Chapter 5.0 Prioritized Action Plan

5.1 Introduction

A Prioritized Action Plan has been developed for the East Branch of the South Branch Kishwaukee River Watershed to provide stakeholders guidance on action items for watershed improvement practices. The Prioritized Action Plan serves as a "roadmap" for the implementation of the watershed-based plan and includes recommended watershed-wide and site specific best management practices (BMPs), a prioritized schedule for the implementation of the BMPs, recommendations on agencies and organizations responsible for plan implementation, and estimated BMPs costs.

The Prioritized Action Plan is divided into four subsections:

- Programmatic Action Plan
- Site Specific Action Plan
- Water Quality Monitoring Plan
- Education and Outreach Plan

The Programmatic Action Plan (Section 5.3) is focused on watershed-wide action items that are not site specific while the Site Specific Action Plan (Section 5.4) identifies specific and actual locations where water quality, hydrological modification, and/or flood reduction/prevention projects can be implemented. The Action Items were selected based on their ability to reach the goals and objectives identified by the Watershed Steering Committee for the East Branch of the South Branch Kishwaukee River Watershed (see Chapter 2.0). For each Watershed-wide and Site Specific recommendation a priority ranking was assigned. Additionally, estimated costs and responsible entities for project implementation are also provided.

Section 5.5 includes the Water Quality Monitoring Plan. The Action Items identified in this plan have not been prioritized. However, recommendations on who, what and where the recommendations should be implemented are included.

Section 5.6 includes the Education and Outreach Plan. The Education and Outreach Plan highlights recommended actions that will need additional outreach and education in order to be implemented.

The six most important recommendations are summarized as follows:

1. Remediate existing flood problems and prevent future flooding by reducing stormwater runoff and restoring areas for surface water storage and absorption such as floodplains, depressional storage areas, and wetlands, which also provide water quality improvement benefits.
2. Restore and manage stream corridors by restoring native riparian buffers, removing excessive debris, and stabilizing the streambed and streambanks with practices that also enhance habitat.

3. Use better stormwater management and low impact development practices for new and existing development that slow, filter, infiltrate, cool, and cleanse stormwater runoff.
4. Modify and use planning and development standards, policies, and capital improvement plans and budgets to protect and enhance water quality.
5. Provide public education and outreach to enhance understanding and appreciation of watershed resources and problems and to provide opportunities for people to get involved in watershed improvement activities.
6. Monitor and evaluate watershed plan implementation and physical watershed conditions to gauge progress towards watershed goals.

5.2 Implementation Partners

Implementation of the Prioritized Action Plan cannot be the responsibility of one watershed stakeholder. Successful plan implementation will require coordination and partnerships between numerous stakeholders in the watershed. Key stakeholders in the East Branch of the South Branch Kishwaukee River Watershed are listed in Table 5-1. A brief description of each stakeholder's role in watershed-plan implementation is also included.

Table 5-1 Key Watershed Stakeholders

Watershed Stakeholders	Abbreviation
Corporate and Business Landowners	CBL
Counties	C
DeKalb Community Foundation	DCCF
DeKalb County Highway Department	DCHD
DeKalb County Forest Preserve District	DCFP
DeKalb County Stormwater Management Committee	DCSWMPC
DeKalb County Watershed Steering Committee	DCWSC
Developers and Builders	DB
Drainage Districts	DD
Educational Institutions	EI
Federal Emergency Management Agency	FEMA
Forest Preserve District of Kane County	FPDKC
Golf Courses	GC
Illinois Department of Natural Resources	IDNR
Illinois Department of Transportation	IDOT
Illinois Emergency Management Agency	IEMA
Illinois Environmental Protection Agency	Illinois EPA
Kane County Department of Transportation	KCDOT
Kishwaukee Ecosystem Partnerships	KREP
Municipalities	MUN
Park Districts	PD
Residents/Owners	RO
Soil Water Conservation District	SWCD
Townships	TOWN
US Army Corps of Engineers	USACE
US Department of Agriculture	USDA
US Environmental Protection Agency	US EPA
US Fish and Wildlife Service	US FWS

Corporate and Business Landowners (CBL)
The active participation of CBLs in the planning process can lead to positive impacts on the quality of the East Branch South Branch Kishwaukee Creek Watershed. Businesses and commercial properties can become involved by retrofitting existing detention basins and swales, managing their grounds, roof runoff, and parking lots to reduce stormwater runoff volume and pollutant loadings, and sponsoring watershed events. Coordination with the CBL community can also lead to new development designed to minimize runoff and pollutant loadings.

Counties (C) including DeKalb and Kane
The Counties are responsible for land use planning, development, natural resource protection, and drainage system management in the unincorporated areas of the East Branch South Branch Kishwaukee Creek Watershed. Working with the Counties and their public works, development, water resources, health, and transportation departments, can help ensure responsible, sustainable land use planning, road and sewer maintenance, and public health policies for the watershed.

DeKalb County Community Foundation (DCCF)
The DeKalb County Community Foundation is committed to providing tools and resources to enhance land use planning within the County through a watershed-based approach and provided the local cash match for the watershed-based planning grant. DCCF holds a position on the DeKalb County Watershed Steering Committee. The DCCF Land Use Committee composed of DCCF board members and community stakeholders, prioritizes and funds eligible projects to implement and enhance the County's watershed-based plan and supports watershed planning opportunities for the balance of the County.

DeKalb County Highway Department (DCHD)
DCHD is responsible for the planning, construction, and maintenance of county highways located in the transportation network that covers the East Branch South Branch Kishwaukee River Watershed. Incorporation of BMPs into road projects can help improvethe environmental quality of the watershed.

DeKalb County Forest Preserve (DCFP)
The DeKalb County Forest Preserve District carries out a broad range of ecological restoration and maintenance activities intended to address our core mission: acquire lands to "preserve, protect and restore the flora, fauna and natural beauties, as near as may be, in their natural state and condition, for the education and recreation of our citizens". The DeKalb County Forest Preserve District manages 16 preserves with woodlands, prairies, wetlands and waterways and within the East Branch South Branch Kishwaukee River watershed the Forest Preserve maintains the Great Western Trail.

DeKalb County Stormwater Management Committee (DCSWMPC)
The DeKalb County Stormwater Management Planning Committee is responsible for the creation for the County-wide Stormwater Management Plan and Ordinance. The Committee provides direction for the Plan's implementation and coordinates the County-wide Stormwater Management Ordinance with the municipalities within the boundaries of the County. The Committee monitors and evaluates the implementation of the County-wide

Stormwater Management Plan and Ordinance, and recommends updates and amendments when deemed necessary or appropriate.

DeKalb County Watershed Steering Committee (DCWSC)
The DeKalb County Watershed Steering Committee (DCWSC) is a consortium of municipalities in the watershed, resource agency professionals, environmental advocates, and local residents that established itself to guide the development of strategies to protect and restore the East Branch South Branch Kishwaukee River and its tributaries. It is likely that DCWSC will be the primary lead for the implementation of the watershed-based plan.

Developers & Builders (DB)
As discussed previously in the watershed-based plan, the design and construction of properties can significantly impact a watershed. Developers should be encouraged or required to utilize development techniques that protect water quality and stream health. Builders should properly install and maintain BMPs during the construction phase in order to reduce the potential for sediment-bearing water to be discharged to creek and natural areas.

Drainage Districts (DD)
Drainage districts are local bodies formed for the purpose of draining, ditching, and improving land for agricultural and sanitary purposes.

Educational Institutions (EI)
There are numerous educational institutions such has Sycamore High School and Northern Illinois University located within and near the watershed that can have an integral role in implementing the watershed plan. These educational institutions have expertise in water quality monitoring and environmental education that can be used to support watershed protection and improvement initiatives.

Federal Emergency Management Agency (FEMA)
FEMA is the principal federal agency involved in flood mitigation and flood disaster response. FEMA is responsible for the National Flood Insurance Program, helps municipalities develop and enforce floodplain ordinances, develops floodplain maps, and administers funding for flood mitigation plans and projects.

Forest Preserve District of Kane County (FPDKC)
The Forest Preserve District of Kane County owns and manages a number of acres of open space within the East Branch South Branch Kishwaukee River Watershed. Issues related to the protection and management of these and potential future FPD holdings will rely in part on the FPDKC.

Golf Courses (GC)
Golf courses can help reduce pollutant loadings, especially nutrients, as well as runoff volume by incorporating BMPs into their golf course management programs.

Illinois Department of Natural Resources (IDNR)
Several offices within IDNR provide services that will be key to the implementation of the East Branch South Branch Kishwaukee Creek Watershed Plan for issues related to water

resource management, habitat protection and management, wildlife management, invasive species control, and wetland management.

- The Office of Water Resources (OWR) is responsible for the regulation of floodplain development as well as for the implementation and funding of structural flood control and mitigation.
- The Office of Realty and Environmental Planning (OREP) is responsible for natural resource and outdoor recreation planning. It also administers the Conservation 2000 Ecosystems Program, which provides technical and financial assistance through a grant program for natural resource protection.
- The Office of Resource Conservation (ORC) reviews Clean Water Act Section 404 wetland permits for impacts on fish and wildlife resources; it manages threatened and endangered species issues; it also protects fisheries and other aquatic resources through regulation, ecological management and public education.

Illinois Department of Transportation (IDOT)
IDOT Region 3 is responsible for the planning, construction, and maintenance of portions of the transportation network that covers the East Branch South Branch Kishwaukee River Watershed. Incorporation of BMPs into IDOT projects can improve the environmental quality of the watershed.

Illinois Emergency Management Agency (IEMA)
IEMA is responsible for flood and disaster planning, emergency response, and hazard mitigation. IEMA works with local governments on flood mitigation plans and provides operational support during floods. IEMA also administers FEMA-funded programs in the state, including flood mitigation grant programs.

Illinois Environmental Protection Agency (Illinois EPA) Bureau of Water
The Illinois EPA is responsible for the protection of the state's water resources and ensuring that Illinois' rivers, streams and lakes will support all uses for which they are designated including protection of aquatic life, recreation and drinking water supplies. The Illinois EPA also provides technical assistance and administers several state and federal grant programs, including Section 319 funding, which helps local governments, not-for-profits, and other stakeholders to complete projects that are aimed at reducing nonpoint source pollution.

Kane County Division of Transportation (KCDOT)
KDOT is responsible for the planning, construction, and maintenance of county highways located in the transportation network that covers the East Branch South Branch Kishwaukee River Watershed. Incorporation of BMPs into KDOT projects can help lead to improvements in the environmental quality of the watershed.

Kishwaukee River Ecosystem Partnership (KREP)
The Kishwaukee River Ecosystem Partnership is a group of open space agencies, conservation organizations and local governments in the Kishwaukee River watershed organized under the auspices of the Illinois Department of Natural Resources to protect and restore the high water quality and habitat values of the river and its tributary streams.

Municipalities (all departments) (MUN)
Municipalities (i.e., local elected officials and local agency staff) have the principal responsibility for land use and development planning, establishing legislative and administrative policies, adopting ordinances and resolutions, setting zoning standards, establishing the annual budget, appropriating funds, and setting tax rates. Municipalities are a critical stakeholder in watershed protection efforts because they are responsible for the enforcement of local land use and development ordinances.

Parks Districts (PD)
Park Districts maintain numerous recreational facilities and parks in the watershed. Partnerships with local park districts can help ensure the preservation of open space while also facilitating recreational and other community opportunities that can help increase support for watershed protection efforts.

Residents and Owners (RO)
The activities of residential landowners, often unknowingly, can have a significant impact of the quality of a watershed. Practices such as excessive lawn fertilization application, disposal of trash and yard waste in waterways or encroachment riparian buffers can be significant sources of nonpoint pollution. Recommendations of the watershed-based plan should include development of education and outreach programs that inform residents about potential consequences of their actions and present alternative actions. Additionally, political pressure from local residents on municipal, township, county, state and federal officials can lead to increased efforts focused on water quality protection and flood remediation.

Soil and Water Conservation Districts (SWCD) including DeKalb and Kane/DuPage
Soil & Water Conservation Districts are locally operated units of government functioning under Illinois law. The SWCD's mission is to promote the protection, restoration, and wise use of the soil, water, and related resources within the district. They provide technical and educational resources in the areas of soils and land use, water quality, soil erosion in both urban and agricultural land uses, conservation program needs, wildlife habitat, and native ecosystem restoration and management.

Townships (TOWN)
While unincorporated townships generally play a secondary role in watershed protection, they often have responsibility for road upkeep and occasionally sponsor drainage system improvement projects. The use of BMPs by townships, especially for road maintenance, can help improve water quality and stream habitat within the watershed.

U.S. Army Corps of Engineers (USACE)
USACE plays a major role in wetland protection and regulation through Section 404 of the Clean Water Act, which requires USACE to administer permit applications for alterations to wetlands that are considered Waters of the United States.

U.S. Department of Agriculture (USDA)
USDA's Farm Services Agency (FSA) has several programs that support watershed protection and restoration efforts. Under the Conservation Reserve Program (CRP), farmers receive annual rental payments, cost sharing, and technical assistance to plant vegetation for land they put into reserve for 10 to 15 years. The Conservation Reserve Enhancement

Program (CREP) targets state and federal funds to achieve shared environmental goals of national and state significance. The program uses financial incentives to encourage farmers and ranchers to voluntarily protect soil, water, and wildlife resources. The Grassland Reserve Program (GRP) uses 30-year easements and rental agreements to improve management of, restore, or conserve up to 2 million acres of private grasslands. The USDA Natural Resource Conservation Service (NRCS) Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on tribal and private working lands. The USDA NRCS Environmental Quality Improvement Program (EQIP) provides financial and technical assistance to agricultural producers in order to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.

U.S. Environmental Protection Agency (USEPA)
The USEPA oversees the environmental protection efforts of the Illinois EPA and is the ultimate source for Section 319 and other environmental improvement programs. Section 404 of the Clean Water Act, which regulates the dredging and filling of wetlands, is jointly administered by USEPA and the U.S. Army Corps of Engineers.

U.S. Fish and Wildlife Service (USFWS)
The USFWS provides technical assistance to local watershed protection groups. It also administers several grant and cost-share programs that fund wetland and aquatic habitat restoration. The USFWS also administers the federal Endangered Species Act and supports a program called Endangered Species Program Partners, which features formal or informal partnerships for protecting endangered and threatened species and helping them to recover. These partnerships include federal partners as well as states, tribes, local governments, nonprofit organizations, and individual landowners.

5.3 Programmatic Action Plan

The Programmatic Action Plan includes recommended BMPs that are applicable watershed-wide and has been divided into two sections. The first section is focused on recommendations that are applicable across the watershed to meet the goals identified by the Watershed Steering Committee. The second section provides a review of the existing stormwater and development ordinances applicable in the watershed and provides recommendations for changes aimed at improving water quality and stream health and the reduction of flooding in the watershed.

Section 5.3.1 Programmatic Action Plan

As discussed in Chapter 2, the watershed-wide goals identified by the Watershed Steering Committee include:

A. Protect and enhance overall surface and groundwater quality in the East Branch South Branch Kishwaukee River Watershed
B. Reduce existing flood damage in the watershed and prevent flooding from worsening

C. Improve aquatic and wildlife habitat in the East Branch South Branch Kishwaukee River Watershed
D. Develop open space in the East Branch South Branch Kishwaukee River Watershed and provide recreational opportunities
E. Increase coordination between decision makers and other stakeholders in the Watershed.
F. Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

The Programmatic Action Plan includes measures related to each goal. This Programmatic Action Plan includes remedial, preventative, regulatory, and maintenance action items that are applicable throughout the watershed. This Programmatic Action Plan should be considered as general guidance for all watershed stakeholders and plan implementers.

The Programmatic Action Plan is presented in table format (Tables 5-2 to 5-7). The tables include the recommended action item/BMP, priority, cost, responsible lead agencies or organization with greatest potential to implement the recommendation, and support agencies or agencies who could assist with technical, financial, or regulatory assistance or whose programs may be impacted by the recommendations. Each recommendation is given a unique ID number (ID#). As some recommendations appear in multiple tables, the ID number will link these recommendations.

Cost estimates are only provided for best management practices that involve construction or engineering costs such as streambank stabilization, native plantings, and feasibility studies. Costs are not included for preventative measures such as outreach and educational programs or regulatory actions. The cost estimates are included for advisory purposes only. The cost estimates are concept level costs and are most useful to compare the relative costs of the recommended BMPs. More detailed costs can be developed when site constraints are more fully investigated and preliminary engineering is conducted.

Each of the BMPs was assigned a priority status and classified as high (H), medium (M), or low (L). Priority status was assigned based on need, cost, potential funding opportunities, and technical needs. High priority action items should be considered short-term goals (1-5 years) while medium and low priority action items are considered long-term goals (greater than 5 years).

Goal A: Protect and enhance overall surface and groundwater quality in the East Branch South Branch Kishwaukee River Watershed

Objectives

1) Implement stormwater best management practices (BMPs) throughout the watershed to improve water quality by reducing nonpoint source pollution.
2) Restore riparian buffers along East Branch South Branch Kishwaukee River and its tributaries.
3) Promote conservation tillage practices to reduce soil erosion and sedimentation
4) Promote nutrient management both in the rural and urban setting to alleviate the over application of nutrients

5) Encourage decision makers to undergo a groundwater study that includes detailed analysis of groundwater use and development of regulatory programs/recommendations aimed at protecting and improving groundwater quality.

As discussed in Chapter 3, stormwater runoff is one of the primary sources of water quality impairment in the watershed. The causes and sources of water quality impairment in the East Branch South Branch Kishwaukee River watershed are directly related to the existing land use in the watershed. As the land use in the watershed moves from natural to agriculture to urban, corresponding modifications of the steam channel, floodplain, wetlands, and riparian corridor have and will continue to occur. In the late 1800s as people moved into the watershed, they drained wetlands by excavating ditches as a means of removing water so that the land could be used for agriculture. It appears that the majority of the streams that make up Virgil Ditch #1, Virgil Ditch #2, Virgil Ditch #3, and Union Ditch #2 were manmade. These manmade ditches are unstable and channelized. Additionally, the natural occurring stream channels of Union Ditch #1, Union Ditch #3, and the East Branch South Branch Kishwaukee River were also channelized during the late 1800s and early 1900s as a means of increasing flow capacities to move water away from the agricultural field as quickly as possible.

There are problems resulting from the channelization of streams and manmade ditches. Channelization is detrimental for the health of streams and rivers through the elimination of suitable instream habitat for fish and wildlife by limiting the number of natural instream features such as pool-riffle sequences in the channel. Additionally, in many locations, a berm comprised of historic side-cast dredge spoils cuts off the stream channels from the floodplain.

Additionally, hydromodification, defined as human induced activities that change the dynamics of surface or subsurface flow, is prevalent in the watershed. Impacts from hydromodification can be seen as early as the late 1800s with the draining of wetlands, construction of the ditches, and the channelization of streams to increase agricultural production. Early settlers of the Midwest quickly realized that the soils found under wetlands and wet prairies were ideal for crop production once the water was removed. In order to "dry" the wetlands and the wet prairies, systems of sub-surface drainage tiles were installed in order to re-route the groundwater away from the wetlands and wet prairies and discharged into streams and ditches. Given that the drain tiles were drained by gravity flow, the receiving surface water needed to be a lower elevation than the tile. As such, ditches were installed and naturalized stream channels were often excavated to a deeper depth and straightened to facilitate quicker drainage of the fields. Once the water was removed, these areas could be put into successful agricultural production. This creation of agricultural land was at the cost of the loss of wetlands, wet prairies, and riparian habitat. Hydromodification attributed to the installation of drain tiles is prevalent throughout the East Branch South Branch Kishwaukee River.

Starting in the mid-1900s, the municipalities in the watershed including the City of Sycamore and the Villages of Cortland and Maple Park began to transition from rural communities into more suburban communities. This transition from rural to suburban is continuing to occur across the watershed as growth pressure increased from the communities located east

and west of the watershed. Without proper planning, the transformation to a more suburban environment the East Branch South Branch Kishwaukee River watershed will begin to experience water quality and habitat degradation.

As of means of protection and improving water quality, the use of stormwater best management practices (BMPs) and the preservation and restoration of the natural drainage system (overland flow paths, streams, and floodplain) should be required in all new development and encourages in areas that have been previously developed. Drainage and detention in existing areas should be retrofitted or repaired to better control runoff rates and volume as well as to improve water quality. Natural and existing drainageways should also be preserved and/or restored to the extent practicable to reduce the impacts of hydrologic modification within the watershed.

All landowners and stakeholders within the watershed have the ability to improve water quality by managing land and property to prevent or remove pollutants in runoff before they are washed into the stream. The implementation of stormwater BMPs is the responsibility of all landowners (for existing development) and developers and builders (for new development). However, municipalities must require or encourage these practices to be installed. Preservation of remaining natural drainage and storage features of the landscape is the responsibility of the private and public land owners. Additionally, the management and maintenance of the stormwater management system (detention basins, storm sewer pipes, drainage swales, etc) is primarily the responsibility of municipalities, unless management of these features has been assumed by a homeowners association or other party.

Programmatic actions aimed at the protection and enhancements of surface and groundwater quality are listed in Table 5-2.

Table 5-2 Water Quality and Groundwater Programmatic Actions

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
1	Watershed-wide	Implement a water quality monitoring program aimed at assessing the current condition of the East Branch of the South Branch of the Kishwaukee River watershed and to assess changes in water quality associated with the implementation of the watershed-based plan.	A1, C1	H	DCWSC	EI, C, MUN	S	n/a	
2	Watershed-wide	Develop a Riparian Landowner Handbook to educate riparian landowners on their responsibilities and easement requirements.	A1, A4, C2	H	DCWSC	SWCD, DCCF	S	$5,000-$20,000	
3	Watershed-wide	Implement a waterside-wide stream maintenance program to remove debris and repair problematic or undersized hydraulic structures.	A1, A2, A4, B2, C1	M	C, DD	USACE, RO	M	$20 per linear foot	
4	Watershed-wide	Update the detailed inventory of all detention and retention basins in the watershed to document storage capacity, vegetation, maintenance needs, etc to identify potential retrofit opportunities.	A1, A2, A3, B4	H	C, MUN	DCWSC, KREP	S	$5,000-$7,000	
5	Watershed-wide	Develop a maintenance plan for all detention and retention basins in the watershed to ensure effective operation and provide maximum detention, water quality benefit, and habitat. The plan should identify who is responsible, a maintenance schedule, budget and funding source.	A1, A2, A3, B4	M	C, MUN	DCWSC, KREP	M	n/a	
6	Watershed-wide	Utilize naturalized detention basins in new development and retrofit existing single function dry bottom detention basins to provide multiple benefits including reducing pollutant loads and proving habitat. Upgrade and maintain existing basins to provide water quality benefits and slower release rates.	A1, A2, A3, A5, B4	M	C, MUN	DCWSC, KREP, DB	M	varies	
7	Watershed-wide	Stabilize eroding shorelines and replace turf pond edges with native vegetation.	A1, A2, A3, C2	L	DD, MUN	RO, CBL	L	$100 per linear foot	

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
8	Watershed-wide	Develop stream restoration guidelines to provide guidance to riparian landowners on methods of streambank stabilization, riparian buffer restoration, and other bioengineering techniques.	A1, A2, A4, C2	M	USDA, SWCD	DCSWC	M	$5,000-$20,000	
9	Watershed-wide	Review and updated local landscaping and stormwater requirements to promote the use of native vegetation in water quality BMPs.	A1, A2, A4, C2, D1	H	C	MUN	S	n/a	
10	Watershed-wide	Develop stormwater BMPs for handling residential stormwater including downspouts and sump pumps. Flow should be directed onto a lawn or areas landscaped with native vegetation.	A2, A5, B4	H	C, DCWSC	MUN	S	varies	
11	Watershed-wide	Encourage septic system owners to properly maintain their septic systems. Provide information on routine maintenance evaluations.	A2, A7	H	C	MUN	S	n/a	
12	Watershed-wide	Develop recommendations for outreach regarding the importance of groundwater quality and quantity.	A6, A7	M	DCWSC	DCCF, SWCD, USDA	M	n/a	
13	Watershed-wide	When replacing pavement use pervious or porous pavement or permeable pavers where appropriate to increase infiltration and reduce runoff volumes.	A1, A2, A3, A5, B4	M	KCDOT, DCHD	MUN, TOWN	M	$2 to $6 per square foot	
14	Watershed-wide	Retrofit roadways and parking lots to allow stormwater to enter infiltration BMPs (rain gardens, swales, etc)	A1, A2, A3, A5, B4	L	C	CBL, MUN, TOWN	L	$40-$60 per square yard	
15	Watershed-wide	Where feasible, convert existing swales and open drainageways to infiltration BMPs with native landscaping.	A1, A2, A3, A5, B4	M	DCWSC	C, MUN	M	$40-$60 per square yard	
16	Watershed-wide	Encourage the implementation of stormwater BMPs in new developments and in redevelopment projects above the minimum requirements.	A1, A2, A3, A5, B4	H	C, MUN	DB	S	varies	

Goal B: Reduce existing flood damage in the watershed and prevent flooding from worsening

Objectives

1) Encourage decision makers to undertake a detailed hydraulic and hydrology study of the watershed.
2) Mitigate for existing flood damage by identifying parcels suitable for flood mitigation projects.
3) Reconnect channelized stream segments to the floodplain where feasible.
4) Implement stormwater best management practices (BMPs) throughout the watershed designed to reduce runoff and encourage infiltration.
5) Protect undeveloped floodplain from development.

Flooding and risk of flooding occurs throughout the East Branch of the South Branch of the Kishwaukee River Watershed. The flooding and increased flood risk is primarily a result of historical development within the floodplain, or the construction of restrictive structures that would not meet current hydraulic criteria. However, some flooding may also be related to the changes in land use over time. The changes in land use, particularly prior to countywide stormwater management ordinances, lead to modifications to the floodplain and wetland areas, increased impervious surfaces, and increased rate and volume of stormwater runoff. While the flooding noted in the watershed is not extensive in terms of area affected, the flooding is extremely destructive and disruptive to those suffering from the flood damage. As such, addressing the current and future flood problem areas is important for those affected. Current flooding that occurs in the watershed includes:

- Overbank flooding from a waterway
- Local drainage problems (shallow flooding on roads, yards and sometimes buildings) often due to development in a drainage way, inadequately maintained drainage ditches, undersized storm sewers, and storm sewers.
- Depressional flooding in areas where water ponds in a natural depression in the landscape and there is no natural outlet for runoff. May be caused by failed or sewer or adjacent or surrounding development causing increased runoff into the depressional area.
- Sanitary sewer backups may occur, flooding basements, when stormwater infiltrates into the sanitary sewer pipes, leaky manholes, or inappropriate connections to the sanitary lines.

Increasing drainage capacity for the flooded areas will likely require the installation of new or larger sewer pipes, larger culverts, larger bridges, or improving the capacity of drainageways and ditches. Additionally, the flood storage capacity of the areas could be increased through the construction new detention facilities or the retrofitting of existing facilities to increase storage capacity. Floodproofing options, such as raising structures or the low water entry points above the level of flooding are also available but are not typically preferred solutions as they don't address the source or cause of flooding.

Programmatic actions aimed at reducing existing flood damage and preventing the flooding from worsening are listed in Table 5-3.

Table 5-3 Flood Mitigation Programmatic Actions

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
3	Watershed-wide	Implement a waterside-wide stream maintenance program to remove debris and repair problematic or undersized hydraulic structures.	A1, A2, A4, B2, C1	M	C, DD	USACE, RO	M	$2 per linear foot per year for maintenance. Hydraulic structures at >$100,000 each	
4	Watershed-wide	Update the detailed inventory of all detention and retention basins in the watershed to document storage capacity, vegetation, maintenance needs, etc to identify potential retrofit opportunities.	A1, A2, A3, B4	H	C, MUN	DCWSC, KREP	S	$5,000-$7,000	
5	Watershed-wide	Develop a maintenance plan for all detention and retention basins in the watershed to ensure effective operation and provide maximum detention, water quality benefit, and habitat. The plan should identify who is responsible, a maintenance schedule, budget and funding source.	A1, A2, A3, B4	M	C, MUN	DCWSC, KREP	M	n/a	
6	Watershed-wide	Utilize naturalized detention basins in new development and retrofit existing single function dry bottom detention basins to provide multiple benefits including reducing pollutant loads and proving habitat. Upgrade and maintain existing basins to provide water quality benefits and slower release rates.	A1, A2, A3, A5, B4	M	C, MUN	DCWSC, KREP, DB	M	varies	
10	Watershed-wide	Develop stormwater BMPs for handling residential stormwater including downspouts and sump pumps. Flow should be directed onto a lawn or areas landscaped with native vegetation.	A2, A5, B4	H	C, DCWSC	MUN	S	varies	

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
13	Watershed-wide	When replacing pavement, use pervious or porous pavement or permeable pavers where appropriate to increase infiltration and reduce runoff volumes.	A1, A2, A3, A5, B4	M	KCDOT, DCHD	MUN, TOWN	M	$7 to $12 per square foot	
14	Watershed-wide	Retrofit roadways and parking lots to allow stormwater to enter infiltration BMPs (rain gardens, swales, etc)	A1, A2, A3, A5, B4	L	C	CBL, MUN, TOWN	L	$40-$60 per square yard	
15	Watershed-wide	Where feasible, convert existing swales and open drainageways to infiltration BMPs with native landscaping.	A1, A2, A3, A5, B4	M	DCWSC	C, MUN	M	$40-$60 per square yard	1
16	Watershed-wide	Encourage the implementation of stormwater BMPs in new developments and in redevelopment projects above minimum amount required.	A1, A2, A3, A5, B4	H	C, MUN	DB	S	varies	
17	Watershed-wide	Prepare a detailed H&H model of the watershed to identify all flood problem areas. Cost varies based on level of detail and project deliverables.	B1, B2, B3, B4, B5	H	C, MUN	FEMA, EI	S	$75,000 to $300,000	
18	Watershed-wide	Identify flood mitigation opportunities in the watershed by creatings additional storage and/or maintaining/improving the local drainage through the installation of new or larger sewer pipes, larger culverts, or improving or increasing the capacity of drainageways.	B2, B3, B4, B5	L	CO, MUN	FEMA	L	varies	
19	Watershed-wide	Create/restore wetlands and depressional areas within the watershed	B2, B3	M	SWCD, USDA	RO, DB	M	$10,000 to $60,000 per acre	
20	Watershed-wide	Identify locations where the incised stream channel can be reconnected to the floodplain	B1	L	SWCD, USDA	DCSWC, RO, DB	L	varies	
21	Watershed-wide	Provide information to residents living within and along the 100-year floodplain on the benefits of a functional floodplain.	B5	H	CO, MUN	FEMA, DCWSC	S	n/a	

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
22	Watershed-wide	Mitigate flood damages by floodproofing or elevating at-risk structures.	B4	L	CO, MUN	FEMA, CBL, RO		$25 to $75 per sq. ft. of structure	

Goal C: Improve aquatic and wildlife habitat in the East Branch South Branch Kishwaukee River Watershed

Objectives

1) Identify opportunities for improving habitat along degraded stream channels using a natural channel design.
2) Identify opportunities for wetland restoration, creation and preservation within the watershed.
3) Restore riparian buffers along the East Branch South Branch Kishwaukee River and its tributaries.
4) Encourage local residents to utilize native species in their landscapes.
5) Identify opportunities for habitat improvements at parks and natural areas.

Streambank erosion is threatening property, damaging infrastructure, and degrading water quality and riparian habitat. Stabilization, restoration and management of the stream channel, streambank and riparian corridor are needed throughout the watershed to improve water quality, maintain floodplain functions, and improve aquatic and wildlife habitat both within and near the streams. Practices that are needed include restoring instream habitat such as pools and riffles, removing excessive debris from the stream channel, establishing naturalized streambanks with native plants, and managing stream corridors by restoring native riparian buffers.

Through easement agreements, most private landowners are responsible for maintaining the stream and riparian zone as it crosses their property or flows along a property line. This includes all aspects of management and maintenance including debris removal, stabilization of streambanks, and management of private stormwater outfall pipes such as sump pumps and downspouts. Exceptions to the private landowner responsibility exist where the stream flows through publically owned lands such as parks and within right-of-way easements. As problems within the stream and riparian corridor are directly related to land use and other activities upstream in the watershed, it is important that all landowners living within the watershed (not just those living adjacent to the creek) work together on implementing the watershed-based plan.

Programmatic actions for the improvement of aquatic and wildlife habitat are detailed in Table 5-4.

Table 5-4 Programmatic actions for the improvement of aquatic and wildlife habitat

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
2	Watershed-wide	Develop a Riparian Landowner Handbook to educate riparian landowners on their responsibilities and easement requirements.	A1, A4, C2	H	DCWSC	DCCF, SWCD	S	$5,000-$20,000	
3	Watershed-wide	Implement a waterside-wide stream maintenance program to remove debris and repair problem hydraulic structures.	A1, A2, A4, B2, C1	M	C, DD	USACE, RO	M	$20 per linear foot	Watershed-wide
7	Watershed-wide	Stabilize eroding shorelines and replace riprap, concrete and turf pond edges with native vegetation.	A1, A2, A3, C2	M	DD, MUN	RO, CBL	M	$100 per linear foot	
8	Watershed-wide	Develop stream restoration guidelines to provide guidance to riparian landowners on methods of streambank stabilization, riparian buffer restoration, and other bioengineering techniques.	A1, A2, A4, C2	M	USDA, SWCD	DCSWC	M	$5,000-$20,000	
9	Watershed-wide	Review and updated local landscaping and stormwater requirements to promote the use of native vegetation in water quality BMPs.	A1, A2, A4, C2, D1	H	C	MUN	S	n/a	
23	Watershed-wide	Use bioengineering techniques in sections of hierologically modified channel to improve instream and streamside habitat.	C1,C 2	M	RO	USACE, SWCD, USDA	M	$50-$150 per linear foot	
24	Watershed-wide	Restore instream and riparian habitat in conjunction with road and bridge improvement projects.	C1,C2	M	KCDOT, DCHD		M	Varies	
25	Watershed-wide	Provide information to residents and business owners on the benefits of native landscaping.	C3	H	DCWSC	SWCD, KREP	S	n/a	
26	Watershed-wide	Promote native plant and native seed exchanges and/or sales.	C3	H	DCWSC	SWCD, KREP	S	n/a	

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
27	Watershed-wide	Where feasible, daylight and re-meander streams that have been contained in ditches or moved underground into culverts and pipes.	C1, C2	L	C, DD, SWCD	RO	L	$575 per linear foot	
28	Watershed-wide	For moderately and severely eroded stream reaches, develop a stream restoration plan and cost estimate.	C1	M	SWCD, DD	C, MUN, USACE	M	varies	
29	Watershed-wide	Establish native riparian buffers along all unbuffered or inadequately buffered stream reaches.	C2, C3, D1, D2	H	SWCD, DD	NRCS, RO	S	$12-$25 per linear foot	
30	Watershed-wide	Restore streams and aquatic habitat to a health stream condition by installing habitat features such as natural channel substrates and pools and riffles.	C1	L	DCWSC, SWCD	KREP, RO, USDA	L	$250-$500 per linear foot	
31	Watershed-wide	Prepare a Natural Areas Management Plan for all public lands in the watershed as a means of identifying opportunities for habitat improvement projects.	C4, D1, D2	M	C	MUN	M	$5,000-$20,000	
32	Watershed-wide	Prevent the spread and control existing populations of invasive plant species.	C4, D2	M	KREP, SWCD	C, DD, MUN, RO	M	varies	

Goal D: Develop open space in the East Branch South Branch Kishwaukee River Watershed and provide recreational opportunities

Objectives

1) Identify open space along the waterways that would provide access to the waterway.
2) Identify open space aimed at protecting and preserving natural resources
3) Identify areas that can be used for multiple uses (trails, passive recreations)
4) Support DeKalb and Kane Counties' Future Land Use Plans which promote conservation and open space corridors
5) Encourage private landowners to install filter strips or riparian buffers along stream corridors

There are approximately 1,542 acres (1.96% of the watershed) of open space, parks, and forest preserves in the watershed. Open space and natural areas such as stream and riparian corridors, wetlands, and parks that remain undeveloped provide storm and flood water protection, serve as natural buffers for streams, and serve as passive and active recreational spaces for residents and visitors to the watershed. As such it is important for the watershed-based plan to identify ways of restoring/creating naturalized open space and improving access to creeks for recreational activities.

Programmatic actions for the development of open space and recreational opportunities are presented in Table 5-5.

Table 5-5 Programmatic actions for the development of open space and recreational opportunities

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
29	Watershed-wide	Establish native riparian buffers along all unbuffered or inadequately buffered stream reaches.	C2, C3, D1, D2	H	SWCD, DD	NRCS, RO	S	$12-$25 per linear foot	
31	Watershed-wide	Prepare a Natural Areas Management Plan for all public lands in the watershed as a means of identifying opportunities for habitat improvement projects.	C4, D1, D2	M	C	MUN	M	$5,000-$20,000	
32	Watershed-wide	Prevent the spread and control existing populations of invasive plant species.	C4, D2	M	KREP, SWCD	C, DD, MUN, RO	M	varies	
33	Watershed-wide	Form partnerships to develop grant applications for the protection of open space and the expansion of trails and greenways.	D1, D2	H	DCSWC, DCCF	PD, DCFP, FPDKC	S	n/a	
34	Watershed-wide	Identify opportunities for municipalities to encourage the use of green infrastructure and open space preservation in new developments.	D1, D2	H	MUN	C	S	n/a	
35	Watershed-wide	Encourage all municipalities in DeKalb County to incorporate the recommendation of the DeKalb County Greenways and Trail Plan into their comprehensive plan.	D2	H	C	DCCF, MUN	S	n/a	

Goal E: Increase coordination between decision makers and other stakeholders in the Watershed.

Objectives

1) Encourage communities to adopt the East Branch South Branch Kishwaukee River Watershed-Based Plan.
2) Encourage the adoption and/or revision of comprehensive plans and ordinances that support the watershed plan's goals and objectives.
3) Encourage communities to continue to be an active member of the Watershed Steering Committee following plan development.

Due to the nature of the watershed, activities in one area of the watershed can impact water resources in another part of the watershed even when those areas seem distant and unconnected. And subsequently, the actions of all those living within the watershed have impacts, whether negative or positive, on the health of East Branch of the South Branch of the Kishwaukee River and its tributaries. As such, the participation and coordination of all watershed stakeholders is necessary for water quality and habitat improvements and flood reduction in the watershed. No single person, municipality or entity can effectively implement the watershed-based plan alone.

Many of the recommendations in the plan require technical expertise and require significant funding to implement. As such, coordination across property and jurisdictional lines is vital for the successful implementation of the plan. By working together, stakeholders can share expertise and equipment making projects that one entity could not do alone feasible. Additionally, available monies can be combined and leveraged for maximum benefits.

Programmatic actions for the development of coordination between decision makers and watershed stakeholders are presented in Table 5-6.

Table 5-6 Programmatic actions for the development of coordination between decision makers and watershed stakeholders

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
36	Watershed-wide	Encourage the adoption of the Watershed-Based Plan by all jurisdictions located in the watershed.	E1, E2	H	C	DCWSC, MUN	S	n/a	
37	Watershed-wide	Continue to meet as the Watershed Steering Committee in order to facilitate plan implementation and conduct progress evaluations.	E1, E3	H	DCWSC	C, DD, MUN	S	n/a	
38	Watershed-wide	Members of the Watershed Steering Committee should work together to prepare grant applications and develop funding packages for the implementation of the plan's recommendations.	E3	H	DCWSC	DDCF	S	n/a	
39	Watershed-wide	Incorporate the watershed-based plan's goals, objectives, and recommendations in to municipal codes, regulations and comprehensive plans.	E1, E2, E3	H	C, MUN		S	n/a	
40	Watershed-wide	Hire a watershed coordinator to assist the Watershed Steering Committee with plan implementation.	E3	M	DCWSC	C, DCCF, MUN	M	$12,000	
41	Watershed-wide	Provide training and educational outreach to municipal officials and engineers on the goals, objectives, recommendations, and implementation of the watershed-based plan.	E1, E2	H	DCWSC	DCCF	S	n/a	

Goal F: Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

Objectives

1) Provide watershed stakeholders with an outreach plan that gives them the skills needed to implement the watershed plan.
2) Develop an urban outreach program for communities that will focus on stormwater management. This may include rain gardens, bioswales, and rainwater capturing.
3) Promote conservation programs for the agricultural community including providing meetings and tours to showcase BMPs.
4) Introduce new concepts into agriculture such as "nutrient farming" or as sometime referred to as "pay for environmental services" programs.

Even the best plan for managing watersheds and controlling nonpoint source pollution cannot succeed without community participation and cooperation. An aggressive public outreach and education program, therefore, is essential and must be nurtured. Because many water quality problems result from individual actions and the solutions are often voluntary practices, effective public involvement and participation to promote the adoption of management practices is necessary. The needed public buy-in and support is impossible unless stakeholders understand their role in watershed protection and restoration and are willing to make changes in their behavior that will help achieve overall watershed goals. A well designed and implemented education and outreach plan is necessary to facilitate changes in stakeholders' opinions and actions.

Programmatic actions for education and outreach are presented in Table 5-7.

Table 5-7 Programmatic actions for education and outreach

ID#	Location	Recommendation/BMP	Goals + Objective	Priority	Lead Agency	Supporting Agency	Timeframe	Project Cost	Status
42	Watershed-wide	Provide training and educational outreach to municipal officials and engineers on the goals, objectives, recommendations, and implementation of the watershed-based plan.	E1, E2, F3	H	DCWSC, DCCF	C, MUN, SWCD	S	n/a	
43	Watershed-wide	Offer workshops to homeowners on native landscaping and other stormwater BMPs.	F2, F3	M	DCWSC, DCCF	KREP, SWCD	M	n/a	
44	Watershed-wide	Encourage interested watershed residents to join the Kishwaukee Ecosystem Partnership.	F1	M	KREP		M	n/a	
45	Watershed-wide	Maintain the watershed planning website to keep the public informed on plan implementation activities.	F2, F3	H	DCWSC, DCCF	C	S	n/a	
46	Watershed-wide	Hold watershed workshops in parks and other open spaces.	F2, F3	M	DCWSC, DCCF	KREP, SWCD	M	n/a	
47	Watershed-wide	Educate riparian property owners on ways to improve riparian conditions for water quality and habitat.	F3	H	DCWSC, DCCF	SWCD	S	n/a	
48	Watershed-wide	Educate homeowners associations, developers, and municipalities about the importance of protecting open space, incorporating stormwater BMPs, and maintenance strategies for existing BMPs.	F2, F3	H	DCWSC, DCCF	DB	S	n/a	
49	Watersged-wide	Install signs at major brodge crossings that include the name of the creek and the watershed.	F2	H	DCWSC	DPT	S	$100-200 per sign	

Section 5.3.2 Regulatory Ordinance Review and Recommendations

Stormwater and floodplain management regulations govern allowable development practices and the required stormwater management controls to prevent future water quality degradation and future flood damages. Since much the watershed is undeveloped, development regulations will play a major role in protecting the watershed going forward. The need for this review of current regulations and recommendations for enhancing these regulations was identified by stakeholders as an important element of the watershed plan.

All of the watershed is regulated by State of Illinois rules and regulations, some of which have become increasingly restrictive and more protective of water quality in the last few years. Stormwater discharges from construction sites are regulated by General NPDES Permit No. ILR10 (current rules became effective 8-1-13). Municipal Separate Storm Sewer Systems (MS4s), are regulated by General NPDES Permit No. ILR40 (expired 03-31-14, expected to be reissued soon). There are also many other state and federal permits that apply to projects with certain types of impacts, but ILR10 and ILR40 are the two of the most broadly reaching, respectively applying to every project that disturbs more than one acre, and every community that operates storm sewers.

Both DeKalb County and Kane County have implemented countywide regulations that set minimum standards for stormwater and floodplain management. Communities may adopt these ordinances with additional restrictions. Based on a review of local ordinances, it was not evident that any communities have adopted amendments to the county ordinances that included significantly more restrictive stormwater regulations. Therefore, this review focuses on regulations that have been established at the county level by both DeKalb and Kane Counties.

Stormwater performance standards that protect the waterways can generally be classified in six categories.

1. Drainage and Detention
2. Soil Erosion and Sediment Control
3. Water Quality
4. Riparian Buffers
5. Wetlands
6. Floodplain Management

For each of these categories, summaries of the current regulations and recommendations potential enhancements are provided below. However, the first summary section includes the definition of regulated development. The definition of regulated development is critical because it determines when and how the performance standards apply.

Regulated Development – The definition of a regulated development identifies what activities are subject to regulation. For DeKalb County, regulated development is identified as a list of activities in Section 7.1 of the ordinance. DeKalb County has a comprehensive list of regulated activities and is possibly one of the most inclusive lists in Illinois. It includes all development that disturbs over 10,000 sq. ft., any construction within 100 feet of a waterway, lake or wetland; and all construction within the Special Flood Hazard Area. While certain agricultural activities involving under one acre are exempted, other development

activities on agricultural land are subject to the ordinance. Also notable is that new residential developments with unincorporated DeKalb county are not allowed, so these types of development will always fall under the jurisdication of a municipality.

Kane County also includes a comprehensive list of "development" activities. While the definition of development determines which types of projects area subject to the ordinance, there is a secondary list in Section 200 (b) that defines which developments must provide detention. Non-residential properties must be at least one acre in size and new residential developments must be at least three acres in size with two or more homes in order for detention storage to be required. Redevelopment projects that impact at least 25,000 square feet are also required to provide detention storage. The minimum development sizes for requiring detention are similar to some nearby counties and less restrictive than others. Kane County should evaluate and consider the potential benefits and impacts of lowering the minimum development size for requiring detention.

Drainage and Detention – In DeKalb County, the required release rate is 0.2 cfs per acre for the 100-year event, unless a development is within 1.5 miles of a municipality in which case it is 0.15 cfs per acre or the adopted release rate (if more restrictive) of that community. In practice, the application of this dual release rate system would have little noticeable effect on the future flooding conditions of a community. Both release rates are much less than an undetained development and it is unlikely that the incremental difference between the two rates (0.05 cfs per acre) is significant enough to be noticeable for a subset of developments within the context of a large watershed. This rule does have the beneficial practical effect of preventing developments from "ringing" a municipality to avoid potentially more stringent release rates. However, the limitations placed on residential development within unincorporated areas also serve this purpose.

In DeKalb County, The peak release rate for the 2-year event and lesser storms is required to be less than pre-development conditions. In practice, this is a challenging requirement to enforce because it hinges on an existing conditions release rate computation that must be submitted by the developer. Standardizing the regulation of the 2-year event should be considered by adopting a constant release rate.

DeKalb County requires maintenance plans for the both the short and long term maintenance of stormwater facilities. If maintenance is to be conducted by a property owners' association, the ordinance acknowledges that the developer must inform them of their responsibility. Experience in other counties has shown that without strong provisions requiring stormwater maintenance, many stormwater features fall into disrepair as associations end up not conducting the appropriate preventative maintenance and then lack the funds to implement major repairs. Future development may lead many more stormwater management features in the county. One consideration could be to include a requirement provisions for financing necessary maintenance be included in deed restrictions or other contractual agreements. In Kane County, the maintenance requirements are similar, but in the absence of a public entity taking responsibility for maintenance, then a special service area is required as a primary or secondary vehicle for collecting funds that are dedicated to maintenance.

Kane County requires that the release for developments required to provide detention be 0.1 cfs per acre for the 100-year storm. It has been found that this release rate also provides control of smaller storm peaks, such as the 2-year storm.

Both counties require the preservation or replacement of any depressional storage volume that is present under predevelopment conditions.

Soil Erosion and Sediment Control – Both county ordinances include requirements for soil erosion and sediment control measures. In addition, all areas of the watershed are protected by ILR10, which when properly followed and enforced provides adequate protection to the watershed from soil erosion and sedimentation.

Water Quality – The capture, reduction and treatment of runoff through green infrastructure and stormwater best management practices are well proven methods for improving the water quality of stormwater from developed areas.

The DeKalb County stormwater ordinance references a runoff reduction hierarchy, but as in many other counties, this provision lacks clarity or detail needed for effective enforcement of this rule. Other counties are moving toward volume control or performance based regulations that specify how the development must reduce volume of runoff leaving the site. There is a growing variety of methods for implementing this type of regulation. Regulations from nearby counties such as McHenry, Lake, DuPage and Cook should be reviewed to determine if any of these approaches to this issue would be an acceptable starting point in DeKalb County.

Kane County requires that the runoff from a 0.75 inch rainfall event over the hydraulically connected impervious area of the new development be stored below the elevation of the primary gravity outlet (retention) of the site runoff storage facility. This provision provides incentive to disconnect and reduce impervious areas and provides additional credit for not disturbing soils and installing deep rooted vegetation. The intent of this requirement is to enhance the water quality of stormwater that is discharged from detention basins. In light of the expanding range of green infrastructure techniques that have evolved over the last decade, an ordinance amendment (Article 16) was adopted to provide additional guidance and flexibility in meeting the retention standard. Article 16 provides guidance on a number of retention based stormwater BMPs that can be used to meet the Kane County 0.75-inch retention standard. This expanded range of practices has enhanced the ability of designers to implement and receive credit for various water quality, stormwater BMPs and green infrastructure solutions.

Riparian Buffers – Healthy Riparian environments reduce flood flow rates and volumes, help to stabilize banks, reduce pollutants and sediment that enter waterways, and provide wildlife habitat. Effective regulation of riparian buffers will protect and enhance the waterways in the watershed.

In DeKalb County, all areas of floodplain are zoned as a floodplain/conservation district (FP/C). Development is restricted within FP/C to a list of restricted uses that generally involve open space and passive recreation. While buffer is defined, there are no

requirements for riparian buffers. The county should consider the benefits of including requirements for riparian buffers.

Kane County regulates linear buffers along waters of the U.S. and jurisdictional and isolated wetlands associated with water courses. The buffer requirement is 50 feet for lineal waters of the U.S. that have a drainage area greater than 640 acres or that are designated as high habitat or high functional value by the Advanced Identification of Aquatic Resources (ADID) study, or have an adjacent wetland with a calculated Floristic Quality Index (FQI) greater than 16. For lineal waters of the U.S. with less than 640 tributary acres, the buffer width varies based on the upstream area.

Wetlands – DeKalb County requires that all development within 100 feet of a wetland be permitted under the stormwater management ordinance. A buffer width of 25 feet is required around all existing wetlands. There are no other provisions that are more protective than the U.S. Army Corps of Engineers (ACOE) Section 404 rules. Additional rules to define and protect isolated wetlands should be considered.

Kane County regulates isolated wetlands that are not regulated by the ACOE when the minimum impact is greater than or equal to 0.10 acre. There are no minimum impact requirements and mitigation requirements are based on the quality of the wetland. Required Buffer widths can vary from 15 to 50 feet around wetlands dependent on size and quality.

Floodplain Management – Both counties participate in the National Flood Insurance Program. Both counties restrict filling of the floodplain and require compensatory storage for any proposed filling. In DeKalb County, all areas of floodplain are zoned as a floodplain/conservation district (FP/C). Development is restricted within FP/C to a list of restricted uses that generally involve open space and passive recreation. The flood protection elevation (a requirement that structure be elevated above the floodplain) has been defined as 2 feet in both DeKalb and Kane Counties (Kane County has a higher FPE of 3 feet along the Fox River).

Section 5.4 Site Specific Action Plan

In addition to the programmatic recommendations, which generally apply watershed wide, site specific action items and recommendations are tied to a particular location in the watershed. As with the programmatic actions, these site specific recommendations were developed to address watershed problems, to improve watershed resources, and to achieve the watershed goals and objectives.

The process of identifying specific sites that are in need of, or suited to, watershed improvement projects has been ongoing during the planning process and will continue throughout plan implementation. Watershed improvement projects in the site specific plan range from small maintenance and repair tasks, to mid-size projects such as detention basin retrofits to the construction of large regional storage facilities.

During development of the watershed-based plan, several methods were used to identify project sites.

1) Members of the DCWSC provided site and project recommendations during meetings.
2) Watershed stakeholders provided site and project recommendations during public meetings.
3) New data was collected and project opportunities were identified during the field assessments conducted as part of the watershed planning process.
4) Extensive map analysis using existing data including land use, wetlands, soil, floodplain, etc. was used to identify locations where beneficial projects could be implemented.

The Site Specific Plan is summarized in table format (Table 5-8). The table includes the recommended BMP, priority, cost, responsible lead agencies or organization with greatest potential to implement the recommendation, and support agencies or agencies who could assist with technical, financial, or regulatory assistance or whose programs may be impacted by the recommendations. Each recommendation is given a BMP ID number (ID#). Following the summary table, Sections 5.4.1 through 5.4.7 provide greater detail on the site specific recommendations.

The provided cost estimates are included for advisory purposes only. The cost estimates should not be interpreted as concept costs and are best used to compare the relative costs of the recommended BMPs. More detailed costs can be developed once site constraints and additional conceptual or preliminary engineering activities are conducted. Funding for these projects will likely come from state and federal grants and local sources. See Chapter 6.0 for additional information on potential funding sources.

Each of the BMPs was assigned a priority status and classified as high (H), medium (M), or low (L). Priority status was assigned based on need, cost, potential funding opportunities, and technical needs. High priority action items should be considered short-term goals (1-5 years) while medium and low priority action items are considered long-term goals (greater than 5 years).

Figure 5-1 shows the location of the Site Specific Projects.

Table 5-8 East Branch South Branch Kishwaukee River Watershed Site Specific Action Plan

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
East Branch South Branch Kishwaukee Subwatershed									
50	at Martin's Ditch	1.5 miles	Stabilize streambanks to reduce the potential for flooding, reduce infrastructure loss and damage, and reduce sediment and pollution loads.	L	Sycamore	DeKalb County	L	Initial Study $25,000; project components starting at $250,000 and potentially ranging up to $4M (longterm)	
51	at B&O Auto Yard	6.8 acres	Install infiltration-based BMPs (rain gardens, bioswales, etc) to capture, store, and remove pollutants from site operations prior to discharging into the East Branch South Branch Kishwaukee River. Develop a Pollution Prevention Plan for site operations.	M	CBL	DeKalb County	M	$50,000 to $500,000	
52	at DeKalb County Government Center	TBD	Install infiltration-based BMPs (permeable pavers/pavement, bioretention basins) in planned parking lot expansion.	H	DeKalb County		S	$15-$50 per square foot (bioinfiltration)	
53	at Evergreen Mobile Home Park	20 acres	Support DeKalb County initiative to remove structures from the floodplain.	H	DeKalb County		S	$1,500,000	
54	South of Elm Street and north of	4.2 acres	Install roadside infiltration-based BMPs (rain gardens, bioswales, etc) in residential areas constructed prior to 1998 to store, capture, and remove pollutants from road runoff	L	DCWSC	Sycamore	L	$15-$50 per square foot (bioinfiltration)	

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
55	at Sycamore Wastewater Treatment Plan	TBD	Explore the feasibility of the construction of a post-treatment polishing wetlands in conjunction with any future plant expansion	L	Sycamore		L	$75,000-$100,000	
56	Parkside Preserve and adjacent 80 acres	80 acres	Stabilize and restore streambanks. Investigate the feasibility of utilizing the site for wetland creation.	H	Sycamore Park District		S	$50-$150 per foot of streambank stabilization and $25,000 to $75,000 per acre of wetland creation	
57	Blue Heron Creek	5.8 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	M	DCWSC, RO	DD, RO	M	$75-200 per foot of active work areas	
58	E Branch S Branch Kishwaukee River just north of Bethany Road and Fenstemaker Road	1.7 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species. Investigate the feasibility of river restoration to reduce poor hydraulic performance.	M	DD, RO	USDA, SWCD	M	$75-200 per foot of active work areas	
59	E Branch S Branch Kishwaukee River near Peace Road	2.0 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	H	DD, RO	USDA, SWCD	S	$75-200 per foot of active work areas	
Union Ditch Subwatershed									
60	At Fulton Drive	4.1 acres	Retrofit existing turf grass detention basin for increased filtering/pollutant removal.	L	DB; DCWSC	Maple Park	L	$10,000 to 25,000 per acre	

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
61	At Union Ditch #2 and County Line Road	0.2 acres	Install an infiltration –based BMP to capture, store, and treat road runoff prior to discharge into Union Ditch #2.	M	DeKalb County	Maple Park	M	$15-$50 per square foot (bioinfiltration)	
62	East of County Line Road between Willow Road and Washington Road	0.66 acres	Install roadside infiltration-based BMPs (rain gardens, bioswales, etc) in residential areas constructed prior to 1998 to store, capture, and remove pollutants from road runoff.	M	DCWSC	Maple Park	M	$15-$50 per square foot (bioinfiltration)	
63	West of Somonauk Road between Carol Avenue and North Avenue	0.95 acres	Install roadside infiltration-based BMPs (rain gardens, bioswales, etc) in residential areas constructed prior to 1998 to store, capture, and remove pollutants from road runoff.	M	DCWSC	Cortland	M	$15-$50 per square foot (bioinfiltration)	
64	East of Somonauk Road between Constoga Avenue and Maple Avenue	0.76 acres	Install roadside infiltration-based BMPs (rain gardens, bioswales, etc) in residential areas constructed prior to 1998 to store, capture, and remove pollutants from road runoff.	L	DCWSC	Cortland	L	$15-$50 per square foot (bioinfiltration)	
65	at Maple Park Wastewater Treatment Plan	TBA	Explore the feasibility of the construction of a post-treatment polishing wetlands in conjunction with any future plant expansion	L	Maple Park		L	$75,000-$100,000	

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
66	at Virgil Forest Preserve	1, 124 acres	Remove trees along drainage ditches, create a 100-150' buffer along the edges and plant with deep rooted native species to stabilize erosion areas along ditch banks.	H	FPDKC		S	$150,000	
67	at Virgil Forest Preserve	1, 124 acres	Map existing drain tile and work with the Village of Virgil and adjacent property owners to isolate groundwater drainage, from surface drainage or other systems connected to the groundwater drainage system.	M	FPDKC		M	$200,000	
68	at Virgil Forest Preserve	1, 124 acres	Install water level control structures and drain tile improvements to allow water level management for wetland creation and flood management.	L	FPDKC		L	$150,000	
69	Union Ditch #32– Maple Park Branch	2.5 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	M	DD, RO	USDA, SWCD	M	$75-200 per foot of active work areas	
70	Union Ditch south of Sycamore to the Union DD	1.9 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	M	DD, RO	USDA, SWCD	M	$75-200 per foot of active work areas	
71	Virgil Ditch #1 West limits of Virgil #1 DD	2.3 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species. Expand Drainage District limits to include area.	H	DD, RO	USDA, SWCD	S	$75-200 per foot of active work areas	
72	Headwaters of Virgil #1	N/A	Develop a Digital Terrain Model and/or detailed hydrologic and hydraulic study utilized to locate, prioritize, and design stormwater BMPs.	L	Kane County, Elburn		L	$15,000	

BMP ID#	Location	Approximate Size	Recommendation/BMP	Priority	Lead Agency	Supporting Agency	Timeframe	Approximate Cost	Status
Virgil Ditch Subwatershed									
66	at Virgil Forest Preserve	1,124 acres	Remove trees along drainage ditches, create a 100-150' buffer along the edges and plant with deep rooted native species to stabilize erosion areas along ditch banks.	H	FPDKC		S	$150,000	
67	at Virgil Forest Preserve	1, 124 acres	Map existing drain tile and work with the Village of Virgil and adjacent property owners to isolate groundwater drainage, from surface drainage or other systems connected to the groundwater drainage system.	M	FPDKC		M	$200,000	
68	at Virgil Forest Preserve	1, 124 acres	Install water level control structures and drain tile improvements to allow water level management for wetland creation and flood management.	L	FPDKC		L	$150,000	
73	Virgil Ditch #3 from Winters Road to Route 64	1.9 miles	Develop and implement stream corridor management program to remove debris jams and nuisance and invasive species.	H	DD, RO	USDA, SWCD	S	$75-200 per foot of active work areas	

5.4.1 Stream Corridor Restoration Projects

BMP ID#50: Martin's Ditch Streambank Stabilization

Martin's Ditch is an urban ditch that drains the central portion of the City of Sycamore. Martin's Ditch originates at the outfall of the stormwater retention basin located south of the intersection of Borden Road and Prairie Drive. From this point, it flows north into another storage basin and then through a residential area, eventually crossing under DeKalb Avenue and IL 64. North of IL 64, Martin's Ditch flows under Cross Street and continues in a northwesterly direction to its confluence with the East Branch South Branch Kishwaukee River near the City of Sycamore Waste Water Treatment Plant.

Martin's ditch is severely confined with residential properties (primarily constructed in the early 20th century) lining its banks for much of its length. Driveways, lawns, residential structures and out buildings are frequently located within 10 feet of the top of bank. The waterway is confined to a very narrow corridor with no buffer along almost its entire length. There are some areas that appear to be in reasonably stable condition without bank protection. There are also many isolated locations where rock, walls, or concrete has been used to stabilize the bank. Finally, there are exposed soil streambanks evident, but these areas likely don't experience severe rates of erosion because the ditch continues to be highly confined. With a highly confined waterway located so close to residential properties, it is likely that some adjacent land owners have replenished or rebuilt streambanks or installed armoring to prevent property loss. However, recent or direct evidence of this occurring was not discovered.

The large detention basins at the upstream end of Martin's Ditch are likely serving to prevent severe flooding of the properties that so closely line the waterway. The primary concern for Martin's Ditch is that all urban runoff from adjacent streets, yards, driveways is discharged directly into the waterway with no opportunity for infiltration, filtering or treatment. Streams that area so close to residential properties also seem to frequently be used for illicit dumping of yard waste or other unwanted items or chemicals. Achieving some separation from adjacent properties would improve the health of Martin's Ditch and reduce pollution discharged from this waterway.

A corridor study should be conducted to determine if a corridor could be reestablished along the ditch to create some buffer from adjacent properties and streets. If properties fall into disrepair or foreclosure, there may be opportunities to assemble properties for a future open space corridor, there also appear to be several unimproved lots along the ditch that may also offer opportunities to restore a stream corridor. Exposed banks could be repaired and stabilized and a buffer area could be established along the waterway. Other communities have successfully implemented programs where they opportunistically acquired properties over time and were eventually able construct an open space stream corridor where properties formerly lined the waterway as with Martin's Ditch. The main water quality benefit associated with the Martin's Ditch streambank stabilization is the reduction of urban non-point source pollutants. Additional benefits include the creation of wildlife habitat, reduce damage to infrastructure, and reduced localized flooding.

BMP ID#56: Parkside Preserve and adjacent lands

The East Branch South Branch Kishwaukee River flows in a northerly direction through lands owned by the Sycamore Park District east of Bethany Road near Quigley Road. Parkside Preserve is situated on the west side of the river and is approximately 30 acres in size. The Sycamore Park District has also acquired 80 acres on the east side of the East Branch South Branch Kishwaukee River. Bank erosion is prevalent along both banks of the East Branch South Branch Kishwaukee River though the Sycamore Park District property. Soft-stabilization measures such as grading to eliminate steep slopes and scour areas, with the subsequent planting of native vegetation, and bioengineering practices should be utilized to stabilize the eroding streambanks. The main water quality benefit associated with the streambank stabilization along the East Branch South Branch Kishwaukee River is the reduction of non-point source pollutants including sediment generated from erosion and in-stream sediment movement. Additional benefits include the creation of wildlife habitat.

BMPID#58: E Branch S Branch Kishwaukee River just north of Bethany Road and Fenstemaker Road

Based upon a review of historic maps, it appears that the existing channel in this location has been straightened and channelized for over 100 years. In its present condition, this reach of the South Branch of the Kishwaukee River provides little to no water quality and wildlife habitat benefits to the watershed other than flood conveyance. Two concepts for enhancing this reach that will provide multiple benefits including water quality enhancement, in-stream habitat, wetland habitat, aesthetic beautification, and potential passive recreation opportunities are described below.

Restoration

The term restoration, as used here, refers to re-establishing historic conditions including channel alignment, meanders, and wetlands to the extent practical. Historic maps, aerial photos, and other resources would be used to guide the design of the re-creation of the historic channel and wetlands. Current hydrology and hydraulics would also have to be considered to ensure there are no adverse flooding impacts, and so that the wetland functions as intended. Re-creation of historic conditions would be achieved primarily through earthwork to re-align the channel to add meanders, re-connect the channel to its floodplain, and to create in-stream hydrodynamic variability through the creation of pools and riffles. Streamside and wetland vegetation would also need to be carefully designed and planted to establish desirable habitats.

Enhancement

The second option for the subject reach would involve leaving the channel in its current location for the most part. Careful planned and executed earthwork would reconnect the channel to wetlands created/restored within the floodplain. Some in-stream work – such as the creation of pools and riffles – could also be accomplished to provide additional water quality and aquatic habitat benefits. Streamside and wetlands vegetation would also need to be thoughtfully designed and planted to achieve the desired goals.

5.4.2 Digital Terrain Modeling and/or Hydraulic and Hydrologic Study

BMP ID#72: Headwaters of Virgil Ditch #1

The headwaters of the Virgil Ditch #1 originate in the northwest quadrant of the Village of Elburn. In the early 2000s, this headwater area has been experiencing commercial and residential development that appears to be altering the flow characteristics of Virgil Ditch #2 downstream of the development. It is recommended that a Digital Terrain Model (DTM) grid be developed to assist with the creation of a flowpath diagram for the subject area. The flowpath diagram represents an idealized representation of how water would flow along the ground surface assuming that all the sewers are full and all lakes, depressional areas and other low-lying areas are full of water. This flowpath diagram can highlight potential project sites by looking for flowpath junctions at problem areas to determine if there is a significant upstream tributary area that could justify the project location.

In addition, a detailed hydrologic and hydraulic study of the subject area could be conducted. This study would take into consideration the current land use, storm sewers, open channels, detention / retention basins and overland flow paths. This study could then be utilized to locate, prioritize, and design improvement projects.

5.4.3 Stream Corridor Management Programs

BMP ID#57, 58, 59, 69, 70, 71, and 73– Various Watershed Locations

Numerous locations in the watershed have been identified as being prone to woody debris jams. Many different types of woody debris can be found in a stream ranging in size from small to large. Small floating debris such as sticks and small limbs may form minor, temporary jams that are easily swept downstream during higher flows. There are usually no significant maintenance problems associated with this small floating debris. Medium floating debris consists of larger tree limbs and sticks introduced into the stream by bank erosion, wind, or the natural shedding of riparian trees and other vegetation. This type of debris could present a maintenance problem if it accumulates at culvert or bridge structures. Large woody debris consists of one to several "key" logs, four inches or more in diameter and at least six feet long, which act as a base on which other stream-borne debris accumulates. Large woody debris (LWD) may include intact branches and may be above or below the water surface or partially submerged. Both medium and LWD present a problem in the East Branch South Branch Kishwaukee River Watershed.

Any medium debris accumulated at culverts and bridge structures should be removed as it can restrict stream flow and cause localized flooding. The presence of LWD is a bit more challenging to handle as it presence can be beneficial or hazardous to the stream and surrounding lands depending on where it is located. Recognizing how LWD is organized in a stream, and how each component functions, is necessary before deciding how and when to remove or modify the structure. A Stream Corridor Management Program should be developed for each of the noted problem areas to provide land owners and municipalities the information needed to assess LWD structures and make decisions about their removal or management.

The Stream Corridor Management Plans should include the following six sections:

1. A discussion on the physical properties (flow characteristics, erosion, sedimentation, etc) of LWD structures including their hazards and benefits.

2. A toolbox of appropriate measures (removal, trimming, anchoring, etc) for remediating hazard LWD structures in the watershed.
3. A methodology (field inspection checklist) for assessing LWD in the watershed.
4. A Field Inventory of all LWD structures with the identified stream reach.
5. A Maintenance/Removal Plan for all hazard LWD structures found within the assessed stream reach.
6. A reference list that includes applicable permits that may be required when dealing with LWD and funding sources and technical resource professionals that may be able to assist with LWD maintenance projects.

5.4.4 Wetland Creation/Restoration and Native Landscaping Restoration

Project #66, 67, and 68 – Virgil Forest Preserve

The Forest Preserve District of Kane County (FPDKC) owns the 1,124-acre Virgil Forest Preserve which is location near the Village of Virgil in the Virgil Ditch and Union Ditch subwatersheds. This expansive preserve was created in 2006 by eight different land acquisitions. Although the fields are currently in cultivation, management plans for the area include large-scale restoration of woodlands and prairies. Using maps from the 1830s, the KCFPD plans to recreate the meandering streams and wetlands that were channelized during the height of agricultural development.

The East Branch South Branch Kishwaukee River Watershed Plan recommends three projects that will assist the FPDKC of completing its vision for the Virgil Forest Preserve:

1. Remove trees along drainage ditches, create a 100-150' buffer along the edges and plant with deep rooted native species to stabilize erosion areas along ditch banks;
2. Map existing drain tile and work with the Village of Virgil and adjacent property owners to isolate groundwater drainage, from surface drainage or other systems connected to the groundwater drainage system; and
3. Install water level control structures and drain tile improvements to allow water level management for wetland creation and flood management.

5.4.5 Urban Projects

Projects #52, 54, 61, 62, 63, and 64 – Infiltration BMPs

Proposed infiltration-based projects such as rain gardens, bioswales, and bioinfiltration basins are proposed for the East Branch South Branch Kishwaukee River Watershed. The main functions of the infiltration-based BMPs are to reduce the velocity of storm water flow and runoff and to provide a water quality filtration device. Infiltration-based BMPs can also create an aesthetically pleasing green space for nearby residents and recreational users.

Implementation consists of removing existing vegetation along with grading the project area to the proper size and slope. An appropriate native seed mix is then spread on the area and perennial vegetation can also be planted. If desired, wetland vegetation can be used on the bottom of the BMP if standing water is expected. Directing water to the infiltration-based BMP is accomplished by grading the surrounding area so that it slopes to the BMP, or incorporating curb cuts into the adjacent street so water flows into the BMP rather than into curb inlets. If installed correctly and maintained over time, infiltration-based BMPs can be an effective best management practice to manage stormwater.

BMP ID#61 is the construction of an infiltration-based BMP on the southeast corner of County Line Road and Union Ditch #2. In its present configuration, drainage from County Line Road is directed via a concrete-lined channel to a catch basin that drains directly to Union Ditch #2. The removal of the concrete-lined channel and the construction of an infiltration-based BMP with native vegetation would provide water quality treatment such as sediment, nutrient, and heavy metal reduction to runoff generated from County Line Road.

There are several areas within incorporated Cortland, Maple Park, and Sycamore that were constructed without detentions (BMP ID#54, 62, 63, and 64. These areas have roadside swales that collect and transport stormwater from the houses, driveways, and roads to the storm sewer system. From the storm sewer system, the stormwater flows untreated into the waterways. The Watershed Plan recommends that a feasibility study to explore opportunities for retrofitting the roadside swales into infiltration swales and rain gardens. By constructing infiltration swales and rain gardens in these areas, the volume and velocity of stormwater runoff generated in these neighborhoods can be reduced.

As a means of calculating the acreage of infiltration-based BMP, the Kane County Stormwater Ordinance retention requirement was utilized. This retention provision requires that the 0.75 inch rainfall event over the hydraulically connected impervious area of development be captured and stored. Table 5-9 lists the recommended acreage of infiltration-based BMP to be installed within each Project area. Note the acreage assumes that each BMP is approximately 1-foot in depth.

Table 5-9 Recommended Acreage of Infiltration-Based BMP

BM ID#	Project Area (acres)	Recommended Acreage of Infiltration-based BMP
54	185.3	4.2
62	29.2	0.66
63	42.1	0.95
64	33.6	0.76

The East Branch South Branch Kishwaukee River Watershed Plan also recommends the construction of infiltration-based BMPs in areas of re-development or new construction. For example, an expansion to the DeKalb County Government Center is planned in the near future. It is recommended that infiltration-based BMP such as bioswales and/or and bioinfiltration basins be utilized in the project design over traditional stormwater management techniques such as turf grass detention basins and turf grass swales.

BMP ID#52: Permeable Pavements

Permeable pavements refer to paving materials that promote the absorption of rainfall and snowmelt. With traditional pavement, the asphalt or concrete is sloped so that rain and snow melt is directed quickly into storm drains and off of the paved surfaces and into the storm sewer system or on-site detention basin. However, a permeable pavement system is constructed with an underdrain and infiltration trench comprised of gravel underneath the paver, porous concrete, or porous asphalt. Rain that falls on the permeable pavement infiltrates into the gravel and then into the soil and/or groundwater below. Once the storage capacity of the infiltration trench has been reached, the underdrain will convey the water into the storm sewer system or on-site detention basin. By infiltrating the majority of

the stormwater that falls onto the permeable pavement, the amount of water and pollution flowing into storm sewers or directly into streams is greatly reduced. Thus, permeable pavement helps maintain a more stable baseflow to streams, reduces flood peaks, and reduces streambank erosion. Permeable pavement also has the ability to improve water quality. Suspended solids are removed through filtration of water through the gravel layer and dissolved pollutants such as nutrients and metals are removed and/or transformed as runoff infiltrates into the soil.

The East Branch South Branch Kishwaukee River Watershed Plan also recommends the use of permeable pavements in areas of re-development or new construction. For example, an expansion to the DeKalb County Government Center is planned in the near future. It is recommended that permeable pavements be used for its parking facility.

BMP ID#60: Wetland/Naturalized Detention Basin Retrofits

Traditional detention basins with turf grass side slopes are designed to prevent flooding by storing stormwater and slowly releasing the stored water into streams or storm sewers. Naturalized detention basins and wetland detention basins are designed not only to provide flood storage but also to treat stormwater and create wildlife habitat.

The greatest benefit of naturalized and wetland detention basins over traditional detention basins is the wetland bottom detention basin's ability to reduce the amount of pollutants in stormwater runoff. Suspended sediments and attached pollutants such as phosphorus and metals are settled out of the stormwater and captured in the basin. Dissolved pollutants such as nitrogen and organic matter is filtered out and/or transformed by the vegetation and as the runoff infiltrates into the underlying soils. The use of native plants on the side slopes also reduces shoreline erosion that is typically observed on turf grass basins. Wetland detention areas provide the most effective water quality benefits when they are at least 3-5 percent as large as the watershed they serve.

Naturalized detention basins typically have an open water basin with native grasses along the side slopes. In a naturalized detention basin retrofits the storage capacity of the basin remains unchanged but the side slopes are replanted with native grasses, shrubs and wildflowers.

Wetland detention basins are designed to mimic the stormwater benefits and aesthetics of natural wetland systems by utilizing wet-tolerant native plants on the side slopes and bottom of the basin. The basins are designed to hold water at all times, whether it be standing water above the ground surface or water saturated just below the soil's surface. Prior to the conversion of a traditional detention basin to a wetland detention basin, a hydrologic and hydraulic should conducted to determine the profile changes necessary in the basin to support wetland vegetation while maintaining its stormwater management function.

During the watershed planning process, moderate shoreline erosion was observed at the detention basin located north of Fulton Drive. As such, it is recommended that basin be naturalized as a means of correcting and preventing erosion.

5.4.6 Wastewater Treatment Polishing Wetlands

BMP ID#55 and 65: City of Sycamore WWTP and Village of Maple Park WWTP

There are two wastewater treatment plants (WWTP) located within the East Branch South Branch Kishwaukee River Watershed: City of Sycamore WWTP (BMP ID#55) and the Village of Maple Park WWTP (BMP ID#65). Both facilities have NPDES permits for their discharge (See Chapter 3.0 for more information on NPDES permits) and are in compliance with the requirements set forth in their permits. However, to ensure the long-term protection of the WWTPs receiving waters, the East Branch South Branch Kishwaukee River and Union Ditch #2, the Watershed Plan recommends that both WWTPs explore the feasibility of the construction of a wastewater treatment "polishing" wetlands as a part of any plant expansion.

Constructed "polishing" wetlands are engineered systems that have been designed and constructed to utilize the natural processes involving wetland vegetation, soils, and their associated microbial assemblages to assist in treating wastewater. These wetlands can provide an important "final touch" to conventional wastewater treatment processes, and are an especially attractive option for consideration if a new plant is being sited or an existing plant expanded. They are designed to take advantage of many of the same processes that occur in natural wetlands, but do so within a more controlled environment. Polishing wetlands can assist WWTPs in meeting and exceeding water quality standards. Wetlands are known to be effective in reducing levels of many pollutants, especially nutrients.

5.4.7 Other Projects

BMP ID#51: B&O Auto Yard

The B&O Auto Yard is an auto salvage yard located along the East Branch South Branch Kishwaukee River. Salvage yards provide a valuable service that contributes to our environmental quality of life through the recycling of auto parts and scrap metals, and conservation of our natural resources. However, without planning and preventative measures, stormwater runoff from the auto salvage operations has the potential to negatively impact water quality. Potential pollutants typically generated at auto salvage yards include oil and grease, ethylene and propylene glycol, total suspended solids (TSS), biological oxygen demand (BOD), heavy metals, and acidic pH.

It is recommended that the B&O Auto Yard develop a Pollution Prevention (P2) Plan that addresses the following waste streams and issues:

1. Practices for used fluids including antifreeze, cleaners, brake fluid, refrigerants, solvents, used oil, and window-washing fluid;
2. Practices for auto parts including airbags, batteries, brake shoes and clutches, catalytic converters, engines, glass, lead parts, mercury switches, radiators and heater cores, tires, torque converters, transmissions, upholstery, and used oil filters;
3. Hazardous waste;
4. Wastewater;
5. Stormwater;
6. Mobile wash services;
7. Storage tanks; and
8. Spill reporting.

Due to its location immediately adjacent to the East Branch South Branch Kishwaukee River and concerns of watershed stakeholders, it is recommended that the B&O Auto Yard conduct a stormwater sampling program to quantify the volume and quality of stormwater that is generated from the site. The results of the stormwater sampling should be used to develop stormwater management BMPs for the site operations. Stormwater BMPs could range from typical stormwater management facilities (detention basins, swales, etc) to engineered systems for treating stormwater runoff from industrial facilities.

BMP ID#53: Evergreen Mobile Home Park

DeKalb County, IL received a mitigation grant from the Federal Emergency Management Agency in June of 2012 to purchase and close the Evergreen Village mobile home park. The 125-unit mobile home park is located entirely within the floodway of the East Branch of the Kishwaukee River, and includes a sanitary treatment plant, paved access roads, and 300+ residents. The site has experienced repeated flooding throughout the 40 years it has been in existence, and is a source of pollutants within the watershed. The project, scheduled for completion by June of 2015, will return the 19.6-acre property to open space and maintain it as such in perpetuity.

5.4.8 Agricultural Projects/Practices

There are many best management practices (BMPs) that are available and appropriate for implementation in agricultural areas. The Natural Resource Conservation Service (NRCS) Illinois Field Office Technical Guides (FOTG) document conservation practices applicable to farming in Illinois and provide details on standards and specifications for these BMPs. The standards describe the conservation practices and where it applies; while the specifications describe the detailed site-specific requirements for constructing, installing, and/or implementing the practice. Many of the BMPs recommended in Chapter 5 of this Watershed-Based Plan are included in the NRCS Illinois FOTG.

As 84.34% (66455.72 acres) of the East Branch of the South Branch of the Kishwaukee River Watershed is used for agricultural purposes, the use of BMPs on agricultural lands is imperative to ensure the protection and improvement of water quality in the watershed. As selecting specific site locations for agricultural practices has many considerations including owner willingness to participate, land configuration, and crop management practices already in place, the Watershed-Plan includes a list of general practices that should be implemented throughout the watershed where practicable. These include: nutrient management and/or integrated pest plans, conservation crop rotation, conservation tillage, contour farming, terracing, grass waterways, water and sediment control basins, grade stabilization structures, drainage water management, streambank stabilization practices, and weirs and cross vanes. Each of these practices and their benefits are highlighted below.

Nutrient Management and/or Integrated Pest Plans

Nutrient management on agricultural fields is extremely important for preventing the loss of nutrients in stormwater runoff during and following rain and snowfall events. Developing a nutrient management plan allows farmers to adopt strategies for controlling and monitoring the form/type, placement, timing, and quantity of fertilizer applied to the fields. Similarly, integrated pest management (IPM) uses a systems based approach to reduce a farmer's dependence on pesticides and herbicides. Both nutrient management plans and IPMs can improve water quality by reducing the amount of pollutants (nutrients, herbicides, and

pesticides) that run off of field and into the streams and wetlands and infiltrate into groundwater.

Conservation Crop Rotation

Crop rotation is the practice of growing various crops on the same field in a planned sequence. The rotation usually involves growing forage crops in rotation with various field crops. The benefits of crop rotation can include reduced runoff and erosion from the fields, reduced need for pesticide and herbicide application, and improvements to aesthetics and wildlife habitat.

Conservation Tillage

Conservation tillage is any method of soil cultivation that leaves the previous year's crop residue such as corn stalks on fields before and after planting the next crop, to reduce soil erosion and runoff. To provide these conservation benefits, at least 30% of the soil surface must be covered with residue after planting the next crop. Some conservation tillage methods forego traditional tillage entirely and leave 70% residue or more. The benefits of conservation tillage include reduction of soil erosion by as much as 60%-90%, conservation of water by reducing evaporation at the soil surface, conservation of energy due to fewer tractor trips across the field and the crop residue provides food and cover for wildlife.

Cover crops

Cover crops are grasses, legumes or forbs planted to provide seasonal soil cover on cropland when the soil would otherwise be bare such as before the crop emerges in spring or after fall harvest. Benefits of cover crops include the reduction of wind and water erosion when the soil would otherwise be bare and the protection of groundwater quality by preventing nitrogen from leaching into the water table.

Contour farming

Contour farming is growing crops "on the level" across or perpendicular to a slope rather than up and down the slope. The rows running across the slope are designed to be as level as possible to facilitate tillage and planting operations on the contour. Benefits of contour farming include a reduction of soil erosion by as much as 50% from up and down hill farming and improvements in water quality though reducing nutrients loads and promotion of infiltration.

Terracing

A terrace is an earthen embankment, ridge or ridge-and-channel built across a slope (on the contour) to intercept runoff water and reduce soil erosion. Terraces are usually built in a series parallel to one another, with each terrace collecting excess water from the area above. Terraces can be designed to channel excess water into grass waterways or direct it underground into the drain tile system.

The use of terraces in agricultural areas can protect and improve water quality by reducing soil erosion by breaking long slopes into a series of shorter ones, intercepting agricultural runoff, and prevent gully formation by directing runoff to stable outlets.

Grass Waterways

Grass waterways are a type of conservation buffer. They are constructed graded channels that are seeded to grass or other suitable vegetation. Grass waterways are generally broad and shallow and are designed to prevent soil erosion while draining runoff water from adjacent cropland. Fabric and rock checks may be installed within the grass waterways to help stabilize the channel until vegetation is established. As water travels down the waterway, the grass vegetation prevents erosion that would otherwise result from concentrated flows. Grass waterways also help prevent gully erosion in areas of concentrated flow.

Grass waterways work best when erosion is controlled on the contributing upland drainage area; otherwise the waterway will become filled with sediment and cease to function properly. As such, grass waterways are commonly used in conjunction other upland erosion control practices such as terraces, contour farming, water & sediment control basins, conservation tillage, conservation crop rotation and cover crops.

Water and Sediment Control Basins

A water and sediment control basin (WASCOB) is a small earthen ridge-and-channel or embankment built across (perpendicular to) a small watercourse or area of concentrated flow within an agricultural field. They are commonly built in a parallel series with the first ridge crossing the top of the watercourse and the last ridge crossing the bottom, or nearly so. They are designed to trap agricultural runoff water and sediment as it flows down the watercourse; this keeps the watercourse from becoming a field gully and reduces the amount of runoff and sediment leaving the field.

WASCOBs are similar to terraces in form and function, but the two practices are not interchangeable. Whereas terraces (and other contour practices, such as contour stripcropping and contour buffer strips) work best on relatively uniform slopes, WASCOBs are generally reserved for fields with irregular topography where contour practices would be difficult to implement or likely to fail.

While terraces generally extend all the way to field edges, following the contour of a slope in a ribbon-like pattern, WASCOBs from a distance look more like short, straight slivers, just long enough to bridge an area of concentrated flow. WASCOBs are generally grassed. The runoff water detained in a WASCOB is released slowly, usually via infiltration or a pipe outlet and tile line.

The use of WASCOBs in agricultural areas can protect and improve water quality by reducing agricultural runoff and sediment loading, reduce the potential for gullies to form in areas of concentrated flows on the fields, and control erosion in hilly areas where the slopes are not uniform enough to use practices that follow the contour such as terraces.

Grade Stabilization Structures

A grade stabilization structure is an embankment or spillway built across a drainageway to prevent soil erosion. Grade stabilization structures are especially important in areas where sediment loading from gully erosion is a major water quality concern.

Gullies tend to advance upslope at overfalls (small, concentrated waterfalls) below which turbulent water undercuts the head of the gully—a process called head-cutting. Grade stabilization structures control the way water falls to lower elevations, preventing gullies from forming or advancing.

There are many types of grade stabilization structures including block chutes, rock chutes, toewall structures, modular block straight drop structures and pipe drop structures. Some are full-flow, allowing water to flow freely over a spillway. Others look like a pond and are designed to detain water behind an embankment. Grade stabilization structures are also used to stabilize erosion-prone sites where a tributary or tile drainage outlet enters a channel such as a ditch from the side; the grade stabilization structure slows the flow of water from the higher elevation of the tributary or side-inlet (where water is entering) to the lower elevation of the channel.

Grade stabilization structures have numerous water quality and stormwater management benefits. These include: reducing soil erosion by preventing gullies from forming or advancing at field edges and other overfalls; reducing peak stormwater flows; reducing and reducing sediment loading in streams, ditches, and wetlands.

Drainage Water Management

Drainage water management is the practice of using a water control structure in the main, submain, or lateral drain tiles to manage water table elevation and the timing of water dischargers from surface and subsurface agricultural drainage systems. The theory of drainage water management is to hold the water and pollutants such as nitrogen, phosphorus, and sediment in the agricultural fields when they are not needed for production. For example, after the harvest, the tile system is restricted using flashboards allowing water to pool on the in the subsurface soils and/or on the fields. Prior to field activities, the flashboards are pulled to allow surface and ground water levels to drop to levels sufficient for planting. After plantings, some flashboards could be replaced to maintain a water level that provides capillary water to the plant's root zones. This manipulation of water levels allows for subsurface water storage on the field during fallow times, as well as, during the growing season.

Benefits of drainage water management include reduction in nutrient loading especially nitrogen. Published studies have found reductions in annual nitrate load in drain flow ranging from about 35% to 81%, on fields using drainage water management in Illinois.

Stream Stabilization Practices

Streambank stabilization involves using vegetation or materials such as riprap or woody debris to stabilize stream, river or ditch banks in order to protect them from erosion or sloughing. The four main practices used in Illinois by the NRCS for streambank stabilization include rock riffle grade control, stone toe protection, bendway weirs, and stream barbs.

Stream stabilization in agricultural areas has numerous benefits including:

- Stabilizes banks and shores, preventing further erosion and degradation;
- Improves water quality by reducing sediment loads in surface waters;

- Helps maintain the capacity of waterways to handle floodwaters, preventing flood damage to utilities, roads, buildings and other facilities;
- Reduces expenses for dredging sediment from lakes and drainage ditches;
- Enhances habitat for fish and other aquatic species by improving water quality and moderating water temperature; and
- Creates habitat for terrestrial wildlife.

Weirs and Cross Vanes

The lack of instream features including pools and riffles is prevalent throughout the watershed. The lack of instream features can be observed in both the man-made ditches and natural stream channels. In-channel BMPs such as boulder weirs and cross vanes can improve water quality by reducing streambank erosion, trapping suspended sediment, and re-oxygenating the water column. In-channel BMPs also provide habitat that supports the propagation of fish and macroinvertebrates.

Built from rocks, logs, or other sturdy material, weirs establish a fixed elevation in the channel and prevent gully erosion caused by channelization. This is done by concentrating flows in the center of the channel. Weirs can provide improvements to water quality, as well as, habitat enhancement. Benefits of weirs include formation of pool habitat, promotion of bar/riffle formation, trapping suspended sediments, re-oxygenating water, allowing organic debris deposition, promotion of invertebrate production, and can distribute water for off channel watering facilities.

Cross vanes are V-shaped instream diversions that can effectively convey stream flow while maintaining the transport of sediment. The cross-vane is a grade control structure that decreases near-bank shear stress, velocity and stream power, but increases the energy in the center of the channel. Cross veins can reduce bank erosion, create a stable width/depth ratio, maintain channel capacity, while maintaining sediment transport capacity of the channel.

In addition to these general agricultural BMPs and practices described above, the Watershed Steering Committee has selected five agricultural practices to highlight as recommendation for the East Branch South Branch Kishwaukee River watershed: riparian buffers, installation of 2-stage channels, removal of spoil piles to reconnect channels to the floodplain, wetland creation and streambank stabilization practices. For each of these six practices, the Watershed Plan has set short term (less than 5 years), medium term (5-10 year), and long term (more than 10 year) "targets" for implementing the practices in the watershed. Table 5-10 details the targets for agricultural BMPs in the East Branch of the South Branch of the Kishwaukee River Watershed.

Table 5-10 Targets for agricultural BMPs in the East Branch of the South Branch of the Kishwaukee River Watershed

Agricultural BMP	Short Term Target (less than 5 years)	Medium Term Target (5-10 years)	Long Term Target (longer than 10 years)
Riparian Buffers	30 additional acres	40 additional acres	45 additional acres
Installation of 2-Stage Channels	4,000 linear feed	6,000 linear feet	9,000 linear feet
Removal of Spoil Piles to Reconnect Channels to Floodplain	n/a	n/a	n/a
Wetland Creation	200 acres	300 acres	500 acres

Riparian Buffers/Vegetative Filter Strips

Riparian buffers (also called vegetative filter strips) are areas of grasses, trees, and other vegetation located adjacent to a waterway that are managed to reduce the negative impact of nearby land uses. Riparian buffers provide several water quality and habitat benefits by 1) separating the crop field from the stream; 2) filtering runoff to remove sediment, nutrients, pesticides and microorganisms; 3) increasing ground water infiltration; 4) taking up nitrate from shallow groundwater 5) providing stormwater storage; 6) stabilizing streambanks; and 7) providing cooler water and air temperatures.

The vegetation and width recommendation for riparian buffers is dependent on the goals and benefits that the buffer is expected to provide. For example, water temperature modification can be achieved with a minimum 10- to 15-foot buffer, reduction in nutrient loading is achieved with a 35- to 100-fot buffer, and flood control benefits are in the 75- to 200-foot range. While there are many environmental and social benefits derived by the presence of riparian buffers, the East Branch South Branch Kishwaukee River Watershed Plan focuses on those benefits that are compatible with the dual ideals of resource protection and the continuance of economically viable agricultural operations. The DeKalb County Watershed Steering Committee has set the following benefits as the primary objective for buffer installation in the watershed:

- Sediment Control
- Nutrient Removal
- Streambank Stabilization
- Wildlife Habitat Improvements

Given the goals and objectives of this watershed plan, it is recommended that minimum 35-foot riparian buffers be established on all constructed agricultural waterways and minimum 50-foot riparian buffers be established on natural waterways. The riparian buffers should be planted with native grasses and wildflowers.

Regularly scheduled maintenance should begin immediately after the buffer has been planted. It is recommended that the established riparian buffers be maintained using mowing and/or prescribed burns over clearing and grubbing. Clearing and grubbing is commonly done with earth moving equipment that leaves the soil exposed and un-vegetated thus increasing the potential for erosion and decreasing the effectiveness of the buffer. Both

mowing and burning allow for the root structure of the plants to stay intact, thus reducing impacts to buffer effectiveness.

Native grass zones in a riparian buffer can benefit from mowing during the early years of establishment. Native prairie grasses and wildflowers are often slow growing above ground during the first year or two after establishment because much of their energy is put into producing a root system. During this time annual weeds rapidly become established and provide competition to the establishing native plants. Because of these challenges, mowing a prairie filter during the first and second year is recommended.

Where practicable, fire is a good maintenance tool for native grass and forb plantings in riparian buffers. To reduce weed competition during the year, prescribed burns are usually performed early in the spring. During this time, many of the competing cool-season grasses, weeds, and woody plants begin growing while the native prairie plants are still dormant. While different burning frequencies may be used, an annual spring-burn for the first three or four years is recommended. Following establishment of a good stand of desired grasses and forbs, a burning cycle of once every three to four years can be used.

Replanting and reseeding may also be required during the first few years following establishment. An annual inspection should be made to identify areas in need of replanting/reseeding. Replanting can be done in the spring or fall.

According to information provided by the DC SWCD there are currently 36 acres of riparian buffers and 36 acres of vegetative filter strips in the DeKalb County portion of the watershed. Information on acreage of existing riparian buffers and vegetative filter strips was not available for Kane County. Using the existing 72 acres of riparian buffer/vegetative strips in the watershed as a starting point, the Watershed-Based Plan sets a goal on increasing the quantity of riparian buffers/vegetative filter strips in the watershed by 40% each 5 years. The target acreages for riparian buffers/vegetative filter strips are 30 acres in years 1-5, an additional 40 acres in years 5-10 and an additional 55 acres in years 10-15 for a total of 125 acres by year 15.

Installation of 2-Stage Channel

Drainage has long been an important component in agriculture and property management. Land with flat, poorly drained soils such as found in the East Branch South Branch Kishwaukee River Watershed requires intensive draining using field tiles in order to successfully grow crops. In addition to the installation of field tiles to drain the land, existing streams were straightened and new ditches were cut to facilitate the removal of the water from the fields. Over time, these stream channels and ditches have experiences bank erosion and scour due to being undersized for the amount of water flowing through them. The "undersized" nature of the streams and ditches has also lead to localized flooding of areas adjacent to the waterways.

Two-stage ditches should be installed in these areas to relieve the erosion, scouring and flooding that conventional ditches have caused. A two-stage ditch incorporates a floodplain zone, called benches, into the ditch by excavating the ditch banks roughly 2-3 feet above the bottom and creating a shelf. This allows the water to have more area to spread out on and connects with a floodplain storage area.

Two-stage ditches have both improved drainage function and ecological function over traditional agricultural ditches. The main water quality benefit associated with the in installation of two-stage ditches throughout the East Branch South Branch Kishwaukee River Watershed is the reduction of non-point source pollutants including sediment generated from erosion and in-stream sediment movement and the reduction of nutrient (phosphorus and nitrogen inputs). Additional benefits include the creation of wildlife habitat.

Two-stage channels can be used in conjunction with buffers, or they may be implemented on their own. The proposed hydrologic and hydraulic modeling effort would provide the tool that would allow for detailed planning, design and permitting for the creation of two-stage channels. In general, they will be reaches that are confined, but not so highly incised that there is additional earthwork or overburden involved in pulling back the banks. Based on the understanding and knowledge attained during the watershed planning process, it is estimated that approximately 5 percent (19,000 linear feet) of the total waterway length could be identified as priority areas for implementation of two-stage channels. It is recommended to implement two stage channels as follows: 4,000 feet in years 1-5; 6,000 linear feet in years 5-10; and 9,000 feet in years 10-15.

Removal of Spoil Piles to Reconnect Channel to Floodplain

As discussed previously in the Watershed-Based Plan, the majority of the stream channels and ditches have been constructed and/or channelized. During the earthwork associated with these activities, in many locations, the spoil piles from the excavations were windrowed (sidecast) along the sides of the channel. In some areas, this placement of soils has caused a "disconnect" between the channel and its floodplain and channel-side wetlands. In an unaltered systems, during high flow events, water would be able to safely overflow from the channel and be stored in the floodplain and/or channel-side wetlands where it would be stored, infiltrated into ground water, and slowly released back into the channel. However, in some locations, the spoil piles found along the watershed's waterways are preventing the water from reaching the floodplain and wetlands leading to higher flows in the channels. These higher flows lead to channel erosion, scour, and downstream flooding. The spoil piles should be removed to open floodplain up to floodwaters and wetland areas in accordance with the Army Corp standards using stabilized inflow and outflow standard designs at the channel slope. Additionally, all removed soils should be properly disposed of in upland areas and not in floodplain or wetlands.

Based on inspection of the topography for the watershed, and based on the field reconnaissance, this presence of soil piles is not a widespread problem in the watershed. Removal of these spoil piles can be done on an as-identified basis. The best way to accomplish these projects would be to incorporated tem into the establishment of buffers or two-stage channel construction.

Wetland Restoration

Wetland restoration reestablishes or repairs the hydrology, plants and soils of a former or degraded wetland that has been drained, farmed or otherwise modified since the watershed was inhabited. The goal of wetland creation is to closely approximate the original wetland's natural condition which resulting in multiple water quality and stream habitat benefits.

Restoring wetland hydrology typically involves breaking drainage tile lines, building a dike or embankment to retain water and/or installing adjustable outlets to regulate water levels. Once hydrology is restored, wetland plants usually include a mix of native water-loving grasses, sedges, rushes and forbs (broad-leaved flowering plants) in the restored wetland and a mix of native grasses and forbs in upland buffers around the wetland.

Wetland restoration has numerous benefits including:

- Improves surface and ground water quality by collecting and filtering sediment, nutrients, pesticides and bacteria in runoff;
- Reduces soil erosion and downstream flooding by slowing overland flow and storing runoff water;
- Wetland plants and ponded conditions utilize trapped nutrients, restore soil organic matter and promote carbon sequestration;
- Provides food, shelter and habitat for many species and enables the recovery of rare or threatened plant communities;
- Restored wetlands provide breeding grounds for ducks, pheasants, and other migratory waterfowl whose habitat is threatened; and
- Connects fragmented habitat when part of a larger complex of wetlands.

According to information provided by the DC SWCD, there are 123.21 acres of wetland restoration in the DeKalb County portion of the Watershed. Information on acreage of existing wetland restoration was not available for Kane County. As discussed in Chapter 3 Section 3.12.6, potential restoration sites were identified using a Geographic Information System (GIS) exercise. This analysis identified 789 potential wetland restoration sites (17,707.61 acres) within the watershed. Additional criterions and a rating scale (1-5 with 5 being the most suitable for restoration) were then used to better identify potential wetland sites. Of the 789 sites (17,707.61 acres) originally identified, 9 sites (177.6 acres) had a value of 5. One hundred and fifty one (151) (4,406 acres) potential restoration sites had a ranking of 4. Using the results of the potential wetland restoration site analysis and best professional judgment, it is recommended to implement wetland restoration as follows: 200 acres in years 1-5; 300 acres in years 5-10; and 500 acres years 10-15.

5.5 Water Quality Monitoring Plan

As detailed in Section 3.14, limited water quality monitoring data is available for the East Branch South Branch Kishwaukee River Watershed. A comprehensive water quality monitoring program should be implemented in the East Branch South Branch Kishwaukee River Watershed aimed at assessing the current condition of the East Branch South Branch Kishwaukee River Watershed and to assess changes in water quality associated with the implementation of the watershed-based plan. A quality assurance project plan (QAPP) should be developed for the comprehensive monitoring program.

It is recommended that Northern Illinois University and their partnership with Sycamore High School and the Watershed Steering Committee take the lead on implementing the water quality monitoring plan in the East Branch South Branch Kishwaukee River Watershed.

Baseline Sampling

Chemical and Physical Water Quality Monitoring

Baseline Sampling

Baseline sampling is regularly scheduled water quality sampling designed to obtain a long term record of water quality in the watershed. Sampling is typically conducted on a weekly, monthly, or yearly basis. Baseline chemical and physical water quality monitoring typically includes monitoring for nutrients, suspended solids, water clarity, dissolved oxygen, temperatures, conductivity, and pH. Due to the frequency of sampling, a baseline program can be expensive so budget is a significant considering in determining the number of sampling sites and the frequency of the sampling.

It is recommended that baseline stream sampling be conducted in the East Branch South Branch Kishwaukee River Watershed at the eight sites established as part of the watershed planning process (Table 5-11). Baseline sampling of these sites will give an overall picture of stream health of the entire watershed. The sites should be sampled on an annual basis. See Table 5-11 for details and the locations of the recommended baseline sampling sites.

Table 5-11 Data Collection Sites in East Branch South Branch Kishwaukee River Watershed

Site Name	Location
East Branch of the South Branch Kishwaukee River	Near Motel Road
Blue Heron Creek	Near Motel Road
Union Ditch #1	Near Hartmann Road
Union Ditch #2	Near Maple Park Road and railroad tracks
Union Ditch #3	Near Airport Road
Virgil Ditch #1	Near Thatcher Road
Virgil Ditch #2	Near Welter Road
Virgil Ditch #3	Near Winters Road

At each sampling site, it is recommended the following, at a minimum, parameters being analyzed as part of the baseline sampling program:

- Temperature
- Conductivity
- pH
- Dissolved Oxygen
- Total Suspended Solids (TSS)
- Total Nitrogen (TN)
- Total Phosphorus (TP)

It is recommended that the water quality samples for TSS, TN, and TP be collected using grab sampling methods. Samples should be collected using careful collection and handling procedures to ensure that the samples are representative and uncontaminated. The collected samples should be submitted for analysis at an Illinois Environmental Protection Agency (IEPA) accredited lab. Temperature, conductivity, pH, and dissolved oxygen measurements

should be collected in the field using portable instruments. To ensure the proper collection and handling, a Quality Assurance Project Plan (QAPP) should be developed for the baseline sampling program.

Stormwater Sampling

Stormwater sampling is water quality sampling immediately following storm events designed to quantify pollutant loading to the creek from runoff events. This information is useful in refining the pollutant loading calculations generated by the PLOAD model to better reflect watershed conditions. It is recommended that stormwater sampling be conducted at each of the baseline sampling sites at a frequency of every 3-5 years, depending on budget constraints. Stormwater samples should be collected within 12 hours of a significant rainfall event (>1.0 inches) and all the stormwater samples should be collected on the same day. The stormwater sampling program should mirror the baseline sampling program in regards to analyzed parameters, sampling methods, and quality assurance/quality control.

Biological Monitoring

Monitoring the biological communities including macroinverterbrates and fish are extremely useful for assessing the health of a stream system. As both fish and macroinvertebrates live in water for all or part of their lives, their survival is related to water quality. These animals are sensitive to different chemical and physical conditions in the water such as increased water pollution or changes in water flow. As such, the richness of fish and macroinvertebrate community composition in a stream or river can be used to provide an estimate of stream health.

Macroinvertebrate Sampling

It is recommended that benthic macroinvertebrate sampling be conducted at each of the eight established sites (Table 5-10). These sites should be sampled on a 5 year basis to provide a baseline on the overall health of the East Branch South Branch Kishwaukee River stream system. Baseline sampling at this location will also provide information on water quality changes resulting from the implementation of the watershed plan.

Macroinvertebrate sampling should also be conducted in stream segments immediately preceding and following the completion of stream restoration and stream habitat enhancement project completed during the implementation phase of the watershed plan. Macroinvertebrate sampling should be conducted prior to the construction of the project and 1-3 years following the completion of the project in order to quantify the success of the project on improving water quality and instream habitat conditions.

Fish Sampling

It is also recommended that watershed stakeholders work with the Illinois Department of Natural Resources (IDNR) and the Illinois Environmental Protection Agency (IEPA) to continue to conduct fish sampling at the established site in the East Branch South Branch Kishwaukee River Watershed on a 5-year interval. See Section 3.13.6 for more information on the fish sampling previously conducted by IDNR.

Habitat Assessment

NIU used a modified qualitative habitat evaluation index (QHEI) to evaluate the stream condition in the watershed. The QHEI gives scientists a qualitative assessment of physical

characteristics of a sampled stream similar to IBI biological data. QHEI represents a measure of instream geography. This comprehensive assessment is critical for evaluating disturbance and land use practices.

The RBP evaluation should be conducted prior to the construction of the project and 1-3 years following the completion of the project in order to quantify the success of the project on improving instream and riparian habitat conditions. Details on the RBP for Habitat are included in Section 3.11.

Hydraulic and Hydrological Sampling

To supplement the water quality and habitat monitoring conducted in the East Branch South Branch Kishwaukee River Watershed, it is important to also assess hydraulic and hydrological conditions of the watershed. As detailed in the previous sections of the watershed plan, a significant portion of the watershed has been channelized and constructed as manmade ditches. This has lead to increase in the total volume and rate of stormwater entering the stream system causing high fluctuations in the water levels and flows in the watershed. These rapidly changing fluctuations are the predominate cause of the hydromodification that is prevalent throughout the watershed. In order to understand and define these hydrological impacts, it recommended that stream flow and stage monitoring be conducted in the East Branch South Branch Kishwaukee River Watershed. When combined with the water quality data collected, the collected stream flow and stage monitoring data will also be useful in refining pollutant load calculations in the watershed.

Flow and water level monitoring

It is recommended that stream flow and water level measurements be based on the methodology outlined in *Discharge measurements at Gaging Stations, U.S. Geological Survey, Techniques of Water-Resources Investigations, Book 3, Chapter A8* by T.J. Buchanan and W.P. Somers. It is recommended that the stream flow and water level be integrated into the baseline and stormwater sampling monitoring program of the sites located in the watershed. All eight sites should be monitored on the same day.

Additional sites for stream flow and stage monitoring may be identified during future Hydraulic and Hydrologic efforts and should be added as necessary.

Stream Bank and Bed Erosion and Deposition Measurements

Stream bank and bed erosion and deposition measurements should be collected at locations in the East Branch South Branch Kishwaukee River watershed that represent typical conditions for the stream network. It is recommended that stream bank and bed erosion and deposition be quantified using the following methods:

- Erosion pins
- Erosion chains
- Stream cross-sections

Measured over time the erosion pins provide a measurement of recession or deposition rates. To measure streambed scour, scour chains should be used. To confirm the rates of erosion and deposition at each study reach, stream-cross-sections should also be surveyed.

5.6 Education and Outreach Plan

The cumulative actions of thousands of individuals can either improve water quality, flooding, and natural resources or further degrade them. As such a watershed-based plan must include a strategy to educate and inform watershed stakeholders about watershed issues and encourage them to take an active role in implementing the watershed-based plan. Because many watershed problems are caused by individual actions and their solutions are often voluntary practices, effective public involvement and participated are necessary for the successful implementation of the plan. Furthermore, the general public is often unaware of the environmental impact their day to day activities have on the watershed's resources. With an understanding of watershed issues, watershed stakeholders can play a critical role in protecting and restoring water quality.

This section of the Action Plan includes:

- Primary goals addressed by each action;
- Targeted audiences and partner organizations;
- Best package (vehicle) for the action message for delivery to the targeted audience;
- Lead and supporting organizations; and
- Potential outcomes

The East Branch South Branch Kishwaukee River (including Union Ditch and Virgil Ditch) Watershed Steering Committee Steering Committee (Watershed Steering Committee) Education Sub-Committee will lead the efforts to build and implement the education and outreach campaign.

5.6.1 Education and Outreach Strategy for the East Branch of the South Branch of the Kishwaukee River watershed

Development of an effective Education and Outreach Plan begins by defining E&O goals and objectives. Watershed Steering Committee specifically addressed watershed information and education issues by developing an education goal. The education goal for the plan reads:

F. Raise stakeholder awareness (residents, public officials, etc) about the importance of best management practices of watershed stewardship

The E&O Plan includes program needs related to each of the watershed goals outlined in Chapter 2. Table 5-10 includes the E&O Plan for the East Branch South Branch Kishwaukee River watershed.

5.6.2 Target Audience

The primary target audiences for the Education and Outreach (E&O Plan are 1) residents and other landowners, 2) Land and resource managers and organizations, 3) Government officials and agencies, and 4) Developers and contractors. Each of these targeted audiences can be broken down into more specific sub-groups as detailed below:

1. Residents, other landowners, and visitors
    a. Riparian landowners and residents (RR)

        i. Rural areas
        ii. Urban/Suburban areas
    b. Non-riparian landowners and residents (NR)
        i. Rural areas
        ii. Urban/Suburban areas
    c. Homeowner Associations (HOA)
    d. General public and visitors (GP)
    e. Businesses and industrial properties (BI)
2. Land and resource managers and organizations
    a. Land and resource managers including golf courses and farmers (LM)
    b. Organizations, committees, and special interest groups involved in water resource management (OG)
3. Government officials and agencies
    a. Local governments including municipalities, townships, park districts, health departments, transportation departments, and other departments that manage land within the watershed (LG)
    b. Schools (S)
4. Developers and contractors
    a. Developers and home builders (DH)
    b. Consultants and contractors including civil engineers, planners, and landscapers (CC)

The abbreviations are keyed to the Education and Outreach Plan in Table 5-12.

To determine programming needs for each audience, Watershed Steering Committee Education Sub-Committee should reach out and speak with representatives from each group to determine their level of understanding of watershed issues. The intent of this plan is to include both existing partners, as well as stakeholders that have previously not been participants in the watershed planning process. It is critical that the E&O Plan address the needs of both groups.

5.4.3 Partner Organizations

Organizations that can assist with the implementation of the Education and Outreach Plan are the same as those charged with implementing the Programmatic and Site Specific Action Plans. These same organizations may also serve as targeted audiences for programs. These organizations are listed in Section 2 of this chapter.

5.4.4 Evaluating the Education and Outreach Plan

Actual reduction in water quality and habitat degradation in the watershed is perhaps the best indication that the Education and Outreach Plan is successful. Although it is extremely difficult to attribute water quality and habitat improvement to a specific action item in the Education and Outreach Plan, there is little doubt that increased knowledge and understanding of watershed issues and solutions is essential to improving water quality and stream health and reducing flooding in the watershed. As such, it is extremely important to regularly evaluate the E&O plan to ensure the programs are being effective. Evaluation conducted early in the process will help determine which programs are meeting their goals and which are not. This will allow for timely refinements to the E&O program to maximize

efforts and facilitate plan implementation. Chapter 6, Section 6.5.1 contains "Report Cards" with milestone related to watershed education that can be used to access the E&O efforts.

Table 5-12 Education and Outreach Action Plan

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate the public about general watershed issues.	All Goals	GP	• Signs at stream crossings and watershed boundaries. • Messages in community newsletters. • Post watershed maps in public buildings. • Distribution of Fact Sheets at libraries and other municipal buildings. • Watershed tours.	DCCF	• General public participate in watershed events and activities. • General public requests additional information on watershed activities.
Educate the public that a watershed-based plan has been developed for the watershed to gain interest for implementing Action Items.	All Goals	GP	• Website. • Public interest message on radio. • Articles in newspaper. • Community meetings.	DC, KC, DCWSC, DCCF	• General public requests additional information on watershed-based plan. • Majority of watershed residents have a working knowledge of watershed conditions and know how to get involved in plan implementation. • Public begins to make small changes in day to day behaviors aimed at improving water quality and habitat in the watershed.
Maintain the watershed planning website	All goals	All stakeholders	• Maintain the website to keep the public informed on plan implementation activities.	DC, DCWSC	• Increase in the number of visitors to the website. • Website users have information related to the watershed including potential and ongoing projects, watershed problems, and a calendar of upcoming events.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Provide training and educational outreach to municipal officials and engineers on the goals, objectives, recommendations, and implementation of the watershed-based plan.	All goals	LG, CC	• Meet with elected boards to promote the Watershed-Based Plan. • Presentation at County, City and Village Board Meetings. • Meet with consulting engineers to promote the Watershed-Based Plan.	DC, KC, DCWSC, DCCF	• All elected officials are familiar with the Watershed-Based Plan. • Local governments adopt the Watershed-Based Plan. • Local governments update stormwater ordinances to reflect plan recommendations.
Educate riparian landowners on their responsibilities and easement requirements.	A & C	RL	• Hold riparian owner training workshops. • Develop and distribute an information booklet/pamphlet. • Host stream cleanups.	SWCD, USDA	• Number of reported debris blocks decrease. • Problems are reported to the proper authorities.
Educate homeowners on how to best maintain septic systems	A	RR, NR	• Distribute educational letters to all residents with septic systems.	DC, KC	• Owners act quickly to mitigate and repair problems with their septic system. • Owners understand the impact poorly maintained and broken septic systems have on water quality. • Elimination of "straight-pipes".
Educate the general public on the importance of groundwater quality and quantity.	A	GP	• Hold education workshops to educate the general public on groundwater related issues. • Hold field trips to educate the general public on the importance of groundwater recharge.	DC, KC, DCWSC, DCCF	• Attendees gain a better understanding of groundwater related issues. • Attendees inform their neighbors of information they learned at the workshops and field trips.

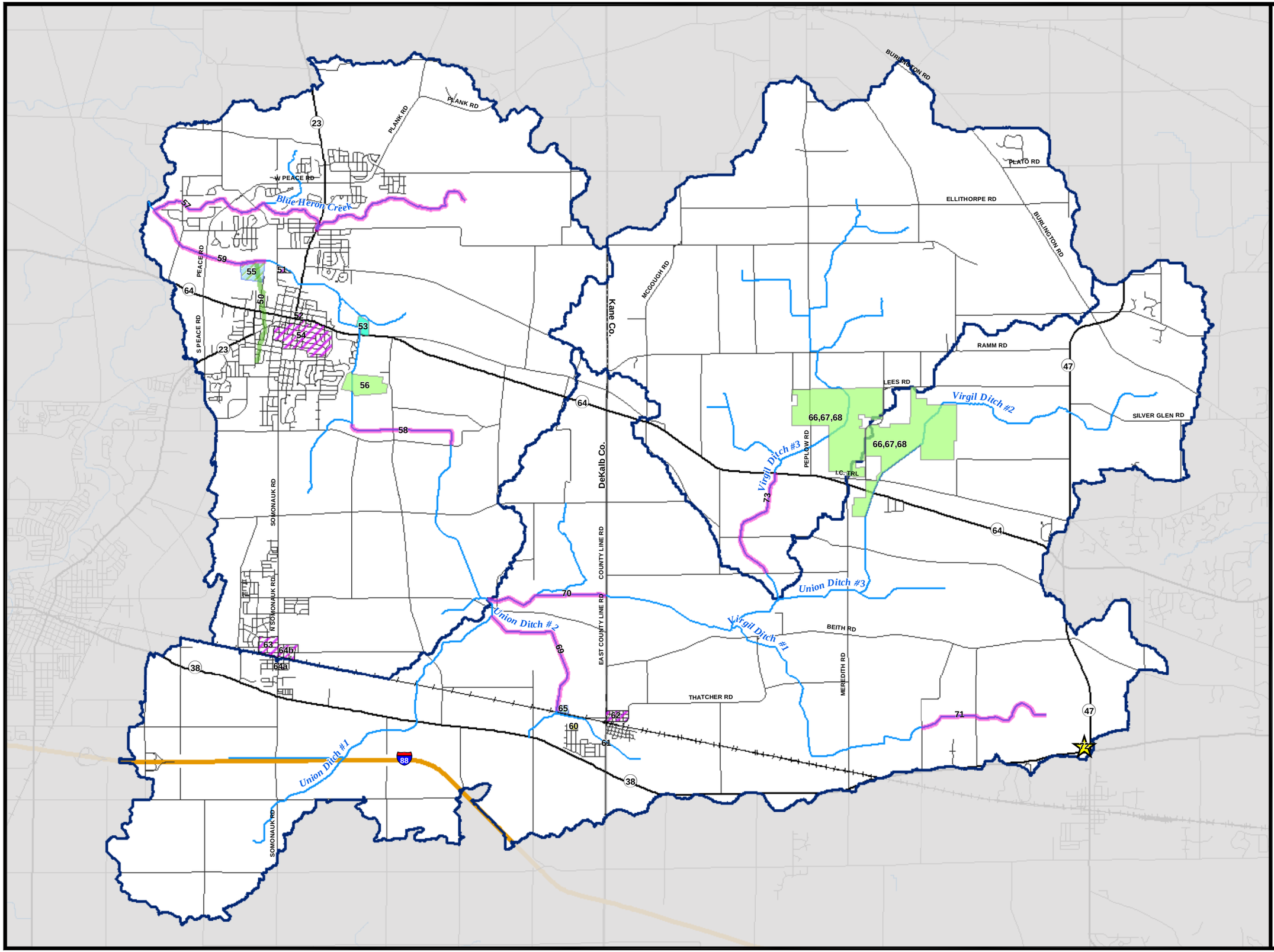
Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate owners/developers of existing and new developments on ways to reduce volume and rate of stormwater runoff.	A & B	HOA, BI, DH, CC, LG	• Meet on a case-by-case basis to develop strategies and incentives for reducing impervious areas. • Distribute fliers to existing HOAs and businesses that highlight the benefits and funding sources for retrofitting existing stormwater management facilities. • Hold training seminars on stormwater BMPs. • Install stormwater BMP demonstration projects.	DC, KC, DCWSC, DCCF	• Municipalities, businesses, and HOAs realize the potential that naturalized detention basins have to improve water quality and reduce flooding. • Municipalities, businesses, and HOAs implement maintenance programs for all existing stormwater management facilities.
Educate municipalities, HOAs, and businesses on importance of and how to maintain naturalized detention basins.	A, B, C, & D	RR, HOA, BI, LG	• Meet with landowners, municipalities, and others who manage these facilities. • Develop and distribute an information booklet/pamphlet. • Hold technical workshops that provide information on detention basin retrofits and stress maintenance needs for existing facilities.	DC, KC, DCWSC, DCCF	• Number of retrofit projects increase. • Detention basins are monitored, maintained, and repaired on a regular basis.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate HOA, developers, and municipalities about the importance of protecting open space.	A, C & D	DH, CC, HOA, LG	• Meet on a case-by-case basis to develop strategies and incentives for developing and preserving open space. • Municipalities use zoning to protect open space and natural areas. • HOAs and developers allocate funding to the protection and restoration of open space. • Distribute copies of the DeKalb County Greenway and Trails Plan. • Presentations on open space at community and board meetings.	DC, KC, DCWSC, DCCF	• Voluntary preservation and restoration of open space. • Linear feet of trail in the watershed increases. • Number of municipalities adopting the DeKalb County Greenway and Trails Plan increase. • Number of government officials and board members reached at community meetings.
Educate municipalities and landowners on stream maintenance strategies aimed at removing debris and repairing problem hydraulic structures.	A & B	RR, HOA, LG	• Meet with landowners, municipalities, and others who manage these facilities. • Hold training seminars on stormwater infrastructure management.	DC, KC, DCWSC, DCCF	• Number of reported debris blocks decrease. • Number of reported culvert issues decrease. • Infrastructure problems are reported to the proper authorities.
Provide information to residents living within and along the 100-year floodplain on the benefits of a functional floodplain.	A & B	RR	• Develop and distribute an information booklet/pamphlet. • Provide contacts for flood assistance on the website. • Hold workshops for landowners on flood proofing and flood awareness.	DC, KC	• Number of flood prone properties owners reached increase. • Number of structures insured, flood proofed, or removed from the flood prone areas increase.
Educate landowners and municipal Public Works about the use of environmentally-friendly (phosphorus-free) fertilizer.	A	GP, LG	• Develop and distribute an information booklet/pamphlet. • Use media (radio, newspapers, website, etc) to communicate the negative impacts of using a phosphorus-based fertilizer.	DC, KC, DCWSC, DCCF	• Decrease in the number of Public Works and homeowners utilizing phosphorus-based fertilizers

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Provide information to residents and business owners on the benefits of native landscaping.	A & C	RR, NR, HOA, BI, CC	• Offer free workshops that help individuals choose the appropriate native plants and trees for their yards, planting beds, etc. • Host native plant and seed sales and exchanges.	USDA, SWCD, DCCF	• Stakeholders can identify native plants. • Number of native plantings in residential yards and near businesses increase. • Stakeholders recognize the benefits of native plants on water quality and habitat.
Educate riparian property owners on ways on streambank stabilization methods that promote water quality and stream habitat.	A, B & C	RR, HOA, BI, CC	• Conduct technical workshops for riparian property owners that recommend bioengineering options, funding sources, and certified contractors for stabilizing eroded streambanks. • Install streambank stabilization demonstration projects. • Provide stream stabilization and restoration stewardship volunteer opportunities. • Develop and distribute an information booklet/pamphlet • Provide a list of funding and technical assistance sources.	USDA, SWCD	• Riparian landowners recognize the benefits of bioengineering techniques for streambank stabilization. • Bioengineering techniques are utilized to stabilize streambanks over hardscape armoring. • Participation in volunteer opportunities. • Requests for technical assistance with projects. • Number of stakeholders attending technical workshops. • Number of stream restoration and stabilization projects increase.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate riparian property owners on ways to improve riparian buffer conditions for water quality and habitat.	A, B & C	RR, HOA, BI, CC	• Hold riparian landowner training workshops on riparian zone management. • Publish articles in newsletters and newspapers. • Provide stream management volunteer opportunities.	USDA, SWCD	• Participation in volunteer opportunities. • Number of stakeholders attending workshops. • Requests for assistance for riparian buffer restoration projects. • Riparian landowners plant native buffers. • Riparian landowners stop dumping yard waste and other trash in the stream.
Educate landowners on lot level BMPs aimed at improving water quality and reducing stormwater	A & B	RR, HOA, BI, CC	• Hold technical sessions on the use and construction of rain gardens, rain barrels, and other lot level BMPs. • Provide detailed instructions on the construction of rain gardens and the use of rain barrels on the website. • Distribute stormwater management how-to materials for rain gardens and rain barrels.	DC, KC, DCWSC, DCCF	• Landowners voluntarily act to reduce the rate and volume of stormwater runoff from their lot. • Number of rain gardens constructed increases. • Number of rain barrels in the watershed increase.
Educate agricultural landowners on BMPs aimed at improving water quality and reducing stormwater	A & B	RR, NR	• Hold technical sessions on agricultural BMPs. • Provide information on available funding sources for the implementation of agricultural BMPs.	USDA, SWCD	• Number of agricultural BMPs increase. • Farmers voluntarily act to reduce the rate and volume of stormwater runoff from their fields.
Educate school children, adults, corporate and political entities on how to provide stewardship in the watershed.	F	All stakeholders	• Provide stewardship volunteer opportunities. • Host activities such as stream cleanups, storm drain painting, and natural area maintenance.	DCCF, DCWSC	• Number of people in the watershed aware of how their daily activities affect water quality and stream health increases. • Individuals make behavior changes to protect and improve water quality and stream health.

Education Action	Primary Goal	Target Audience	Package (vehicle)	Lead and Supporting Organizations	Outcomes/Behavior Changes
Educate students on the methods of water quality and habitat assessment and watershed planning	A, B, C, & D	S	• Provide technical assistance to the water quality and watershed planning coursework at Sycamore High School and Northern Illinois University and other partners as appropriate.	DCCF, DCWSC	• Collection of additional water quality and habitat data in the watershed. • Number of students studying environmental science and engineering increases.



0 0.5 1

Miles

1 inch = 6,500 feet

Legend

- Other Type of BMP
- Stream Corridor Restoration
- Stream Corridor Plan
- Detention Basin Retrofit
- Infiltration Based BMP
- Other Type of BMP
- Post-treatment Wetland
- Wetland Creation/Restoration
- Rivers & Streams
- Watershed Boundary
- Interstate/Tollway
- U.S. Highway
- State Highway
- Streets
- Railroads
- County Boundary

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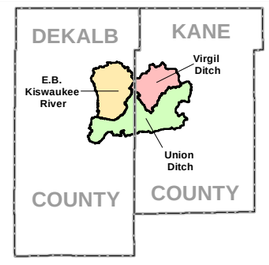
Union-Virgil Ditch Watershed Improvement Plan



5-1 - Site Specific BMP Locations