Fox River Study Group

Fox River Ecosystem Partnership

Executive Summary

Mill Creek Watershed-based Plan

Kane County, Illinois

September 2019

CMAP | HELPING COMMUNITIES PROSPER

Planning to Protect Local Water Resources

Beginning in fall 2017, the Chicago Metropolitan Agency for Planning (CMAP)—in partnership with Kane County's Division of Environmental and Water Resources and Development and Community Services Department along with the Fox River Ecosystem Partnership and Fox River Study Group—began working with local stakeholders to develop a watershed-based plan that aims to improve and protect water resources in the Mill Creek watershed. After two years of input on local priorities, issues, and opportunities, CMAP and partners developed a plan for the Mill Creek watershed that aims to improve and protect the water quality in Mill Creek, its tributaries, and the numerous wetlands, lakes, and ponds within the watershed as well as the Fox River downstream. Download the full Mill Creek Watershed Plan from the CMAP website at https://www.cmap.illinois.gov/programs/lta/mill-creek.

What is Watershed Planning?

Watershed planning is a voluntary and collaborative approach that uses a watershed as a project boundary to address a variety of water resource challenges and opportunities. The planning process and resulting plan are informed by both local knowledge and science-based information. Recommendations are developed to help restore the beneficial uses of impaired waters or protect and maintain the quality of unimpaired or threatened waters, a primary objective of watershed plans.

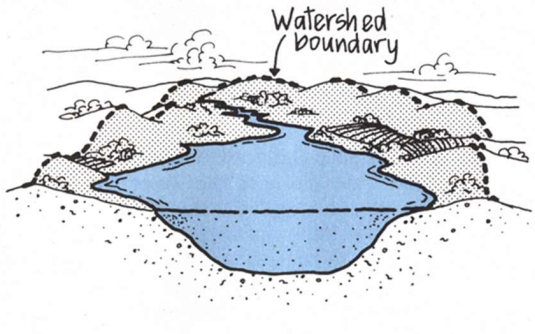
Watershed planning provides opportunities for community members from many jurisdictions across a watershed to work together, identify common water resource challenges, and then develop collaborative solutions to address those challenges in ways that more closely match the natural flow of water through our landscapes.

Watershed planning creates a forum for community discussion and deliberation, which often leads to the pursuit of other community-driven objectives. Consequently, watershed plans can be multi-objective plans that acknowledge the value of water and other natural resources and, with this perspective, seek to improve quality-of-life in the watershed for both current residents and future generations. Although watershed plans are advisory only, they necessary for the implementation of project ideas to be funded through certain funding programs.

Figure 1. Watershed 101.

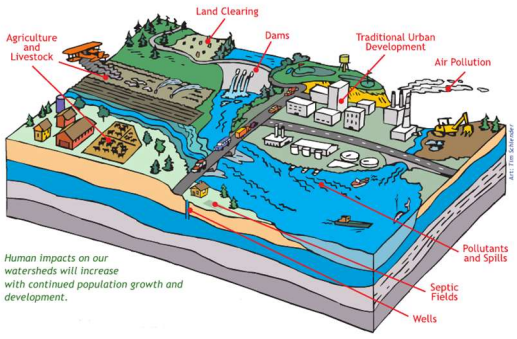
What is a watershed?

A watershed is the land area from which rainwater and snowmelt drains into a body of water such as a stream or lake. Watershed boundaries are defined by nature and are largely determined by the surrounding topography or "lay of the land."



Why do watersheds matter?

Watersheds are important because what we do on the land directly affects the quality of our surface waters, drinking water supply, local economy, wildlife habitat, and recreational resources.



Introduction: The Mill Creek Watershed

The Mill Creek watershed lies within the Lower Fox River Subbasin and is completely bound within Kane County in northeastern Illinois (Figure 2). Mill Creek—a tributary of the Fox River—originates in a Campton Hills subdivision approximately a half mile west of the Campton Forest Preserve. The creek meanders southeast and junctures at the Fox River in the unincorporated area of Mooseheart. The 31 square mile planning area is subdivided into eleven subwatersheds, which allows for a more nuanced understanding of local conditions and improves the consideration, placement, and prioritization of best management practices.

Figure 2. Fox River Basin and the Mill Creek Watershed

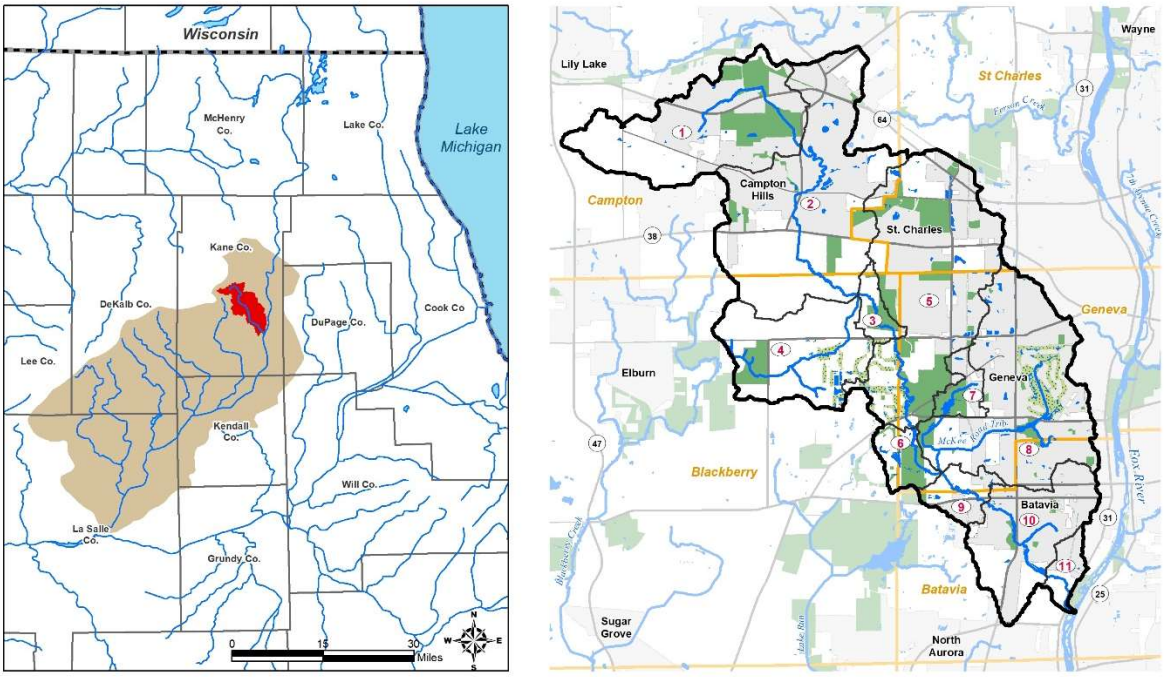


Table 1. Mill Creek watershed facts

Size	31 sq. mi., 19,990.8 acres
County	Kane
Municipalities	Batavia, Campton Hills, Geneva, St. Charles, North Aurora
Townships	Batavia, Blackberry, Campton, Geneva, St. Charles
Population (2010)	47,383
Incorporated land (2013)	11,254.6 acres, 56.3%
Unincorporated land (2013)	8,736.2 acres, 43.7%
Agriculture land use	5,578.6 acres, 27.9%
Single family residential land use	(5,077.2 acres, 25.4%),
Open space land use	(3,761.8 acres, 18.8%)
Water supply sources	Shallow bedrock/gravel and deep sandstone aquifers
Dominant soil type	Silt loams with somewhat poor to moderate draining characteristics

Water quality challenges

Everything we do on the land in a watershed affects the quality of the water in our streams, rivers, lakes, wetlands, and groundwater (water naturally stored underground in aquifers). A major source of pollution in streams and lakes comes from "nonpoint" sources. Unlike point source pollution that comes from a single and identifiable source, nonpoint source pollution is caused by rainfall or snowmelt moving across the land as stormwater runoff, picking up pollutants along the way that are carried into local streams and lakes. This is also called stormwater pollution. Pollution can enter bodies of water through stormwater drainage systems as well.

Water quality is generally evaluated by the absence or presence of certain elements (e.g. water chemistry) or attributes (e.g. aquatic biology, physical characteristics of stream network). Although many of these elements are naturally occurring and not innately harmful, it is their excessive concentrations that can negatively affect water quality. The table below provides a summary of common water quality indicators and associated sources or causes of impairment.

Table 2. Water Quality Characteristics

Water Quality Indicator	Potential Primary Sources of Impairment
Chloride	Road salt, water softeners
Fecal coliform	Potentially many, including failing septic systems, pet waste, waterfowl and other wildlife waste, manure, illicit sewer connections, etc.
Dissolved oxygen	Sediment oxygen demand, algal blooms/respiration, hydrologic modification
Phosphorus	Wastewater treatment plants, septic systems, urban & agricultural runoff including pet, waterfowl/wildlife, & livestock waste
Nitrogen	Wastewater treatment plants, septic systems, urban & agricultural runoff including pet, waterfowl/wildlife, & livestock waste
Suspended sediments	Erosion from streambanks, lakeshores, construction sites, agricultural fields

Regular testing of Illinois' streams and lakes for these and other water quality concerns is managed by the Illinois Environmental Protection Agency (EPA). Waterbodies are assessed for certain designated uses (e.g., aquatic life, primary contact, water supply, aesthetic quality) and the results are reported every two years in the *Illinois Integrated Water Quality Report and Section 303(d) List* (Integrated Report). In 2016, Mill Creek was assessed and determined to not be supporting of its primary contact (e.g., swimming, water skiing) designated use. Illinois EPA determined the cause of the primary contact nonsupport is due to fecal coliform (an indicator of bacterial contamination) and stormwater pollution in the form of urban runoff and/or storm sewers.

All communities within the Mill Creek Watershed are dependent on its shallow and deep sandstone aquifers for adequate and safe drinking water as well. Impacts to streams and other aquatic and natural ecosystems that help recharge these groundwater resources are in need of protection. Many areas throughout the Mill Creek Watershed are moderately and highly susceptible to groundwater contamination from industrial chemicals and other sources of pollution. Chlorides from road salts and water softeners are a growing concern for groundwater resources and surface water as well. Failing septic systems can also introduce pollutants into groundwater, streams, and lakes.

Vision for the Mill Creek Watershed

The Mill Creek Watershed-based Plan provides a roadmap for protecting and improving local water quality and thus the quality of life for those that live, work, and play within the Mill Creek Watershed., the steering committee developed the following vision for the future of the Mill Creek watershed:

> *The Mill Creek watershed will be a watershed in which private property owners and public agencies work cooperatively to maintain a functional and healthy system benefiting water quality, biodiversity, and humans.*

In light of the existing challenges facing the watershed, the steering committee also established goals to help guide current and future stakeholders towards the future they envision:

- Improve and protect the ecological integrity of surface water resources to attain or maintain designated uses of aquatic life support, fish consumption, primary contact, and aesthetic quality.
- Protect, restore, expand, and maintain natural areas and open space and increase native aquatic and terrestrial plant and animal species diversity.
- Raise public awareness and increase understanding of the impacts of land use and land/water management decisions on water and habitat quality, and further encourage implementation of watershed protection practices.
- Build, strengthen, and support local partnerships and expertise to protect our streams, lakes, and wetlands via plan implementation.
- Protect the quality and quantity of groundwater.
- Reduce flooding and attendant streambank and shoreline erosion and infrastructure risk through initiatives to improve and protect water quality.

Plan Recommendations

The plan outlines recommendations to address nonpoint source pollution through coordinating, protective, and remedial activities over the next ten years. In order to work towards achieving the pollutant-load reduction, recommendations focus in part on reducing fecal coliform loadings from potential sources. Recommendations also address water quality protection more broadly, including planning, programs, and projects to reduce stormwater runoff volumes and nutrient and sediment loadings entering Mill Creek as well as protect and restore the stream, lake, and wetland, and riparian habitat within the Mill Creek Watershed. The following recommendations were developed collaboratively with the input of local government representatives and other community members.

Continue planning, policy, and programming efforts

The policy, planning, and programming recommendations within the plan focus on actions and initiatives that local government agencies can adopt, improve, or expand on in the near future. Improved coordination and communication of existing efforts as well as advancing water quality and watershed health goals through updating and better aligning comprehensive plans, local plans, and ordinances area common themes that run through these recommendations.

Planning and policy

- Align local plans and ordinances with best practices.
- Coordinate planning efforts to advocate for bike trails and public transportation.
- Develop agricultural resource conservation plans and nutrient management plans.
- Incorporate green infrastructure designs in new and redevelopment projects as well as infrastructure maintenance programs.

Programming

- Coordinate efforts to manage invasive vegetation
- Coordinate efforts to leverage existing and develop new programs to educate and involve watershed residents

Implement BMP Projects

The plan recommends a series of best management practice (BMP) projects to reduce nonpoint source pollution throughout the Mill Creek Watershed. BMP projects may be implemented at a localized level, such as green stormwater retrofits on private property or municipal parcels, while others may require collaboration among county, township, municipal, and other partners, such as stream channel restoration. The plan also calls out over 130 potential sites identified by stakeholders where BMP projects could be implemented within the next ten years to help improve Mill Creek's water quality and watershed health. In addition to these site-specific projects, the plan outlines watershed-wide scenarios to encourage community members to conceptual additional projects within the watershed that would help achieve the plan's water quality goals. A short description of the types of BMP projects identified throughout the plan are described below. (See section 4.3 in the plan for more details on BMP projects.)

Install Urban BMPs

Incorporating BMPs into new construction is much more cost-effective and efficient than retrofitting existing systems. Site stormwater BMPs, beyond naturalized detention basins, should be incorporated at the time of initial design and built during initial construction. The plan calls for a variety of urban BMPs to be installed throughout the watershed including bioretention (and biofiltration) and infiltration facilities, vegetated swales/bioswales, permeable and porous pavements, among others.

Retrofit Urban Stormwater Infrastructure

The plan recommends stormwater infrastructure in developed area be retrofitted to allow for improved pollutant removal efficiencies as well stormwater volume and rate reductions. A variety of retrofits that could be implemented throughout the watershed include detention basin retrofits, hydrodynamic separators, and building retrofits – such as planter boxes and green roofs.

Restore stream channels and riparian buffers

The plan calls for the restoration and stabilization of Mill Creek and its tributaries. Stream restoration projects focus on improving channel sinuosity, installing natural features such as riffles and pools, stabilizing eroding streambanks, removing concrete-lined channels, and daylighting enclosed stream sections. Water quality benefits of stream restoration projects include reducing streambank erosion, trapping suspended sediment, re-oxygenating the water column, and reconnection to the floodplain, among others. In-channel restoration also provides habitat that supports the propagation of fish and macroinvertebrates.

Conduct stream maintenance

The plan recommends that Mill Creek watershed communities work cooperatively with Kane County, park districts, the Forest Preserve District, school districts, HOAs, and private land owners in the long-term ecological management of stream corridors including adjacent wetlands and upland natural areas. Reaches of Mill Creek and its tributaries are in need of debris and trash removal that contributes to overbank flooding, streambank erosion, and sediment deposition.

Restore natural areas

Within the watershed are substantial areas where invasive brush species have overtaken former "natural" areas. The plan recommends invasive vegetation in natural areas be removed and replaced with native vegetation. Restoration activities across the watershed's natural areas – including its woodlands, savannas, grasslands, and natural and farmed wetlands – will help reduce sedimentation and remove stormwater pollutants in streams and wetlands, improve wildlife habitat and biodiversity, promote groundwater recharge, and increase stormwater storage.

Integrate denitrifying bioreactors and saturated buffers

There are numerous opportunities within the Mill Creek Watershed to install woodchip bioreactors (a.k.a. denitrifying bioreactors)—a constructed trench designed to receive and significantly reduce nitrogen (N) levels from drain tile discharge. Drain tiles are prevalent throughout agricultural (and rural residential) portions of the watershed, and their discharges can be a significant source of nitrogen. In addition to the water quality benefits of this BMP, bioreactors do not take agricultural land out of production or decrease drainage effectiveness; they require little or no maintenance, and can last for up to 20 years.

Reduce chloride loadings

The primary approach to address chloride in the Mill Creek watershed is to target chloride loadings from roadway deicing and snow removal activities on public and private roads and parking lots. The plan recommends that public snow removal agencies and private landowners and their contractors evaluate and implement alternative roadway snow and ice management methods. This may include the use of alternative products that have lower or no chloride content to supplement road salt usage, such as beet juice, as well as alternative approaches of snow and ice management such as pretreatment of road surfaces with liquid anti-icing products in advance of winter storm events or pre-wetting solid deicing materials to minimize salt bounce and scatter.

Education and Outreach

The plan outlines a series of recommendation for increasing information, education, and outreach activities within the Mill Creek watershed. The plans also provides detailed information on resources and tools to effectively educate and conduct a watershed outreach campaign. Effective education and outreach is crucial to a watershed plan's success since many watershed problems often result from human actions and solutions. The general public is often unaware of the impact their day-to-day activities have on watershed health and solutions are often voluntary. Education and outreach activities can help raise awareness of threats to local water resources and help motivate changes in behavior to improve watershed health and water quality.

Expected Water Quality Benefits and Costs

Potential pollutant load reductions for nitrogen, phosphorus, sediment, and fecal coliform were estimated as for the site-specific BMP opportunities identified by stakeholders as well as for a suite of "watershed-wide" BMP scenarios. Conceptual level installation cost estimates were based on information available on the proposed BMP projects, typical design components required for such projects, and unit cost information available from other projects in northeastern Illinois and around country. The results are summarized in the table below.

Table 3. Summary of watershed-wide and site-specific BMPs estimated pollutant load reductions and implementation costs.

BMP Type	Scenario	Est. Qty.	Unit	N Reduc. (lb/yr)	P Reduc. (lb/yr)	Sed. Reduc. (t/yr)	FC Reduc. (cfu/yr)	Estimated Cost ($)
Bioretention Facility	WW	210,000	sq ft	7187	356	117	3.65E+13	$ 8,400,000
Rain Garden	WW	359,000	sq ft	3,589	174	79	3.23E+12	$ 4,308,000
Infiltration Trench	WW	38,100	ft	3,509	162	97	2.42E+12	$ 1,905,000
Grass-lined Channel (vegetated swale/ bioswale)	WW	11	ac	1,768	76	29	9.39E+12	$ 11,604,384
Filter Strip - Ag	WW	16	ac	6,160	750	358	2.53E+13	$ 3,240
Filter Strip - Urban	WW	18	ac	18,064	2,452	907	3.13E+13	$ 3,660
Pervious and Porous Pavements	WW	938,600	sq ft	6,495	251	149	8.92E+12	$ 11,263,200
Dry Detention basin retrofit	WW	77	ac	90,546	4,238	1348	4.18E+14	$ 387,000
Wet detention basin retrofit	WW	12	ac	212	30	11	7.18E+11	$ 61,254
Tree Box Filter	WW	89	#	184	9	22	9.90E+11	$ 1,335,000
Hydrodynamic Separators	WW	111	#	4,979	1,063	229	0.00E+00	$ 2,220,000
Green Roof	WW	35	ac	388	20	19	1.57E+12	$ 18,138,384
Denitrifying Bioreactor	WW	32	ac	25,420	0	0	4.35E+13	$ 960,000
Saturated Buffer	WW	25,500 / 51	ft / #	34,354	820	0	4.29E+13	$ 102,000
Riparian Corridor Restoration	WW	80	ac	356,763	16,006	749	1.43E+14	$ 480,000
Prairie Restoration	WW	214	ac	23,039	1,322	54	1.84E+13	$ 535,000
Wetland Restoration	WW	160	ac	47,029	1,660	809	3.98E+14	$ 1,680,000
Streambank Protection	WW	13,000	ft	302	116	186	0	$ 1,814,760

BMP Type	Scenario	Est. Qty.	Unit	N Reduc. (lb/yr)	P Reduc. (lb/yr)	Sed. Reduc. (t/yr)	FC Reduc. (cfu/yr)	Estimated Cost ($)
Bioretention Facility	SS	15.2 / 662,112	ac / sq ft	2,226	74	44	1.20E+13	$ 14,918,947
Cistern	SS	2	#	0	0	0	0	$ 60,000
Constructed Wetland	SS	7.5	ac	232	9	5	4.45E+11	$ 78,750
Dredging	SS	8,500	cy	0	0	0	0	$ 350,000
Filter Strip - Ag	SS	9.4	ac	438	24	12	1.00E+12	$ 862,314
Filter Strip - Urban	SS	4.2	ac	279	7	4	6.65E+11	$ 418,979
Geothermal system	SS	2	#	0	0	0	0	$ 110,000
Grassed Waterway	SS	17.1	ac	899	59	49	1.29E+12	$ 32,387
Grass-lined Channel (vegetated swale/bioswale)	SS	1.5	ac	40	2	1	9.98E+10	$ 2,936,469
Infiltration Trench	SS	140	ft	8	0	0	4.50E+10	$ $15,743
Oak Ecosystem / Woodland Restoration	SS	34	ac	459	21	1	1.06E+11	$ 204,000
Pervious and Porous Pavements	SS	27.3 / 1.19 M	ac / sq ft	152	7	4	1.91E+11	$ 14,745,931
Prairie Restoration	SS	178	ac	1,139	65	3	4.28E+11	$ 847,500
Salinity and Sodic Soil Management	SS	85	ac	0	0	0	0	$ 40,000
Saturated Buffer	SS	3,300 / 2.3	ft / ac	176	4	0	1.06E+11	$ 6,000
Shoreline Protection	SS	7,580	ft	12	5	8	0	$ 1,093,000
Stream Channel Restoration (remeandering)	SS	2660	ft	10	4	6	0	$ 798,000
Stream Channel Restoration (conv. CCLC)	SS	1.7	ac	273	248	40	0	$ 3,021,200
Stream Channel Stabilization	SS	150	ft	9	1	1	5.23E+10	$ 127,362
Streambank Protection	SS	2,600	ft	9	4	6	0	$ 735,000
Wetland Acquisition	SS	12.3	ac	0	0	0	0	$ 93,400
Wetland Enhancement	SS	5.5	ac	132	5	3	7.78E+11	$ $57,750
Wetland Restoration	SS	321.3	ac	9,244	465	206	2.74E+13	$ 6,843,710
TOTALS				**645,725**	**30,509**	**5,556**	**1.23E+15**	**$ 113,597,324**

Notes:
SS = site specific
WW = watershed-wide
n/a = not applicable

ac = acre
ft = feet
# = number
lb = pounds
t = tons
cfu = colony forming units

N = nitrogen
P = phosphorus
Sed. = sediment
FC = fecal coliform
Reduc.=- reduction

Implementing the Plan

Although there is considerable merit in producing a watershed-based plan, actual protection and improvement in water quality in the Mill Creek Watershed will be a result of implementing the plan's various project, planning and policy, programming, as well as education and outreach recommendations. A ten-year schedule for plan implementation was developed with the assumption that the plan will be updated every ten years. It should be noted that implementation of projects and programs is based on a variety of factors including, but not limited to, securing appropriate funding, receiving participation from willing landowners and local governments, and availability of technical assistance resources. Implementation of the outreach and education recommendations will be an on-going effort among partnering organizations, agencies, local governments, homeowners associations, and other groups that are active within the watershed.

To help facilitate plan implementation, it is encouraged that members of the Mill Creek watershed planning steering committee continue to work in their communities to support these efforts. CMAP, other organizations, and consultants can also provide assistance to communities for those recommendations that are related to comprehensive planning, codes and ordinances for water resource protection (e.g., Model Water Use Conservation Ordinance), conservation design, and stormwater best management practices.

Acknowledgements

This project was made possible by Section 604(b) of the Clean Water Act, as amended, and the Illinois Environmental Protection Agency, Bureau of Water, who distributed funds to the Chicago Metropolitan Agency for Planning (CMAP). CMAP, the regional planning agency for the seven counties of northeastern Illinois and the delegated authority for the region's areawide water quality management plan, led the planning process. Support was provided by Kane County's Division of Environmental and Water Resources and Development and Community Services Department, along with the Fox River Study Group and Fox River Ecosystem Partnership. The following agencies and organizations served on the project's steering committee:

Batavia Park District, Campton Township Parks & Open Space, City of Batavia, City of Geneva, City of St. Charles, Forest Preserve District of Kane County, Friends of the Fox River, Garfield Farm Museum, Geneva Park District, Kane County Farm Bureau, Kane-DuPage Soil & Water Conservation District, Mill Creek Special Service Area, St. Charles Park District, The Conservation Foundation, Village of Campton Hills, and Wasco Sanitary District.





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FY20-0011