunities for retrofitting existing sites with stormwater BMPs. This can be achieved through overlay zones that encourage the use of stormwater BMPs for such sites. Other community or neighborhood programs such as rain barrel cost share, rain garden programs, conversion of turf areas to native vegetation in public spaces present educational opportunities in addition to potential water quality improvements as a result of reduced stormwater run-off. The Center for Watershed Protection offers a variety of resources that articulate stormwater retrofit opportunities.[27] In addition, USEPA offers information on stormwater management best practices.[28] It is recommended that communities within the watershed consult these resources before any retrofit activity.

Pet Waste Ordinances

Pet waste ordinances are fairly common in northeastern Illinois communities. Such ordinances require pet owners to remove and properly dispose of any excreta deposited by her/his pet on public or private property. Proper disposal can be achieved either through the placement of waste in designated receptacles or containers that are regularly emptied by the municipality, or by flushing the waste. Some ordinances require pet owners to carry a suitable container or instrument for the removal of waste at all times when walking their animals.[29] Fines up to $500 are sometimes levied on 'repeat offenders.' While enforcing such an ordinance by a municipal entity comes with some difficulties, self-policing might be an effective approach. Communities in the Blackberry Creek Watershed that do not currently have pet waste regulations are encouraged to adopt such ordinances.[30]

[26] "Low Impact Development," U.S. EPA, last modified March 18, 2011, accessed November 9, 2011, http://www.epa.gov/owow/NPS/lid/. For more information, see also "Stormwater Management," Center for Watershed Protection, accessed November 9, 2011, http://www.cwp.org/your-watershed-101/stormwater-management.html.

[27] Center for Watershed Protection. "Urban Stormwater Retrofit Practices." *Urban Subwatershed Restoration Manual*, Manual 3. Ellicott City, MD: Center for Watershed Protection, August 2007. http://www.cwp.org/categoryblog/92-urban-subwatershed-restoration-manual-series.html (accessed November 7, 2011).

[28] "Stormwater Management Best Practices," U.S. EPA, last modified August 16, 2011, accessed November 8, 2011, http://www.epa.gov/oaintrnt/stormwater/best_practices.htm.

[29] *Pet Waste Disposal*. *City of Sugar Land, TX, City Code*, Chapter 3, Section 13 (2008). http://www.sugarlandtx.gov/utilities/stormwater/animal_waste.asp (accessed December 29, 2011).

[30] For more information, see "Model Pet Waste Ordinance," Association of New Jersey Environmental Commissions, accessed December 29, 2011, http://www.anjec.org/pdfs/ModelOrd-PetWaste.pdf.

Water Use Conservation Ordinances

Governmental entities within the watershed are encouraged to formally promote water efficiency and conservation practices through the adoption of all or a portion of CMAP's Model Water Use Conservation Ordinance.[31] The ordinance addresses conservation measures by sectors, including Residential and Commercial/Industrial/Institutional (CII) as well as location: indoors and outdoors; with additional sections covering key topics such as Variances, Water Waste, Pricing, Violations, and Information and Outreach. Ordinance items are further clarified in the Commentary, In Practice, and Learn More sections. Where possible, local examples are highlighted and calculations of water savings that demonstrate conservation program benefits are also included. Of particular importance to this watershed plan is the adoption of the ordinance components addressing the following topics: Plumbing Fixtures and Fixture Fittings, Dishwashers and Clothes Washers, Water Recycling Systems, Lawn watering, and Waterwaste.

Tree Preservation Ordinances

Trees provide various benefits to a neighborhood, such as increased property values, additional savings through energy conservation, better soil stabilization, and enhanced air quality through the removal of airborne pollutants.[32] Trees also slow and reduce stormwater runoff and increase groundwater infiltration, both of which are important factors for improved water quality. Community tree preservation ordinances generally reflect a locality's needs and goals ranging from the preservation of old growth to reduction of tree loss during construction and/or the provision of tree replacement when losses cannot be avoided. Off-site reforestation or setting aside wooded areas as preserves are strategies that can be used in these ordinances to serve multiple purposes of tree and open space preservation. Conducting a tree inventory is an important first step prior to drafting an ordinance so that a community may assess available tree resources and design the ordinance accordingly.[33] As with most ordinances, fostering community support is critical for effective implementation.[34]

[31] CMAP. *Northeastern Illinois Regional Water Supply/Demand Plan*. Chicago, IL: CMAP, March 2010. http://www.cmap.illinois.gov/water-2050 (accessed November 8, 2011).

[32] CMAP. *Preservation of Parks and Open Space Summary*. Chicago, IL: CMAP, 2007. http://www.cmap.illinois.gov/strategy-papers/parks-and-open-lands (accessed December 29, 2011).

[33] "A Guide To Developing A Community Tree Preservation Ordinance," Minnesota Shade Tree Advisory Committee, accessed December 29, 2011, http://www.mnstac.org/RFC/preservationordguide.htm.

[34] North Carolina State University Cooperative Extension. *Developing Successful Tree Ordinances*. North Carolina State University Cooperative Extension, 2006. http://www.ces.ncsu.edu/forestry/pdf/ag/ag693.pdf (accessed December 29, 2011).

4.3.2 Planning/Programming Recommendations

Groundwater Protection Strategies

The stakeholder group identified the following strategies for groundwater protection:

- Develop ordinances and subdivision regulations that provide 5-year recharge zone buffers around shallow wells or 1,000-foot protection zones for community water supplies
- Adopt similar and consistent water conservation ordinances, utilizing the CMAP 2010 Model Water Use Conservation Ordinance as a reference[35]
- Implement informational campaigns on the importance and mechanisms of water conservation
- Develop target water demand reductions per household or per capita
- Adopt policies consistent with the recommendations of *Water 2050: The Northeastern Illinois Regional Water Supply/Demand Plan*[36]
- Participate through councils of government and county governments in the structure and committees of the Northwest Water Planning Alliance (NWPA)[37]

[35] CMAP. Model Water Use Conservation Ordinance. Chicago, IL: CMAP, 2010. http://www.cmap.illinois.gov/regional-water-supply-planning (accessed December 29, 2011).
[36] CMAP. *Northeastern Illinois Regional Water Supply/Demand Plan*. Chicago, IL: CMAP, March 2010. http://www.cmap.illinois.gov/water-2050 (accessed November 8, 2011).
[37] http://www.nwpa.us/

Wellhead Protection Programs

Implementing an Illinois EPA Source Water Protection Program (SWPP)[38] is a proactive approach to protecting groundwater resources. It involves implementing a five step "multi-barrier approach" aimed at protecting water quality, as follows:

1. Organize a local committee in collaboration with a municipal/public water supplier to include water system users, landowners, and other community representatives. This generates support for the program that is critical for its success.
2. Map sensitive protection areas. This includes the delineation of areas around a pumping well that supplies water to a well or spring, or a drainage basin that supplies water to a surface water intake. Illinois EPA has information on delineation of sensitive zones available in the Source Water Assessment Fact Sheets.[39]
3. Conduct a contaminant source inventory. Using the IEPA Fact Sheets, if available, this inventory will identify the location of contaminant sources in relation to the specific water source under study. Landfills, above ground storage tanks, livestock confinement areas, and railroad right of ways are readily identified contaminant sources. Other sources include dry wells, underground tanks, and old mines, among others. Community members, such as

[38] "Source Water Assessment and Protection Program," IEPA, accessed November 7, 2011, http://www.epa.state.il.us/water/groundwater/source-water-assessment/.
[39] "SWAP Fact Sheets," IEPA, accessed December 29, 2011, http://www.epa.state.il.us/cgi-bin/wp/swap-fact-sheets.pl.

senior groups, might present the best resources for information on these harder to locate contaminant sources.

4. Develop management and protection strategies. Strategies fall into two categories: control and intensive management. Control management is implemented in the minimum setback zone[40] and includes measures such as ownership or easement of the land immediately surrounding the well to reduce/eliminate the introduction of contaminants. Intensive management strategies focus on pollution prevention activities in the maximum setback zone and may include activities such as requiring secondary storage for certain chemicals and best management practices for agricultural lands. Additional protection strategies include groundwater monitoring, design and operation standards, and public education programs.
5. Plan for the future. In this step, communities undergo contingency planning for various scenarios, e.g., if populations grow beyond available supplies, if water sources become contaminated, or in the instances of drought. By reviewing current land uses, water consumption trends, and alternative water supplies; communities may be in a better state of preparedness for emergencies if they were to take appropriate measures to protect and maintain existing water resources.

Natural Lawn Care & Sustainable Landscape Practices

Maintaining turfgrass through conventional methods requires large amounts of fuel, fertilizers and pesticides, some of which runs off to local waterbodies leading to an increase in nonpoint-source pollutant loads. Communities in the watershed are encouraged to pursue the reduction of pesticides and other potentially toxic substances into water resources by promoting less intensive maintenance, natural lawn care practices and other sustainable methods at the household and community level. Outreach efforts may be directed at a wide local audience, including landscape professionals and municipalities, residents, lawn product retailers, and business and institutional property owners through programs such as Lawn to Lake: Healthy Landscapes, Healthy Lakes.[41]

Agricultural Best Management Practices

Livestock managers should implement livestock exclusion fencing to separate livestock from direct contact with streams. Developing an alternative water source could facilitate this exclusion. Heavy use area protections should also established to reduce erosion from livestock.

[40] IEPA requires a minimum of 200- 400 feet setback for Community Water Supplies and proposes a 1,000 feet maximum setback. ("Source Water Assessment and Protection Program," IEPA, accessed November 7, 2011, http://www.epa.state.il.us/water/groundwater/source-water-assessment/.)

[41] This program is the result of a collaboration between CMAP, Illinois-Indiana Sea Grant, and the University of Illinois at Chicago. More information is available at: http://www.lawntolake.org/GreatLakes/index.htm.

In addition to wetland restoration opportunities on currently farmed wetlands in these watersheds, there are many other BMPs available and appropriate for implementation in agricultural areas. The Natural Resource Conservation Service (NRCS) Field Office Technical Guide (FOTG) comprehensively documents conservation practices applicable to the State of Illinois as well as standards and specifications for these practices.[42] Practice standards describe the conservation practice and where it applies, while practice specifications describe the detailed, site-specific requirements for implementing or installing a practice. Many of the broad conservation practices and Best Management Practices (BMPs) that are discussed in this plan are thoroughly outlined in the NRCS Illinois FOTG. Here a set of broad practices are described to outline in a general way the types of practices most commonly employed for conservation-oriented efforts in an agricultural context.

Many agricultural BMPs focus on livestock management. Better management of manure in agricultural areas can help to reduce nutrient, sediment, and fecal coliform runoff contributing to water resource degradation. Developing a farm-wide manure management plan might involve such practices as excluding livestock from water bodies with fencing or stream crossings, along with the construction of alternative water sources to prevent contamination from manure entering water bodies. Similarly, diverting clean water away from areas covered with manure on farms can help to reduce contamination of runoff. To address sediment runoff caused by livestock, heavy use area protection helps to prevent erosion by creating foundations to support animals and soil where animals gather for watering and feeding.

If they have not done so already, agricultural landowners should adopt integrated nutrient and/or pest management plans that help to reduce nutrient and pesticide runoff to streams in the watershed planning area.

Likewise, nutrient management is extremely important for preventing the loss of nutrients to storm runoff during and after precipitation events. Developing a nutrient management plan coupled with soil testing can help to prevent excess nutrient application while better matching the timing and form of nutrient application to the plant's need. A nutrient management plan allows farmers to adopt integrated strategies for monitoring and controlling the form, placement, timing and amount of fertilizer applications and other soil amendments which help to reduce nutrient runoff. Similarly, integrated pest management seeks to apply a systems approach to agricultural management to reduce dependence on synthetic inputs, possibly improving water quality through less pesticide runoff. For example, IPM relies on the close observation of the lifecycle of pests and their interaction with the ecosystem to detect crop damage. When detected, further crop damage is prevented through the use of mechanical trapping, natural predators, growth regulators, chemical mating disruptors, and possibly the judicious use of chemical pesticides.

[42] USDA NRCS. *Field Office Technical Guide*. Kane and Kendall Counties, Illinois. Washington, D.C.: USDA NRCS, 2011. http://efotg.sc.egov.usda.gov/efotg_locator.aspx?map (accessed September 13, 2011).

Cropland management practices such as rotational grazing, cover cropping and/or conservation tillage should be implemented to control erosion and reduce required nutrient applications.

Finally, altering cropping practices also can help significantly to reduce nutrient and sediment runoff. Prescribed or rotational grazing can be used to control the location, intensity, frequency, duration, and season of grazing, which can help to improve water quality and filtration and prevent erosion. Cover cropping—maintaining a crop cover or crop residue in agricultural fields—increases nutrient retention in soil and prevents erosion. Green manure is cover cropping designed to add nutrients to soil and reduce required fertilizer application. In this case, the cover crop is grown for a specified amount of time and then plowed under. The related practice of conservation tillage (with variations including no-till and strip-till methods) leaves soil totally or partially untilled and covered with some amount of crop residue which prevents erosion and increases soil moisture. However, a higher reliance on herbicide with conservation tillage to control weeds may lead to more chemical runoff, so this practice might be best limited to those lands with the greatest risk of erosion.

Agricultural landowners should implement general best management practices like upland erosion controls, streambank or lake shore protection, and/or wetland protection/restoration to protect water quality, in addition to agriculture-specific BMPs discussed above.

Additionally, many BMPs not specific to agriculture are still complementary to agricultural land use and appropriate for implementation by private landowners. The NRCS FOTG contains practice standards and specifications for many of these BMPs as well.[43] Upland erosion control relies on practices that slow and filter water prior to drainage into a water body, for example, grass waterways; terracing; buffer and filter strip creation; and installation or retrofitting of water and sediment control basins. Streambank or lake shore protection can prevent erosion using, critical area seeding and bank re-shaping, tree revetments, root wad installation, stream barbs, bendway weirs, longitudinal peaked stone toe protection, rock riffles, and grade stabilization structures to prevent streambank failure. Wetland protection, restoration or construction can improve water quality since wetlands act to filter water and can remove some particulate and dissolved contaminants such as sediment and nutrients. Finally, conservation easements are voluntary, legally enforceable land preservation agreements between landowners and a government agency. Conservation easements maintain open space and its associated environmental benefits by excluding development on protected lands.[44]

[43] USDA NRCS. *Field Office Technical Guide*. Kane and Kendall Counties, Illinois. Washington, D.C.: USDA-NRCS, 2011. http://efotg.sc.egov.usda.gov/efotg_locator.aspx?map (accessed September 13, 2011).

[44] For more information on establishing a conservation easement, contact The Conservation Foundation. http://www.theconservationfoundation.org/

Table 4-1.
Summary of Policy and Planning/Programming Recommendations for the Blackberry Creek Watershed

GREEN INFRASTRUCTURE FRAMEWORK CATEGORY	RECOMMENDATIONS	
Open Space Reserve	Policy • Open space protection ordinances • Farmland preservation ordinances • Ordinances promoting interconnectivity of currently protected open space	Planning/Programming • Conservation easements • Purchase or transfer of development rights • Municipal buy-back programs for areas in the 100-year floodplain • Creation of conservancies of volunteer land stewards for maintenance and restoration activities in forest preserve and park district properties • Open space plan development • Wellhead protection programs • Oak stand inventory
	Implementers Municipalities and Counties	Implementers Municipalities and Counties, Land trust agencies, Forest Preserve and Park Districts, Townships, Landowners
Planned Development	Policy • Overlay zones where BMPs are required for lands identified as critical to source water quality protection and recharge • Minimum open space requirements for subdivisions, land-cash donation ordinances • Conservation Design/LID regulations • Bonus for/require stormwater retention in new development or redevelopment	Planning/Programming • Protection measures for pre-identified sensitive lands • Natural lawn care and sustainable landscape practices • Oak stand inventory • Preservation of existing/mature trees • Landowner stewardship programs
	Implementers Municipalities and Counties	Implementers Municipalities and Counties, Developers, Landowners
Developed Lands	Policy • Pet waste pick-up ordinances • Water Use Conservation Ordinance • Tree Preservation Ordinances	Planning/Programming • Natural lawn care and sustainable landscape practices • Detention basin inventories and retrofit programs • Rain garden and rain barrel cost-share programs • Sustainable road salting and maintenance programs • Urban greening/urban forestry programs • Oak stand inventory • Landowner stewardship programs • Audubon Cooperative Sanctuary Program certification for golf courses
	Implementers Municipalities and Counties	Implementers Municipalities, Counties, Forest Preserve and Park Districts, Landowners, Landscape companies, Golf course owners/operators
Agricultural Lands	Policy Livestock facility siting laws/ordinances, animal waste management ordinances	Planning/Programming • Agricultural BMPs: Expansion and better-funding for USDA-NRCS/SWCD livestock operations management programs • Soil conservation practices • Integrated nutrient and/or pest management planning • Oak stand inventory • Sealing of abandoned wells
	Implementers State, Municipalities, and Counties	Implementers Landowners, County Farm Bureaus, Soil & Water Conservation Districts, USDA-Natural Resources Conservation Service, USDA-Farm Service Agency, County Health Departments, University of Illinois-Extension

5. NONPOINT SOURCE POLLUTION CONTROL IMPLEMENTATION PROJECTS

Based on the input of local planning participants throughout the planning process and focused meetings and discussions with staff and officials of municipalities, townships, counties, park and forest preserve districts, and homeowner associations within the watershed, numerous opportunities were identified to implement projects throughout the watershed with the goal of protecting and restoring Blackberry Creek and its tributaries. Potential projects were divided into two categories depending on the time frame in which they reasonably could be implemented: short-term (within 1-5 years of Plan adoption) and long-term (within 5-10 years of Plan adoption). These best management practice (BMP) projects are not listed in any particular order, other than they are generally arranged by location from north to south (Figure 5-1, Table 5-1, Table 5-4). Note that educational signage projects are included in these "on-the-ground" BMP project lists (educational programs are included in the "Programs" section in Chapter 6). Both the short-term and long-term BMP project lists are not intended to be limited only to those identified during the planning process, but also to provide examples that community members could use to conceptualize other similar projects within the watershed. The expectation is that BMP projects other than those presented here that provide similar water quality benefits would be eligible for 319 grant funding, among other grant programs.

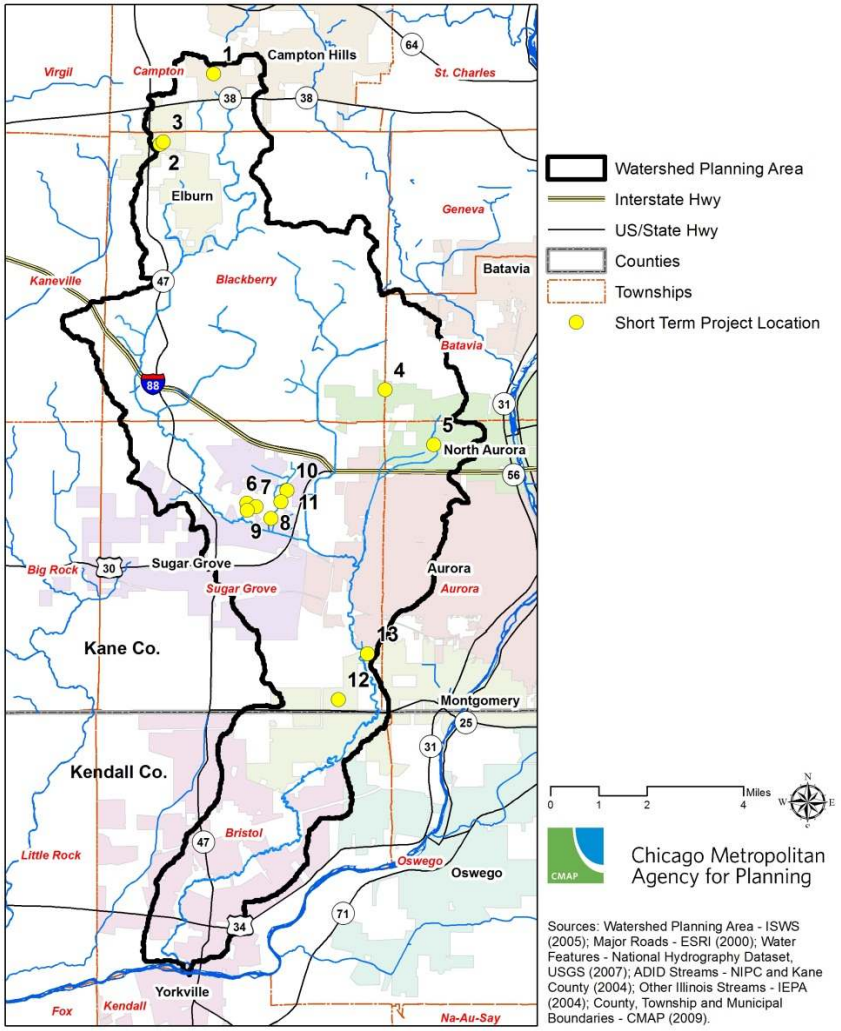


Figure 5-1. Short-term BMP project locations within the Blackberry Creek Watershed.

5.1. SHORT-TERM PROJECTS

Table 5-1.
Short-term "On-the-Ground" Best Management Practice (BMP) Projects, Blackberry Creek Watershed [1]

PROJECT MAP #	PROJECT NAME ORDESCRIPTION	IEPA CATEGORY	BMP TYPE	BMP CODE	UNITS	ESTIMATED QUANTITY	ESTIMATED PROJECT COST	ESTIMATED POLLUTANT LOAD REDUCTION					LANDOWNERS	PARTNERS
								SEDIMENT (tons/yr)	TSS (lbs/yr)	PHOSPHORUS (lbs/yr)	NITROGEN (lbs/yr)	FECAL COLIFORM (units)		
1	Headwaters Conservation Area NPS education	Other	Education (signage)	1	#	2-3	$10,000	n/a	n/a	n/a	n/a	n/a	Campton Township	
2	North Street Bioswales	Urban	Bioswales	814	acres	0.35 ac	$24,195	—	38,900	654	0	0	Village of Elburn	Consultant
		Other	Education (signage)	1	#	2	$10,000	n/a	n/a	n/a	n/a	n/a		
3	Prairie Park NPS education	Other	Education (signage)	1	#	2-3	$10,000	n/a	n/a	n/a	n/a	n/a	Village of Elburn	
4	Tanner/Mirador Park NPS education	Other	Education (signage)	1	#	2-3	$10,000	n/a	n/a	n/a	n/a	n/a	Batavia Park District	H.O.A.
5	Oak Hill Pond Shoreline Stabilization & Buffer Establishment	Hydrologic	Shoreline Protection	580	feet	0.73 ac	$96,348	28	—	45	113	0	H.O.A.	Village of North Aurora
		Other	Buffer Zone Enhancement/ Installation	35	acres									
6	Hankes Road Bioswales	Urban	Bioswales	814	acres	0.45 ac	$40,561	—	2,445	17	183	2E+12	Sugar Grove Township	Prestbury Citizens Assoc., Consultant
7	Lake Blackberry Shoreline Stabilization & Buffer Establishment	Hydrologic	Shoreline Protection	580	feet	1.13 ac	$84,417	17	476	31	71	3E+11	Prestbury Citizens Assoc.	Consultant
		Other	Buffer Zone Installation	35	acres									
8	Lake Prestbury Buffer Establishment & Shoreline Stabilization	Other	Buffer Zone Installation	35	acres	0.20 ac	$15,946	—	38,259	452	15	3E+11	Prestbury Citizens Assoc.	Consultant
		Hydrologic	Shoreline Protection	580	feet	1,715 ft								
9	Hankes Creek Stabilization & Buffer Establishment	Hydrologic	Streambank Protection	580	feet	300 ft x 2	$31,114	6	—	10	25	0	Prestbury Citizens Assoc.	Consultant
		Urban	Urban Filter Strip	835	acres	0.31 ac								
10	Mossfield Right of Way Natural Area Restoration	Urban	Natural Area Restoration	342	acres	0.06	$6,216	—	7	0.06	0.09	4E+09	Prestbury Citizens Assoc.	
11	Walnut Lane Natural Area Restoration	Urban	Natural Area Restoration	342	acres	0.58 ac	$17,531	—	—	—	—	—	Prestbury Citizens Assoc.	

[1] Estimated pollutant load reductions and conceptual level costs were developed by Hey and Associates, a water resource engineering firm retained by CMAP, based on available project information provided by the local project sponsors in association with similar types of projects completed in the past several years throughout the northeastern Illinois region.

Table 5-1. (continued)
Short-term "On-the-Ground" Best Management Practice (BMP) Projects, Blackberry Creek Watershed [2]

12	Stuart Sports Complex BMPs for Runoff Reduction & Water Quality Benefits	Hydrologic	Wetland Restoration	657	acres	4.92 ac	$3,525,010	—	29,238	26	62	—	Fox Valley Park District	Consultant
		Urban	Naturalized Wet Detention, Naturalized Dry Detention, Bioswales, Permeable Pavers, Natural Area Restoration	800 809 814 890 342	acres	13.5 ac 14 ac 1.6 ac 5.2 ac 9.5 ac								
		Other	Education (signage)	1	#	6		n/a	n/a	n/a	n/a	n/a		
13	Jericho Lake Park BMPs for Runoff Reduction & Water Quality Benefits	Urban	Bio-retention Facility, Bioswales, Permeable Pavers, Natural Area Restoration, Revegetated Riparian Zone/Corridor (stream buffer)	812 814 890 342 835	acres		$389,795	11	769	7	14	6E+11	Fox Valley Park District	Consultant
		Hydrologic	Shoreline Protection	580	feet									
		Other	Education (signage)	1	#	4		n/a	n/a	n/a	n/a	n/a		

Table 5-2.
Summary of Short-term Project Pollutant Load Reductions

	ESTIMATED POLLUTANT LOAD REDUCTION				
IEPA PROJECT CATEGORY	SEDIMENT (tons/yr)	TSS (lbs/yr)	PHOSPHORUS (lbs/yr)	NITROGEN (lbs/yr)	FECAL COLIFORM (counts/year)
Hydrologic	51	476	86	209	3E+11
Other	11	71,360	704	259	2E+12
Urban	0	38,359	452	15	2E+11
Total	62	110,094	1,242	483	3E+12

Table 5-3.
Summary of Short-term Project Costs

IEPA PROJECT CATEGORY	ACCUMULATIVE COST OF SHORT-TERM PROJECTS
Hydrologic	$211,879
Other	$4,003,309
Urban	$45,946
Total	$4,261,133

[2] Ibid. 1.

5.1.1 Short-term Project Descriptions

1. Headwaters Conservation Area Nonpoint Source (NPS) Education

Owned and managed by Campton Township Open Space, the 349-acre Headwaters Conservation Area was acquired by the Township between 2002 and 2007 to preserve the headwaters of Blackberry Creek. The site is known for its scenic vistas, walking and equestrian trails, fenced dog park, and educational kiosks.[3] Ongoing prairie and wetland restorations protect and improve Blackberry Creek water quality and are planned and implemented as funding allows. The addition of educational signage focusing on the value and importance of this headwaters area in preserving and protecting Blackberry Creek water quality would be outcome of this proposed short-term project. Additional wetland, prairie, and woodland restoration work is included in the long-term BMP project list (project C1 in Table 5-4).

Figure 5-2. Location of (top) and scenic vista in (bottom) the Headwaters Conservation Area.
(Photo courtesy of Jack Shouba, Campton Township Open Space)

[3] http://www.camptontownship.com/main/Open_Space_Volunteers/Location_of_Open_Space_Properties.htm#openspacearea1

2. North Street Bioswales

This project would convert four turf grass swales/ditches along North Street in Elburn to bioswales (Figures 5-3, 5-4). Encompassing a total of about 0.35 acres (total of 822 linear feet at 16 to 18 to 20 feet wide), one bioswale would be located on the north side of North Street between the front of the Public Works facility westward to Third Street, while the others would be along the south side of North Street extending from in front of the village hall eastward past the water tower. An educational sign would be developed explaining the function and value of the bioswales.

Figure 5-3. Proposed bioswale locations (highlighted) along North Street, Elburn.

Figure 5-4. Proposed bioswale areas along North Street in Elburn. Top: view westward from east end of proposed bioswale in front of Public Works facility. Bottom: view eastward from west end of proposed bioswale in front of Village Hall (August 2011).

3. Prairie Park NPS Education

The Village of Elburn previously naturalized the detention basin and two swales within Prairie Park (Figure 5-5), located near the northeast corner of North and Third Streets, adjacent to the Public works facility. The addition of educational signage explaining the water quality benefits of the naturalized basin is herein proposed.

Figure 5-5. Naturalized swale (top) and stormwater basin (bottom) in Prairie Park, Elburn (August 2011).

4. Tanner/Mirador Park NPS Education

Tanner/Mirador Park, located within a North Aurora neighborhood (Figure 5-6), was designed with numerous "nature play" elements such as nature-themed playground equipment and open activity areas, including large granite boulders to climb on and a tall grass prairie "hide and seek" area. The park is currently under construction and will be completed in summer 2012. The inclusion of educational signage explaining the numerous benefits of native vegetation, including water quality protection, is proposed.

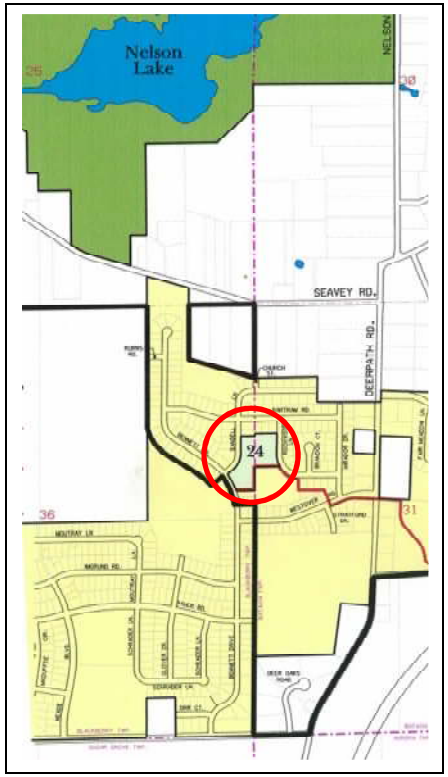


Figure 5-6. Location of Tanner/Mirador Park in North Aurora (circled, light green area labeled "24").

5. Oak Hill Pond Shoreline Stabilization & Buffer Establishment

This project would stabilize approximately 2,650 linear feet of pond shoreline via re-grading and native buffer establishment. Currently, turfgrass is the predominant shoreline vegetation. The shoreline is undercut and sloughing, with 1-2 foot high exposed banks (Figure 5-7). Engineering plans have been prepared. The pond is located within the Oak Hill subdivision within the Village of North Aurora.

Figure 5-7. Sloughing and eroding shorelines at Oak Hill Pond, North Aurora. *(Photos courtesy of Village of North Aurora)*

6. Hankes Road Bioswales

Having previously undertaken a successful bioswale project on their own accord in 2011 (Figure 5-8), Sugar Grove Township would like to convert an additional four turf grass swales/ditches along Hankes Road to bioswales (Figures 5-9, 5-10). Encompassing a total of approximately 0.45 acres (about 775 total linear feet at about 15 feet wide), three bioswales would be located on the east side and one on the west side of Hankes Road within the Prestbury subdivision These bioswales also would complement proposed project #9.

Figure 5-8. Previously installed bioswale along Hankes Road (top photos June 2011; bottom photos August 2011).

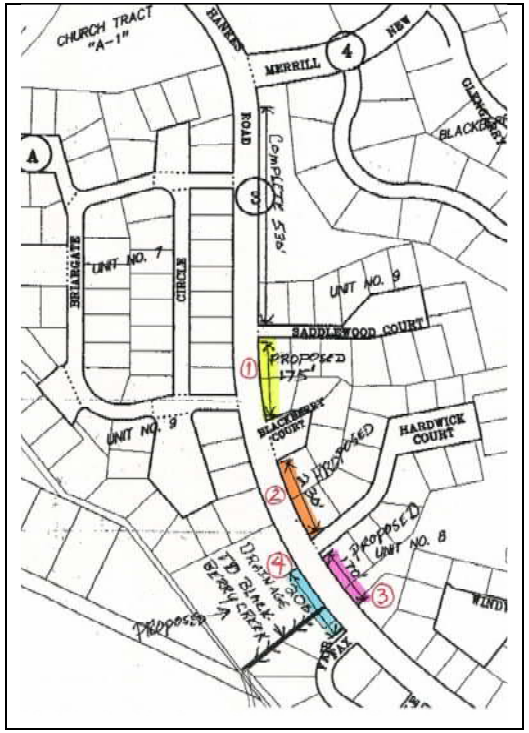


Figure 5-9. Proposed bioswale locations (highlighted) along Hankes Road, Sugar Grove Township.

Figure 5-10. The proposed bioswale area west of Hankes Road, Sugar Grove Township. Views northward (top) and southward (bottom) from entrance drive to Hankes Park (summer 2011). The corrugated plastic pipes (lower right corner in bottom photo) route drainage southwestward to Hankes Creek that flows to Blackberry Creek in the Bliss Woods Forest Preserve.

7. Lake Blackberry Shoreline Stabilization & Buffer Establishment

This project would stabilize approximately 1,000 linear feet of Lake Blackberry's shoreline (Figure 5-11) via re-grading and native buffer establishment totaling about 1.13 acres. Approximately 2/3 of the eroding shoreline exhibits 1 to 2 foot-high sloughing undercut banks while the other 1/3 exhibits 3 to 4-foot high sloughing/undercut/exposed banks (Figure 5-12). Located in the Prestbury subdivision in Sugar Grove Township, this project would complement two of the other proposed short-term BMP projects: projects #6 and #9.

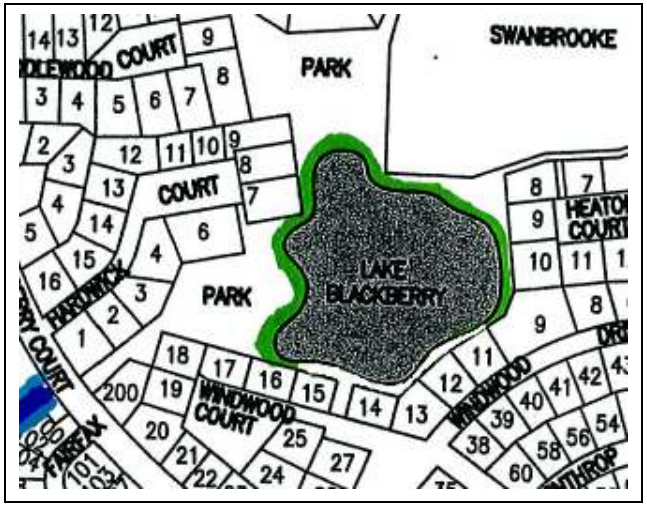


Figure 5-11. Proposed shoreline stabilization area at Lake Blackberry.

Figure 5-12. Examples of Lake Blackberry shoreline conditions along SE (top) and SW shore (bottom) areas (December 2011).

8. Lake Prestbury Buffer Establishment & Shoreline Stabilization

After completing a successful stabilization project of much of the most severely eroding shoreline of Lake Prestbury in 2007 (funded in part through a Section 319 Nonpoint Source Pollution Control Program grant from Illinois EPA), the Prestbury Citizens Association would like to continue implementing their master plan to protect and improve the water quality of both Lake Prestbury and downstream Blackberry Creek. This project proposes the establishment of approximately 0.20 acres of shoreline buffer along the north, west, and southeast shores, along with 1,715 linear feet of stabilization along areas of the north, northwest, and southeast shores (Figure 5-13).

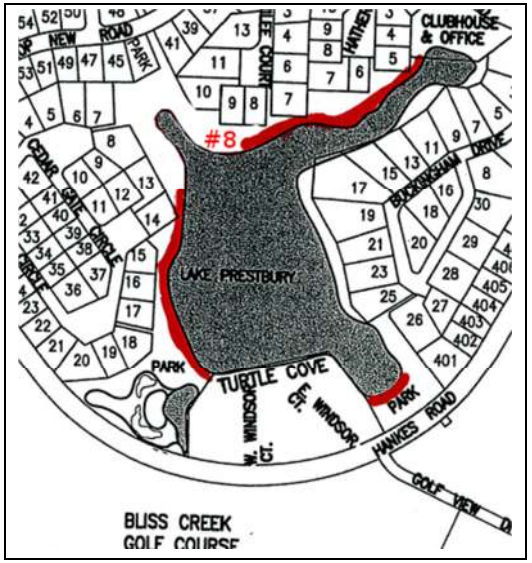


Figure 5-13. Proposed shoreline buffer areas (red-highlighted) at Lake Prestbury.

Figure 5-14. Example of Lake Prestbury north shoreline where buffer establishment is proposed (December 2011).

Figure 5-15. Example of previously stabilized southwest shoreline at Lake Prestbury (June 2007).

9. Hankes Creek Stabilization & Buffer Establishment

The stabilization of approximately 300 linear feet (600 total bank-feet) of streambank and establishment of about 0.31 acres of streamside buffer are proposed for Hankes Creek in Sugar Grove Township. Running along the southern border of Hankes Park, this stream collects water runoff from the neighboring Prestbury subdivision and Hankes Road swales, and enters Blackberry Creek in the adjoining Bliss Woods Forest Preserve (Figure 5-16).

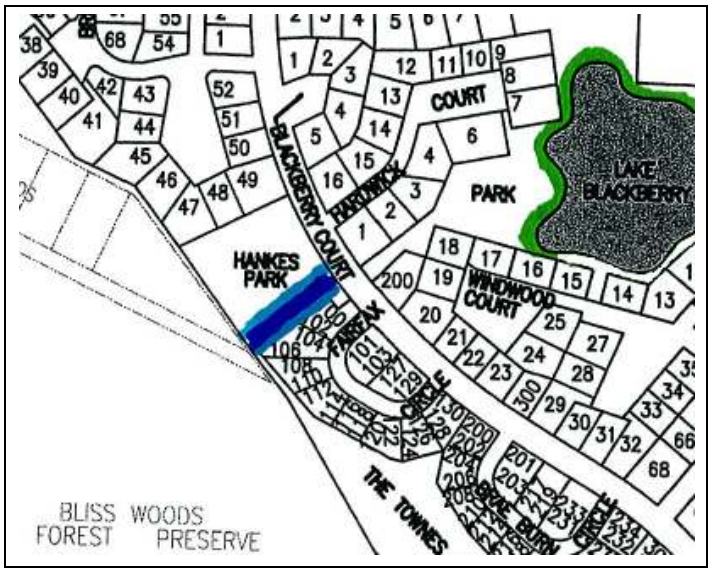


Figure 5-16. Location of Hankes Creek (blue-highlighted) in the Prestbury subdivision.

Figure 5-17. Upstream view of Hankes Creek bank conditions. Invasive brush has been cleared from the left but not yet from the right bank (December 2011).

10. Mossfield Right-of-Way Natural Area Restoration

This project would naturalize an approximately 0.06 acre drainageway in the Prestbury subdivision (Figures 5-18, 5-19), providing pollutant filtration and infiltration of rainwater runoff before reaching Carson Slough, an Illinois Natural Areas Inventory site.

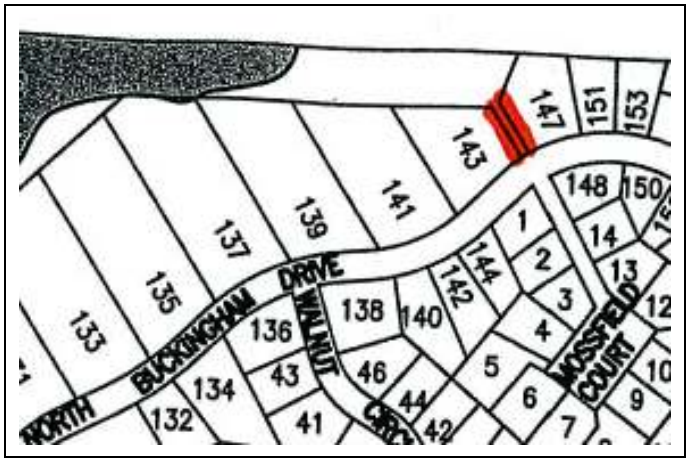


Figure 5-18. Location of Mossfield right-of-way (red-highlighted) in the Prestbury subdivision.

Figure 5-19. Views northward of the grassy (top) and scrubby (bottom) areas of the Mossfield right-of-way. Carson Slough is visible in the background (December 2011).

11. Walnut Lane Natural Area Restoration

This project would naturalize an approximately 0.58 acre parcel within the Prestbury subdivision (Figure 5-20), focusing on the removal of invasive and non-native species and re-establishment of native vegetation to reduce erosion, improve rainwater filtration, promote infiltration, and enhance wildlife habitat.

Figure 5-20. Location of Walnut Lane natural area (yellow - highlighted) in the Prestbury subdivision.

Figure 5-21. View northward of the Walnut Lane natural area, partially cleared by Prestbury Citizens Association (PCA) volunteers (December 2011). *(Photo courtesy of PCA.)*

12. Stuart Sports Complex BMPs for Runoff Reduction & Water Quality Benefits

This project will incorporate several BMPs in the 135-acre expansion of the Fox Valley Park District's Stuart Sports Complex, providing substantial pollutant removal and infiltration of rainwater runoff, along with important public education opportunities about the water quality benefits of such practices. Engineering plans have been completed and are nearing final approvals by the Village of Montgomery. The Park District has a construction management firm in place

and plans to begin going out for construction bids in spring 2012 (beginning with bids for earthwork, site utilities, electrical, and concrete). [4]

Among the baseball and soccer fields, the following BMPs will be incorporated at the site (Figure 5-22):

- Wetland restoration of 3 farmed wetlands (nearly 5 acres)
- A naturalized wet detention pond (approximately 13.5 acres)
- A naturalized dry detention "run" consisting of four basins which will also provide infiltration (approximately 14 acres total)
- Two bioswales (one serving each parking lot, totaling about 1.6 acres)
- One vegetated swale which will also provide infiltration
- Natural area restoration (low profile prairie totaling about 9.5 acres)

And if a grant can be obtained for the increased cost compared to asphalt for the two parking lots:

- Permeable pavers in the two parking lots (totaling approximately 5.2 acres)

Note: A construction management firm allows flexibility in construction sequencing which will be of added benefit if a grant were to be obtained so that the parking lots could built using permeable pavers.

13. Jericho Lake Park BMPs for Runoff Reduction & Water Quality Benefits

The Fox Valley Park District plans to incorporate the following BMPs as part of their Jericho Lake Park revitalization work:

- Permeable paver parking lot (75-80 spaces)
- Bioretention area
- Bioswale (associated with the parking lot from which runoff would be routed to the bioretention area)
- Natural area restoration (in area northeast of Jericho Lake)
- Native buffer establishment in the corridor along Blackberry Creek
- Shoreline stabilization of a small section along the north shore of Jericho Lake (by proposed shelter near biorention area)

A conceptual plan is provided in Figure 5-23. In addition to the water quality BMPs, several recreational improvements also are planned.

[4] Palmquist, J. Fox Valley Park District. Personal communication with the author(s). December 2011.

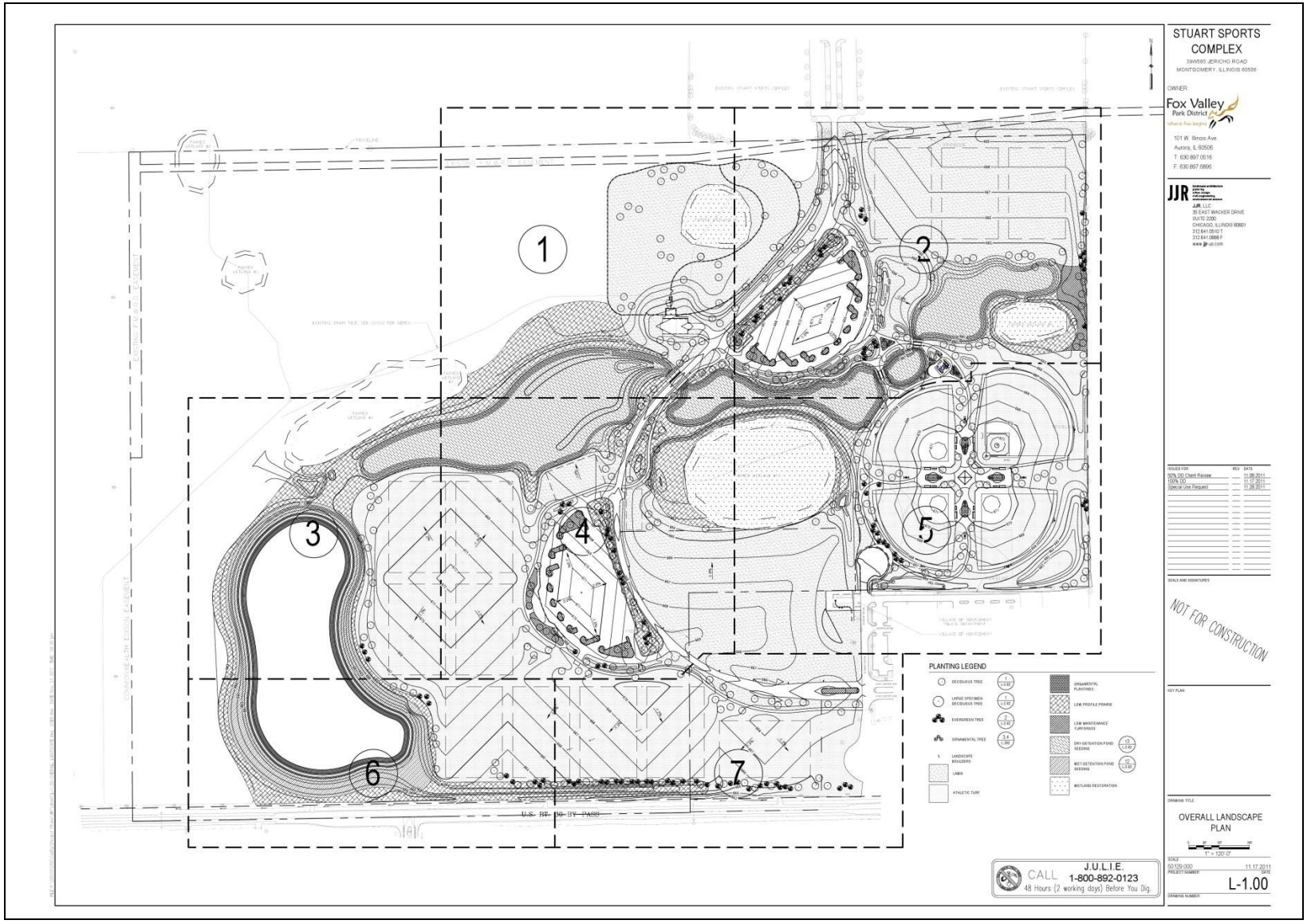


Figure 5-22. Preliminary landscape plan, including the BMPs, for the Stuart Sports Complex. *(Courtesy of Fox Valley Park District and JJR LLC.)*

Figure 5-23. Concept plan for Jericho Lake Park featuring several BMPs. *(Courtesy of Fox Valley Park District..)*

5.1. LONG -TERM PROJECTS

Table 5-4.
Long-Term Best Management Practice (BMP) Projects and Programs, Blackberry Creek Watershed

PROJECT #	IEPA CATEGORY	BMP TYPE OR DESCRIPTION	BMP CODE	UNITS	PROJECT LOCATION / DESCRIPTION	LANDOWNERS	POTENTIAL PARTNERS
C1	Hydrologic	Wetland Restoration	657	acres	Headwaters Conservation Area BMPs for Runoff Reduction & Water Quality Improvement	Campton Township	
	Urban	Critical Area Planting	342	acres			
	Other	Woodland Improvement	666	acres			
C2	Hydrologic	Wetland Acquisition by public entity(ies) and/or Conservation Easement by private landowners; Wetland Restoration	6, 657	acres	ADID wetland band along Blackberry Creek corridor between Rt. 38 (south of/abutting Headwaters Cons Area & E of Pouley Rd) & S to Campton/Blackberry Twp line (Campton Twp, Sec 33)	multiple private	Campton Twp, FPD of Kane Co., The Conservation Foundation, private landowners
E1	Other	Toxic Salt Reduction	610	acres	Public Works facility on North Street, Elburn	Village of Elburn	
E2	Hydrologic, Urban	Metra parking lot retrofits to increase infiltration	various		Metra station at 43W166 Keslinger Rd, Elburn	Metra	Village of Elburn
E3	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits – Metra parking lot expansion	various		Metra station at 43W166 Keslinger Rd, Elburn	Metra	Village of Elburn
E4	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits within new residential development	various		Elburn Station subdivision development & Anderson Rd extension, Elburn	developer	Village of Elburn
E5	Hydrologic, Other	Shoreline Protection (stabilization) & Buffer zone enhancement / installation	580, 35	feet, acres	Wet detention basin in NW corner of Blackberry Creek subdivision, S of Keslinger Rd, W of President St, Elburn	Blackberry Creek H.O.A.	Village of Elburn
E6	Urban	Bioswale	814	acres	turfgrass swale along S side Keslinger Rd along N edge Blackberry Crk subdivision, Elburn	Kane Co.?	Kane Co. DOT, Blackberry Creek HOA, Village of Elburn
E7	Other	Buffer zone enhancement / installation	35	acres	Wet detention basin in SE area of Blackberry Creek subdivision, Elburn	Blackberry Creek HOA	Village of Elburn
E8	Hydrologic	Shoreline Protection (stabilization) & Buffer zone enhancement / installation	580, 35	feet, acres	Wet detention basin in NE area of Blackberry Creek subdivision, W of Blackberry Crk Dr, S of Freedom Rd, Elburn	Blackberry Creek HOA	Village of Elburn
E9	Hydrologic	Streambank Protection (stabilization)	580	feet	SE of Richmond & and President Streets in Blackberry Creek subdivision, Elburn	Blackberry Creek HOA	Village of Elburn

Table 5-4. (continued)
Long-Term Best Management Practice (BMP) Projects and Programs, Blackberry Creek Watershed

PROJECT #	IEPA CATEGORY	BMP TYPE OR DESCRIPTION	BMP CODE	UNITS	PROJECT LOCATION / DESCRIPTION	LANDOWNERS	POTENTIAL PARTNERS
L1	Hydrologic, Urban, Agriculture	Streambank Protection, Buffer zone enhancement, Wetland Restoration, Low Impact Development BMPs for runoff reduction & water quality benefits during site retrofitting (e.g., bioswales, bioinfiltration, permeable parking lots), Ag BMPs	various		Former Broadview Academy campus at 41W751 Keslinger Rd, LaFox (east of Elburn)	private	KDSWCD
G1	Urban	Hathaway Park Basin Retrofit	812	acre		Geneva Park District	H.O.A.
B1	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits within new commercial & residential development	various		NW corner Randall Rd & Orchard Rd, Batavia	Moose International	City of Batavia, developers
B2	Urban, Hydrologic	West Main Community Park BMPs for Runoff Reduction & Water Quality Improvement	814, 890, 800, 835	acres	West Main Community Park, 40W101 W Main St, Batavia (SE of W. Main St. & Fabyan Pkwy intersection; abuts Dick Young FP to E)	Batavia Park District	Kane Co.
	Education		1	#			
BB1	Hydrologic	Wetland Acquisition by public entity(ies) and/or Conservation Easement by private landowners; Wetland Restoration	6, 657	acres	ADID wetland band along Blackberry Creek corridor and nearby ADID drainageway between Campton/ Blackberry Twp line and south to Metra RR tracks (Blackberry Twp, Sec 3 & 4)	multiple private	Blackberry Twp, FPD of Kane Co, The Conservation Foundation, private landowners
BB2	Hydrologic	Wetland Acquisition by public entity(ies) and/or Conservation Easement by private landowners; Wetland Restoration	6, 657	acres	ADID wetland bands along Blackberry Creek and Lake Run corridors from approx. Hughes Rd south to Blackberry/Sugar Grove Twp line (Blackberry Twp, Sec 17, 20, 30, 31, 32, 33; 13, 14, 15, 23, 24, 25, 26, 35)	multiple private	Blackberry Twp, FPD of Kane Co, The Conservation Foundation, Geneva Pk Dist, Batavia Pk Dist, private landowners
S1	Urban	Hankes Road Bioswale	814	acres	along E/N side of Hankes Rd between Winthrop New Rd and Lake Prestbury outlet channel, Sugar Grove	Village of Sugar Grove	Prestbury Citizens Association
S2	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits within new residential development	various		Phase 2 of Settler's Ridge subdivision development, Sugar Grove	developer	Village of Sugar Grove
W1a	Other	Planning	3	#	Integrated Curriculum for Water Quality Protection - Development	Waubonsee Community College	
W1b	Other	Education	1	#	Integrated Curriculum for Water Quality Protection - Implementation	Waubonsee Community College	

Table 5-4. (continued)
Long-Term Best Management Practice (BMP) Projects and Programs, Blackberry Creek Watershed

Project #	IEPA Category	BMP Type or Description	BMP Code	Units	Project Location / Description	Landowners	Potential Partners
P1	Urban	Retrofit of cul-de-sac island; reduce sheet erosion in adjacent open space (Critical Area Planting, potential Bioswale)	various		Green Hills Ct, open space area, Green Heron Ln	Prestbury Citizens Association	
P2	Urban	Downspout Disconnection, Rain Garden, Rain Barrel	37	#	Clubhouse building & grounds	Prestbury Citizens Association	
P3	Urban	Parking lot retrofit – permeable pavers	890	acres	Clubhouse parking lot	Prestbury Citizens Association	
P4	Urban	Road retrofit to Porous Pavement or permeable pavers	890	acres	Golf View Rd (1/2 mile long), adjacent to Bliss Creek Golf Course	Prestbury Citizens Association	Bliss Creek Golf Course, fire district
A1	Hydrologic, Other	Foxcroft Lake accumulated sediment removal, shoreline stabilization, & buffer zone enhancement	7, 580, 35	#, feet, acres	NW of intersection of Foxcroft Dr & Birch Rd, Aurora	Fox Valley Park District	City of Aurora, HOA?
A2	Urban	Downspout disconnection, rain barrels, rain gardens	37	#	neighborhood around Roberts Lake, Aurora	multiple private	City of Aurora, TCF
A3	Hydrologic, Urban	Orchard Lake North shoreline stabilization & buffer establishment/ enhancement	580, 35	feet, acres	SW of intersection of Orchard Rd & W Illinois Ave, Aurora	City of Aurora	
A4	Urban	BMPs to increase infiltration along drainageway	various		between approx. Marigold Ct and W Illinois Ave (upstream of Orchard Lake North), Aurora	City of Aurora	surrounding neighborhood
A5	Hydrologic, Urban	Shoreline Protection (stabilization) & Buffer establishment/ enhancement	580, 35	feet, acres	Wet detention pond SE of intersection of Orchard Rd & Galena Blvd, Aurora	City of Aurora	
M1a	Other	Planning	3	#	Montgomery Overflow Water Quality Impact Study	multiple private, possibly public	Village of Montgomery, Kane County, others
M1b	Hydrologic	Implementation of Montgomery Overflow Water Quality Impact Study Recommendations	various			multiple private, possibly public	Village of Montgomery, Kane County, others
M2	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits within new residential development	various		future subdivision development E of Gordon Rd & S of Jericho Rd, Montgomery	developer	Village of Montgomery
M3	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits within new residential development	various		future subdivision development W of Gordon Rd & S of U.S. Rt. 30, Montgomery	developer	Village of Montgomery

Table 5-4. (continued)
Long-Term Best Management Practice (BMP) Projects and Programs, Blackberry Creek Watershed

Project #	IEPA Category	BMP Type or Description	BMP Code	Units	Project Location / Description	Landowners	Potential Partners
M4	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits within new commercial development	various		future commercial development along U.S. Rt. 30 and W of Gordon Rd, Montgomery	developer	Village of Montgomery
M5	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits within new residential development	various		future subdivision development NE of Gordon Rd & Galena Rd, Montgomery	developer	Village of Montgomery
Y1	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wet detention basin at SW corner Fremont St & Landmark Dr, Yorkville	HOA	
Y2	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wet detention basin at SE corner Fremont St & Landmark Dr, Yorkville		
Y3	Urban	Dry detention basin retrofit to increase water quality benefits			Dry basin on N side Landmark Dr at Fremont St, Yorkville	developer/ business association	Future Business Association/owners
Y4	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wet detention basin near SE corner Rt 47 & Countryside Pkwy in front of Yorkville REC Center, Yorkville	United City of Yorkville (during leasing period)	
Y5	Urban	Rain garden	814	acres	S of and adjacent to Yorkville REC Center, Yorkville	United City of Yorkville (during leasing period)	
Y6	Urban	Dry detention basin retrofit to increase water quality benefits			Dry basin to E/SE of Yorkville REC Center, Yorkville	developer	
Y7	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wet detention basin at SW corner Kennedy Rd & Autumn Creek Blvd, Yorkville	developer/HOA	
Y8	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wet detention basin near NW corner Autumn Creek Blvd & Crimson Ln, Yorkville	developer/HOA	
Y9	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wet detention basin near NE corner Autumn Creek Blvd & Crimson Ln, Yorkville	developer/HOA	
Y10	Urban	Shoreline Protection, Urban Filter Strip (buffer establishment)	580, 835	feet, acres	3 wet detention basins at Bridge Park near SW corner Galena Rd & Kennedy Rd, Yorkville	United City of Yorkville	
Y11	Urban	Shoreline Protection, Urban Filter Strip (buffer establishment)	580, 835	acres	Raymond Regional Stormwater Detention site: E of Bristol Bay subdiv near NE corner Galena Rd & Rt 47, Yorkville	United City of Yorkville	
Y12	Hydrologic, Urban	Shoreline Protection (shoreline stabilization), Urban Filter Strip (buffer establishment)	580, 835	feet, acres	Wet detention basin at NW corner Rt 47 (N Bridge St) & Wheaton Av in Yorkville Business Center, Yorkville	developer/business association	
Y13	Hydrologic, Urban	Shoreline Protection (shoreline stabilization), Urban Filter Strip (buffer establishment)	580, 835	feet, acres	Wet detention basin at SW corner Rt 47 (N Bridge St) & Wheaton Av in Yorkville Business Center, Yorkville	developer/business association	

Table 5-4. (continued)
Long-Term Best Management Practice (BMP) Projects and Programs, Blackberry Creek Watershed

Project #	IEPA Category	BMP Type or Description	BMP Code	Units	Project Location / Description	Landowners	Potential Partners
Y14	Hydrologic, Urban	Building & parking lot retrofits to increase infiltration & water quality benefits; Urban Filter Strip (buffer establishment)	various; 835	#; acres	Former XPAC parcel with wet detention basin near NW corner Rt 47 & Cannonball Tr, Yorkville	business owner	
Y15	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wetland detention basin at SW corner Faxon Rd & Alandale Ln in Whispering Meadows subdivision, Yorkville	developer (area will later be deeded to Whispering Meadows HOA)	
Y16	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wet detention basin at NW corner Alice Av & Alandale Ln in Cannonball Estates subdivision, Yorkville	developer (area will later be deeded to Cannonball Estates HOA)	
Y17	Urban	Urban Filter Strip (buffer establishment)	835	acres	Wet detention basin with dry extended detention near SW corner Faxon Rd & Alice Av in Kylyn's Ridge subdivision, Yorkville	HOA	
Y18	Urban	Urban Filter Strip (buffer establishment)	835	acres	2 wet detention basins adjacent/west of Cannonball Tr & N of Kendall Marketplace, Yorkville	developer/business association	
Y19	Hydrologic, Urban	Urban retrofits (buildings & grounds) to provide infiltration & water quality benefits	various		Kendall Marketplace, NW corner of Veterans Pkwy & Cannonball Tr, Yorkville	developer/business association	
Y20	Hydrologic, Urban	Urban retrofits (buildings & grounds) to provide infiltration & water quality benefits	various		Rush-Copley Medical Center site at SW corner Veterans Pkwy & Beecher Rd, Yorkville	Rush-Copley	
Y21	Hydrologic	Ravine stabilization (Stream Channel Stabilization)	584	feet	Blackberry Woods subdivision, directly adjacent to BBC (downgradient from Rush-Copley Medical Center), Yorkville	developer (will be deeded to United City of Yorkville)	Rush-Copley
Y22	Urban	Urban Filter Strip (buffer establishment)	835	acres	Yorkville-Bristol (Jaycee) Pond, Yorkville-Bristol Sanitary District, River St, Yorkville	Yorkville-Bristol Sanitary District	United City of Yorkville & Illinois DNR
Y23	Hydrologic, Urban	Dam Removal, Streambank Protection (stabilization), Urban Filter Strip (buffer establishment)	16, 580, 835	#, feet, acres	Removal of Blackberry Creek dam at River Rd, Yorkville	Yorkville-Bristol Sanitary District	Illinois DNR, USACE, Kendall Co., IDOT
KA1	Hydrologic	Wetland Acquisition by public entity(ies) and/or Conservation Easement by private landowners; Wetland Restoration	6, 657	acres	ADID wetland band along Blackberry Creek corridor between Rt. 38 (S of/abutting Headwaters Cons Area & E of Pouley Rd) and Campton/Blackberry Township line, and continuing South to Metra RR tracks; also nearby ADID wetland drainageway to connect to Johnson Mound FP (Campton Twp Sec 33; Blackberry Twp Sec 3 & 4)	private	FPD of Kane Co., Campton Twp, Blackberry Twp, The Conservation Foundation, private landowners

Table 5-4. (continued)
Long-Term Best Management Practice (BMP) Projects and Programs, Blackberry Creek Watershed

Project #	IEPA Category	BMP Type or Description	BMP Code	Units	Project Location / Description	Landowners	Potential Partners
KA2	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits within new residential & commercial development	various		unincorporated Kane Co.	multiple	Kane Co., developers, business owners
KA3	Hydrologic, Urban	Streambank Protection (stabilization), Urban Filter Strip (buffer zone establishment), Brush Management, Tree/Shrub Establishment	580, 835, 314, 612	feet, acres	Blackberry Creek within northern segments of Johnson's Mound Forest Preserve, E of Pouley Rd, N & S of Keslinger Rd (Blackberry Twp, Sec 4, 9); approx. 8000 ft of stream	FPD of Kane Co.	FPD volunteers
KA4	Hydrologic	Streambank Protection (stabilization)	580	feet	Hughes Creek Golf Club, 1749 Spring Valley Dr, Elburn	FPD of Kane Co.	golf course mngmnt company, Audubon Cooperative Sanctuary Program for Golf
KA5	Hydrologic	Wetland Acquisition & Restoration	6, 657	acres	ADID wetland band along Lake Run corridor from approx. Main St south to Seavy Rd, parcels abutting Dick Young Forest Preserve (Blackberry Twp, Sec 23, 25, 26); approx. 6000 ft of stream, 40-80 ac of land	currently multiple private	FPD of Kane Co., Blackberry Twp, Batavia Park District, FPD volunteers
	Hydrologic, Urban	Streambank Protection (stabilization), Stream Channel Restoration (remeandering), Urban Filter Strip (buffer zone establishment), Brush Management, Tree/Shrub Establishment	580, 9, 835, 314, 612	feet, acres			
KA6	Hydrologic, Urban	Streambank Protection (stabilization), Brush Management, Tree/Shrub Establishment	580, 314, 612	feet, acres	Blackberry Creek within Hannaford Woods Forest Preserve between Rt 47 and Ka-De-Ka Rd; Preserve abuts Waubonsee Community College (Sugar Grove Twp, Sec 4, 5, 9); approx. 4000 ft of stream, 40 ac of land	FPD of Kane Co.	FPD volunteers, Waubonsee Community College
KA7	Hydrologic, Urban	Streambank Protection (stabilization), Stream Channel Restoration (reconnection to flooplain), Brush Management	580, 9, 314	feet, acres	Blackberry Creek within Bliss Woods Forest Preserve, E of Rt 47 between Ka-De-Ka Rd & Bliss Rd (Sugar Grove Twp, Sec 9); approx. 3500 ft of stream	FPD of Kane Co.	FPD volunteers
KA8	Hydrologic, Urban	Streambank Protection (stabilization), Stream Channel Restoration (reconnection to floodplain, remeandering), Urban Filter Strip (buffer zone establishment)	580, 9, 835	feet, acres	Lake Run tributary in Aurora West Forest Preserve, continuing north from end point of FAA 3190604 stream restoration project	FPD of Kane Co.	FPD volunteers
KA9	Hydrologic	Wetland Acquisition by public entity(ies) and/or Conservation Easement by private landowners; Wetland Restoration	6, 657	acres	ADID wetland band along Blackberry Creek corridor between Jericho Rd & Baseline Rd/ U.S. Rt 30; parcels abut Fox Valley Park District land to N (Jericho Lake Park) & W (Stuart Sports Complex)	multiple private	FPD of Kane Co., Fox Valley Park District, Village of Montgomery, The Conservation Foundation, private landowners

Table 5-4. (continued)
Long-Term Best Management Practice (BMP) Projects and Programs, Blackberry Creek Watershed

Project #	IEPA Category	BMP Type or Description	BMP Code	Units	Project Location / Description	Landowners	Potential Partners
KE1	Hydrologic, Urban	Streambank Protection (stabilization), Stream Channel Restoration (reconnection to flooplain), Brush Management, Urban Filter Strip (buffer zone establishment/ enhancement)	580, 9, 314, 835	feet, acres	Blackberry Creek within Blackberry Trail Forest Preserve between Rt 30/Baseline Rd S to near Galena Rd (Bristol Twp, Sec 1 & 2)	Kendall Co FPD	FPD volunteers
KE2	Hydrologic, Urban	Wetland Acquisition and/or Natural Area Easement establishment by public entity(ies) and/or Conservation Easement establishment by private landowners; Wetland Restoration; Urban Filter Strip (buffer zone establishment)	6, 657, 835	acres	Blackberry Creek corridor E of Cannonball Trail between Rt 47 and Rt 34, Yorkville	Multiple private, public	Kendall Co. FPD, City of Yorkville, The Conservation Foundation, private landowners
KE3	Hydrologic, Urban	Low Impact Development BMPs for runoff reduction & water quality benefits associated with widening of Rt 47	various		Rt 47 in Kane & Kendall Counties from Cross St in Sugar Grove & Kennedy Rd in Yorkville	IDOT – District 1 & District 3	Village of Sugar Grove, Kane Co., Rob Roy Drainage Dist., Village of Montgomery, City of Yorkville, Kane & Kendall Co. Farm Bureau, Kane-DuPage SWCD, The Conservation Foundation, CMAP
KE4	Other	Advanced Identification of High Quality Wetlands and Streams in Kendall County	3	#	throughout Kendall County	various	Kendall Co, Kendall Co SWCD, NRCS, IDNR, INHS, USFWS, USACE, others
Watershed-Wide							
WW1	Other	Education, Technical Assistance	1, 4	#	information, education, & outreach materials & activities targeting homeowners (example topics: understanding the functions and care of naturalized stormwater management facilities, lawn care, pet waste, septic systems, disposal of unwanted medicines…)	various	Municipalties, Counties, Townships, HOAs, neighborhoods, CMAP, TCF, SWCDs, FREP, consultants …
WW2	Other	Education, Technical Assistance	1, 4	#	information, education, & outreach materials & activities targeting agricultural & rural landowners	various	SWCDs, USDA-NRCS, Farm Bureau, peers, Counties …
WW3	Other	Education, Technical Assistance	1, 4	#	manure management for small farms	various	U of Illinois Extension, SWCDs, NRCS, owners and managers, peers, Counties, FREP, TCF…

Table 5-4. (continued)
Long-Term Best Management Practice (BMP) Projects and Programs, Blackberry Creek Watershed

Project #	IEPA Category	BMP Type or Description	BMP Code	Units	Project Location / Description	Landowners	Potential Partners
WW4	Other	Education, Technical Assistance	1, 4	#	information, education, & outreach materials & activities targeting municipal and county decisionmakers, developers, and consultants (example topics: putting runoff reduction into practice in new & redevelopment, alternative deicing ...)	various	Municipalties, Counties, Townships, peer associations, CMAP, TCF, SWCDs, FREP, consultants …
WW5	Other	Education, Technical Assistance	1, 4	#	Golf Course Audubon Certification for Protecting Water Quality and Enhancing Habitat	various	Audubon, golf course owners and managers, peers, CMAP, TCF, SWCDs, FREP, consultants …
WW6	Other	Planning, Monitoring	3, 2	#	stream monitoring program – Planning and Implementation (short-term intensive, long-term baseline)	various	Municipalties, Counties, Townships, peer associations, CMAP, TCF, SWCDs, FREP, consultants …
WW7	Other	Education, Technical Assistance, Monitoring	1, 4, 2		lake monitoring program (e.g., Volunteer Lake Monitoring Program)	various	IEPA, CMAP, Municipalties, Counties
WW8	Other	Monitoring	2	#	bioswale performance monitoring	Sugar Grove Twp, Village of Elburn, Fox Valley Park Dist, others	CMAP, TCF, SWCDs, FREP, consultants …
Additional Project and Program Ideas							

6. EDUCATION AND OUTREACH

We all have an impact on water quality. From the cars that we drive to the fertilizer we put on our lawns, pollutants from these activities and many others wash off the land and flow across the landscape, often through storm sewer systems, to our rivers and streams. These individual actions have relatively small impacts on water quality, but when looked at cumulatively they have a huge impact. This is nonpoint source pollution, so named because it does not originate from one pipe, but from many sources scattered across the landscape. Nonpoint source pollution is the nation's largest remaining water quality problem.

Education and outreach is essential to improving water quality within a watershed. If people don't understand what effects their actions have on water quality, improvements might be made through regulation and incentives, but only for a period of time. People want to do the right thing; they often just don't know what it is or how to do it. A watershed plan needs to include ways to make stakeholders aware of the issues, educating them on what needs to be done, and motivating them to take action. If stakeholders are involved in creating and implementing the plan, research shows that the watershed will have a higher level of long-term support and success.

Education of local residents must start with the basics; many studies have found that although the general public has heard the term "watershed," few are able to define it or explain how they have an impact on it. Not only will the education and outreach campaign need to define terms, but it will need to raise a general awareness of the problems in the watershed and the potential solutions. Then the campaign will need to find a way to motivate residents to act, contributing to improving water quality through their own actions, their government, and those which they support financially. The impact of not taking action must also be demonstrated.

This section of the watershed plan will lay the groundwork for creating a successful education and outreach campaign. First, it will summarize some existing literature on how to create a successful education and outreach campaign. Then it reviews some education and outreach activities that occurred during the watershed planning effort. Lastly, this section closes with a look ahead at education and outreach activities that were determined by the stakeholders to be necessary for improving water quality in the Blackberry Creek watershed.

Figure 6-1. FREP Noon Network participants spreading prairie plant seed at Dick Young Forest Preserve (May 2011).

6.1 RESOURCES FOR WATERSHED EDUCATION AND OUTREACH CAMPAIGNS

There are many resources available to assist in developing an effective watershed education and outreach campaign. Agencies like U.S. EPA and Illinois EPA have many resources available including *Getting in Step: a Guide for Conducting Watershed Outreach Campaigns* (USEPA 2003) and *Guidance for Developing Watershed Action Plans in Illinois* (IEPA and CMAP, 2007). Not-for-profit organizations like the Center for Watershed Protection and The Conservation Foundation (TCF) are also great sources of information, often having brochures, fliers and other information applicable to watershed problems already on hand. The following information summarizes key findings from these resources.

6.1.1 Cause-based Marketing

Research has shown that cause-based or social marketing is the most effective way to get people to change their behavior. Cause-based marketing is the practice of looking at people as consumers, but instead of selling products or services, as a watershed group, we are selling ideas, attitudes and behaviors. The goal of cause-based marketing is not to make a profit, but to improve society and the environment. Part of this campaign should include persuading the public that there is a problem that only they can solve.

Identifying the Audience

Before any of the following education and outreach strategies are employed, the target audience(s) must be identified. Different strategies will be used for different audiences. For example, if the goal is to reduce fecal coliform in the watershed, then targeting residents that have pets might be an effective strategy. The target audience should be broken down into the smallest segment possible to achieve the best results, then creating a message that resonates with the target audience and inspires them to act.

Understanding the Audience

Knowing some information about the target audience(s) is essential. Campaign audiences have varied values and beliefs, and they will not necessarily be the same as those implementing the watershed plan. The following is a list of a few questions that are important to know about the target audience(s), before education and outreach activities begin:

- What does the audience know already?
- What are their existing beliefs and perceptions?
- How does the audience receive messages and information?
- What will make the audience change their behavior?
- Other important factors include education, age, culture, and religion.

In order to create a successful education and outreach campaign, it is necessary to understand the audience(s). What causes the audience to engage in the behaviors we want to change? How can we most effectively convey that message to them? How can

we motivate the audience(s) to change? The understanding of the audience can be completed at the same time or subsequent to identifying the audience(s). Surveys, focus groups, and even simple observations can lead to a greater understanding of the audience and a successful campaign.

Barriers

Another component to establishing a successful education and outreach campaign is anticipating problems and road blocks. Barriers are just that: problems that might prevent residents from changing their behavior. Often barriers include time and/or resources. A barrier can also be that a person is simply not aware of the affect of their actions.

A common barrier is that the action desired is not socially acceptable. For example, rain gardens or other native vegetation is often perceived as looking weedy or unkempt. A resident might want to improve infiltration and have a low maintenance garden, but is resistant to installing a rain garden because he doesn't want to offend his neighbors. The message needs to be conveyed to that resident and his neighbors that natives can be planted in beds, can be low to the ground, and not look weedy. In this regard, barriers need to be minimized or removed.

Social Norms

Related to the example just cited are social norms. Social norms are the behavioral expectations and cues within a group of people. It is a social norm that we maintain our lawns with grass species that are mowed to a certain height frequently. Through education and outreach, new examples need to be created showing the different, desired action. Then one by one, new social norms need to be established. People are more likely to change their behavior if they see someone else benefitting from the new behavior.

Creating the Message

Messages must be clear and contain specific calls to action. They are designed to raise awareness, educate or motivate to action. Campaigns should inform and suggest acceptable behaviors. People are more likely to change their behaviors when they see other people modeling the behavior first.

Messages need to capture the audience's attention. What is needed to get the audience's attention will vary by different segments of the audience. Insights to this information may have been gleaned when identifying the audience, through information such as demographics or may be indicated by the message itself.

Ask people to do something in response and let them know what effect this behavior will have. Be

clear and concise. Consider what behavior you are trying to change and what behavior should replace it.

Formatting the Message

How the message is distributed to the audience can make or break an outreach campaign. The packaging of a message can help foster relationships and a sense of community, build understanding, and motivate people to action or it can be expensive and time consuming while producing little results. The target audience(s) should dictate which format should be used to convey the message. Formats can change over the course of the campaign. A campaign could start out raising general awareness with public service announcements (PSAs) and once the audience understands the problem, brochures could be distributed to further inform residents about what they can to do to contribute to the solution. According to the U.S. EPA's Getting in Step guide, if the budget is small, the frequency in which your audience hears or sees the message is important. The following describes formats and messages that were used during the planning effort and what the watershed planning group would like to do going forward.

6.2 Education and Outreach Activities During the Blackberry Creek Watershed Planning Process

A variety of education and outreach activities took place during the creation of this plan. They have laid the groundwork for a successful education and outreach campaign and may also indicate what may not work in the future.

Website

Materials for the watershed planning effort were posted at http://foxriverecosystem.org/blackberry.htm, which is the Fox River Ecosystem Partnership website. Meeting agendas, literature, maps, meeting presentations, upcoming events, and the watershed plan were posted there.

Literature

Two brochures were developed as part of the watershed planning effort. The first brochure provided information about the watershed planning effort itself. The second brochure contained more detailed information about nonpoint source pollution and BMPs. In addition, a poster was developed for the Blackberry Creek watershed to show what can be done to reduce potential sources of fecal coliform, thereby improving water quality (Figure 6-2).

FREP Noon Network

Stakeholders helped identify and coordinate a program for the May 18, 2011, FREP Noon Network at Nelson Lake Forest Preserve.

Stream Walks

Stakeholders and landowners visited various points of interest and concern along Blackberry Creek.

Municipal & County Outreach

Electronic slide show presentations were created to help keep our municipal and county partners informed of the watershed planning process, and to let them know we would be visiting again to consider Plan adoption. Scheduled appearances were made by TCF staff with municipal staff, board, and/or committee members at Aurora, Elburn, North Aurora, Montgomery, Yorkville, Kane County, and Kendall County.

Open House

The watershed planning process was presented to stakeholders at a public forum on March 22, 2011, from 4:30 – 6:30 PM, where people could ask questions of the committee, consultants, and other parties involved in developing the plan.

Figure 6-2. Poster describing what can be done to reduce potential sources of fecal coliform to Blackberry Creek.

Presence in the Community

Throughout the late summer and early fall of 2011, TCF participated in a number of community events within the Blackberry Creek Watershed. TCF participated and distributed information to stakeholders at Corn Boil Days, Sugar Grove; Pet Parade, North Aurora; Hometown Fest, Yorkville; Fishing Fun at the Farm, Aurora; and October Fest River Run, Montgomery.

6.3 EDUCATION AND OUTREACH ACTIVITIES GOING FORWARD

Throughout the watershed planning process, the stakeholders discussed education and outreach a number of times. The following recommendations and activities for targeted audiences were determined to be desirable. Stakeholders expressed an interest in partnering with state and regional resources with similar goals and missions. Please see the last page of this chapter for a list of state, regional, and local resources.

Recommendations:

- **BBC Watershed Coalition will partner with existing organizations to provide a 319 grant writing workshop to assist lead implementers with 319 applications.**
- **BBC Watershed Coalition will work with partnering organizations to raise awareness about all potential sources of fecal coliform bacteria and water quality.**
- **BBC Watershed Coalition will heavily target landowners and Homeowners Associations, especially those identified in the critical areas analysis for fecal coliform bacteria, about proper septic maintenance and warning signs of a failing system.**
- **BBC Watershed Coalition will distribute U.S. EPA's "Healthy Lawn Care Practices" and "Reduce Runoff: Slow it Down, Spread it Out, Soak it In!" DVDs to homeowners associations for use at meetings as an educational tool.**
- **BBC Watershed Coalition will continuously work with municipalities to promote the use of the Model Water Use Conservation Ordinance in their respective municipalities.**

Organization

Momentum from the planning process should continue through the organization of a "coalition" to help encourage plan implementation. The coalition would be best served by hiring a watershed coordinator (at least part-time). The watershed coordinator would provide a focused, local approach to watershed planning, taking into consideration regional activities and opportunities. The ideal candidate will be familiar with available resources, grant writing, and fostering collaborative partnerships/efforts. The coordinator would establish a presence with each local government and district in the watershed as well as with other interested parties to promote the goals and priorities in the watershed plan. Please note that grant-to-grant support for the watershed coordinator position would not be a preferred funding option due to lack of financial stability.

Ideally such a coalition would meet quarterly. More frequent meetings could be warranted depending on current activities such as applying for grant funding or urgent watershed issues. The coalition could be supported by dues collected from interested parties. The planning process reviewed and considered similar successful models from the DuPage River Salt

Creek Workgroup and the Lower DuPage River Watershed Planning processes.

The coalition would mostly likely consist of current interested parties that were active during this planning process in addition to other potential partners. A list of regional and local organizations to contact to continue building the coalition is provided at the end of this chapter. This list is not exhaustive and was the original outreach list utilized by The Conservation Foundation at the beginning of this planning process.

Public Awareness Campaign

It may be desirable to put a number of the activities listed below together into a campaign that would pool resources from, and benefit, the entire watershed. The Coalition would conduct pre-campaign research to identify and better understand the targeted audience(s), develop a slogan, determine the method(s) and message(s), develop a fixed timeframe, and include pre- and post- testing to gauge effectiveness.

Website

Websites are an excellent way of quickly connecting to a large audience. A mix of scientific and general information about the watershed can be located all in one place. The material can be changed and updated frequently and people can provide feedback and information quickly. A website is a relatively inexpensive education and outreach tool. The Blackberry Creek Watershed Coalition will investigate ways to maintain the existing website on the Fox River Ecosystem Partnership website.

Interpretive Signs

Interpretive signs communicate specific messages to viewers. These messages can be written to change behavior, educate, or evoke an emotion in the reader. They are mounted so they are visible to all viewers and can be constructed of many different materials. Interpretive signs can be used to educate viewers on a number of water quality issues: the purpose detention ponds, no mow zones, establishing native plants, being a good neighbor to wetlands, etc.

Figure 6-3. Example of an interpretive sign explaining the benefits of infiltrating rainwater at the Batavia Park District's West Main Street Park, within the Blackberry Creek Watershed.

Brochures

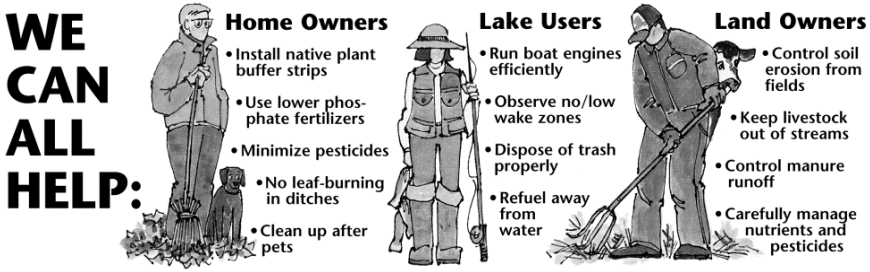
Printed material is a popular format for conducting education and outreach activities. It can be created easily and inexpensively. People can refer to printed materials again and again. The current brochures should continue to be distributed as long as they are useful. New brochures could be developed or adapted to cover additional topics including BMPs for homeowners, information on proper salt and fertilizer use, and information on fecal coliform.

Public Service Announcements

A public service announcement (PSA) can be an inexpensive way to reach a variety of people. PSAs can be broadcast on radio, television or even on websites. In addition to the U.S. EPA's PSA on lawn care, local college students and broadcasting classes can be used to assist in the creation of a PSA. PSAs are often aired for no charge on local cable access channels or radio stations, although time slots may not be ideal.

Activities for Targeted Audiences

In order to prioritize our outreach and education activities, stakeholders identified the following activities that would help reach our targeted audiences to increase awareness of watershed issues, inform them of potential solutions, and motivate them to act.



Curricula and Training

In-service programs for teachers are available through the local Soil & Water Conservation Districts. Support activities that will promote the growth of students' awareness of water-related employment opportunities and educational criteria. The Chicago Wilderness Corporate Council's Teaching Academy is a program that provides technical assistance to teachers to help prepare localized curricula relevant to natural resources in the area. The Project WET Curriculum and Activity Guide contains 91 multi-disciplinary water-related activities for students in grades K to 12. The guide features cross-reference and planning charts, glossary, and background material on activity development and field testing.

- Kane-DuPage Soil & Water Conservation District http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District http://www.kendallswcd.org/ 630-553-5821, Ext. 3
- The Conservation Foundation http://www.theconservationfoundation.org/ 630-428-4500
- The Chicago Wilderness Corporate Council, Teaching Academy http://www.chicagowilderness.org/ 312-580-2137
- Project WET http://www.projectwet.org/ 866-337-5486

Recommendation: Support strategies to implement water science curriculums into classrooms and training opportunities for teachers that will increase their capacity to incorporate concepts of water science in their environmental education classrooms.

Agriculture in the Classroom

USDA Agriculture in the Classroom supports state programs by providing a network that seeks to improve agricultural literacy — awareness, knowledge, and appreciation — among PreK-12 teachers and their students. The program is carried out in each state, according to state needs and interests, by individuals representing farm organizations, agribusiness, education and government. In Illinois, the AITC program is coordinated by the Illinois Farm Bureau and County Ag Literacy Coordinators administer the program locally.

Stakeholders can contact the Kane-DuPage or Kendall County Soil & Water Conservation Districts.

- Kane-DuPage Soil & Water Conservation District http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District http://www.kendallswcd.org/ 630-553-5821, Ext. 3

Watershed Quilt Project[1]

The Watershed Quilt Project is a grassroots project inspired by the Nature Quilt Project in Macomb, Illinois. A local version of the project builds on recommendations of the recent Aux Sable Creek Watershed Plan that recommends introducing the concepts of watersheds and stormwater in the classroom as well as working on programs with children such as precipitation monitoring, runoff tracing, stream monitoring and analysis, and habitat assessments.

Project Mission: Raising awareness of the assets, opportunities and challenges in our local natural areas to gain a better understanding of the interconnectedness between people and the natural world around them through children's education. We do this through promoting outdoor environmental education, environmental literacy, the arts, cultural discovery and activism demonstrating the ability of children to make a positive difference in addressing global environmental challenges.

[1] "Watershed Quilt Project," Aux Sable Creek Watershed, accessed December 20, 2011, www.auxsablecreekwatershed.org/watershedquiltproject.html.

- Aux Sable Creek Watershed, Watershed Quilt Project
  Joan Soltwisch 815-690-3658

Recommendation: The Watershed Quilt Program should be implemented in the Blackberry Creek Watershed within the next five years.

World Water Monitoring Day™

World Water Monitoring Day™ is an international education and outreach program that builds public awareness and involvement in protecting water resources around the world by engaging citizens to conduct basic monitoring of their local water bodies. The program is coordinated by the Water Environment Federation and the International Water Association. Sponsors include the USGS, U.S. EPA, PerkinElmer, Sinclair Knight Merz, ITT Corporation, and Smithfield Foods. Groups can purchase test kits on the World Water Monitoring Day website. Basic test kits include one set of hardware and enough reagents to conduct up to 50 rounds of testing for pH, dissolved oxygen, temperature, and turbidity. The Classroom kit includes five sets of hardware and enough reagents to conduct up to 50 rounds of testing for pH, dissolved oxygen, temperature and turbidity.

- Water Environment Federation
  http://www.worldwatermonitoringday.org/index.html
  703-535-5264

Recommendation: The Blackberry Creek Watershed Coalition should participate in World Water Monitoring Day in the next three to five years.

Envirothon Competition

The Envirothon is an exciting, fun way for high school students to learn about the environment. It combines in-class curriculum with hands-on field experiences, while demonstrating the role people have in important environmental issues, such as forestry and wildlife management, water quality, and soil erosion. At the completion of the year-long learning process, the Envirothon conducts a series of competitions where students are tested on five subjects: soil, aquatics, wildlife, forestry and a specific environmental issue, which changes from year to year. The Illinois Envirothon competition is co-sponsored by the Association of Illinois Soil & Water Conservation Districts (AISWCD), local Soil & Water Conservation Districts (SWCDs), and cooperating conservation partners.

- Kane-DuPage Soil & Water Conservation District
  http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District
  http://www.kendallswcd.org/ 630-553-5821, Ext. 3

Recommendation: Participation in the program by each high school in the Blackberry Creek Watershed in the next three to five years should be encouraged.

Mighty Acorns®

The Mighty Acorns® program incorporates classroom curriculum, hands-on restoration activities and exploration as it seeks to provide our children with multiple, meaningful, sustained interactions with the land. Students use the land as an

outdoor laboratory for learning science and, at the same time, the ecosystems benefit from their restoration work. Mighty Acorns® is a stewardship-based curriculum for 4th-6th graders. Classes adopt a natural area in their community and visit it throughout the school year in order to participate in stewardship activities. Each field trip is preceded by a classroom lesson on related ecological concepts. Summer nature camps for Mighty Acorns® have also been developed through partnerships between The Conservation Foundation and local park districts.

- The Conservation Foundation http://www.theconservationfoundation.org/ 630-428-4500

Recommendation: School districts and park districts within the Blackberry Creek Watershed should implement the Mighty Acorns program within the next five years.

Conservation@Home

Conservation@Home is a program created by The Conservation Foundation which is geared towards homeowners. The program encourages and recognizes property owners who protect and/or create yards that are environmentally friendly and conserve water. This includes planting native vegetation, creating butterfly and rain gardens, and removing invasive species. Conservation@ Home is appropriate for outreach to municipalities, park districts, homeowners and homeowner associations through seminars, workshops, one-on-one conversations, and the distribution of printed materials.

Figure 6-4. The rain garden at the Montgomery Village Hall provides an example of a Conservation@ Home project.

- The Conservation Foundation http://www.theconservationfoundation.org/ 630-428-4500

HOA/ Adult Presentations

Stakeholders believe the watershed would benefit from providing a "suite" of topics to present to Homeowners Associations throughout the watershed. The topics might include a series of presentations covering the following topics: soil testing/ fertilizer, benefits of native plants, establishing no mow zones, detention ponds - their purpose and management, rain barrels/gardens, etc. A variety of agricultural and natural resource topics are available through the Kane-Dupage SWCD Community Assistance program. The Kendall County SWCD and The Conservation Foundation provide presentations as well.

- Kane-DuPage Soil & Water Conservation District http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District http://www.kendallswcd.org/ 630-553-5821, Ext. 3

- The Conservation Foundation http://www.theconservationfoundation.org/ 630-428-4500

Partners for Conservation

The program provides technical and financial assistance (cost-share) to landowners to address erosion issues. The local Soil and Water Conservation District (Kane-DuPage SWCD and Kendall County SWCD) administer this program with funding provided by the State of Illinois through the Illinois Department of Agriculture. Practices on agricultural land include: Grassed waterways, grade stabilization structures, water & sediment control basins, filter strips, nutrient management, etc. Practices not specific to agricultural land include: Streambank stabilization and restoration, well sealing, rain gardens, and special projects (non-traditional practices such as urban stormwater basin retro-fitting).

- Kane-DuPage Soil & Water Conservation District http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District http://www.kendallswcd.org/ 630-553-5821, Ext. 3

Events/ Conferences

The Coalition could promote its message about improving water quality in the Blackberry Creek Watershed by attending and distributing information at existing events/ conferences or by creating their own event (watershed tour, an environmental fair, or a listening session). The Coalition would benefit from the opportunities to talk to residents and gauge their understanding of the water quality problem as well as hear their concerns about the watershed. In an effort to pool resources, share ideas, and provide technical assistance, the Coalition might also pursue coordinating a session at a larger, regional conference. Professionals are encouraged to attend workshops and conferences hosted by government agencies or non-profit water-quality groups.

- The Conservation Foundation http://www.theconservationfoundation.org/ 630-428-4500

River Sweep

A river sweep is a coordinated, periodic clean-up of area waterways. The purpose is to create a connection between people and the river by having volunteers remove trash and debris from the river. A community-coordinated river sweep can involve a number of stakeholders, from students to corporations. The river sweep can also help develop a stewardship program to restore natural areas by removing invasive species. A central coordination entity should be established. Funding for supplies is available through the IEPA SCALE grant program.

- The Conservation Foundation http://www.theconservationfoundation.org/ 630-428-4500

Storm Drain Stenciling

Storm drain stenciling involves volunteers painting a stenciled message or gluing a specially-designed medallion on or near a storm drain, as well as distributing literature explaining what

they are doing and why. Stenciling is a way of explaining nonpoint source pollution to the general public and connecting volunteers and residents to the environment. The program educates twice, once to the crew of volunteers who stencil, then to those who read the message, such as "Dump no Waste – Drains to River." Various groups can participate in stenciling, such as youth groups, homeowners associations, and businesses.

- Kane-DuPage Soil & Water Conservation District http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District http://www.kendallswcd.org/ 630-553-5821, Ext. 3
- The Conservation Foundation http://www.theconservationfoundation.org/ 630-428-4500

Figure 6-5. Example of a storm drain medallion glued to a curb next to a storm drain inlet.
(Woods Creek Watershed, McHenry County.)

Policy, Code, and Ordinance Review

Utilize the US EPA's "Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scale," and "Managing Wet Weather with Green Infrastructure" resources to help municipalities increase awareness of and help guide them through the process of removing barriers, revising and creating codes, ordinances, and incentives to better protect water quality. Reviews can be formally facilitated by resources like the Chicago Metropolitan Agency for Planning (CMAP), or structured as a peer-to-peer roundtable. Topics may include restoring wetlands, maintaining natural drainage areas for water quality and water supply benefits and reduced flooding, deicing practices and products, among others.

- Chicago Metropolitan Agency for Planning http://www.cmap.illinois.gov/ 312-454-0400

Regional Planning

Develop a regional floodplain management plan. Potential benefits of the plan include: improvement of public safety; reduction of flood damage costs to communities; increase in resources for local flood safety programs; opportunities for reduced flood insurance rates for communities participating in FEMA's Community Rating System; improvement of riparian vegetation, wildlife habitat and water quality; preservation of historical land uses; retention of natural beauty of the area.

- Federal Emergency Management Agency, National Flood Insurance Program
  http://www.fema.gov/business/nfip/crs.shtm
  800-611-6122

Technical Workshops

For developers, municipal and county planning, engineering and public works staff members. Topics would be chosen that address water quality issues, particularly fecal coliform, presented by Kane-DuPage SWCD, Kendall County SWCD, as well as The Conservation Foundation.

- Kane-DuPage Soil & Water Conservation District
  http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District
  http://www.kendallswcd.org/ 630-553-5821, Ext. 3
- The Conservation Foundation
  http://www.theconservationfoundation.org/ 630-428-4500

Water Sense Program

Encourage partnerships with WaterSense, a U.S. EPA Partnership Program. As a partner, the organization will have access to tools and resources to promote and educate residents the need for water efficiency. Using water more efficiently makes sense for consumers, communities, and the environment. Water efficiency measures, as part of broader conservation efforts, can help reduce water and wastewater infrastructure costs and ensure resources for future generations.

Our growing population is putting stress on water supplies and distribution systems, threatening human health and the environment. The average household uses 100+ gallons of water each day. Water has become a national priority. A recent study showed at least 36 states are anticipating local, regional, or statewide water shortages by 2013. However using water more efficiently, will help preserve supplies for future generations, save money, and protect the environment. WaterSense makes it easier to identify water-efficient products and practices.

- U.S. Environmental Protection Agency, Water Sense Program
  http://www.epa.gov/WaterSense/ 866-987-7367

Natural Resource Information (NRI) Reports

The Kane-DuPage SWCD and Kendall County SWCD provide natural resource information to officials of the local governing body and other decision makers. The NRI report intends to present the most current natural resource information available in an understandable format for sites that are being considered for development. It contains a description of the present conditions and resources available and their potential impact on each other.

- Kane-DuPage Soil & Water Conservation District
  http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District
  http://www.kendallswcd.org/ 630-553-5821, Ext. 3

Soil Erosion & Sediment Control

Expertise provided by the Kane-DuPage and Kendall County Soil and Water Conservation Districts to agencies (Illinois EPA, United States Army Corps of Engineers) and local governments (County and Municipal Government) as part of a cooperative agreement.

- Kane-DuPage Soil & Water Conservation District http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District http://www.kendallswcd.org/ 630-553-5821, Ext. 3

Natural Resources Conservation Service (NRCS) Programs

NRCS's natural resources conservation programs help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. Public benefits include enhanced natural resources that help sustain agricultural productivity and environmental quality while supporting continued economic development, recreation, and scenic beauty. The Coalition could help encourage landowners to utilize NRCS programs, especially those that help reduce the potential for fecal coliform bacteria loadings in local steams.

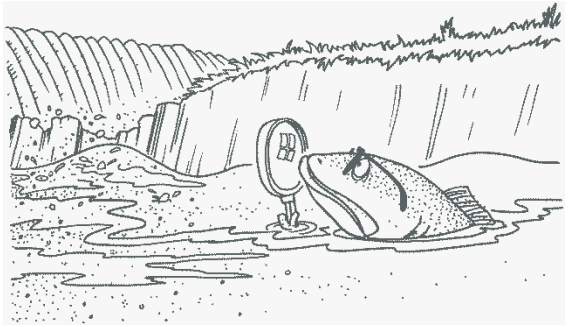
- US Department of Agriculture, Natural Resources Conservation Service http://www.nrcs.usda.gov/
- Kane-DuPage Soil & Water Conservation District http://www.kanedupageswcd.org/ 630-584-7961, Ext. 3
- Kendall County Soil & Water Conservation District http://www.kendallswcd.org/ 630-553-5821, Ext. 3

Table 6-1. Regional Resources

Chicago Metropolitan Agency for Planning
Chicago Botanic Garden
Chicago Wilderness
The Conservation Foundation
The Delta Institute
Friends of the Fox River
Fox River Ecosystem Partnership
Fox River Study Group
Illinois Department of Natural Resources
Illinois Environmental Protection Agency
Illinois Natural History Survey
Illinois State Geological Survey
Illinois State Water Survey
The Morton Arboretum
National Council for Public Partnerships
Open Lands
Peggy Notebaert Nature Museum
United States Department of Agriculture – Natural Resources Conservation Service
United States Environmental Protection Agency
United States Fish and Wildlife Service
United States Geological Survey
University of Illinois - Extension

Table 6-2. Local Resources

County Farm Bureaus
County Health Departments
Drainage Districts
Equestrian Groups
Faith-based Organizations
Fishing Clubs
Forest Preserve Districts
Homeowners Associations
Libraries
Municipalities
Park Districts
Parks and Recreation Departments
Private consulting firms
Sanitary Districts / Wastewater Treatment Plants
Schools
Scouting Organizations
Service Organizations
Soil & Water Conservation Districts
Townships



7. MONITORING SUCCESS

Although there is considerable merit in producing a watershed plan, actual protection of and improvement in water quality in the Blackberry Creek Watershed will be a result of implementing the plan's various project, program, planning, and policy recommendations. Improving water quality will happen over time and with considerable effort by all with a stake in watershed health including residents, local governments, agencies, organizations, and the business community.

7.1 INTERIM MEASUREABLE MILESTONES

Since implementation of recommendations will require resources such as staff time, funding, or both, one means for measuring progress includes number of grant applications submitted by those with an identified lead role for project implementation. Funding sources are identified below.

A measurable milestone for monitoring progress towards plan implementation is development of at least ten grant applications by stakeholders for project implementation within the 5-year/ short-term planning timeframe. Another milestone will be a semiannual convening of stakeholders, at a minimum, to gauge progress and discuss evolving needs and planned activities.

7.2 CRITERIA TO MEASURE SUCCESS

Measuring the watershed plan's success hinges on how many of the policy, project, program, and education/outreach recommendations are implemented. A summary of criteria for each category follows.

7.2.1 Policy and Planning

The watershed plan describes numerous policy recommend-dations. As this plan was written on the premise of a 5-year planning cycle, identified parties are encouraged to implement the plan's policy recommendations by 2016. Success will be measured by those with lead roles (e.g., municipalities) having implemented at least three of the recommended measures within the 5-year planning timeframe.

To help facilitate these efforts, CMAP or other consultants can provide assistance to communities for those recommendations that are related to comprehensive plans and ordinances, such as incorporating the Model Water Use Conservation Ordinance. Furthermore the Blackberry Creek Watershed planning participants should continue to work with and within the watershed's communities to support this effort.

7.2.2 Short- and Long-term Projects

The lead implementers of the proposed short-term, on-the-ground projects listed in Table 5-1 estimate a 2016 project completion date. Success will be measured accordingly. Additionally, as the long-term/10-year timeframe projects and programs listed in Table 5-3 become better defined, their implementation may be able to occur sooner than 2021. It should be noted that implementation of any of these projects is based on a variety of factors including, but not limited to, securing appropriate funding and participation from willing landowners and local governments.

7.2.3 Education and Outreach

The outreach and education recommendations will be an on-going effort with partnering agencies, organizations, homeowners associations, and other relevant groups that are active within the watershed. The pace of implementation of the outreach and education recommendations would be greatly increased by the hiring of at least a part-time watershed coordinator. Success will be measured by the number of education and outreach recommendations implemented by identified leads and others within the 5-year planning timeframe.

7.3 Monitoring to Evaluate Effectiveness Over Time

Monitoring plan effectiveness over time can be measured a variety of ways. First, stakeholders agreed upon a number of goals for which evaluation measures were identified (Chapter 1). Thus, stakeholders can review how well goals are being met via these evaluation measures.

Secondly, a number of groundwater protection strategies were identified (Chapter 4) that feature evaluation measures too. These can be followed methodically over time to judge plan effectiveness.

Of course, the ultimate measure for evaluating watershed plan effectiveness over time is improvement of water quality as evidenced by full attainment of designated use(s) and removal from the 303(d) list. Water chemistry aside, fish and macro-invertebrate IBI scores are additional indicators of improving water quality and will be tracked for change and/or trends. Then there is the matter of actual water quality monitoring; a topic to which we now turn.

7.3.1 Stream and Lake Sampling

As stated throughout the plan, fecal coliform is Blackberry Creek's only identified impairment; however, neither specific types nor geographic locations of potential contamination sources are known. Absent this information, the watershed plan addresses a variety of potential sources through recommend-

dations aimed at reducing the concentration of fecal coliform in the watershed (public outreach and education, policy, projects).

In order to better assess in-stream conditions and potential fecal coliform sources, additional monitoring within Blackberry Creek and its tributaries is recommended. Lakes in the watershed should also be monitored. The collection of water chemistry and biological data will allow decision-makers within the watershed to determine long-term trends and improve characterization of different sources of pollutants, not only fecal coliform but other parameters as well, such as nutrients, suspended solids, and chlorides.

By 2016, a more detailed and frequent monitoring program should be implemented throughout the Blackberry Creek Watershed. Stakeholders could partner with Fox River Study Group (FRSG), Illinois State Water Survey (ISWS), and Illinois EPA to develop a more robust stream water quality monitoring scheme, with a primary goal of achieving an improved understanding of the sources of fecal coliform within the watershed. Stakeholders could also partner with Illinois DNR, Illinois EPA, and other resource agencies to conduct a more extensive survey of the stream network's biota (e.g., fish, mussels, aquatic insects). A monitoring program for the lakes in the watershed should also be implemented to gather baseline data. There are several efforts to collect more water quality data already happening throughout the Fox River Basin (e.g., Friends of the Fox River Monitoring Network, Illinois Water Sentinals, Illinois Volunteer Lake Monitoring Program). The Blackberry Creek Watershed stakeholders could also work with these organizations and partner on monitoring projects as funding and resources are available.

Figure 7.1. Fish survey in Lake Run at Aurora West Forest Preserve following a 319-funded stream restoration project, August 2006 (left); a grass pickerel (*Esox americanus*) collected during the survey (right).
(Photos courtesy Ken Anderson, Kane Co.)

Developing a better baseline understanding of fecal coliform issues will allow for evaluation of the effectiveness of implementation efforts over time. To that end, water samples that indicate a positive change or trend towards lower fecal coliform concentrations and ultimately, compliance with the water quality standard, will provide the best criteria to measure success.

After monitoring data are collected and analyzed with conclusive results as to the origin(s) of the fecal coliform contamination, the Blackberry Creek Watershed stakeholders can reevaluate the plan's recommendations and make appropriate adjustments to priorities at that point.

7.4 NEXT STEPS

After the planning process, CMAP will be approaching all the municipalities within the watershed to seek formal approval of the watershed plan. Furthermore, The Conservation Foundation and CMAP have committed to hosting two meetings in 2012 to assist stakeholders with plan implementation.

7.5 FUNDING OPPORTUNITIES

Plan implementation is largely based on the availability of funding for projects and other plan recommendations. Table 7-1 describes several potential funding sources that may be used to help move forward with plan implementation.

Table 7-1.
Some Potential Funding Sources to Assist with Plan Implementation

PROGRAM	FUNDING AGENCY	TYPE	FUNDING AMOUNT	ELIGIBILITY	ACTIVITIES FUNDED	WEBSITE
WATER QUALITY						
Capitalization Grants for Clean Water State Revolving Funds	U.S. EPA/Office of Wastewater Management	Loan revolving fund	No limit on wastewater funds; Drinking water up to 25% of available funds	Local government, Individuals, Citizen groups, Not-for-profit groups	Wastewater treatment; Nonpoint source pollution control; Watershed management; Restoration & protection of groundwater, wetlands/riparian zones, and habitat.	http://www.epa.gov/owm/cwfinance/index.htm
Non-point Source Management Program (319 grants)	Illinois EPA	Matching Grant (60% funded)	No set limit on awards	Local government, Businesses, Individuals, Citizen & environment groups	Controlling or eliminating non-point pollution sources; Stream bank restoration; Pesticide and fertilizer control.	http://www.epa.state.il.us/water/financial-assistance/non-point.html
Illinois Green Infrastructure Grant Program for Stormwater Management	Illinois EPA	Matching Grant Minimum Local MatchCSO: 15%; Retention and Infiltration: 25%; Green Infrastructure Small Projects: 25%	Up to: CSO: $3M or 85% of project costs; Retention and Infiltration: $750,000 or 75% of project costs; Green Infrastructure Small Projects: $75,000 or 75% of project costs	Any entity that has legal status to accept funds from the state of Illinois, including state and local governmental units, nonprofit organizations, citizen and environmental groups, individuals and businesses	Green infrastructure best management practices (BMPs) for stormwater management to protect or improve water quality.	http://www.epa.state.il.us/water/financial-assistance/igig.html
Sustainable Agriculture Grant Program	Illinois Department of Agriculture	Matching Grant (60% funded)	—	Organizations, governmental units, educational institutions, non-profit groups, individuals	Practices are aimed at maintaining producers' profitability while conserving soil, protecting water resources and controlling pests through means that are not harmful to natural systems, farmers or consumers.	http://www.agr.state.il.us/Environment/conserv/index.html
Streambank Stabilization and Restoration Program	Illinois Department of Agriculture	Matching grant (amount funded not specified)	—	Landowners, Citizen groups, Not-for-profit groups	Naturalized streambank stabilization in rural and urban communities, work with SWCD	http://www.agr.state.il.us/Environment/conserv/index.html
Conservation Innovation Grants	Natural Resources Conservation Service	Matching grant (50% funded)	Up to $75,000 under State Component	Landowners, Organizations	Projects targeting innovative on-the-ground conservation, including pilot projects and field demonstrations.	http://www.il.nrcs.usda.gov/programs/cig/

Table 7-1. (continued)
Some Potential Funding Sources to Assist with Plan Implementation

HABITAT						
Partners for Fish and Wildlife Habitat Restoration Program	Department of Interior, U.S. Fish and Wildlife Service	Cost-share (50% funded)	up to $25,000	Private landowners	Voluntary restoration or improvements of native habitats for fish and wildlife; Restoration of former wetlands, native prairie stream and riparian areas and other habitats.	http://www.fws.gov/policy/640fw1.html
Bring back the Natives Grant Program	National Fish and Wildlife Foundation	Matching Grant (33% funded)	Varies with project ($50,000-$75,000)	Not-for-profit groups, Universities, Local governments	Restoration of damaged or degraded riverine habitats and native aquatic species through watershed restoration and improved land management.	http://www.nfwf.org/AM/Template.cfm?Section=charter_programs_list&CONTENTID=18473&TEMPLATE=/CM/ContentDisplay.cfm
Wildlife Habitat Incentives Program	U.S. Department of Agriculture	Grant, Matching Grant (at least 75% funded)	—	Private landowners, Not-for-profit groups	Establishment and improvement of fish and wildlife habitat on private land.	http://www.nrcs.usda.gov/programs/whip/
Native Plant Conservation Initiative	National Fish and Wildlife Foundation	Matching Grant (50% funded)	$10,000-$50,000	Community and watershed groups, Nonprofit groups Educ. institutions, Conservation districts, Local governments	"On-the-Ground" projects that involve local communities and citizen volunteers in the restoration of native plant communities.	http://www.nfwf.org/programs/npci.htm
WETLANDS						
Wetlands Reserve Program	USDA NRCS	Direct contracts with landowners; Easement (100%); Cost Share and 30 year easements (75%)	No set limit on awards	Individual Citizen groups, Not-for-profit groups	Wetlands restoration or protection through easement and restoration agreement	http://www.nrcs.usda.gov/programs/wrp/states/il.html
Wetlands Program Development Grants	U.S. EPA	Matching Grant (75% funded)	No set limit on awards	Not-for-profit groups; Local government	Developing a comprehensive monitoring and assessment program; Improving the effectiveness of compensatory mitigation; Refining the protection of vulnerable wetlands and aquatic resources	http://www.epa.gov/owow/wetlands/grantguidelines
Northeastern Illinois Wetlands Conservation Account	U.S. Fish and Wildlife Service/ The Conservation Fund	Grant/Matching Grant (50% match strongly suggested)	Average of ~$38,000	A partnership of: Governmental agencies; Not-for-profit conservation groups; Private landowners	Restoration of former wetlands; Enhancement and preservation of existing wetlands; Creation of new wetlands Wetlands education and stewardship	http://www.conservationfund.org/node/133
Small Grants Program	North American Wetlands Conservation Council	Matching Grant	Up to $75,000	A partnership of: Governmental agencies, Not-for-profit conservation groups; Private landowners	Long-term acquisition, restoration, enhancement of natural wetlands	http://www.fws.gov/birdhabitat/Grants/NAWCA/index.shtm
Wetland Restoration Fund	Openlands	Grant	$5,000-$100,000	Local government; Not-for-profit groups; Citizen groups; Other organizations	Wetlands and other aquatic ecosystem restorations within the six-county Chicago region on land under conservation easement or owned by a government agency	
Five Star Restoration Program	National Fish and Wildlife Foundation	Matching Grant (50% funded)	One-year projects: $10,000-$25,000; Two-year projects: $10,000 -$40,000	Any public or private entity that can receive grants	Seeks to develop community capacity to sustain local natural resources for future generations by providing modest financial assistance to diverse local partnerships for wetland and riparian habitat restoration	http://www.nfwf.org/AM/Template.cfm?Section=Charter_Programs_List&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=60&ContentID=17901
PRIVATE						
Tellabs	Tellabs Foundation	Grant	At least $10,000	Not-for-profit groups	Environmental protection and improvement programs; Organizations which protect the environment	http://www.ivp.tellabs.com/about/foundation.shtml
GVF Core Program	Grand Victoria Foundation	Grant/Matching Grant	Varies with scope of project, size of organization, other funding	Not-for-profit groups	Preservation and restoration of natural lands and waterways	www.grandvictoriafdn.org

APPENDICES

APPENDIX A: Blackberry Creek Watershed Planning Meeting Participants *(in alphabetical order)*

Name	Organization
Chris Adesso	Pizzo & Associates
Hala Ahmed	Chicago Metropolitan Agency for Planning
Kenneth Anderson	Kane County Environmental Management
Anita Anderson	Resident
Greg Anderson	Homeowner
Steve Andras	City of Aurora
Megan Andrews	Kendall County Soil & Water Conservation District
Steve Arnold	Kane County Farm Bureau
Jake Ayala	TCF intern
Matt Bardol	Geosyntec Consultants
Krysti Barksdale-Noble	United City of Yorkville Community Development
Noel A. Basquin	City of Batavia Engineering
Kristin Bilar	Campton Township Open Space
Scott Buening	Village of North Aurora Community Development
Jim Campbell	Blackberry Oaks Golf Course
Jerad Chipman	Village of Montgomery
Karen Clementi	Deuchler Environmental Inc.
Andrea Cline	The Conservation Foundation
Robert Davidson	Kendall County Board
Kara DeGraff	Integrated Lakes Management
Jennifer Duncan	North Aurora River District Alliance
Megan Elberts	Chicago Metropolitan Agency for Planning
Jerry Elliott	Sugar Grove Water Authority

Name	Organization
Bill Gain	Rempe-Sharpe & Associates
Brandy Gentile	Homeowner
Bill Grabarek	Village of Elburn Board
Ellen Hadzima	Homeowner
E. Robert Hadzima	Homeowner
George Hauser	Prestbury Citizens Association Board
Anthony Heddlesten	US Army Corps of Engineers
Wally Heggemeier	Homeowner
Fred Houdek	Sierra Club / Homeowner
Holly Hudson	Chicago Metropolitan Agency for Planning
Greg Huggins	Sugar Grove Township Road District
Rich Hutter	Cherry Hill Homeowners Association
Candice Jacobs	Kane-DuPage Soil & Water Conservation District
Scott Jesseman	Sugar Grove Drainage District #1
Monika Kastle	TCF intern
Al Kent	Prestbury Citizens Association Board
Natalie Kirshner	TCF intern
Karen Kosky	Kane County Environmental Management
Dan Larsen	Waubonsee Community College
Dan Lobbes	The Conservation Foundation
Tim Loftus	Chicago Metropolitan Agency for Planning
Joanne Mahr	Homeowner / Landowner
Alicia McCallum	Homeowner
Scott McCallum	Homeowner

Name	Organization
Brook McDonald	The Conservation Foundation
Robert McMillan	Homeowner / Property owner
Jim Michels	Blackberry Township
Karen Miller	Kane County Development Department
Kelsey Musich	Kane-DuPage Soil & Water Conservation District
Suzi Myers	Kane County Farm Bureau
Dan Nagel	Sugar Grove Township
Tara Neff	The Conservation Foundation
John Nevenhoven	Village of Elburn Public Works
Mary Ochsenschlager	Kane-DuPage Soil & Water Conservation District, Homeowner
John Ortilieb	U.S. Army Corps of Engineers
Jeff Palmquist	Fox Valley Park District
Tim Paulson	Engineering Enterprises Inc.
Steve Pescitelli	Illinois Department of Natural Resources
Jason Petit	Kendall County Forest Preserve District
Don Pfeffer	Sugar Grove Water Authority
Michelle Piotrowski	Engineering Enterprises Inc.
Kyle Price	The Conservation Foundation
Martha Price	Cannonball Trail Civic League, TCF
Lee Rasmussen	Landowner
Marge Roe	Prestbury Citizens Association
Ray Roe	Prestbury Citizens Association
Robert Rung	Illinois Department of Natural Resources
Tom Ryterske	USDA - Natural Resources Conservation Service
Jim Schlay	Property owner / Landowner
L. Eric Schoeny	City of Aurora, Fox River Ecosystem Partnership, Fox River Study Group
Laura Schraw	United City of Yorkville Community Development
Paul M. Schuch	Kane County Facilities, Subdivision & Environmental Resources Dept.
Tony Scott	Ledger Sentinel
Andy Shaw	Northern Illinois University
Louise Sherman	Townes of Prestbury
Jim Slowikowski	Illinois State Water Survey
Maggie Soliz	Pizzo & Associates
Tom Stefancic	Prestbury Citizens Association
Barry Studemann	Cardno ENTRIX
Tori Trauscht	Integrated Lakes Management
Erin Tuttle	The Conservation Foundation
Drew Ullberg	Forest Preserve District of Kane County
Bob Walker	Engineering Enterprises Inc.
Dale Willerth	Waubonsee Community College
Erin Willrett	Village of Elburn
Lori Wolf	The Conservation Foundation / Watershed resident
William Wulf	Homeowner / Landowner
Richard Young	Village of Sugar Grove
Angela Zubko	Kendall County Department of Planning, Building, & Zoning

APPENDIX B: Local Ordinance and Code Review Request Letter

To: Blackberry Creek Watershed Government Representative

From: Hala Ahmed, Blackberry Creek Watershed Planning Manager

Date: March 4, 2011

Re.: Ordinance/Code Review

As part of our work on the 2011 Blackberry Creek Watershed Action Plan, we are conducting a local ordinance and code review to identify areas where local governments may wish to update ordinances to reduce the negative impacts of stormwater on water quality. To achieve this, we are using the Zoning Code Analysis and Ordinance Language Recommendations document completed by the Conservation Design Forum (CDF) in 2004. Our objective is to highlight the successes in ordinance change and address the code language recommendations that were not adopted as well as identify barriers to adoption of the recommended language.

The attached survey is based on the CDF analysis of the ordinances and codes relevant to your community and is a suggested mechanism for your response with code updates in your community. Please feel free to use it or whatever format you think appropriate. You can find the CDF documents at: http://foxriverecosystem.org/blackberry.htm under *Resources & Documents*. Code analyses and language recommendations were completed for 9 governmental units in the watershed, including Kane and Kendall Counties. Each report is 16 pages long, the first 7 pages explain how to use the document followed by a table that spans 8 pages with details on code categories, references, and recommended standards. The last page of the document is a table with recommended transportation standards. Our focus is on the zoning and subdivision regulations, so please take a moment to review the relevant recommended language prior to responding. Also, please feel free to include any comments or ideas that you think will benefit this project. If you think there are other staff members who can better respond to this survey, please feel free to pass this information to the appropriate staff person. I will follow up with you during the week of March 13th, 2011. In the meantime, please do not hesitate to contact me with any questions at hahmed@cmap.illinois.gov or (312) 386-8800. I appreciate your time and assistance.

Community:

Person completing survey:

Title:

Contact information:

No.	Code/Standard Categories	Local Code Reference	Language Adopted (Y/N)	Reason if not adopted

Additional comments:

APPENDIX C: Center for Watershed Protection's Code and Ordinance Worksheet

CODE AND ORDINANCE WORKSHEET

About the Adobe Acrobat Form

Note: Acrobat Reader will not save the information entered into a form. Saving changes is only possible with a full version of Acrobat.

- The blue fields indicate that an answer is required.
- The gray fields are for notes and are not required, but highly recommended.
- The green fields will automatically summarize the points – no input is needed here.

To fill out a form:

1. Select the hand tool.
2. Position the pointer inside a form field, and click. The I-beam pointer allows you to type text. If your pointer appears as a pointing finger, you can select an item from a list (i.e., YES or NO).
3. After entering text or making a selection, press Tab to accept the form field change and go to the next or previous field.
4. Once you have filled in the appropriate form fields, do both of the following:
   - Choose File > Export > Form Data to save the form data in a separate FDF file. Type a filename and click save.
   - Print the form so that you have a hard copy for your records.

And Most Importantly…
Send CWP a copy! Let us know how you did!

The Code and Ordinance Worksheet allows an in-depth review of the standards, ordinances, and codes (i.e., the development rules) that shape how development occurs in your community. You are guided through a systematic comparison of your local development rules against the model development principles. Institutional frameworks, regulatory structures and incentive programs are included in this review. The worksheet consists of a series of questions that correspond to each of the model development principles. Points are assigned based on how well the current development rules agree with the site planning benchmarks derived from the model development principles.

The worksheet is intended to guide you through the first two steps of a local site planning roundtable.

Step 1: Find out what the Development Rules are in your community.

Step 2: See how your rules stack up to the Model Development Principles.

The homework done in these first two steps helps to identify which development rules are potential candidates for change.

PREPARING TO COMPLETE THE CODE AND ORDINANCE WORKSHEET

Two tasks need to be performed before you begin in the worksheet. First, you must identify all the development rules that apply in your community. Second, you must identify the local, state, and federal authorities that actually administer or enforce the development rules within your community. Both tasks require a large investment of time. The development process is usually shaped by a complex labyrinth of regulations, criteria, and authorities. A team approach may be helpful. You may wish to enlist the help of a local plan reviewer, land planner, land use attorney, or civil engineer. Their real-world experience with the development process is often very useful in completing the worksheet.

Identify the Development Rules

Gather the key documents that contain the development rules in your community. A list of potential documents to look for is provided in Table 1. Keep in mind that the information you may want on a particular development rule is not always found in code or regulation, and maybe hidden in supporting design manuals, review checklists, guidance document or construction specifications. In most cases, this will require an extensive search. Few communities include all of their rules in a single document. Be prepared to contact state and federal, as well as local agencies to obtain copies of the needed documents.

Table 1: Key Local Documents that will be Needed to Complete the COW
Zoning Ordinance
Subdivision Codes
Street Standards or Road Design Manual
Parking Requirements
Building and Fire Regulations/Standards
Stormwater Management or Drainage Criteria
Buffer or Floodplain Regulations
Environmental Regulations
Tree Protection or Landscaping Ordinance
Erosion and Sediment Control Ordinances
Public Fire Defense Masterplans
Grading Ordinance

Identify Development Authorities

Once the development rules are located, it is relatively easy to determine which local agencies or authorities are actually responsible for administering and enforcing the rules. Completing this step will provide you with a better understanding of the intricacies of the development review process and helps identify key members of a future local roundtable. Table 2 provides a simple framework for identifying the agencies that influence development in your community. As you will see, space is provided not only for local agencies, but for state and federal agencies as well. In some cases, state and federal agencies may also exercise some authority over the local development process (e.g., wetlands, some road design, and stormwater).

USING THE WORKSHEET: HOW DO YOUR RULES STACK UP TO THE MODEL DEVELOPMENT PRINCIPLES?

Completing the Worksheet

Once you have located the documents that outline your development rules and identified the authorities responsible for development in your community, you are ready for the next step. You can now use the worksheet to compare your development rules to the model development principles. The worksheet is presented at the end of this chapter. The worksheet presents seventy-seven site planning benchmarks. The benchmarks are posed as questions. Each benchmark focuses on a specific site design practice, such as the minimum diameter of cul-de-sacs, the minimum width of streets, or the minimum parking ratio for a certain land use. You should refer to the codes, ordinances, and plans identified in the first step to determine the appropriate development rule. The questions require either a yes or no response or specific numeric criteria. If your development rule agrees with the site planning benchmark, you are awarded points.

Calculating Your Score

A place is provided on each page of the worksheet to keep track of your running score. In addition, the worksheet is subdivided into three categories:

- Residential Streets and Parking Lots (Principles No. 1 - 10)
- Lot Development (Principles No. 11 - 16)
- Conservation of Natural Areas (Principles No. 17 - 22).

For each category, you are asked to subtotal your score. This "**Time to Assess**" allows you to consider which development rules are most in line with the site planning benchmarks and what rules are potential candidates for change.

The total number of points possible for all of the site planning benchmarks is 100. Your overall score provides a general indication of your community's ability to support environmentally sensitive development. As a general rule, if your overall score is lower than 80, then it may be advisable to systematically reform your local development rules. A score sheet is provided at end of the Code and Ordinance Worksheet to assist you in determining where your community's score places in respect to the Model Development Principles. Once you have completed the worksheet, go back and review your responses. Determine if there are specific areas that need improvement (e.g., development rules that govern road design) or if your development rules are generally pretty good. This review is key to implementation of better development: assessment of your current development rules and identification of impediments to innovative site design. This review also directly leads into the next step: a site planning roundtable process conducted at the local government level. The primary tasks of a local roundtable are to systematically review existing development rules and then determine if changes can or should be made. By providing a much-needed framework for overcoming barriers to better development, the site planning roundtable can serve as an important tool for local change.

Table 2: Local, State, and Federal Authorities Responsible for Development in Your Community

Development Responsibility		State/Federal	County	Town
Sets road standards	Agency:			
	Contact Name:			
	Phone No.:			
Review/approves subdivision plans	Agency:			
	Contact Name:			
	Phone No.:			
Establishes zoning ordinances	Agency:			
	Contact Name:			
	Phone No.:			
Establishes subdivision ordinances	Agency:			
	Contact Name:			
	Phone No.:			
Reviews/establishes stormwater management or drainage criteria	Agency:			
	Contact Name:			
	Phone No.:			
Provides fire protection and fire protection code enforcement	Agency:			
	Contact Name:			
	Phone No.:			
Oversees buffer ordinance	Agency:			
	Contact Name:			
	Phone No.:			
Oversees wetland protection	Agency:			
	Contact Name:			
	Phone No.:			
Establishes grading requirements or oversees erosion and sediment control program	Agency:			
	Contact Name:			
	Phone No.:			
Reviews/approves septic systems	Agency:			
	Contact Name:			
	Phone No.:			
Review/approves utility plans (e.g., water and sewer)	Agency:			
	Contact Name:			
	Phone No.:			
Reviews/approves forest conservation/ tree protection plans	Agency:			
	Contact Name:			
	Phone No.:			

Development Feature	*Your Local Criteria*

1. Street Width

What is the minimum pavement width allowed for streets in low density residential developments that have less than 500 daily trips (ADT)? _____ feet

*If your answer is between **18-22 feet**, give yourself **4** points • •*

At higher densities are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)? YES

*If your answer is **YES**, give yourself **3** points • •*

Notes on Street Width (include source documentation such as name of document, section and page #):

2. Street Length

Do street standards promote the most efficient street layouts that reduce overall street length? YES

*If your answer is **YES**, give yourself **1** point • •*

Notes on Street Length (include source documentation such as name of document, section and page #):

3. Right-of-Way Width

What is the minimum right of way (ROW) width for a residential street? _____ feet

*If your answer is **less than 45 feet**, give yourself **3** points • •*

Does the code allow utilities to be placed under the paved section of the ROW? YES

*If your answer is **YES**, give yourself **1** point • •*

Notes on ROW Width (include source documentation such as name of document, section and page #):

4. Cul-de-Sacs

What is the minimum radius allowed for cul-de-sacs? _____ feet

*If your answer is **less than 35 feet**, give yourself **3** points • •*

*If your answer is **36 feet to 45 feet**, give yourself **1** point • •*

Can a landscaped island be created within the cul-de-sac? YES

*If your answer is **YES**, give yourself **1** point • •*

Are alternative turnarounds such as "hammerheads" allowed on short streets in low density residential developments? YES

*If your answer is **YES**, give yourself **1** point • •*

Notes on Cul-de-Sacs (include source documentation such as name of document, section and page #):

Code and Ordinance Worksheet *Subtotal Page 5* 0

-5-

Development Feature	*Your Local Criteria*

5. Vegetated Open Channels

Are curb and gutters required for most residential street sections? YES

*If your answer is **NO**, give yourself **2** points • •*

Are there established design criteria for swales that can provide stormwater quality treatment (i.e., dry swales, biofilters, or grass swales)? YES

*If your answer is **YES**, give yourself **2** points • •*

Notes on Vegetated Open Channel (include source documentation such as name of document, section and page #):

6. Parking Ratios

What is the minimum parking ratio for a professional office building (per 1000 ft^2 of gross floor area)? _____ spaces

*If your answer is **less than 3.0 spaces**, give yourself **1** point • •*

What is the minimum required parking ratio for shopping centers (per 1,000 ft^2 gross floor area)? _____ spaces

*If your answer is **4.5 spaces or less**, give yourself **1** point • •*

What is the minimum required parking ratio for single family homes (per home)? _____ spaces

*If your answer is **less than or equal to 2.0 spaces**, give yourself **1** point • •*

Are your parking requirements set as maximum or median (rather than minimum) requirements? YES

*If your answer is **YES**, give yourself **2** points • •*

Notes on Parking Ratios (include source documentation such as name of document, section and page #):

7. Parking Codes

Is the use of shared parking arrangements promoted? YES

*If your answer is **YES**, give yourself **1** point • •*

Are model shared parking agreements provided? YES

*If your answer is **YES**, give yourself **1** point • •*

Are parking ratios reduced if shared parking arrangements are in place? YES

*If your answer is **YES**, give yourself **1** point • •*

If mass transit is provided nearby, is the parking ratio reduced? YES

*If your answer is **YES**, give yourself **1** point • •*

Notes on Parking Codes (include source documentation such as name of document, section and page #):

Code and Ordinance Worksheet *Subtotal Page 6* 0

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Development Feature	Your Local Criteria

8. Parking Lots

What is the minimum stall width for a standard parking space? ____ feet
*If your answer is **9 feet or less**, give yourself **1** point • •*

What is the minimum stall length for a standard parking space? ____ feet
*If your answer is **18 feet or less**, give yourself **1** point • •*

Are at least 30% of the spaces at larger commercial parking lots required to have smaller dimensions for compact cars? YES
*If your answer is **YES**, give yourself **1** point • •*

Can pervious materials be used for spillover parking areas? YES
*If your answer is **YES**, give yourself **2** points • •*

Notes on Parking Lots (include source documentation such as name of document, section and page #):

9. Structured Parking

Are there any incentives to developers to provide parking within garages rather than surface parking lots? YES
*If your answer is **YES**, give yourself **1** point • •*

Notes on Structured Parking (include source documentation such as name of document, section and page #):

10. Parking Lot Runoff

Is a minimum percentage of a parking lot required to be landscaped? YES
*If your answer is **YES**, give yourself **2** points • •*

Is the use of bioretention islands and other stormwater practices within landscaped areas or setbacks allowed? YES
*If your answer is **YES**, give yourself **2** points • •*

Notes on Parking Lot Runoff (include source documentation such as name of document, section and page #):

Code and Ordinance Worksheet *Subtotal Page 7* 0

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Development Feature	Your Local Criteria

• • **Time to Assess:** Principles 1 - 10 focused on the codes, ordinances, and standards that determine the size, shape, and construction of parking lots, roadways, and driveways in the suburban landscape. There were a total of **40** points available for Principles 1 - 10. What was your total score?

Subtotal Page 5 0 + Subtotal Page 6 0 + Subtotal Page 7 0 = 0

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

11. Open Space Design

Are open space or cluster development designs allowed in the community? YES
*If your answer is **YES**, give yourself **3** points • •*
*If your answer is **NO**, skip to question No. 12*

Is land conservation or impervious cover reduction a major goal or objective of the open space design ordinance? YES
*If your answer is **YES**, give yourself **1** point • •*

Are the submittal or review requirements for open space design greater than those for conventional development? YES
*If your answer is **NO**, give yourself **1** point • •*

Is open space or cluster design a by-right form of development? YES
*If your answer is **YES**, give yourself **1** point • •*

Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g., setbacks, road widths, lot sizes) YES
*If your answer is **YES**, give yourself **2** points • •*

Notes on Open Space Design (include source documentation such as name of document, section and page #):

Code and Ordinance Worksheet *Subtotal Page 8* 0

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Development Feature	Your Local Criteria

12. Setbacks and Frontages

Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in the community? YES
*If your answer is **YES**, give yourself **1** point • •*

What is the minimum requirement for front setbacks for a one half (½) acre residential lot? feet
*If your answer is **20 feet or less**, give yourself **1** point • •*

What is the minimum requirement for rear setbacks for a one half (½) acre residential lot? feet
*If your answer is **25 feet or less**, give yourself **1** point • •*

What is the minimum requirement for side setbacks for a one half (½) acre residential lot? feet
*If your answer is **8 feet or less**, give yourself **1** points • •*

What is the minimum frontage distance for a one half (½) acre residential lot? feet
*If your answer is **less than 80 feet**, give yourself **2** points • •*

Notes on Setback and Frontages (include source documentation such as name of document, section and page #):

13. Sidewalks

What is the minimum sidewalk width allowed in the community? feet
*If your answer is **4 feet or less**, give yourself **2** points • •*

Are sidewalks always required on both sides of residential streets? YES
*If your answer is **NO**, give yourself **2** points • •*

Are sidewalks generally sloped so they drain to the front yard rather than the street? YES
*If your answer is **YES**, give yourself **1** point • •*

Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)? YES
*If your answer is **YES**, give yourself **1** point • •*

Notes on Sidewalks (include source documentation such as name of document, section and page #):

14. Driveways

What is the minimum driveway width specified in the community? feet
*If your answer is **9 feet or less (one lane) or 18 feet (two lanes)**, give yourself **2** points • •*

Code and Ordinance Worksheet *Subtotal Page 9* 0

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Development Feature	Your Local Criteria

Can pervious materials be used for single family home driveways (e.g., grass, gravel, porous pavers, etc)? YES
*If your answer is **YES**, give yourself **2** points • •*

Can a "two track" design be used at single family driveways? YES
*If your answer is **YES**, give yourself **1** point • •*

Are shared driveways permitted in residential developments? YES
*If your answer is **YES**, give yourself **1** point • •*

Notes on Driveways (include source documentation such as name of document, section and page #):

15. Open Space Management

Skip to question 16 if open space, cluster, or conservation developments are not allowed in your community.

Does the community have enforceable requirements to establish associations that can effectively manage open space? YES
*If your answer is **YES**, give yourself **2** points • •*

Are open space areas required to be consolidated into larger units? YES
*If your answer is **YES**, give yourself **1** point • •*

Does a minimum percentage of open space have to be managed in a natural condition? YES
*If your answer is **YES**, give yourself **1** point • •*

Are allowable and unallowable uses for open space in residential developments defined? YES
*If your answer is **YES**, give yourself **1** point • •*

Can open space be managed by a third party using land trusts or conservation easements? YES
*If your answer is **YES**, give yourself **1** point • •*

Notes on Open Space Management (include source documentation such as name of document, section and page #):

16. Rooftop Runoff

Can rooftop runoff be discharged to yard areas? YES
*If your answer is **YES**, give yourself **2** points • •*

Do current grading or drainage requirements allow for temporary ponding of stormwater on front yards or rooftops? YES
*If your answer is **YES**, give yourself **2** points • •*

Notes on Rooftop Runoff (include source documentation such as name of document, section and page #):

Code and Ordinance Worksheet *Subtotal Page 10* 0

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Development Feature	Your Local Criteria

• • **Time to Assess:** Principles 11 through 16 focused on the regulations which determine lot size, lot shape, housing density, and the overall design and appearance of our neighborhoods. There were a total of **36** points available for Principles 11 - 16. What was your total score?

Subtotal Page 8 [0] + Subtotal Page 9 [0] + Subtotal Page 10 [0] = [0]

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

17. Buffer Systems

Is there a stream buffer ordinance in the community? YES
*If your answer is **YES**, give yourself **2** points • •*

If so, what is the minimum buffer width? [ ] feet
*If your answer is **75 feet or more**, give yourself **1** point • •*

Is expansion of the buffer to include freshwater wetlands, steep slopes or the 100-year floodplain required? YES
*If your answer is **YES**, give yourself **1** point • •*

Notes on Buffer Systems (include source documentation such as name of document, section and page #):

18. Buffer Maintenance

If you do not have stream buffer requirements in your community, skip to question No. 19

Does the stream buffer ordinance specify that at least part of the stream buffer be maintained with native vegetation? YES
*If your answer is **YES**, give yourself **2** points • •*

Does the stream buffer ordinance outline allowable uses? YES
*If your answer is **YES**, give yourself **1** point*

Code and Ordinance Worksheet *Subtotal Page 11* [0]

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Development Feature	Your Local Criteria

Does the ordinance specify enforcement and education mechanisms? YES
*If your answer is **YES**, give yourself **1** point • •*

Notes on Buffer Systems (include source documentation such as name of document, section and page #):

19. Clearing and Grading

Is there any ordinance that requires or encourages the preservation of natural vegetation at residential development sites? YES
*If your answer is **YES**, give yourself **2** points • •*

Do reserve septic field areas need to be cleared of trees at the time of development? YES
*If your answer is **NO**, give yourself **1** point • •*

Notes on Buffer Maintenance (include source documentation such as name of document, section and page #):

20. Tree Conservation

If forests or specimen trees are present at residential development sites, does some of the stand have to be preserved? YES
*If your answer is **YES**, give yourself **2** points • •*

Are the limits of disturbance shown on construction plans adequate for preventing clearing of natural vegetative cover during construction? YES
*If your answer is **YES**, give yourself **1** point • •*

Notes on Tree Conservation (include source documentation such as name of document, section and page #):

21. Land Conservation Incentives

Are there any incentives to developers or landowners to conserve non-regulated land (open space design, density bonuses, stormwater credits or lower property tax rates)? YES
*If your answer is **YES**, give yourself **2** points • •*

Is flexibility to meet regulatory or conservation restrictions (density compensation, buffer averaging, transferable development rights, off-site mitigation) offered to developers? YES
*If your answer is **YES**, give yourself **2** points • •*

Notes on Land Cons. Incentives (include source documentation such as name of document, section and page #):

Code and Ordinance Worksheet *Subtotal Page 12* [0]

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Development Feature	Your Local Criteria

22. Stormwater Outfalls

Is stormwater required to be treated for quality before it is discharged? YES

*If your answer is **YES**, give yourself **2** points • •*

Are there effective design criteria for stormwater best management practices (BMPs)? YES

*If your answer is **YES**, give yourself **1** point • •*

Can stormwater be directly discharges into a jurisdictional wetland without pretreatment? YES

*If your answer is **NO**, give yourself **1** point • •*

Does a floodplain management ordinance that restricts or prohibits development within the 100-year floodplain exist? YES

*If your answer is **YES**, give yourself **2** points • •*

Notes on Stormwater Outfalls (include source documentation such as name of document, section and page #):

Code and Ordinance Worksheet *Subtotal Page 13* 0

• • **Time to Assess:** Principles 17 through 22 addressed the codes and ordinances that promote (or impede) protection of existing natural areas and incorporation of open spaces into new development. There were a total of 24 points available for Principles 17 - 22. What was your total score?

Subtotal Page 11 0 + Subtotal Page 12 0 + Subtotal Page 13 0 = 0

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

To determine final score, add up subtotal from each • **Time to Assess**

Principles 1 - 10 (Page 8)	0
Principles 11 - 16 (Page 11)	0
Principles 17 - 22 (Page 13)	0
TOTAL	0

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Code and Ordinance Worksheet

SCORING (A total of 100 points are available):		Your Community's Score
90- 100	•	Congratulations! Your community is a real leader in protecting streams, lakes, and estuaries. Keep up the good work.
80 - 89	•	Your local development rules are pretty good, but could use some tweaking in some areas.
70 - 79	•	Significant opportunities exist to improve your development rules. Consider creating a site planning roundtable.
60 - 69	•	Development rules are inadequate to protect your local aquatic resources. A site planning roundtable would be very useful.
less than 60	•	Your development rules definitely are not environmentally friendly. Serious reform of the development rules is needed.

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NOTES

About CMAP

The Chicago Metropolitan Agency for Planning (CMAP) is the region's official comprehensive planning organization. Its GO TO 2040 planning campaign is helping the region's seven counties and 284 communities to implement strategies that address transportation, housing, economic development, open space, the environment, and other quality of life issues. See **www.cmap.illinois.gov** for more information.

Back cov er: Yellow-headed blackbird courtesy of Bob Andrini, Kane County Audubon.

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