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for

Illinois Environmental Protection Agency

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EXECUTIVE SUMMARY

Introduction
In 2016, HeartLands Conservancy received a grant from the Illinois Environmental Protection Agency (IEPA) to develop a Watershed Plan for the Lower Silver Creek watershed, which drains to the Kaskaskia River. The intent was to fully analyze the watershed and make recommendations toward improving water quality, mitigating adverse effects of flooding, and providing watershed-level recommendations for stormwater management.

The Lower Silver Creek watershed is the area of land which drains into Silver Creek in St. Clair County. The watershed includes surface water bodies (e.g., streams), groundwater (e.g., aquifers), and the surrounding landscape, which is largely agricultural land. Eight municipalities fall within the watershed boundaries.

The Watershed Plan offers guidance for managing watershed resources on public property, as well as providing a platform to encourage other watershed stakeholders (landowners, residents, businesses, developers, public agencies, and non-profits) to participate. The plan is not regulatory, meaning it does not become law. The intent is to encourage voluntary improvements to water quality and stormwater management in the watershed, for agricultural, urban, and natural areas and waters.
The Lower Silver Creek Watershed
The Lower Silver Creek watershed is located 20 miles east and south of St. Louis, Missouri. The majority of the watershed lies within St. Clair County, Illinois, and small portions lie within Madison and Clinton counties. The watershed’s 454 miles of streams drain roughly 126,000 acres of land. Silver Creek flows south from the project area to join the Kaskaskia River, which ultimately drains into the Mississippi River.

The Lower Silver Creek watershed project area contains numerous subwatersheds, called HUC12s and HUC14s. “HUC” stands for Hydrologic Unit Code, a number that identifies the general location and size of the watershed. Many of the issues identified in the watershed are assessed at these subwatershed levels.

Most of the watershed’s 77,500 residents live in unincorporated areas where farming is the primary land use. Agricultural land makes up 63% of the watershed, with most of that land in row crop farming. Eight municipalities, thirteen townships, and three counties are located within the watershed.

Goals, Objectives, and Targets
The plan promotes a functioning, healthy watershed and guides the development, enhancement, and implementation of actions to achieve these goals:

<table>
<thead>
<tr>
<th>GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOAL 1: Improve Surface Water Quality</td>
</tr>
<tr>
<td>GOAL 2: Reduce Flooding/Mitigate Flood Damage</td>
</tr>
<tr>
<td>GOAL 3: Promote Environmentally Sensitive Development</td>
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<tr>
<td>GOAL 4: Support Healthy Habitat</td>
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<td>GOAL 5: Develop Organizational Frameworks</td>
</tr>
<tr>
<td>GOAL 6: Conduct Education and Outreach</td>
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</tbody>
</table>

Objectives were developed to specify progress towards these goals. Targets in this plan were set at levels that can feasibly be reached by the implementation of a suite of Best Management Practices (BMPs), or Management Measures, over time. The targets include a 25% reduction in phosphorus loading and a 15% reduction in nitrogen loading by 2030 (based on Illinois Nutrient Loss Reduction Strategy), and a 15% reduction in sediment loading (based on estimated impacts of proposed BMPs) by 2030.
Key Watershed Issues

Analysis of the existing and predicted future conditions in the watershed (Appendix A: Watershed Resource Inventory) included collecting data from several government data sources, delineating HUC14 watershed boundaries, using the USEPA’s Spreadsheet Tool for Estimating Pollutant Loads (STEPL), conducting an aerial assessment of stream and riparian conditions, field checks at stream sites, and stakeholder engagement. From this research, the following issues were identified:

Surface water issues
- **Primary Sources of Water Quality Impairment.** The primary causes of impairment identified by the IEPA to Silver Creek and its tributaries are phosphorus, sediment, and dissolved oxygen (DO).
- **Soil Erosion from Agricultural Land.** With 63% of the watershed in agricultural use, soil erosion is common, carrying nutrients and sediments from fields to waterways.
- **Soil Erosion from Streams.** Streambank and channel erosion contributes approximately 53% of the sediment loading.
- **Logjams.** Logjams contribute to soil erosion as stream flow acts to erode the stream channel.
- **Private Sewage and Animal Waste.** Poorly maintained private sewer systems and runoff of animal waste contribute bacteria such as *E. coli* to surface water.
- **Infiltration into sanitary sewers (de facto combined sewers).** Aging sanitary sewer infrastructure leaks cause sewer backups and combined sewer overflows, leading to higher water treatment costs.
- **Dumping and Littering.** Trash and debris is an issue in places where roads cross the creek and its tributaries.

Flooding issues
- **Prevalent Flooding.** Flooding is common both inside and outside of floodplains, with frequent damage to homes, businesses, and crops, and loss of road access.
- **Extensive Floodplain.** Almost 20% of the watershed is in the 100-year floodplain.
- **Flooding Outside of Floodplains.** The flatter, higher ground at the edges of the watershed experiences flash floods/urban flooding, often as a result of large areas of impervious surfaces, changes in local hydrology, and severe storm events. Lack of stormwater infrastructure, inadequate infrastructure, aging infrastructure, and inadequate maintenance of infrastructure contribute to the problem.

Land cover and development issues
- **Poorly Planned Development.** Population growth in the watershed will likely be accompanied by new development on agricultural land or forest. Many older developments did not include well-designed or adequate drainage infrastructure, which has exacerbated water quality and flooding issues.
- **Poor Aquifer Replenishment.** Replenishment of aquifers has declined as impervious surfaces increased.

Habitat issues
- **Invasive Species Present.** Invasive species crowd out native plants that protect streambanks from erosion.
- **Unprotected Habitat for Endangered Species.** Where their native habitat is not preserved as open space, endangered species cannot be expected to thrive over the long term.
- **Poor Riparian Conditions.** Approximately six miles of the riparian area, the area directly adjacent to streams on either side, is in “poor” ecological condition (Appendix A, p.78).

Organizational needs/issues
- **Need for Partnerships.** A network of partners is needed to improve water quality and flooding issues and implement this plan.
- **Need for Updated Operations.** Existing municipal, township, and county operations would benefit from changes that then become routine and long-lived.
- **Need for Funding.** Leveraging funding from government and other programs is needed to fully implement the plan and ensure landowners have ongoing support.
**Information and outreach issues**

- **Need for Communication.** More communication about funding and technical resources is needed between potential partners.
- **Lack of Access to Technical Resources and Funding.** There is a need to connect and assist potential partners, with technical resources and funding opportunities.
- **Need for Outreach to Key Stakeholders.** A large group of landowners and other key stakeholders working together is needed to achieve the goals of this plan.

**Critical Areas**

“Critical Areas” were identified at locations in the watershed where existing or potential future causes and sources of pollutants or existing functions are significantly worse than other areas of the watershed, OR there is significant potential for the area to make progress towards one or more of the plan’s goals. The Critical Areas were identified using survey and stakeholder information, aerial and field assessments, and U.S. Department of Agriculture (USDA) modeling.

The following Critical Areas were identified:

1. **Critical Stream Reaches:** Highly degraded stream reaches (8.9 miles)
2. **Critical Riparian Areas:** Highly degraded riparian areas (14.1 miles)
3. **Critical Wetland Areas:** Areas suitable for wetland restoration (671 acres)

**Implementation**

Recommended actions, identified as Management Measures, that address the plan’s goals, objectives, and targets are provided to partners.

**Recommended Management Measures**

**Programmatic Measures,** including general remedial, preventive, and policy watershed-wide measures, and **Site-Specific Measures,** on-the-ground practices that can be implemented to improve surface and groundwater quality and flooding, are recommended. Management Measures identified for Critical Areas are prioritized for short-term implementation (e.g., wetland restoration projects in Critical Wetlands Areas). All recommendations in the plan are for guidance only and are not required by any federal, state, or local agency.

Together, these practices can make changes in the watershed that will meet and exceed the Impairment Reduction Targets. Significant participation from local landowners, farmers, residents, municipalities, and developers will be needed to achieve these targets.

**Programmatic Measures**

**Protection and management of natural areas**

- Conservation Development design, which protects natural features like streams, steep slopes, and forest in new development (especially subdivisions), and management procedures for these areas.
- Open space and natural area protection from the design stage through to the stage where the landowner owns the property.
- Green infrastructure incentives, which promote the protection of forest, wetlands, and other green infrastructure (e.g., planting street trees).
- Monitoring of water quality, flow, and stream health to help measure progress.
- Hydrologic/flood studies, to properly identify the floodplain and update floodplain maps.
Lower Silver Creek Watershed Plan

Restoration of natural areas
- In-lieu fee ecological mitigation, a type of program that funds the restoration of ecologically sensitive wetlands and streams to mitigate for the losses of those features to new development.
- Native landscaping, which encourages the use of native plants on public and private property.
- Stream Cleanup Team, which removes litter and debris from streams and waterbodies.

Wastewater management
- Sewage Treatment Plant upgrades, which reduce the pollutant loading in wastewater discharge from wastewater facilities.
- Private sewage monitoring, a proactive program that samples private sewage systems to check for water quality problems and to encourage regular maintenance.

Natural resource policy
- Flood Damage Prevention Ordinance, which limits inappropriate development in floodplains, adopted by counties and municipalities.
- Riparian Buffer Ordinance, which limits development in riparian areas (areas adjacent to streams and waterbodies), encouraging forest and grassland that helps to filter and slow down runoff.
- Watershed Plan integrated into community policies and programs.

Funding
- Federal and state programs such as the Conservation Reserve Enhancement Program (CREP) and the Environmental Quality Incentives Program (EQIP) are available to landowners in the watershed to finance practices that prevent soil erosion, among other benefits.
- Financial support for stormwater infrastructure created, such as a Stormwater Utility, which is dedicated to upgrades and maintenance of detention basins, ditches, and other conveyance structures.

Site-Specific Measures
Agricultural
- Animal waste storage/treatment systems, which reduce nutrient and bacteria pollution from livestock waste.
- Bioreactors, also known as denitrifying bioreactors, which are ditches filled with wood chips that contain denitrifying bacteria that remove nitrogen from water coming from tile drainage systems.
- Comprehensive Nutrient Management Plans, which lead to reduced nutrient pollution from livestock operations.
- Conservation tillage (reduced tillage/no-till), which leads to a reduction in soil erosion and the transport of associated nutrients, such as phosphorus, to the waterways.
- Contour buffer strips, which are narrow strips of perennial vegetation that slow surface runoff and trap sediment, significantly reducing sheet and rill erosion and removing pollutants from runoff.
- Cover crops, which prevent erosion, improve soil health, break pest cycles, and suppress weeds.
- Grassed waterways, which are vegetated channels designed to slow surface water to reduce soil erosion and flooding.
- Nutrient Management Plans, which lead to reduced nutrient pollution from land on which crops are grown.
- Ponds, which store stormwater, settle out sediments, and allow nutrient uptake by aquatic organisms.
- Riparian buffers, which are vegetated zones immediately adjacent to streams that protect the stream channel.
- Terraces, which consist of ridges and channels constructed across the slope of a field, reducing soil erosion and surface runoff on sloping fields.
- Water and Sediment Control Basins (WASCOBs), which are small earthen ridge-and-channel structures or embankments built across a small watercourse in a field. They hold runoff, reducing the amount of sediment and sediment-borne phosphorus leaving the field and preventing the formation of gullies.
- Wetlands, which function as one of the most effective pollution removal practices.
Forest
• Forest stand improvement, which manages forest species composition (including removal of invasive species), can increase infiltration, reduce erosion, and provide long-term wildlife habitat.

Urban areas
• Bioswales, also known as vegetated swales, which increase infiltration and delay stormwater surges during heavy rainfall.
• Detention basins (new and retrofitted), which store flows during and incrementally release the stored water.
• Pervious pavement, which allows infiltration of stormwater into a below-ground storage area through holes in the pavement.
• Rain gardens, which temporarily store and infiltrate rain water, significantly slowing the flow of water, improving water quality, and providing wildlife food and habitat.
• Rainwater collection and reuse, using rain barrels or cisterns.
• Single property flood reduction strategies, which differ from property to property, based on the sources of flooding and appropriate flood reduction strategies.
• Stormwater system maintenance and expansion, which is crucial for the efficient conveyance of stormwater.
• Tree planting, adding street trees in the public right-of-way, or on private property, to help control stormwater runoff.

Streams and lakes
• Logjam removal, which removes debris from the stream channel, reducing scouring in the stream channel and the risk of floods overtopping the channel.
• Shoreline stabilization, which reduces bank erosion along lake shores.
• Streambank and channel restoration, which includes stabilization, grade control structures (e.g. riffles and pools), and re-meandering where appropriate. These reduce erosion and can provide flood storage.

Measuring Success
Activities in the watershed plan will be assessed over time, to measure the success of the watershed plan and its implementation. A set of Progress Report Cards is included in Appendix F, and it includes milestones for short-term (one to 10 years; 2018-2028), medium-term (10 to 20 years; 2028-2038), and long-term (20+ years; 2038+) timeframes. The report card can be used to identify and track plan implementation and effectiveness. Checking in at appropriate milestones helps watershed partners make corrections and ensure that progress is being made towards achieving the plan’s goals.

Information and Education Plan
Public outreach and educational activities are vital for supporting a healthier watershed. The Information and Education component of this plan supports the cumulative actions of partners, stakeholders, and the public across the watershed to accomplish its goals and objectives. Recommended information and outreach activities include:

• Municipal outreach, including information on websites and social media;
• Watershed plan outreach;
• An Agricultural BMP Workshop;
• A BMP or Demonstration Project Tour;
• A public events booth;
• Field days;
• Educational signs;
• School projects; and
• Watershed protection awareness.
SECTION 1: INTRODUCTION

Simply stated, a “watershed” is the area of land that drains into a common water body, such as a creek or river. It can be thought of as a large bathtub: when a drop of water hits anywhere in the tub, it eventually finds its way to the drain (the lowest point). The rim of the bathtub is like the watershed boundary—any drop falling outside it will not reach the drain. On land, a watershed boundary is determined by topography, and it includes surface water bodies (e.g., streams, rivers, lakes, reservoirs, and wetlands), groundwater (e.g., aquifers and groundwater basins), and the surrounding landscape.

The Lower Silver Creek watershed is a largely agricultural area in southwestern Illinois that drains to the Kaskaskia River (Figure 1). Rain falling on the watershed collects phosphorus and sediment on its way downhill to Silver Creek. Excessively high concentrations in Little Silver Creek, Loop Creek, and Ogles Creek earned them a place on the Illinois EPA 303(d) list of impaired waters for several successive years. Flooding is also a problem throughout the watershed, both where creeks rise up out of their banks and on roads in and near urban areas (i.e., “flash flooding”).

In 2016, HeartLands Conservancy received a grant from the IEPA to develop a Watershed Plan for the Lower Silver Creek watershed. A Watershed Plan is a strategy for managing watershed resources on public property, as well as providing a platform to encourage other watershed stakeholders (land owners, residents, businesses, developers, and non-profits) to participate. The plan is not regulatory, meaning it does not become law. The intent is to encourage voluntary improvements to stormwater management and water quality in the watershed.

**Lower Silver Creek Watershed**

The Lower Silver Creek watershed is located approximately 20 miles east of St. Louis, Missouri, in southwestern Illinois. The majority of the watershed is in St. Clair County, and small portions are in Madison (6,683 acres) and Clinton (835 acres) counties. The watershed’s 454 miles of streams drain roughly 126,000 acres of land. Silver Creek flows south from the project area to join the Kaskaskia River, which ultimately drains into the Mississippi River.

The Lower Silver Creek watershed project area contains numerous subwatersheds, called HUC14s (Figure 2). “HUC” stands for Hydrologic Unit Code, a number that indicates the general location and size of the watershed.

Little Silver Creek, Loop Creek, Ogles Creek, and Engle Creek are major tributaries to Silver Creek in the watershed project area. Little Silver Creek drains the Village of Lebanon and the area to the northeast. Loop Creek drains the area south of Shiloh and east of Belleville. Ogles Creek drains parts of O’Fallon and Fairview Heights, and Engle Creek also drains a large portion of O’Fallon.
The watershed is home to approximately 77,568 people, the majority of which live in unincorporated areas where farming is the primary land use. Agricultural land makes up 63% of the watershed, with most of that land is in row crop farming.

All or portions of eight municipalities, thirteen townships, and three counties are located within the watershed (Table 1).

Table 1. Jurisdictions in the watershed.

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Area within watershed (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>County (inclusive of municipalities)</td>
<td>124,331</td>
</tr>
<tr>
<td>St. Clair</td>
<td>116,814</td>
</tr>
<tr>
<td>Madison</td>
<td>6,683</td>
</tr>
<tr>
<td>Clinton</td>
<td>835</td>
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<tr>
<td>Municipalities</td>
<td>24,389</td>
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<tr>
<td>Belleville</td>
<td>1723</td>
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<tr>
<td>Fairview Heights</td>
<td>1391</td>
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<tr>
<td>Freeburg</td>
<td>2150</td>
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<tr>
<td>Lebanon</td>
<td>1584</td>
</tr>
<tr>
<td>Mascoutah</td>
<td>6178</td>
</tr>
<tr>
<td>O’Fallon</td>
<td>7443</td>
</tr>
<tr>
<td>Shiloh</td>
<td>3632</td>
</tr>
<tr>
<td>Summerfield</td>
<td>273</td>
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<tr>
<td>Census-designated Place</td>
<td>15</td>
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<tr>
<td>Rentchler</td>
<td>15</td>
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<tr>
<td>Unincorporated Areas</td>
<td>99,942</td>
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<td>St. Clair County</td>
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<td>Townships</td>
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<td>St. Jacob</td>
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<tr>
<td>Engelmann</td>
<td>6,149</td>
</tr>
<tr>
<td>New Athens</td>
<td>814</td>
</tr>
<tr>
<td>Scott Air Force Base</td>
<td>2,781</td>
</tr>
</tbody>
</table>
Purpose
The purpose of the Lower Silver Creek Watershed Plan is to promote a healthy, functioning watershed that sensitively balances farming, development, and natural ecosystems, including restoring surface water quality to streams and managing stormwater in floodplains and communities. The plan should enhance, manage, and protect the watershed’s human, natural, and socio-economic resources by identifying strategies and resources that promote the health and safety of human inhabitants, improve surface and groundwater quality, prevent flood damage, protect wildlife, and increase environmental education.

Methodology
HeartLands Conservancy developed a watershed planning approach based on guidance from IEPA’s Nonpoint Source Program, USEPA’s nine elements of watershed planning, and other local and regional watershed plans. The process included the following components:

1. Watershed area data collection and analysis
2. Delineation of subwatersheds
3. Stakeholder engagement
4. Key issue identification and goal setting
5. Critical Areas identification
6. Management Measure and target development
7. Implementation Schedule development
Watershed Data Collection and Analysis
A Watershed Resource Inventory (Appendix A) was developed, which reviews the existing conditions within the watershed. The inventory documents existing conditions in Silver Creek and its tributaries including channelization, erosion, riparian area condition, soil types, demographics, land use/land cover, and climate. Existing pollutant loads of nitrogen, phosphorus, and sediment are estimated from existing land uses using the STEPL from the U.S. Environmental Protection Agency (USEPA). See Planning inputs (right) for a list of data collected or generated for the Watershed Resources Inventory.

**Aerial assessment of stream and riparian conditions**
Little information previously existed about the condition of the streams in the watershed. To gather information about the stream reaches, geo-referenced video footage was taken on low-level helicopter flights over the larger streams in the watershed (116 miles or 26% of the total stream miles in the watershed). Midwest Streams, a firm with expertise in stream health, viewed the videotapes to assess three parameters for each stream: streambank erosion, degree of channelization, and condition of the riparian area. Later, Midwest Streams followed up with field checks at 52 locations to collect bank height data for erosion calculations.

**Detention basin survey**
The project team looked at aerial photographs of the watershed, along with USGS topographic maps, an elevation dataset, and the National Hydrography Dataset (NHD), to identify detention and retention basins. A point was created for each basin located within 500 feet of a group of four or more buildings, to avoid classifying natural ponds as detention basins. Three hundred and ninety-four (394) detention or retention basins were identified in the watershed.

**Delineation of subwatersheds**
At the start of the process, the project area was already divided into six subwatersheds, or hydrologic units (HUCs), called HUC12s. To provide more detailed analysis and recommendations for the watershed, the HUC12s were further divided into 22 smaller HUC14 subwatersheds. The project team used USGS methodology for defining watersheds in the Watershed Boundary Dataset (WBD), a component of the NHD.

Throughout this plan, the term “subwatershed” refers to the HUC14 subwatershed level.

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**Planning inputs**
The following types or sources of data were used to shape the Plan:

**Watershed Resources Inventory**
- Watershed boundaries (incl. HUC14s)
- Streams and waterbodies
- Direction of flow
- Topography
- Climate (incl. temperature and precipitation)
- Geology
- Aquifers
- Wells
- Hydric and hydrologic soils
- Erodible soils
- Water table
- Jurisdictional roles (federal, state, and local)
- Demographics
- Land use/land cover
- Ecological significance
- Fish and wildlife populations
- Transportation infrastructure
- Cultural/historic resources
- Impervious cover
- Streambank & streambed erosion
- Channelization
- Logjams
- Detention and retention basins
- Floodplains
- Critical infrastructure
- National Flood Insurance Program (NFIP) communities
- IEPA 303(d) impaired waters
- Other water quality data
- Spreadsheet for Estimating Pollutant Loads (STEPL) analysis

**Watershed Plan**
- Agricultural Conservation Planning Framework (ACPF) GIS tools
- Best Management Practice (BMP) pollutant reduction efficiencies

**Stakeholder engagement**
- Open House Events
- Stakeholder meetings
Community Partnership Group

The Scott Air Force Base Community Partnership Group provided technical guidance on the watershed planning process. The group consisted of professionals in stormwater management, water quality, stream and soil health, conservation, and urban planning, representing municipalities, Scott Air Force Base, and other entities (Table 3).

The group helped to guide data collection and analysis, goal and target setting, and recommendations. Specifically, the group reviewed the aerial assessment methodology and results, the STEPL use, draft nutrient reduction targets and other targets, and milestones for Plan implementation. The group met four times during the planning period and provided comments on the draft Plan in a meeting, via email and one-on-one meetings, and Open Houses.

<table>
<thead>
<tr>
<th>Entity</th>
<th>Representative(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scott Air Force Base</td>
<td>Water Program Manager, Planner, and others</td>
</tr>
<tr>
<td>MidAmerica Airport</td>
<td>Airport Engineer, Director of Engineering and Planning</td>
</tr>
<tr>
<td>U.S. Army Corps of Engineers</td>
<td>Strategic Planning Coordinator, Plan Formulator, Project Manager</td>
</tr>
<tr>
<td>East-West Gateway Council of Governments</td>
<td>Director of Community Planning</td>
</tr>
<tr>
<td>HeartLands Conservancy</td>
<td>President &amp; CEO, Project Manager, Associate Planner</td>
</tr>
<tr>
<td>City of Belleville</td>
<td>Planner &amp; GIS Coordinator, Director of Economic Development, Planning &amp; Zoning</td>
</tr>
<tr>
<td>City of Fairview Heights</td>
<td>Director of Public Works, Director of Land Use &amp; Development</td>
</tr>
<tr>
<td>Village of Freeburg</td>
<td>Village Administrator</td>
</tr>
<tr>
<td>City of Lebanon</td>
<td>Mayor</td>
</tr>
<tr>
<td>City of Mascoutah</td>
<td>City Manager</td>
</tr>
<tr>
<td>City of O’Fallon</td>
<td>Community Development Director</td>
</tr>
<tr>
<td>Village of Shiloh</td>
<td>Village Administrator, Director of Public Works</td>
</tr>
<tr>
<td>Village of Summerfield</td>
<td>Mayor pro tem</td>
</tr>
<tr>
<td>St. Clair County</td>
<td>Floodplain Manager, County Engineer</td>
</tr>
<tr>
<td>St. Clair County Board</td>
<td>District 19 Board Member</td>
</tr>
<tr>
<td>St. Clair County Soil and Water Conservation District</td>
<td>Board Member</td>
</tr>
<tr>
<td>Madison County Planning &amp; Development</td>
<td>Stormwater Coordinator</td>
</tr>
<tr>
<td>USDA - Wildlife Services</td>
<td>Biological Science Technician</td>
</tr>
<tr>
<td>U.S. Fish and Wildlife Service</td>
<td>Fish Biologist</td>
</tr>
<tr>
<td>CDI, Inc.</td>
<td>Water Resources Group Leader, Business Development Manager</td>
</tr>
<tr>
<td>Midwest Streams</td>
<td>President</td>
</tr>
<tr>
<td>National Great Rivers Research &amp; Education Center</td>
<td>Watershed Scientist</td>
</tr>
</tbody>
</table>
**MS4 Co-Permittee Group, St. Clair County**

Several communities in the watershed are members of the St. Clair County Municipal Separate Storm Sewer Systems (MS4) group. Engineering firm RJN Group acts on behalf of the county as the Coordinator for the MS4 Co-Permittee Group, which consists of 22 communities (including the county itself). The eight MS4 members within the Lower Silver Creek watershed are shown in Table 2. The group works together to help the individual communities and townships meet the 6 minimum control measures of their ILR40 permits.

The minimum requirements are: 1) Public education and outreach, 2) Public participation/involvement, 3) Illicit discharge detection and elimination, 4) Construction site runoff control, 5) Post-construction runoff control, and 6) Pollution prevention/good housekeeping.

<table>
<thead>
<tr>
<th>County</th>
<th>Municipalities</th>
<th>Townships</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Clair County</td>
<td>City of Belleville</td>
<td>Caseyville Township</td>
</tr>
<tr>
<td></td>
<td>City of Fairview Heights</td>
<td>O’Fallon Township</td>
</tr>
<tr>
<td></td>
<td>City of O’Fallon</td>
<td>St. Clair Township</td>
</tr>
<tr>
<td></td>
<td>Village of Shiloh</td>
<td></td>
</tr>
</tbody>
</table>

**Stakeholder Engagement**

Early on and throughout the planning process, the planning team interviewed numerous stakeholders including the St. Clair County Soil and Water Conservation District and seven of the eight municipalities in the watershed. Two Open House events were also used to gather input and get feedback from the general public. Municipalities were asked about their drinking water source(s), wastewater treatment system(s), and flooding, as well as issues such as erosion, siltation, and water quality issues. Other stakeholders were asked about these issues in their jurisdiction or on their property. A table summarizing the input from municipalities can be found in Appendix A (Watershed Resource Inventory). Stakeholder input was particularly helpful in shaping the Critical Area locations and the Information and Outreach section of the Plan, which identifies outreach gaps and opportunities with specific events and groups. Some of the issues identified during outreach include recurrent flooding; high levels of sediment, phosphorus, and nitrogen; and inadequate communication/coordination among potential watershed partners.

**Key Issue Identification and Goal Setting**

Using the results of the stakeholder outreach process, the project team identified the key issues—such as erosion and flash flooding—in the watershed. As the key issues evolved, common themes emerged and the project team was able to develop overarching goals and objectives for the watershed.

**Critical Areas Identification**

In addition to identification of key issues, the project team used information gathered from municipalities, townships, the county, individual property owners, and a variety of technical and spatial data resources and modeling to determine the locations of Critical Areas in the watershed. A “Critical Area” is a location in the watershed where existing or potential future causes and sources of pollutants are significantly worse than other areas, or there is significant potential to make progress towards watershed plan goals.

**Management Measures and Targets**

Based on the Watershed Resource Inventory and input from stakeholders and the public, management measures and targets were identified. Management Measures include potential BMPs for prevention, remediation, restoration, and maintenance to achieve water quality, natural resources, and flood control objectives. For each BMP, the plan identifies pollutant load reduction and other benefits,
approximate costs, and a schedule for implementation. Sources of financial and technical support are also identified, and measures of success and milestones are established to monitor the ongoing progress of the plan.

**Spreadsheet Tool for Estimating Pollutant Loads (STEPL)**
The National Great Rivers Research and Education Center (NGRREC) used the STEPL, which uses land cover, precipitation, and elevation data to estimate nitrogen, phosphorus, and sediment runoff from specific drainage areas. The tool created estimates for current land use conditions and future land cover scenarios incorporating Management Measures. The Community Partnership Group reviewed these numbers to set targets for pollutant load reduction in the watershed.

**Agricultural Conservation Planning Framework (ACPF)**
HeartLands Conservancy and NGRREC used the ACPF, a set of GIS tools developed by the USDA to identify locations where certain BMPs (such as terraces and grassed waterways) would be well-suited. The ACPF uses topographic data (LiDAR) to create maps of drainage pathways across agricultural land. These drainage pathways are used alongside land cover, rainfall, and soils data to create useable maps within the watershed. HeartLands Conservancy worked closely with USDA to use the ACPF tools to get the most accurate and useful results for this watershed. The Lower Silver Creek watershed is one of the first watersheds in the State of Illinois to make use of the ACPF for planning purposes (perhaps the second watershed after the Upper Silver Creek watershed).

**Implementation Schedule**
For each Management Measure, an implementation schedule was developed. Partners in the watershed plan can monitor progress and effectiveness using progress report cards (Appendix F).

**Water quality monitoring**
NGRREC staff collected existing water quality monitoring data for the watershed (from ISGS, IEPA, and other sources), and created a monitoring plan for the coming years (Appendix D).
SECTION 2: GOALS, OBJECTIVES, AND TARGETS

Goals and Objectives

A set of long-term goals and objectives were developed to address the challenges and issues associated with maintaining a healthy, functioning watershed (Table 4). These goals address the issues identified in the Watershed Resources Inventory and input from residents, land owners, businesses, and government officials.

Each goal and objective aligns with a challenge/issue to be addressed, a set of recommended BMPs, the roles of organizations implementing those BMPs, specific and general projects using those BMPs, and ranking of the priority of the recommended BMPs.

Table 4. Goals and objectives of the Watershed Plan.

<table>
<thead>
<tr>
<th>Goals</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve Surface Water Quality</td>
<td>• Decrease pollutant loading to Silver Creek and its tributaries.</td>
</tr>
<tr>
<td></td>
<td>• Reduce phosphorus by 25% by 2030.</td>
</tr>
<tr>
<td></td>
<td>• Reduce sediment by 15% by 2030.</td>
</tr>
<tr>
<td></td>
<td>• Reduce nitrogen by 15% by 2030.</td>
</tr>
<tr>
<td></td>
<td>• Maintain DO levels above standard minimums.</td>
</tr>
<tr>
<td></td>
<td>• Create a private sewage assessment strategy.</td>
</tr>
<tr>
<td></td>
<td>• Monitor water quality and identify trends.</td>
</tr>
<tr>
<td></td>
<td>• Increase awareness of consequences of littering/illegal dumping.</td>
</tr>
<tr>
<td>Reduce Flooding/Mitigate Flood Damage</td>
<td>• Increase stormwater captured, stored, and infiltrated.</td>
</tr>
<tr>
<td></td>
<td>• Limit development in the 100-year floodplain.</td>
</tr>
<tr>
<td></td>
<td>• Institute development standards that minimize impervious surfaces.</td>
</tr>
<tr>
<td></td>
<td>• Preserve the natural flow of streams and slow peak stream flow.</td>
</tr>
<tr>
<td></td>
<td>• Promote ongoing maintenance of stormwater storage and conveyance infrastructure.</td>
</tr>
<tr>
<td></td>
<td>• Provide information about flood damage prevention and insurance.</td>
</tr>
<tr>
<td>Promote Environmentally Sensitive Development</td>
<td>• Conserve sensitive lands.</td>
</tr>
<tr>
<td></td>
<td>• Increase the acreage of forest, native grassland, and wetlands.</td>
</tr>
<tr>
<td></td>
<td>• Use wetland mitigation banking or in-lieu fee programs.</td>
</tr>
<tr>
<td></td>
<td>• Implement low-impact development strategies.</td>
</tr>
<tr>
<td></td>
<td>• Work with municipalities to amend policies and regulations to include conservation, native landscaping, stormwater management, and low-impact design.</td>
</tr>
<tr>
<td>Support Healthy Habitat</td>
<td>• Promote healthy ecosystems within streams and riparian areas.</td>
</tr>
<tr>
<td></td>
<td>• Monitor fish and aquatic macroinvertebrate communities.</td>
</tr>
<tr>
<td></td>
<td>• Identify and protect key natural features and wildlife corridors.</td>
</tr>
<tr>
<td></td>
<td>• Prioritize “green” stormwater management approaches.</td>
</tr>
<tr>
<td></td>
<td>• Create an invasive species removal strategy.</td>
</tr>
<tr>
<td>Develop Organizational Frameworks</td>
<td>• Formalize a network of partners to implement the plan.</td>
</tr>
<tr>
<td></td>
<td>• Leverage funding from a variety of sources to implement the plan.</td>
</tr>
<tr>
<td>Conduct Education and Outreach</td>
<td>• Identify opportunities to assist stakeholders with watershed management.</td>
</tr>
<tr>
<td></td>
<td>• Connect watershed stakeholders to decision-makers and experts.</td>
</tr>
<tr>
<td></td>
<td>• Offer opportunities for public education and participation in watershed matters.</td>
</tr>
<tr>
<td></td>
<td>• Develop public recognition programs focused on the watershed plan’s goals.</td>
</tr>
</tbody>
</table>
GOAL 1: IMPROVE SURFACE WATER QUALITY
This plan aims to improve surface water quality in the Lower Silver Creek watershed, so that the streams can be safely used by residents, and to remove Little Silver Creek, Loop Creek, and Ogles Creek from IEPA’s 303(d) list of impaired waters.

The Lower Silver Creek watershed receives excessive phosphorus and sediment. High levels of these pollutants, and low levels of dissolved oxygen in Little Silver Creek, earned Little Silver Creek, Loop Creek, and Ogles Creek a place on the Illinois EPA 303(d) list of impaired waters for several successive years. (Lower Silver Creek itself was assessed as “fully supporting” aquatic life and aesthetic quality in 2016). For this plan, numerical reductions for impairments in the watershed are based on modeled pollution data, historical monitoring data, and the Illinois Nutrient Loss Reduction Strategy. The main water quality parameters of concern are sediment, phosphorus, and DO. The Watershed Impairment Reduction Targets table on page 27(Table 5) provides details on the sources of these reduction targets.

Water Quality Objectives:

1.1 Decrease overall pollutant loading to Silver Creek and its tributaries, and remove Little Silver Creek, Loop Creek, and Ogles Creek from the Illinois EPA 303(d) list of impaired waters.

1.2 Achieve a 25% reduction in phosphorus from the watershed by 2030. (i.e., a 25% reduction in the annual total phosphorus load by 2030, based on the Illinois Nutrient Loss Reduction Strategy.)

1.3 Achieve a 15% reduction in sediment from the watershed by 2030. (i.e., a 15% reduction in the annual sediment load, based on estimates from a suite of BMPs that also address the needed phosphorus reduction.)

1.4 Achieve a 15% reduction in nitrogen from the watershed by 2030. (i.e., a 15% reduction in the annual total nitrogen load by 2030, based on the Illinois Nutrient Loss Reduction Strategy.)

1.5 Maintain Dissolved Oxygen (DO) levels above standard minimums. (i.e., consistently maintain levels higher than the minimum concentrations set in Illinois standards (35 Ill. Adm. Code 302), set by the Illinois Pollution Control Board in 2011). These standards are as follows: March – July: 5.0 mg/L at any time, 6.0 mg/L as a daily mean averaged over 7 days; August – February: 3.5 mg/L at any time, 4.0 mg/L as a daily mean averaged over 7 days, 5.5 mg/L as a daily mean averaged over 30 days.

1.6 Create a comprehensive strategy to improve the assessment and maintenance of private sewage systems (i.e., septic tanks) for correct functioning.

1.7 Monitor the Lower Silver Creek watershed’s water quality to identify trends and evaluate the success of watershed management activities.
GOAL 2: REDUCE FLOODING AND MITIGATE FLOOD DAMAGE

Manage and mitigate floods to improve water quality, reduce property damage and health risk, and reduce infrastructure maintenance costs.

Within the Lower Silver Creek watershed, there is a need for further outreach and dissemination of resources about flood damage prevention and flood insurance; a decrease in impervious surface area; preservation and slowing of natural stream flow; an increase in flood storage and infiltration features such as detention basins, wetlands, and no-till agriculture; and changes in policy to discourage development in flood-prone areas.

Flood Management Objectives:

2.1 Increase the amount of stormwater captured, stored, and infiltrated in the watershed, particularly upstream of areas with periodic or regular property damage caused by flooding.

2.2 Limit development in the FEMA identified 100-year floodplain.

2.3 Institute development standards that seek to minimize the amount of impervious surfaces in new development and redevelopment projects.

2.4 Preserve the natural flow regime of streams in the watershed, and identify opportunities to slow peak stream flow and recharge groundwater where increases in flood height are acceptable.

2.5 Promote ongoing maintenance of stormwater storage and conveyance infrastructure (e.g. detention basins and ponds) to maximize storage capacity.

2.6 Provide information and outreach about flood damage prevention and flood insurance.
GOAL 3: PROMOTE ENVIRONMENTALLY SENSITIVE DEVELOPMENT PRACTICES
Promote development practices that protect environmentally sensitive lands (e.g., steep slopes, wetlands, and forests), conserve soil, limit new impervious surfaces, and increase the use of native vegetation.

**Development Objectives:**

3.1 *Conserve sensitive lands by taking them out of crop production and/or protecting them from development.* These lands include cropland that frequently floods, those with highly erodible soils, forested lands adjacent to waterways (riparian areas), and steep slopes.

3.2 *Increase the acreage of forest, native grassland, and wetland in the watershed while reducing the acreage of impervious surface area and turf grass. Reconnect forest tracts for habitat connectivity.*

3.3 *Use wetland mitigation banking or in-lieu fee programs to offset the environmental impacts of new development.*

3.4 *Implement low-impact development (LID) strategies so that important watershed processes and water resource functional values are protected.* Development should allow high infiltration, use minimal impervious surface area, protect trees and native vegetation, and have adequate stormwater and sediment detention.

3.5 *Work with municipalities to update their comprehensive plans, zoning ordinances, and subdivision regulations to include conservation, native landscaping, stormwater management, and low-impact development standards.*

GOAL 4: SUPPORT HEALTHY FISH AND WILDLIFE HABITAT
Improve and protect habitat in streams and water bodies to promote biodiversity.

**Habitat Objectives:**

4.1 *Promote healthy ecosystems within streams and riparian areas to provide habitat for a wide variety of native fish, invertebrate, plant, and animal species.*

4.2 *Monitor fish and aquatic macroinvertebrate communities alongside water quality data to assess suitability of habitat.*

4.3 *Identify, protect, and restore key natural features and corridors for wildlife, including wetlands, forest, and grassland, to prevent the loss or degradation of fish and wildlife habitat.*

4.4 *Prioritize “green” stormwater management approaches that use native vegetation to naturally filter pollutants over conventional structural approaches, such as riprap and piped conveyance.*

4.5 *Create a strategy to remove invasive species within the watershed, and educate landowners about invasive species and how to safely remove them.*
GOAL 5: DEVELOP ORGANIZATIONAL FRAMEWORKS TO IMPLEMENT WATERSHED GOALS
Facilitate partnerships with stakeholders and leverage resources to implement the watershed plan.

Organizational Framework Objectives:

5.1 Formalize a network of partners dedicated to implementing the watershed plan and other water quality and stormwater management issues in the watershed and the county.

5.2 Leverage funding from a variety of sources to implement the watershed plan.

GOAL 6: CONDUCT EDUCATION AND OUTREACH
Promote public awareness, understanding, and stewardship of the watershed and the Watershed Plan.

Education and Outreach Objectives:

6.1 Identify opportunities to assist municipalities, counties, state and federal agencies, and other stakeholders with watershed management and conservation efforts.

6.2 Connect watershed residents, farmers, and business owners to decision-makers and experts with knowledge about water quality, flooding issues, and solutions.

6.3 Offer effective opportunities for public education, training, and participation in watershed matters, including information-based resources and demonstration projects.

6.4 Develop public recognition programs focused on the watershed plan’s goals.
Watershed Impairment Reduction Targets
Establishing “Impairment Reduction Targets” is an important part of the watershed planning process. It enables calculations to be made about how implementation of a suite of Management Measures can be expected to reduce watershed impairments over time.

The Impairment Reduction Targets for nutrients in this Watershed Plan are based on the Illinois Nutrient Loss Reduction Strategy, published by IEPA in 2015. The Strategy describes a comprehensive suite of Best Management Practices (BMPs) for reducing nutrient loads from wastewater treatment plants and urban and agricultural runoff. Its targets are a 25% reduction in phosphorus and a 15% reduction in nitrogen by 2025, with an eventual target of 45% reduction for both nutrients. This Watershed Plan uses these reduction targets but extends the deadline to 2030, and adds a target of a 15% reduction in sediment (Table 5). The estimated reduction in phosphorus and nitrogen loads based on the BMPs recommended in this plan exceeds the 25% targets, because the Management Measures recommended to meet the 15% reduction in sediment reduced those nutrient loads by a greater proportion.

Additional watershed-wide impairment reduction targets were established for dissolved oxygen, flood damage, habitat degradation, wetlands, surface water infiltration, and private sewage (Table 5).
Table 5. Watershed-wide impairment reduction targets, their basis, and reductions from Critical Areas and other areas recommended.

<table>
<thead>
<tr>
<th>Impairment: Cause of Impairment</th>
<th>Basis for Impairment</th>
<th>Reduction Target</th>
<th>Reduction from Critical Areas and other areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Quality/Aquatic Life:</strong> Phosphorus</td>
<td>166,316 lbs/year of phosphorus loading, based on STEPL model. Phosphorus is a 303(d) listed impairment for Little Silver Creek, Loop Creek, and Ogles Creek for 2016.</td>
<td><strong>25%</strong> or 41,579 lbs/year reduction in phosphorus loading by 2030, based on the Illinois Nutrient Loss Reduction Strategy</td>
<td>11,087 lbs/year reduction from Critical Stream Reaches and other poor condition stream reaches 4,633 lbs/year reduction from Critical Riparian Areas and other riparian areas 494 lbs/year reduction from Critical Wetland Areas 29,132 lbs/year reduction from other agricultural areas 1,522 lbs/year reduction from urban and forested areas</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>50,889 lbs/year or 30.6% total phosphorus reduction</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Water Quality/Aquatic Life:</strong> Sediment</td>
<td>64,483 tons/year of sediment loading, based on STEPL model Sedimentation/siltation is a 303(d) listed impairment for Little Silver Creek and Loop Creek for 2016.</td>
<td><strong>15%</strong> or 9,672 tons/year reduction in sediment loading by 2030, based on estimated impacts of proposed BMPs. Similar target to phosphorus; sediment is its primary transport mechanism.</td>
<td>2,278 tons/year reduction from Critical Stream Reaches and other poor condition stream reaches 1,085 tons/year reduction from Critical Riparian Areas and other riparian areas 166 tons/year reduction from Critical Wetland Areas 4,228 tons/year reduction from other agricultural areas 407 tons/year reduction from urban and forested areas</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>9,815 tons/year or 15.2% total sediment reduction</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Water Quality/Aquatic Life:</strong> Nitrogen</td>
<td>775,661 lbs/year of nitrogen loading, based on STEPL model</td>
<td><strong>15%</strong> or 116,349 lbs/year reduction in nitrogen loading by 2030, based on the Illinois Nutrient Loss Reduction Strategy</td>
<td>49,202 lbs/year reduction from Critical Stream Reaches and other poor condition stream reaches 18,139 lbs/year reduction from Critical Riparian Areas and other riparian areas 996 lbs/year reduction from Critical Wetland Areas 179,516 lbs/year reduction from other agricultural areas 7,047 lbs/year reduction from urban and forested areas</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>268,353 lbs/year or 34.6% total nitrogen reduction</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Water Quality/Aquatic Life:</strong> Dissolved Oxygen</td>
<td>Minimum 3.4 mg/L (median 7.8 mg/L) dissolved oxygen, based on samples collected from Silver Creek between 1972 and 1997 by the Illinois Water Science Center and IEPA. Dissolved oxygen is a 303(d) listed impairment for Little Silver Creek for 2016.</td>
<td>No samples lower than the minimum concentration in streams: March – July: 5.0 mg/L at any time, 6.0 mg/L daily mean averaged over 7 days August – February: 3.5 mg/L at any time, 4.0 mg/L daily mean averaged over 7 days, 5.5 mg/L daily mean averaged over 30 days Based on 35 Ill. Adm. Code 302 (Illinois Pollution Control Board (IPCB), 2011).</td>
<td>228,254 feet streambank and channel restoration, including riffle pools and other structures that increase re-aeration (33% of all streams with high streambank erosion) 464 acres (201,960 feet) of moderate or poor condition riparian areas ecologically restored, including 100% Critical Riparian Areas</td>
</tr>
</tbody>
</table>
## Lower Silver Creek Watershed Plan

<table>
<thead>
<tr>
<th>Impairment: Cause of Impairment</th>
<th>Basis for Impairment</th>
<th>Reduction Target</th>
<th>Reduction from Critical Areas and other areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality/Aquatic Life:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fecal coliform</td>
<td>Median 200 cfu/100ml fecal coliform concentrations, based on samples collected from Silver Creek (1972-2011, Illinois Water Science Center and IEPA)</td>
<td><strong>Private sewage assessment strategy</strong> created, identifying improvements and connection opportunities</td>
<td>Reductions following maintenance and replacement as a result of private sewage inspections, and tap-ons to municipal wastewater systems</td>
</tr>
<tr>
<td>Flood Damage: Flooding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>inside and outside floodplain</td>
<td>Flood damage and road closures reported by municipalities, residents, and others both inside and outside the 100-year floodplain.</td>
<td><strong>100 acres dry detention basins</strong> installed, <strong>100 acres wet detention basins</strong> installed, <strong>Retrofits &amp; maintenance</strong> of existing detention basins</td>
<td><strong>100 acres dry detention basins</strong> installed, <strong>100 acres wet detention basins</strong> installed, <strong>Retrofits and maintenance on 67 existing detention basins</strong> (assumed average size: 1.4 acres)</td>
</tr>
<tr>
<td>Habitat Degradation:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invasive/non-native plant species in riparian areas; hydrologic changes due to loss of wetlands; logjams</td>
<td>There are 14.1 miles of Critical Riparian Area, including 6 miles of riparian areas in poor condition per the aerial assessment, and 8.4 miles identified as Critical Zones by the ACPF Riparian Function Assessment tool (there is some overlap).</td>
<td><strong>100% Critical Riparian Areas</strong> restored, <strong>Other riparian areas in moderate condition</strong> restored</td>
<td>464 acres (201,960 feet) of moderate or poor condition riparian areas ecologically restored, including 100% Critical Riparian Areas</td>
</tr>
<tr>
<td>Wetland Loss: Flood storage and filtration functions</td>
<td>Thousands of acres of wetlands lost since pre-settlement; loss of ecosystem functions</td>
<td><strong>100% Critical Wetlands Areas</strong> restored</td>
<td>671 acres (100%) Critical Wetlands Areas restored</td>
</tr>
<tr>
<td>Reduced infiltration to groundwater</td>
<td>Current 2.8% impervious cover; current 9,732 acres developed open space (2011 NLCD) or 2,695 acres open space (EWG)</td>
<td><strong>Preservation of open space and infiltration measures</strong> used in new and redevelopment, <strong>Increase in rain gardens</strong> and <strong>Increase in pervious surfaces</strong> in new and redevelopment</td>
<td>Preservation of open space and infiltration measures in all new and redevelopment, e.g., designed for Conservation Development and green infrastructure</td>
</tr>
<tr>
<td>Fecal coliform: Private sewage</td>
<td>Over 3,000 private sewage systems estimated in watershed, estimated 10% private sewage failure rate nationwide</td>
<td><strong>Reduction</strong> in in-stream measured fecal coliform (see fecal coliform target above), <strong>Proactive inspection programs</strong> for private sewage, not just complaint-based</td>
<td>Reduction in in-stream measured fecal coliform at the USGS gauge site, Proactive county/municipal coordination for private sewage, beyond complaint-based assessment</td>
</tr>
</tbody>
</table>
SECTION 3: ISSUES AND CRITICAL AREAS

Key Issues Identified
The following issues were identified in the watershed planning process. Issues are organized by the primary goal to which they relate, such as flooding. For some issues, Critical Areas where the issue is most prevalent or impactful were identified (see p.37).

Surface water quality

Issue: IEPA Primary Sources of Impairment. The primary sources of impairment to streams in the watershed listed on the IEPA 303(d) list are: agriculture, crop production (crop land or dry land), streambank modifications/destabilization, municipal point source discharges (storm sewers), and urban runoff/storm sewers. Fertilizers and erosion on crop land contribute to significant phosphorus and sediment loading. The 2015 Illinois Nutrient Loss Reduction Strategy identified the need for statewide reductions in nutrient pollution (including phosphorus) in Illinois waterways. Wetlands, which act as natural filters and remove nutrients and other pollutants, were once widespread in the watershed but are now scarce. Over 600 acres of Critical Wetland Areas have been identified in the watershed, in locations which are highly suitable for restoration/construction of wetlands (see p.38).

Additional surface water issues reported by municipalities include bad odor in a stream near suspected failing private sewage systems, and litter and dumping in and near streams. Water quality monitoring at two locations on Ogles Creek in 2017, required for St. Clair County's MS4 reporting, showed high fecal coliform levels. Point sources of pollution come from nine facilities that require a NPDES permit discharging wastewater into the watershed. Table 5 lists the known water quality impairments in the watershed and their associated causes and sources. Municipalities in the watershed use purchased surface water from Illinois American Water (for O’Fallon, Shiloh, Belleville, and Scott Air Force Base) and Summerfield-Mascoutah-Lebanon (SLM) (for Summerfield, Mascoutah, Lebanon, Freeburg, and the MidAmerica Airport). Illinois American Water draws its water from the Mississippi River, while SLM draws from the Kaskaskia River.

Issue: Soil Erosion from Agricultural Land. Because 63% of the watershed is agricultural (and most is row crops), farming practices factor significantly in the amount and type of pollutants reaching the waterways. An estimated 37% of sediment and 74% of phosphorus in the watershed comes from cropland (see Appendix A, p.123). According to the 2015 Illinois Department of Agriculture Soil Conservation Survey, St. Clair County farmers used some form of conservation tillage on more than 98% of corn fields and nearly 100% of soybean fields. Conservation tillage (reduced tillage) and no-till practices contribute significantly less sediment and nutrients than traditional tillage. However, tillage is not the only source of soil erosion on agricultural land. Municipalities and residents identified instances where row crops are consistently planted up to the edge of fields and into drainage ditches, leading to greater soil erosion and widening the ditch.
Many farmers in the watershed have adopted glyphosate-resistant crops. When spraying these crops with the herbicide, overspray onto adjacent ditches can occur. Plant cover is frequently absent along the steep slopes of road ditches, which increases erosion and sedimentation in both the ditch and downstream and contributes to flooding. Similarly, urban ditches are contributing sediment to waterways when mowers are set too low, scraping up the dirt and vegetation in the ditch. This sediment and vegetation debris accumulates in the ditches, creating dams and leading to flooding. Glyphosate is occasionally used intentionally to kill vegetation in ditches, which encourages the growth of weedy plants and invasives (e.g., poison hemlock, giant ragweed, and Johnson grass) and increases erosion.
Table 6. Causes and sources of watershed impairments and the associated goals that address them.

<table>
<thead>
<tr>
<th>IEPA or other impairment</th>
<th>Cause of impairment</th>
<th>Known or potential source of impairment</th>
<th>Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality - Aquatic Life</td>
<td><strong>Nutrients</strong>: Phosphorus (known impairment) and Nitrogen (potential impairment)</td>
<td>Streambank and channel erosion; Agricultural row crop runoff; Failing private sewage systems; Wastewater treatment plants; Lawn fertilizer; Level of landowner education; Livestock operations (manure)</td>
<td>1</td>
</tr>
<tr>
<td>Water Quality - Aquatic Life</td>
<td><strong>Sediment</strong>: Total Suspended Solids / Turbidity (known impairment)</td>
<td>Streambank and channel erosion; Agricultural row crop runoff; Construction sites; Livestock operations (manure)</td>
<td>1</td>
</tr>
<tr>
<td>Water Quality - Aquatic Life</td>
<td>Low <strong>dissolved oxygen</strong> (known impairment)</td>
<td>Heated stormwater runoff from urban areas; Lack of natural riffles in streams (incl. channelized streams)</td>
<td>1</td>
</tr>
<tr>
<td>Water Quality - Aquatic Life</td>
<td><strong>Fecal coliform</strong> (potential impairment)</td>
<td>Failing private sewage systems; Livestock operations (manure); Wastewater treatment plants</td>
<td>1</td>
</tr>
<tr>
<td>Habitat Degradation</td>
<td><strong>Invasive/non-native plant species and degradation in riparian and other natural areas</strong> (known impairment)</td>
<td>Existing and introduced invasive species populations; Logjams, trash/debris, and other obstructions in streams; Level of public education</td>
<td>3, 4, 6</td>
</tr>
<tr>
<td>Habitat Degradation</td>
<td><strong>Loss and fragmentation of open space/wetlands/natural habitat</strong> (known impairment)</td>
<td>Inadequate protection policy; Lack of land acquisition funds; Traditional development design; Streambank, channel, and riparian area modification; Lack of restoration and maintenance funds; Wetland and riparian buffer loss</td>
<td>3, 4, 5</td>
</tr>
<tr>
<td>Flood Impacts</td>
<td><strong>Encroachment in 100-year floodplain</strong> (known impairment)</td>
<td>Channelized streams; Agricultural drain tiles; Wetland and riparian buffer loss; Logjams and other obstructions in streams; Existing and future urban impervious surfaces</td>
<td>2, 3, 5</td>
</tr>
<tr>
<td>Flood Impacts</td>
<td><strong>Urban flooding/flash flooding</strong> (known impairment)</td>
<td>Existing and future urban impervious surfaces; Inadequate stormwater infrastructure (e.g. too few detention basins); Poor stormwater infrastructure design &amp; function; Lack of funding for stormwater infrastructure; Agricultural drain tiles; Traditional development design</td>
<td>2, 5</td>
</tr>
</tbody>
</table>
**Issue: Soil Erosion from Streams.** In addition to soil erosion from farmland, streambank and channel erosion contributes much of the sediment loading in the watershed. Streambank erosion has a very high sediment delivery rate (100%) to the stream. Sixty-two miles of streams assessed in the watershed had high streambank erosion (including Critical Stream Reaches, which had high streambank erosion and high channelization – see p.37). An additional 45 miles of streams assessed had moderate streambank erosion. Streambanks contribute an estimated 53% of sediment in the watershed to streams (see Appendix A, p.123). Stream erosion is especially problematic in areas that are becoming increasingly urbanized, due to the increased volume of water reaching streams in “flashy” surface flow during storm events. Several municipalities highlighted soil erosion issues within their municipal boundaries along creeks and ditches. O’Fallon noted that its streams are getting wider but not deeper, as the water reaches shale bedrock on the streambed. Summerfield and Belleville identified areas of high streambank erosion where trees have been cut down next to streams to expand row crop agriculture, causing the streambanks to collapse and the creeks to widen. Southwestern Illinois College (SWIC)-Belleville identified high erosion areas on the southwest side of its campus. Several Open House attendees also reported erosion on their properties from widening ditches, tributaries, and creeks.

**Issue: Logjams.** Streambank erosion is also exacerbated by logjams, which are woody vegetation and/or other debris which obstructs a stream channel and backs up stream water. Logjams can be both a cause and a result of streambank erosion. They can alter flow, directing water outwards to the streambanks, increasing scouring and bank erosion. Logjams in the Silver Creek corridor increase flooding upstream, causing roads to be covered with water in the City of Lebanon (e.g., Highway 50, a major route into the city). Logjams result from streambank erosion when a stream is incising or meandering excessively, causing large woody vegetation on the banks to be undercut and fall into the stream. Changes in forest tree species composition can also increase logjams; in the forest east of Scott Air Force Base, several older bottomland hardwood trees are dying and falling into the floodplain and creek at the same time. Several stakeholders identified beavers as a cause of logjams along Silver Creek.

**Issue: Contamination from Private Sewage and Animal Waste.** Large spikes in fecal coliform levels have occurred at monitoring gauges on Silver Creek between 1979 and 1997. The watershed likely has over 3,000 private sewage systems (i.e., septic systems), most of which are in the unincorporated area. USEPA uses a figure from the U.S. Census Bureau that at

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**Objectives addressing this issue:**

♦ Reduce sediment by 15% by 2030.

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**Objectives addressing this issue:**

♦ Reduce sediment by 15% by 2030.

---

**Objectives addressing this issue:**

♦ Create a private sewage assessment strategy.
least 10% of septic systems nationwide have stopped working. Madison County officials estimate that the failure rate in the area is actually much higher (up to 90% in older developments). Municipalities and Open House attendees reported occurrences of and bad odors from failing systems.

The St. Clair County Health Department reports that a lack of access to municipal sewer systems is the major sewer issue for the county. There are several areas in the watershed where older development has small lots, inadequate private sewer systems, and no easy way to connect to a public system. New residential development located within 300 feet of an existing public system is required by the county to connect to that system; for commercial development (including some subdivisions), that distance is 1,000 feet. For existing development, there is no such requirement unless the private sewer system fails. And many older private systems are physically too far from a public system to make connecting cost-effective. St. Clair County used to have grants to assist with connection to public sewers, but funding has been reduced or eliminated. Funding to assist in connecting older development to public sewer, and to help maintain private sewer systems, would be beneficial.

Waste from livestock and other animal feeding operations (AFOs) can also contribute nutrients and bacteria to surface water. Private sewage and animal waste are considered point sources of pollution that emanate from specific locations. Municipal wastewater is largely treated at facilities within the watershed, and residents are encouraged to tap on to municipal sewer lines when feasible.

**Issue: Infiltration into Sanitary Sewers (De Facto Combined Sewers)**

All of the municipalities in the watershed have separate storm and sanitary sewer systems. (The City of Belleville does have combined sewers, but these are located outside the watershed.) However, several municipalities report that aging infrastructure has led to instances of infiltration of stormwater into the sanitary system, resulting in sewer backups, de facto combined sewers, and occurrences of combined sewer overflows (CSOs). This results in property damage, raw sewage draining into surface water, and increased costs of cleanup and sewage treatment for municipalities.

**Objectives addressing this issue:**
- Decrease pollutant loading to Silver Creek and its tributaries.
- Promote ongoing maintenance of stormwater storage and conveyance infrastructure.

**Issue: Dumping and Littering.** Trash and debris is an issue in places where roads cross Silver Creek and its tributaries. People throwing trash out of car windows or dumping unwanted or hazardous materials leads to debris deposits that are eyesores, harm fish and wildlife, and create obstructions in the creek. Illegal dumping of large objects into or next to creeks is also an issue, particularly in wooded, secluded areas. Open House attendees mentioned litter, trash, and debris on their property or on the creeks and streams they drive past.

**Objectives addressing this issue:**
- Decrease pollutant loading to Silver Creek and its tributaries.
- Increase awareness of consequences of littering/illegal dumping.
**Flooding**

**Issue: Prevalent Flooding.** Flooding is highly prevalent in the Lower Silver Creek watershed, both inside and outside of floodplains, and in rural and urban areas. Urban flooding was probably the most important issue to the municipalities interviewed; all of them had experienced at least some flooding in developed areas or on roads. Open House attendees reported flooding on their properties and on the roads around them. Some floods occur as a result of backup from the Kaskaskia River; when river levels are high, the water from Silver Creek has nowhere to go and causes stream levels to rise.

**Objectives addressing this issue:**
♦ Increase stormwater captured, stored, and infiltrated.
♦ Institute development standards that minimize impervious surfaces.

**Issue: Extensive Floodplain.** FEMA has identified almost 20% of the watershed as 100-year floodplain. This area is almost entirely riverine floodplain around Silver Creek and its larger tributaries. Over time, the floodplain surrounding Silver Creek has filled with sediment in some places, for example, where I-64 and Route 50 cross Silver Creek. This has caused a reduction in flood storage and extended the reach of floodwaters. All of the municipalities in the watershed are enrolled in the National Flood Insurance Program, as are St. Clair, Madison, and Clinton counties.

**Objectives addressing this issue:**
♦ Limit development in the 100-year floodplain.
♦ Preserve the natural flow of streams and slow peak stream flow.
♦ Provide information about flood damage prevention and insurance.

**Issue: Flooding Outside of Floodplains.** The area outside the floodplain is impacted by flash floods/urban flooding from time to time. This flooding is a result of increased impervious surfaces (e.g., pavement and roofs in developed areas), changes in local hydrology (such as ditches installed or filled in), and severe storm events with heavy rainfall. Lack of stormwater infrastructure, inadequate infrastructure (such as undersized culverts), aging infrastructure, and inadequate maintenance of infrastructure all contribute to the issue of flooding outside of floodplains.

**Objectives addressing this issue:**
♦ Institute development standards that minimize impervious surfaces.
♦ Promote ongoing maintenance of stormwater storage and conveyance infrastructure.

**Land Cover and Development**

**Issue: Poorly Planned Development.** Development in the Metro East is occurring at a rapid pace. Madison and St. Clair counties combined lose 0.33 acre of agricultural land to development every minute, according to the USDA’s National Agricultural Statistics Service (NASS) for 2007-2012. The population in the watershed is also projected to increase (slowly) over the next few decades. New development will likely occur within and around municipalities in the watershed, consuming as much as 19,000 acres of farmland and 5,000 acres of forest. New impervious surfaces will compound the problems of flooding, lack of infiltration, and poor water quality. Without changes in policy to encourage greater detention and green infrastructure, local flash flooding will pose significant risks to both new...
and existing development and infrastructure. Municipalities in the watershed need stronger policies to maintain stormwater infrastructure, protect steep slopes, and preserve native vegetation as development occurs.

**Issue: Poor Aquifer Replenishment.** The water table is very shallow over much of the watershed, and rainfall slowly replenishes groundwater supplies removed by people or evapotranspiration. However, replenishment of aquifers has declined as impervious surfaces have increased in area. Continued development outside municipalities has added impervious surface which does not allow infiltration and replenishment of the water table. Future development is likely to continue this trend.

Additionally, conventional row crop agriculture results in less infiltration of rainwater compared to conservation and no-till farming practices due to the destruction of natural soil structure. The Illinois State Geological Survey has documented 1,217 water wells in the watershed, including industrial and commercial wells and wells. Reductions to aquifer replenishment may become an issue for the businesses and private residences that use wells for their drinking water supply and other purposes. No wellhead protection plan is known to be in place in the watershed.

**Habitat**

**Issue: Invasive Species.** Invasive species, such as bush honeysuckle, Phragmites, tree-of-heaven, Bradford Pear trees, and garlic mustard are threats to many natural areas because they crowd out native trees and shrubs that protect streambanks from erosion. Invasives also crowd out food sources of animals and insects, further degrading the ecosystem. See Table 6 for causes and sources associated with habitat degradation.

**Objectives addressing this issue:**
- Create an invasive species removal strategy.
- Work with municipalities to update policies and regulations to include conservation, native landscaping, stormwater management, and low-impact design.
- Increase the acreage of forest, native grassland, and wetlands.
- Monitor fish and aquatic macroinvertebrate communities.

**Issue: Threatened and Endangered Species.** The Indiana Bat, a federally endangered species, has been observed in the forest at Scott Air Force Base. Two state-listed endangered bird species were also observed: the Snowy Egret and the Little Blue Heron. Eleven other species federally listed as endangered, threatened, or proposed as threatened may be present in the watershed. Removing invasive species, restoring wetlands, and protecting native habitat around streams will help provide habitat and food sources for endangered species to thrive.

**Objectives addressing this issue:**
- Promote healthy ecosystems within streams and riparian areas.
- Conserve sensitive lands.
- Use wetland mitigation banking or in-lieu fee mitigation.
- Identify and protect key natural features and wildlife corridors.
- Monitor fish and aquatic macroinvertebrate communities.
**Issue: Poor Riparian Conditions.** The forested corridor (or riparian area) along Silver Creek provides habitat for neo-tropical migratory songbirds which fly through and/or nest there after migrating from Central and South America. The songbirds require dense forest interior conditions without gaps, which discourage nest predators such as raccoons, opossums, skunks, and cowbirds. Approximately 6 miles of the riparian area along streams is in “poor” ecological condition (Appendix A, p.78). Over 12 miles of streams were identified as Critical Riparian Areas (see p.37).

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>♦ Conserve sensitive lands.</td>
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<tr>
<td>♦ Work with municipalities to amend policies and regulations to include conservation, native landscaping, stormwater management, and low-impact design.</td>
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<tr>
<td>♦ Prioritize “green” stormwater management approaches.</td>
</tr>
<tr>
<td>♦ Identify and protect key natural features and wildlife corridors.</td>
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</table>

**Issue: Poor Macroinvertebrate Diversity.** The quality and diversity of macroinvertebrate populations indicates the health of the ecosystem and quality of water for human consumption. Macroinvertebrates (animals without a backbone that are large enough to be viewed through a microscope) are an important part of the aquatic food chain and serve as indicators of stream health. Monitoring of macroinvertebrate populations within the Lower Silver Creek watershed indicate very poor to fair conditions over time, and the watershed lacks diversity of macroinvertebrate populations.

<table>
<thead>
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<tr>
<td>♦ Monitor fish and aquatic macroinvertebrate communities.</td>
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</table>

**Organizational needs/issues**

**Issue: Lack of Coordination/Partnerships.** There are many potential partners in the region dedicated to different aspects of water quality and stormwater management, including federal agencies, state agencies, non-profits, land trusts, land owners, institutions, and local governments. To effectively implement the watershed plan and the county’s stormwater program, a network of these partners should be established to help tackle certain issues and objectives. The Scott AFB Community Partnership Program is a great starting point.

<table>
<thead>
<tr>
<th>Objectives addressing this issue:</th>
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<tbody>
<tr>
<td>♦ Formalize a network of partners to implement the plan.</td>
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</table>

**Issue: Need for Updated Operations.** The plan can be most effective when its goals, strategies, and recommendations are integrated into the operations of partner organizations. When an organization or community has made a commitment to the plan by adding its recommended Best Management Practices (BMPs) to its operations schedules and budgets, those BMPs become much easier to implement. St. Clair County’s MS4 program is a good source of information about stormwater BMPs. Maintenance agreements are an indispensable tool to help municipalities, Homeowners Associations, and others with the operation and maintenance of stormwater infrastructure. A detailed maintenance agreement lays out the responsibilities of the parties involved in maintaining a functioning drainage system.

Street sweeping is an important municipal operation that improves the water quality of urban runoff. It is not included in this plan as a separate Management Measure; the MS4 municipalities in the watershed already conduct regular street sweeping. Townships that do street sweeping on oil and chip
roads in the watershed are able to reclaim the excess rock swept up and reuse it the next time the roads are oiled.

**Issue: Need for Funding.** There are a variety of funding sources and programs available to implement goals and objectives of the watershed plan. Existing resources include IEPA Section 319, Conservation Reserve Program (CRP), EQIP, Conservation Stewardship Program (CSP), foundation grants, and various other programs.

<table>
<thead>
<tr>
<th>Objectives addressing this issue:</th>
</tr>
</thead>
<tbody>
<tr>
<td>♦ Leverage funding from a variety of sources to implement the plan.</td>
</tr>
<tr>
<td>♦ Develop public recognition programs focused on the watershed plan’s goals.</td>
</tr>
</tbody>
</table>

**Information and Outreach**

**Issue: Need for Communication.** Public engagement and education on water quality and flooding issues and solutions can greatly increase the progress towards watershed improvement. Communication to and between stakeholders and the general public helps increase buy-in and connects people with technical resources to protect the watershed.

<table>
<thead>
<tr>
<th>Objectives addressing this issue:</th>
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</thead>
<tbody>
<tr>
<td>♦ Connect watershed stakeholders to decision-makers and experts.</td>
</tr>
<tr>
<td>♦ Offer opportunities for public education and participation in watershed matters.</td>
</tr>
</tbody>
</table>

**Issue: Lack of Access to Technical Resources and Funding.** The public engagement process also revealed that many land owners in the watershed want to help. Many came to meetings requesting technical support and assistance with obtaining funding to implement BMPs on their land. Municipalities also need access to resources and funding to implement projects within city limits.

<table>
<thead>
<tr>
<th>Objectives addressing this issue:</th>
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<tbody>
<tr>
<td>♦ Offer opportunities for public education and participation in watershed matters.</td>
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</table>

**Issue: Need for Outreach to Key Stakeholders.** Because a large proportion of the watershed is private property, and water-based recreation is uncommon, individual interactions with streams and waterbodies in the watershed are limited. Education and outreach efforts to engage landowners and other key stakeholders are needed to increase environmental awareness and achieve the goals of this plan. A single regulatory agency or group cannot be as effective as a combined effort with other groups all working towards the same goal. Many people will work hard to help make the watershed better if they understand what to do and how it will help.

<table>
<thead>
<tr>
<th>Objectives addressing this issue:</th>
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</thead>
<tbody>
<tr>
<td>♦ Develop public recognition programs focused on the watershed plan’s goals.</td>
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</tbody>
</table>
Critical Areas

For this plan, a “Critical Area” is best described as a location in the watershed where existing or potential future causes and sources of pollutants or issues are significantly worse than other areas of the watershed, OR there is significant potential for the area to make progress towards one or more of the Watershed Plan goals. The following Critical Areas were identified:

1. Critical Stream Reaches - Highly degraded stream reaches (8.9 miles);
2. Critical Riparian Areas - Highly degraded riparian areas (14.1 miles); and
3. Critical Wetland Areas - Areas suitable for wetland restoration (671 acres).

The Management Measures recommended are focused on these Critical Areas, but are also recommended for application elsewhere in the watershed where conditions are suitable.

The location and extent of each Critical Area was informed by data collected in the Watershed Resource Inventory, including an aerial assessment of streambank condition, riparian area condition, and channelization; as well as through information collected during stakeholder engagement. The Agricultural Conservation Planning Framework (ACPF), a Geographic Information Systems (GIS) model developed by USDA, provided locations for Critical Areas on agricultural land. The following explains how the Critical Areas were delineated.

Critical Stream Reaches

Critical stream reaches exhibit highly eroded banks or stream beds, or degraded channel conditions, that are a major source of total suspended solids (sediment), phosphorus and nitrogen carried with it. 8.9 miles of stream reaches have been identified as high priority “Critical Stream Reaches,” using aerial assessment and field verification data on streambank erosion, streambed erosion, and channelization. The Critical reaches have high streambank erosion and high channelization. Streambank stabilization and channel restoration BMPs, including bioengineering, will greatly reduce sediment and nutrients transported downstream, increase dissolved oxygen levels, and improve habitat.

Critical Riparian Areas

Critical riparian areas are areas adjacent to stream reaches that:

1) Have limited or no vegetated buffer beside the stream (i.e., “poor” riparian condition as determined by aerial assessment), and/or
2) Receive significant surface runoff and groundwater and have high ecological significance (i.e., riparian areas that are determined as “Critical Zones” by the ACPF modeling – see Appendix B).

Along the stream corridors, 14.1 miles were identified as Critical Riparian Areas. Revegetation of these areas with appropriate native trees and vegetation and removal of invasive species in these areas will increase surface water infiltration and reduce sediment and nutrient flows to the streams.
Critical Wetland Areas

Wetlands are highly effective at filtering pollutants from surface water, in addition to providing flood storage and wildlife habitat benefits. Critical wetland areas, which are highly suitable for restoration/construction of wetlands, include:

1) Areas on agricultural land that are highly suitable for nutrient removal wetlands and have high, very high, or critical runoff risk, as determined by the ACPF; and
2) Areas identified as having a high restoration rank (8 to 13 on a scale of -2 to 13) from the Missouri Resource Assessment Partnership (MoRAP) assessment of wetland importance.

Because the ACPF tool is directed at agricultural land, the nutrient removal wetlands output by the model are all in agricultural fields. They also tended to be large areas (greater than 1 acre each).

The MoRAP wetland restoration assessment used hydric soils and proximity to existing wetlands as criteria for its algorithms, so the areas with high restoration rank values are largely in or close to stream corridors. The MoRAP-generated wetland areas tended to be much smaller areas (less than a tenth of an acre in size), but several such areas were often close together. They are difficult to see on the maps on the following pages because they are so small in size. Also, the MoRAP assessment area only covered the northern end of the Lower Silver Creek watershed - approximately down to Scott Air Force Base as its southern boundary - so there are more Critical Wetland Areas identified in the northern end of the watershed.

The Critical Wetland Areas identified can catch sediment which has eroded from agricultural land and stream channels close to the sources of such sediment. There are 671 acres of Critical Wetland Areas in the watershed.

All of the Critical Areas identified in the watershed are shown in Figure 4. Pages 40 to 83 show the Critical Areas in more detail in each HUC14 subwatershed. Each individual type of Critical Area is shown in maps in Appendix B, with more information about the sources of data behind the selection of Critical Area locations.

The planning team expected to see more overlap between Critical Stream Reaches, Riparian Areas, and Logjams, but these areas are largely geographically separate. This illustrates the conservative nature of the assessments used to find these areas—stringent criteria used to identify each type of Critical Area that created very narrowly defined/small areas of each. It is important to note that a measure taken to address one of these problems, such as streambank restoration, will likely address logjam issues and improve riparian conditions as well.
Figure 4. Critical Areas for stream reaches, riparian areas, and wetlands. See Appendix B for maps of each individual Critical Area type.
HUC 07140204050701: Upper Ogles Creek (Fairview Heights area)

This subwatershed is a long, rectangular-shaped drainage area in the northwestern portion of the Lower Silver Creek watershed, draining the upper portion of Ogles Creek. It extends approximately from the Madison-St. Clair county line in the north to south of I-64 in Fairview Heights to the south. It is located entirely in St. Clair County.

**Area:** 6,611 acres  
**Named streams:** Ogles Creek  
**Counties:** St. Clair  
**Municipalities:** O'Fallon and Fairview Heights  
**Townships:** Caseyville, O'Fallon

**Critical Stream Reaches:** No Critical Stream Reaches were identified in this subwatershed.

**Critical Riparian Areas:** No Critical Riparian Areas were identified in this subwatershed.

**Critical Wetland Areas:** A 9.8-acre Critical Wetland Areas as identified at the east end of Savannah Hill Trail off Savannah Hills Blvd in northern Fairview Heights.

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204050702: Lower Ogles Creek (north of O'Fallon)

This subwatershed drains the lower portion of Ogles Creek and flows into Silver Creek just south of the Madison-St. Clair county line. It extends from just above the Madison County line down into St. Clair County and includes a portion of the City of O'Fallon.

**Area:** 3,745 acres  
**Named streams:** Ogles Creek  
**Counties:** Madison and St. Clair  
**Municipalities:** O'Fallon  
**Townships:** Caseyville, Jarvis, O'Fallon

**Critical Stream Reaches:** No Critical Stream Reaches were identified in this subwatershed.

**Critical Riparian Areas:** No Critical Riparian Areas were identified in this subwatershed.

**Critical Wetland Areas:** 5.4 acres of Critical Wetland Area were identified at 17 locations in the watershed, most of which are in the Silver Creek corridor.

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204050801:07140204050801-Little Silver Creek

This subwatershed drains the upper portion of Little Silver Creek in the northeastern corner of the Lower Silver Creek watershed. It is primarily located in Madison County, but extends slightly into St. Clair County.

Area: 5,765 acres
Named streams: Little Silver Creek
Counties: Madison and St. Clair
Municipalities: None
Townships: Lebanon, St. Jacob

Critical Stream Reaches: No Critical Stream Reaches were identified in this subwatershed.

Critical Riparian Areas: 9,346 feet (1.77 miles) of Critical Riparian Areas were identified along Little Silver Creek.

Critical Wetland Areas: 80.7 acres of Critical Wetland Areas were identified in five locations on tributaries to Little Silver Creek.

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204050802: **Emerald Mound-Little Silver Creek** (north of Lebanon)

This v-shaped subwatershed in the northeast of the Lower Silver Creek watershed receives water from the headwaters of Little Silver Creek. It is located primarily in St. Clair County, but extends slightly into Madison County.

**Area:** 5,765 acres  
**Named streams:** Little Silver Creek  
**Counties:** Madison and St. Clair  
**Municipalities:** Lebanon  
**Townships:** Lebanon, O’Fallon, St. Jacob

**Critical Stream Reaches:** 546 feet (0.10 miles) of Critical Stream Reaches were identified on Little Silver Creek.

**Critical Riparian Areas:** 1,879 feet (0.36 miles) of Critical Riparian Areas were identified on Little Silver Creek and one of its highly channelized tributaries.

**Critical Wetland Areas:** 111.3 acres of Critical Wetland Areas were identified at several locations in the subwatershed, including in the Little Silver Creek corridor.

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204050802 - Emerald Mound-Little Silver Creek

Legend
- Critical Stream Reaches: 0.10 miles
- Critical Riparian Areas: 0.88 miles
- Critical Wetland Areas: 111.3 acres

Streams
0 0.25 0.5 1 Miles
HUC 07140204050803: **East Branch Little Silver Creek** (north of Summerfield)

This subwatershed drains the headwaters of East Branch Little Silver Creek. It is located primarily in St. Clair County, with small portions extending north into Madison County and east into Clinton County.

**Area:** 8,253 acres  
**Named streams:** East Branch Little Silver Creek  
**Counties:** Clinton, Madison and St. Clair  
**Municipalities:** None  
**Townships:** Lebanon, St. Jacob, Sugar Creek

**Critical Stream Reaches:** 256 feet (0.05 miles) of Critical Stream Reaches were identified on East Branch Little Silver Creek.

**Critical Riparian Areas:** 15,892.8 feet (3.01 miles) of Critical Riparian Areas were identified, largely along East Branch Little Silver Creek.

**Critical Wetland Areas:** 60.4 acres of Critical Wetland Areas were identified throughout the subwatershed, mostly on small unnamed tributaries.

No **flooding locations** were identified by stakeholders in this subwatershed.
HUC 07140204050804: City of Lebanon-Little Silver Creek (southeast Lebanon)

This oval-shaped subwatershed is located entirely in St. Clair County, and covers the southeast side of the City of Lebanon. Route 4 and Highway 50 run through the subwatershed.

**Area:** 3,437 acres  
**Named streams:** Little Silver Creek  
**Counties:** St. Clair  
**Municipalities:** Lebanon  
**Townships:** Lebanon, O’Fallon

**Critical Stream Reaches:** No Critical Stream Reaches were identified in this subwatershed.

**Critical Riparian Areas:** 2,376 feet (0.45 miles) of Critical Riparian Areas were identified along Little Silver Creek.

**Critical Wetland Areas:** 28.8 acres of Critical Wetland Areas were identified along Little Silver Creek and unnamed tributaries.

**Flooding locations** were identified by stakeholders in three locations in the City of Lebanon, including serious and persistent road overtopping at Route 50 near where it meets Route 4.
**HUC 07140204050805: Village of Summerfield-Little Silver Creek** (Summerfield area)

This subwatershed is located in the eastern portion of the Lower Silver Creek watershed and includes the village of Summerfield. The majority of the area lies south of Highway 50 and east of Route 4.

**Area:** 8,437 acres  
**Named streams:** None  
**Counties:** St. Clair  
**Municipalities:** Lebanon, Summerfield  
**Townships:** Lebanon, Mascoutah, O’Fallon, Shiloh Valley

**Critical Stream Reaches:** No Critical Stream Reaches were identified in this subwatershed.

**Critical Riparian Areas:** No Critical Riparian Areas were identified in this subwatershed.

**Critical Wetland Areas:** 43.7 acres of Critical Wetland Areas were identified along the unnamed tributaries, including a large area upstream of the Village of Summerfield.

**Flooding locations** were identified by stakeholders at several locations in and around the Village of Summerfield, including two road overtopping locations on Summerfield St Jacob Road both north and south of the village.
HUC 07140204050903-Silver Creek (Silver Creek at the county line)

This long subwatershed extends along Silver Creek from Madison County in the north to St. Clair County in the south. Only the St. Clair portion of the subwatershed is included in the Lower Silver Creek watershed.

Area: 3,323 acres  
Named streams: Silver Creek  
Counties: Madison and St. Clair  
Municipalities: None  
Townships: Jarvis, Lebanon, O'Fallon, St. Jacob

Critical Stream Reaches: 2,052 feet (0.39 miles) Critical Stream Reaches were identified along Silver Creek.

Critical Riparian Areas: No Critical Riparian Areas were identified in this subwatershed.

Critical Wetland Areas: A 6.4-acre Critical Wetland Area was identified on a tributary to Silver Creek.

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204050904: Engle Creek (O'Fallon area)

This subwatershed drains a large portion of the City of O'Fallon and includes Engle Creek and Rock Spring Branch. It lies primarily north of I-64 and northwest of Highway 50.

Area: 7,434 acres
Named streams: Engle Creek, Rock Spring Branch
Counties: St. Clair
Municipalities: O'Fallon, Shiloh
Townships: Caseyville, O’Fallon, Shiloh Valley

Critical Stream Reaches: 866 feet (0.16 miles) of Critical Stream Reaches were identified on Engle Creek and Rock Spring Branch.

Critical Riparian Areas: No Critical Riparian Areas were identified.

Critical Wetland Areas: 15.4 acres of Critical Wetland Areas were identified, largely in the lower Engle Creek corridor near Silver Creek.

Flooding locations were identified by stakeholders at two areas on downstream Engle Creek, near its confluence with Silver Creek.
HUC 0714020405 0905: Hageman Creek – Silver Creek (Silver Creek north of SAFB)

This large subwatershed includes Hagemann Creek and a long segment of Silver Creek north of Scott Air Force Base. It also covers small portions of the City of O'Fallon and a large portion of the western side of the City of Lebanon.

**Area:** 10,664 acres  
**Named streams:** Silver Creek, Hageman Creek  
**Counties:** St. Clair  
**Municipalities:** Lebanon, O'Fallon, Shiloh  
**Townships:** Lebanon, Mascoutah, O'Fallon, Shiloh Valley

**Critical Stream Reaches:** 31,632 feet (5.99 miles) of Critical Stream Reaches were identified on Silver Creek and Hagemann Creek.

**Critical Riparian Areas:** 6,538 feet (1.24 miles) of Critical Riparian Areas were identified on tributaries and old remnant channels contributing to Silver Creek.

**Critical Wetland Areas:** 206.3 acres of Critical Wetland Areas were identified at several locations along Silver Creek and its tributaries.

**Flooding locations** were identified by stakeholders at Highway 50 and at I-64.
HUC 07140204051001: Scott Air Force Base Pond-Silver Creek (Shiloh and north side of SAFB)

This subwatershed includes unnamed tributaries draining the eastern side of the Village of Shiloh, flowing through the north side of SAFB to join Silver Creek.

**Area:** 4,249 acres  
**Named streams:** Silver Creek  
**Counties:** St. Clair  
**Municipalities:** Mascoutah, O’Fallon, Shiloh  
**Townships:** Mascoutah, O’Fallon, Shiloh Valley

**Critical Stream Reaches:** No Critical Stream Reaches were identified.

**Critical Riparian Areas:** No Critical Riparian Areas were identified.

**Critical Wetland Areas:** A 0.4-acre Critical Wetland Area was identified northwest of the MidAmerica Airport runway adjacent to a tributary stream.

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204051002:07140204051002-Union Cemetery (MidAmerica Airport and north side of Mascoutah)

This rectangular-shaped subwatershed is bisected by I-64. It includes much of MidAmerica Airport and the north side of the City of Mascoutah.

Area: 5,467 acres
Named streams: None (tributaries to Silver Creek)
Counties: St. Clair
Municipalities: Mascoutah
Townships: Mascoutah

Critical Stream Reaches: No Critical Stream Reaches were identified.

Critical Riparian Areas: 1,057 feet (0.2 miles) of Critical Riparian Areas were identified, just east of MidAmerica Airport.

Critical Wetland Areas: One 0.8-acre Critical Wetland Area was identified on an unnamed tributary just north of I-64 (close to the "64" label on this map).

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204051003: **Hog River-Silver Creek** (Mascoutah, SAFB)

This triangular-shaped subwatershed includes a large portion of the city of Mascoutah and a portion of Scott Air Force Base. Parts of Routes 4, 161, and 177 run through it.

**Area:** 7,061 acres  
**Named streams:** Silver Creek, Hog River  
**Counties:** St. Clair  
**Municipalities:** Mascoutah  
**Townships:** Engelmann, Freeburg, Mascoutah, Shiloh Valley

**Critical Stream Reaches:** A 1,571-foot (0.30-mile) Critical Stream Reach was identified along Silver Creek.

**Critical Riparian Areas:** 5,573 feet (1.06 miles) of Critical Riparian Areas were identified along Silver Creek and a tributary.

**Critical Wetland Areas:** No Critical Wetland Areas were identified in this subwatershed.

**Flooding locations** were **identified by stakeholders** in several locations, including road overtopping on Route 4 north of Mascoutah and Route 161 northeast of Mascoutah near Silver Creek.
HUC 07140204051101: Upper Loop Creek (eastern Belleville area)

This subwatershed drains the upper reaches of Loop Creek as it flows eastward through Shiloh and Belleville. Route 161 and Route 158 run through it.

**Area:** 6,446 acres  
**Named streams:** Loop Creek  
**Counties:** St. Clair  
**Municipalities:** Belleville, Freeburg, Shiloh  
**Townships:** Belleville, Freeburg, Shiloh Valley

**Critical Stream Reaches:** A 414-foot (0.08-mile) Critical Stream Reach was identified on Loop Creek.

**Critical Riparian Areas:** 1,147 feet (0.22 miles) of Critical Riparian Areas were identified on Loop Creek.

**Critical Wetland Areas:** 57.4 acres of Critical Wetland Areas were identified, including areas within municipal boundaries.

No **flooding locations** were **identified by stakeholders** in this subwatershed.
HUC 07140204051102: Ash Creek (Shiloh, SAFB area)

This subwatershed includes Ash Creek, which drains the western side of SAFB. Route 158 and Route 161 pass through it.

Area: 3,463 acres
Named streams: Ash Creek
Counties: St. Clair
Municipalities: O'Fallon, Shiloh
Townships: Shiloh Valley

Critical Stream Reaches: No Critical Stream Reaches were identified.

Critical Riparian Areas: 2,450 feet (0.46 miles) of Critical Riparian Areas were identified in two sections of urban Troy, one of which crosses Route 162.

Critical Wetland Areas: A 6.3-acre Critical Wetland Area was identified in the northwest of the watershed within the boundary of the Village of Shiloh.

Flooding locations were identified by stakeholders at two locations: an SAFB subdivision (containing Greenfield Circle), and Route 161 across Ash Creek.
HUC 07140204051103: Hazel Creek (east of Freeburg)

This subwatershed encompasses Hazel Creek and drains the land east of the Village of Freeburg.

Area: 3,932 acres  
Named streams: Hazel Creek  
Counties: St. Clair  
Municipalities: Freeburg  
Townships: Freeburg, Shiloh Valley

Critical Stream Reaches: No Critical Stream Reaches were identified.

Critical Riparian Areas: No Critical Riparian Areas were identified.

Critical Wetland Areas: A 9.6-acre Critical Wetland Area was identified upstream (west) in the subwatershed.

A flooding location was identified by stakeholders where Hazel Creek meets Loop Creek and joins Silver Creek, with floodwaters covering the land around the bridge and rising up to the level of the bridge.
HUC 07140204051104: Lower Loop Creek (southeast Shiloh, Rentchler)

This subwatershed is located in the west-central portion of the Lower Silver Creek watershed and includes the downstream portion of Loop Creek and its tributaries. It drains the southeast corner of Shiloh and the southwest corner of SAFB, and encompasses the unincorporated community of Rentchler. Route 158, Route 177, and Route 161 run through it.

**Area:** 7,662 acres  
**Named streams:** Loop Creek  
**Counties:** St. Clair  
**Municipalities:** Belleville, Mascoutah, Shiloh (also SAFB and the unincorporated community of Rentchler)  
**Townships:** Belleville, Freeburg, Shiloh Valley, St. Clair

**Critical Stream Reaches:** 2,064 feet (0.39 miles) of Critical Stream Reaches were identified in three locations on Loop Creek, including where Route 158 crosses Loop Creek.

**Critical Riparian Areas:** 6,633 feet (1.26 miles) of Critical Riparian Areas were identified on Loop Creek and on a tributary passing close to Rentchler.

**Critical Wetland Areas:** A 6.8-acre Critical Wetland Area was identified on agricultural land outside the Village of Shiloh.

**Flooding locations** were identified by stakeholders at three locations: at a road/railroad crossing at Shiloh Station West, at Route 158, and where Loop Creek and joins Silver Creek.
HUC 07140204051104 - Lower Loop Creek

Legend
- Critical Stream Reaches
- Critical Riparian Areas
- Critical Wetland Areas
- Flooding (from stakeholders)
- HUC14 of Interest
- HUC14 subwatersheds
- Municipalities
- Streams

Critical Stream Reaches: 0.39 miles
Critical Riparian Areas: 1.25 miles
Critical Wetland Areas: 6.8 acres
HUC 07140204051201: City of Mascoutah (southern Mascoutah)

This long, narrow subwatershed drains southwestern Mascoutah and land to the south of the city. Route 177 and Route 4 intersect within the subwatershed.

**Area:** 7,061 acres  
**Named streams:** None (tributaries to Silver Creek)  
**Counties:** St. Clair  
**Municipalities:** Mascoutah  
**Townships:** Engelmann, Freeburg, Mascoutah

**Critical Stream Reaches:** No Critical Stream Reaches were identified.

**Critical Riparian Areas:** 6,045 feet (1.14 miles) of Critical Riparian Areas were identified on unnamed tributaries near Silver Creek.

**Critical Wetland Areas:** No Critical Wetland Areas were identified.

A flooding location was identified by stakeholders where floodwaters overtop Grodeon Road at its intersection with Brickyard Road just east of the Silver Creek Preserve.
HUC 07140204051202: Funk Cemetery-Silver Creek (southwest of Mascoutah)

This rectangular-shaped subwatershed includes a long segment of Silver Creek. It is located to the southwest of the City of Mascoutah.

**Area:** 2,881 acres  
**Named streams:** None (tributaries to Silver Creek)  
**Counties:** St. Clair  
**Municipalities:** None  
**Townships:** Engelmann, Freeburg

**Critical Stream Reaches:** No Critical Stream Reaches were identified.

**Critical Riparian Areas:** A 3,067-foot (0.58-mile) Critical Riparian Area was identified on Silver Creek just south of the confluence of Loop Creek and Silver Creek.

**Critical Wetland Areas:** No Critical Wetland Areas were identified.

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204051203: Heberers Branch-Silver Creek (northeast of Freeburg)

This subwatershed includes Heberers Branch and a segment of Silver Creek east of Freeburg. It includes land previously used for mining, and contains several lakes and ponds that formed as a result of mining and subsidence.

**Area:** 4,673 acres  
**Named streams:** Silver Creek, Heberers Branch  
**Counties:** St. Clair  
**Municipalities:** Freeburg  
**Townships:** Freeburg

**Critical Stream Reaches:** No Critical Stream Reaches were identified.  
**Critical Riparian Areas:** No Critical Riparian Areas were identified.  
**Critical Wetland Areas:** A 9.7-acre Critical Wetland Area was identified.  

No flooding locations were identified by stakeholders in this subwatershed.
HUC 07140204051204: Jacks Run-Silver Creek (Freeburg area)

This subwatershed contains a large portion the Village of Freeberg, and drains to Jacks Run, Lemen Branch, and Silver Creek. Routes 13 and 15 run through it. It includes land previously used for mining, and contains several lakes and ponds that formed as a result of mining and subsidence.

Area: 5,416 acres  
Named streams: Jacks Run, Lemen Branch  
Counties: St. Clair  
Municipalities: Freeburg  
Townships: Freeburg, New Athens

Critical Stream Reaches: 3,561 feet (0.67 miles) Critical Stream Reaches were identified along Silver Creek.

Critical Riparian Areas: 898 feet (0.17 miles) Critical Riparian Areas were identified along Silver Creek.

Critical Wetland Areas: 5.4 acres of Critical Wetland Areas were identified directly adjacent to Silver Creek.

A flooding location was identified by stakeholders at the intersection of Lemen Branch and Route 13, south of Freeburg.
HUC 07140204051205: Biebell Lake-Silver Creek (north of New Athens)

This y-shaped subwatershed comprises the southernmost stretch of Silver Creek in the watershed, where Silver Creek drains to the Kaskaskia River. Route 15 runs through the top portion of the subwatershed.

**Area:** 6,602 acres  
**Named streams:** Silver Creek  
**Counties:** St. Clair  
**Municipalities:** None  
**Townships:** Freeburg, New Athens

**Critical Stream Reaches:** 3,955 feet (0.75 miles) Critical Stream Reaches were identified on Silver Creek.

**Critical Riparian Areas:** 7,844 feet (1.49 miles) Critical Riparian Areas were identified on Silver Creek and its tributaries.

**Critical Wetland Areas:** 338.2 acres of Critical Wetland Areas were identified.

No flooding locations were identified by stakeholders in this subwatershed.
SECTION 4: OVERVIEW OF MANAGEMENT MEASURES

The term “Management Measures” or “Best Management Practices” (BMPs) generally describes acceptable practices that could be put into place to protect water quality and control stormwater. BMPs are typically designed to reduce stormwater volume, peak flows, and/or nonpoint source pollution. Two types of Management Measures are recommended to address the goals of this Plan:

- **Programmatic Measures**: general remedial, preventive, and policy watershed-wide Management Measures that can be applied by various stakeholders.
- **Site-Specific Measures**: locations where specific Management Measures can be implemented to improve surface and groundwater quality, green infrastructure, and flooding.

Programmatic Measures include policy changes, environmental monitoring, design processes, and other measures that can be applied by various partner and stakeholder organizations across the watershed. Information and education measures can be considered programmatic measures, and these are outlined separately in the Information and Education Plan section (Section 6).

Site-Specific Measures, which are often structural, can be implemented on the ground to improve surface and groundwater quality, green infrastructure, and flooding. The Site-Specific Management Measures are divided into four categories: **agricultural, forest, urban, and streams and lakes**.

This section provides an overview of many Management Measures that are recommended within the watershed.

**Programmatic Management Measures**

**Conservation Development**

Conservation Development, also known as Cluster Design or Open Space Design, is a set of tools for designing development in a way that protects open space, aquatic habitat, and other natural resources. Conservation Development subdivisions are characterized by compact, clustered lots surrounding a common open space, which often includes a waterway, waterbody, or detention area. This facilitates development density needs while preserving the most valuable natural features and ecological functions of a site.

Open space designs have many benefits in comparison to conventional subdivisions: they can reduce impervious cover, stormwater pollutants, construction costs, grading, and the loss of natural areas. Despite these benefits, many communities’ zoning ordinances do not permit Conservation Development designs, because of code requirements for minimum lot sizes, setbacks, frontage distances, and more. These ordinances should be amended to allow for the implementation of Conservation Development design. Ordinance effectiveness and implementation should be periodically reviewed.

Developers should be encouraged to set up management procedures that protect sensitive natural areas/open space. Natural areas and systems can be donated to a public agency or conservation organization for long-term management to ensure that they have regular maintenance over time and
remain aesthetically pleasing and functional spaces. Alternatively, Homeowners Associations (HOAs) can explicitly take on the management of the natural areas, writing rules about maintenance and fees into their bylaws.

**Federal and State Programs**

Federal and state agricultural easement and working lands programs such as CRP, CSP, EQIP, and the Agricultural Conservation Easement Program (ACEP) are designed to reimburse farmers and landowners for implementing practices that protect soil and water health.

**Financial support for stormwater infrastructure**

Maintenance of wastewater treatment systems imposes costs on communities that are usually recaptured through municipal property taxes and/or sewer fees. Stormwater infrastructure, however, does not often have such dedicated funding. Permitted municipal separate storm sewer systems (MS4s) are required to meet minimum control measures, but there are needs and issues beyond these measures, such as flood mitigation, that do not have dedicated funding. Green infrastructure is also not often funded through typical stormwater programs.

Several policy approaches can assign dedicated funding for stormwater infrastructure that prevents flooding and allows infiltration. As outlined in the 2015 Urban Flooding Awareness Act Report prepared by IDNR, USEPA recommendations for financing stormwater management include:

- Stormwater utility (or service fees),
- Property taxes/general funds,
- Sales tax,
- Special assessment districts,
- System development charges,
- Municipal bonds and state grants, and
- Low-interest loans.

These funding options are explored in more detail in Appendix C.

**Flood Damage Prevention Ordinance**

All of the counties and municipalities in the watershed are members of the National Flood Insurance Program (NFIP), and as such, have a Floodplain Ordinance in effect. These ordinances require specific development standards for structures and activities in the 100-year floodplain (as designated by the Federal Emergency Management Agency (FEMA). Due to increasing flood risk and flood insurance rates due to climatic changes and inadequate policies, strengthening these ordinances would help protect individuals and communities from flood loss and damage. One way of strengthening floodplain ordinances to reduce flood risk is to use text from the State of Illinois's Model Floodplain Ordinance, or the model ordinance published by the Association of State Floodplain Managers (ASFPM). Ordinance effectiveness and implementation should be periodically reviewed.
**Green infrastructure incentives**

Green infrastructure can be defined as our region’s natural resources, including open space, woodlands, wetlands, gardens, trees, and agricultural land. It can also be defined as the nodes and corridors of vegetation over the region, or the site-scale structures and landscaping that recreate natural processes, such as rainscaping. Green infrastructure results in a higher diversity of plants and animals, removal of nonpoint source pollution, infiltration of stormwater, and healthier ecosystems. Communities can offer incentives for developers that design for or implement green infrastructure, including flexible implementation of regulations, fee waivers, tax abatement, and streamlining the development review process. These incentives can be granted on a case-by-case basis.

**In-lieu fee ecological mitigation**

In-lieu fee mitigation is an opportunity to assist developers in meeting their mitigation needs while directing mitigation to high quality sites in the watershed. Under an in-lieu fee program, a developer can pay a fee in lieu of having to restore or protect wetlands on the development site, or to mitigate losses of those sites by protecting or restoring wetlands off-site. The fee goes to a third-party organization which can direct the funds to high quality ecological sites for which restoration efforts will have the most environmental impact.

**Monitoring**

Monitoring of water quality, flow, and stream health in the Lower Silver Creek watershed will provide data that can be used to support future resource management decisions and assess the effectiveness of Management Measures that are implemented. NGRREC, a partner on this plan, is well situated to conduct this type of monitoring.

Continuous monitoring at the U.S. Geological Survey (USGS) gage 05594800 located on the main stem of Silver Creek (near Freeburg) would provide a broad assessment of surface water quality throughout the year. It will also allow trends to be identified by comparing new data to historical data collected by USGS and the Illinois Water Sciences Center (IWSC) at this location from 1974 to 1997.

In addition, secondary monitoring stations could be added upstream from the USGS gage in order to identify the relative contributions of HUC14 subwatersheds to overall water quality in the larger watershed. Samples could be collected quarterly to determine seasonal variations in water quality. Additional sampling could be done during major storm events. See Section 7 (Implementation) for the monitoring timeline and Appendix D for more detail on the recommended monitoring components.

The following parameters could be monitored:

- Flow
- Sediment (Total Suspended Solids)
- Total Phosphorus
- Total Nitrogen
- Non-Purgeable Organic Carbon (NPOC)
- Soluble reactive phosphate (SRP)
- Nitrite+nitrate-nitrogen (NO₂⁺NO₃-N)
- Ammonium-nitrogen (NH₄-N)

**ISCO sampler collecting water quality data. A sampler like is currently being used for water quality monitoring by NGRREC in the Upper Silver Creek watershed. Photo: University of Delaware.**

*Primary goal addressed: 1. Improve Surface Water Quality*  
*Primary goal addressed: 3. Promote Environmentally Sensitive Development*
**Native landscaping**

The use of native plants in landscaping on public and private property should be encouraged as a way to enhance stormwater management structures, slow down surface runoff, extend green infrastructure networks, and support wildlife. Native plants can be used in rainscaping, flower gardens, roadside ditches, and many other locations. Changes to weed control ordinances (or other ordinances that specify plant species to be used in landscaping) may be needed to allow appropriate growth of native plants. Ordinance effectiveness and implementation should be periodically reviewed. Likewise, the removal of invasive species is important in promoting biodiversity.

**Open space and natural area protection**

Several actions can be taken to encourage the protection of natural areas and open space in new development. These include establishing a dedicated source of funding for open space acquisition and management (including conservation easements), creating agriculture zoning districts with very large minimum lot sizes, adopting an open space and parks plan, and adopting regulations to protect steep slopes, wetlands, and other sensitive natural areas. Comprehensive plans should be regularly updated to help protect valuable natural areas and open space from development and guide new development in ways that minimize negative water quality and flooding impacts.

**Private sewage monitoring**

Private sewage inspections are required by St. Clair and Madison counties during real estate transactions and are performed following complaints, but these can occur many years apart for a single property. More regular inspections (e.g., every three to five years) should be considered by watershed jurisdictions. An intensive inspection of private septic systems in areas with recurring problems should also be considered. Data on private sewage violations and water quality parameter exceedances should be collected and mapped. Connections to public sewer systems should be encouraged in new development. One option for financing sewer improvements is to create a Special Service Area (SSA) on a problem area to collect funds from property owners to collectively fund repairs or connections to municipal wastewater systems.

**Riparian Buffer Ordinance**

A riparian buffer is an undisturbed, naturally vegetated strip of land adjacent to a body of water. Among their many benefits, riparian buffers improve water quality, reduce erosion, store floodwater, and provide habitat for wildlife. In this region, oak-hickory forest or prairie grassland are appropriate vegetation types. The ACPF GIS tools produced suggested vegetation types for each side of the streams in the watershed (see Appendix C). A riparian buffer ordinance protects a riparian area of a certain width from new development and other disturbances, and promotes revegetation/reforestation.

**Sewage Treatment Plant upgrades**

Upgrades to wastewater treatment plants in the watershed should be installed to meet permit requirements, and to protect these critical facilities from flooding. Other improvements may include incorporating nutrient removal technologies. USEPA’s draft “Case Studies on Implementing Low-Cost
Lower Silver Creek Watershed Plan

Modifications to Improve Nutrient Reduction at Wastewater Treatment Plants” document, published in August 2015, is a good source of information about optimizing nutrient removal in different types of treatment systems. As a further measure, a Nutrient Credit Trading system can be set up. In this system, municipalities can create agreements a land conservation organization and IEPA to provide payments on a conservation easement that reduces nutrient discharge from agricultural land in order to offset a Sewage Treatment Plant’s discharge.

Stream Cleanup Team
A Stream Cleanup Team with funding and resources dedicated to stream cleanup in the watershed would help to improve water quality, reduce flood risk (by removing litter and debris), and monitor stream health. The program could include an education component, roles for volunteers, and a stream inventory. The Team could inform local sheriffs’ departments about sites with the most litter/debris so that they can more effectively enforce laws on littering and dumping. In previous years (2013-2016), Streambank Cleanup and Lakeshore Enhancement (SCALE) grants from USEPA were made available to support cleanup efforts under Section 319 of the Clean Water Act. The funds were paid to groups that “have already established a recurring streambank or lakeshore cleanup,” and used for dumpster rental, landfill fees, and safety attire. Recipients such as Alton Marketplace/Main Street and the Village of Swansea received $500 (or more if more participants were involved). This program may be funded again in future.

Watershed Plan supported and integrated into community plans
Watershed partners, including communities, should adopt or support the Watershed Plan and incorporate its goals and recommended actions into their policies (such as ordinances and comprehensive plans).

Hydrologic/Flood Study
The most recent FEMA Flood Insurance Study in St. Clair County was completed in 2003. Since then, significant development has occurred in the watershed, resulting in increased runoff and a more complex stormwater drainage network. Increased runoff usually comes with increased flood heights. In an effort to reduce impacts from flooding, the Lower Silver Creek watershed would greatly benefit from an updated hydrologic study and updated floodplain maps. Once the updated floodplain has been properly identified, a follow up step to help with flood risk reduction and awareness would be identifying critical facilities (e.g., fire stations, police stations, schools, hospitals) and infrastructure that are in the floodplain and other flooding locations. As significant flooding has been noted outside of mapped floodplains, it is reasonable to assume that some of that flooding is from outdated maps which no longer properly represent the one percent annual chance exceedance floodplain.

Primary goal addressed: 4. Support Healthy Habitat
Primary goal addressed: 5. Develop Organizational Frameworks
Primary goal addressed: 2. Reduce flooding and mitigate flood damage
Site-Specific Management Measures

The following BMPs are recommended for agricultural, forest, and urban land, and streams and lakes. See Appendix C for more detailed descriptions of these BMPs, including the amount, cost, and pollutant load reduction.

Agricultural Management Measures

Animal waste storage/treatment system

Livestock produce waste, primarily manure, which needs to be well-managed to maintain water quality. Proper treatment and use of animal waste can be determined in a Comprehensive Nutrient Management Plan that helps farmers to integrate waste management into overall farm operations (see below). A waste storage and treatment system may be recommended for individual farms.

Bioreactors (denitrifying)

Bioreactors, also known as denitrifying bioreactors, are ditches filled with wood chips that contain denitrifying bacteria. The bioreactor is placed at the outlet of a tile drainage system, and the bacteria remove nitrogen from water leaving the system. Research has shown an estimated bioreactor lifespan of 15 to 20 years, after which the woodchips would be replaced if treatment was to be continued.

Comprehensive Nutrient Management Plans (CNMPs)

ACNMP is a strategy for farmers to integrate livestock waste management into overall farm operations. Such a plan can recommend waste storage structures and strategies that increase waste storage time, eliminate unwanted runoff, incorporate manure nutrients into crop nutrient budgets, and efficiently apply manure to cropland without runoff (e.g., manure injection). When these structures and strategies are in place, manure is a useful asset to cropland that provides benefits to soil health.

Conservation tillage (reduced tillage/no-till)

Reducing the extent of tillage is known as conservation tillage; when no tillage is used, it is called no-till. Reducing tillage leads to a reduction in soil erosion and the transport of associated nutrients, such as phosphorus, to the waterways. No-till allows natural soil structure to develop, which results in increased infiltration of rain water, reduced surface runoff, and reduced overtopping of roads adjacent to farm fields.

Contour buffer strips

Contour buffer strips are strips of perennial vegetation that alternate with wider cultivated strips down a slope; the crop rows are farmed along the contour. The narrow strips of perennial vegetation are not part of the normal crop rotation. They slow surface runoff and trap sediment, significantly reducing sheet and rill erosion and removing pollutants from runoff.
Cover crops
Cover crops can provide multiple benefits: preventing erosion, improving soil’s physical and biological properties, supplying nutrients, improving the availability of soil water, breaking pest cycles, and suppressing weeds. Planted in the fall and/or spring, they take up unused fertilizer, build soil structure, and release nutrients for the following crop to use. The species of cover crop selected along with its timing and management determine the specific benefits.

Grassed waterways
A grassed waterway is a vegetated channel designed to move stormwater at a non-erosive velocity to reduce soil erosion and flooding. Grassed waterways prevent gully erosion and protect water quality. They are most appropriate for areas where there is soil erosion from concentrated runoff.

Nutrient Management Plans (NMPs)
A NMP is a strategy for obtaining the maximum return from on- and off-farm fertilizer resources in a manner that protects the quality of nearby water resources. Creating an NMP involves reviewing soil maps, field boundaries, and nutrient uptake of crops to determine nutrient needs for each field and the types and amounts of fertilizers to meet those needs.

Ponds
Ponds are popular features that also have significant pollutant removal benefits when well sited and designed. Also known as wet ponds, stormwater ponds, or wet retention ponds, they are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season). As stormwater runoff enters the pond, the sediment settles out and some nutrient uptake takes place. Nitrogen removal via denitrifying bacteria can also occur in ponds.

Riparian buffers
Riparian buffers are vegetated zones immediately adjacent to a stream. They protect the stream channel and provide room for streams to move naturally; support habitat; reduce erosion; offer recreational space; and protect water quality. Buffers function as a vegetated filter strip and as overbank erosion protection during peak flows. The vegetation can be native forest, grasses, or shrubs.

Terraces
Terraces consist of ridges and channels constructed perpendicular to the slope of a field to intercept runoff water. Terracing is a soil conservation practice that reduces soil erosion and surface runoff on sloping fields. Terraces may be parallel on fairly uniform terrain or vary from parallel when the terrain is undulating. Over 140,000 feet of terraces have been put in place on farmland in St. Clair County between 2010 and 2015 thanks to the efforts of the Natural Resources Conservation Service (NRCS) and other partners.
**Water and Sediment Control Basins (WASCOBs)**

WASCOBs are small earthen ridge-and-channel structures or embankments that are built across a small watercourse or area of concentrated flow within a field. They are designed to hold agricultural water so that sediment and sediment-borne phosphorus settle out, reducing the amount of sediment leaving the field and preventing the formation of gullies.

**Wetlands**

Wetlands, also known as Nutrient Removal Wetlands, consist of a depression created in the landscape where hydric soils allow aquatic vegetation to become established. They are among the most effective stormwater practices in terms of pollutant removal. Wetlands can easily be designed for flood control by providing flood storage above the level of the permanent pool. The wetlands and surrounding buffers also offer environmental benefits such as increases in wildlife habitat and carbon sequestration. Wetlands can be natural or “constructed,” meaning that they mimic naturally occurring wetlands. Wetland restoration is an important tool for bringing back the ecosystem services of nutrient removal and flood storage to a drainage area. Wetlands that have filled with sediment over time, such as swamp areas in the Silver Creek corridor, can be dredged to improve flood storage while retaining wildlife habitat.

**Forest Management Measure**

**Forest stand improvement**

Forest stand improvement is an approach to forest management that prioritizes forest health and wildlife habitat. Trees within the stand that are a desirable species, age class, and form are retained while those competing with these trees are “culled” (i.e., cut or girdled). This decreases competition for the desirable trees, increases growth rates, and allows managers to shape the future forest. Forest management can favor trees that produce more hard and soft mast (nuts, seeds and fruit) to support wildlife populations. Additionally, forest stand improvement can help improve water quality by removing undesirable species, including invasive species such as honeysuckle, that increase soil erosion on the forest floor by suppressing ground cover vegetation.

---

**Primary goal addressed:** 1. Improve Surface Water Quality  
**ACPF areas identified:** Yes  
**Pollution reduction:** 58% sediment, 35% P, 28% N  
**Cost:** $366/acre

---

**Primary goal addressed:** 1. Improve Surface Water Quality  
**Addresses Critical Wetland Areas**  
**ACPF areas identified:** Yes  
**Pollution reduction:** 78% sediment, 44% P, 20% N  
**Cost:** $13,163/acre

---

**Primary goal addressed:** 4. Support Healthy Habitat  
**Pollution reduction:** est.5% sediment, 5% P, 5% N  
**Cost:** $356/acre

---

Wetlands at the Silver Creek Nature Preserve.  
Photo: HeartLands Conservancy
Selected Agricultural Management Measures (BMPs).

Above: Grassed waterways in Upper Silver Creek watershed. Photo: HeartLands Conservancy.

Above: Terraces. Photo: NRCS.

Above: Contour buffer strips. Photo: NRCS.

Above: Grassed waterways in Upper Silver Creek watershed. Photo: HeartLands Conservancy.


Urban Management Measures

**Bioswales**

Bioswales are swaled (sloped) drainage courses designed to remove debris and reduce pollution from surface water. The sides of the swale are less than 6% slope and the swale may be filled with vegetation, compost, and/or riprap. The design of the swale should maximize the time water spends there, which aids in infiltration (for groundwater recharge) and pollutant removal. Bioswales are often effective when sited adjacent to parking lots. They can capture and treat stormwater during the “first flush” of rain on the parking lot, which carries substantial automotive pollution.

In 2012, the City of O’Fallon, Illinois and HeartLands Conservancy conducted a feasibility study to determine optimal locations for implementing bioswales—including retrofitting existing concrete swales and identifying future installation areas—to reduce the volume of stormwater runoff and related pollutants and sediments. The city also studied two pilot locations for a six-month period to establish baseline flow data in existing concrete roadside swales. The feasibility study encouraged the implementation of bioswales and other stormwater BMPs in areas of new development, particularly in residential parcels, through identified marketing strategies; recommended that city ordinances allow for the utilization of BMPs in both existing and new development; and identified high-priority areas (i.e., residential streets) where existing concrete swales could be retrofitted to bioswales, specifically when the current infrastructure is being repaired or replaced, to cut costs.

**Detention basins**

A detention basin is a constructed basin that receives, temporarily stores, and then gradually releases stormwater. They are designed to store flows during the most critical part of the flood and release the stored water as the flood subsides. While detention does not reduce the total volume of runoff from a flood event, it does reduce the peak flow rate. Many are also designed to treat stormwater by removing sediments, nutrients, and other pollutants.

Older detention basins may no longer function properly, and would benefit from adding extended detention outlet structures and vegetation, removing sediment, and altering flow-through patterns. Retrofitting existing detention basins can be cheaper than constructing new basins. New detention basins (dry and wet), retrofits to existing basins (e.g., addition of native vegetation, volume increases), and maintenance of existing basins (e.g., dredging to remove sediment) are recommended in this plan. Repair and/or improvement of retention areas are recommended across the county in the St. Clair County Multi-Hazard Mitigation Plan (Appendix C).

Large, regional detention basins serving several municipalities/entities may be an effective option for reducing flood impacts to communities in the Silver Creek corridor. For example, if regional detention basins could store stormwater draining towards Scott Air Force Base from the west during heavy storm events, the flood impacts on the Base would be reduced.

---

**Primary goal addressed:** 2. Reduce Flooding/Mitigate Flood Damage

**Pollution reduction:** 77% sediment, 17% P, 47% N

**Cost:** $18/sq ft

---

**Primary goal addressed:** 2. Reduce Flooding/Mitigate Flood Damage

**Pollution reduction:** 58% (dry) or 60% (wet) sediment, 26% (dry) or 45% (wet) P, 30% (dry) or 35% (wet) N

**Cost:** $43,805/acre (dry), $48,122/acre (wet)
**Pervious pavement**

Pervious pavement, also referred to as porous or permeable pavement, allows infiltration of stormwater into a below-ground storage area through holes in the pavement. It reduces the amount and rate of stormwater runoff over the ground surface, and is a useful practice for areas requiring a smooth, paved surface that would normally be covered with impervious concrete or asphalt. Pervious pavement is suitable for parking lots, private roads, fire lanes, residential driveways, sidewalks, and bike paths, where the subsoil is of a suitable composition. Pervious pavement does require periodic cleaning with a vacuum to remain effective over time.

**Rain gardens**

Rain gardens are vegetated basins that temporarily store and infiltrate rain water. Situated near the lowest point of a small drainage area (such as a single residential lot), they significantly slow the flow of water, improve water quality, and provide food and shelter for birds, butterflies, and insects. Rain gardens can be used in combination with roof downspout disconnection and redirection, so that rainwater from a roof is channeled to the rain garden to infiltrate into the soil, reducing stormwater runoff.

**Rainwater collection**

Rainwater collection systems gather rainwater in structures such as rain barrels or cisterns, so that it can be used or released at a later time. They are often connected to roofs and gutters. Collecting rainwater in these systems decreases localized stormwater runoff during times of peak flow and reduces household water use and water bills.

**Single property flood reduction strategies**

Property owners can use a number of practices to reduce flood damage, including many low-cost options. The key to successfully mitigating future damages is to identify the source(s) of flooding at the site scale. It is important to educate property owners about these sources of flooding and appropriate flood reduction strategies. The Illinois Urban Flooding Awareness Act Final Report, published in June 2015, identified typical causes of basement flooding including overland flow, infiltration, and sewer backup. The report identified solutions available to address these causes, such as structural inspections, site grading, overhead sewer installation, drain tile, downspout disconnection, rain gardens, and pervious pavement. Information from this Report is located in Appendix C. Additional mitigation activities include elevating structures in frequently flooded areas and sanitary sewer line repairs to prevent stormwater infiltration and sewer backups (Appendix C – Management Measures).

To aid homeowners in making decisions about flood risk to their homes, materials about the National Flood Insurance Program (NFIP) should be made available by communities. Additionally, communities should consider coordinating with FEMA and IDNR on a home buyout program to relieve homeowners in frequently flooded areas who do not wish to remain.
**Stormwater and sanitary sewer system maintenance and expansion**

Storm drain systems require regular maintenance to function as planned. Cleaning out culverts, ditches, clogged drains, and storm drain inlets reduces the amount of pollutants, trash, and debris entering receiving waters. In some cases, stormwater infrastructure is not appropriately sized to accommodate the flow it receives, due to changes in the upstream drainage area or inappropriate sizing. In some areas, a stormwater pipe designed to convey the 10-year storm based on rainfall data through 1960 would only carry the 6.6-year rainfall estimated from a dataset extending to the 1980’s.

The 2011 St. Clair County Multi-Hazard Mitigation Plan identified storm drain system improvement projects (Appendix C—Management Measures). Culverts, ditches, and detention basins that often overflow should be assessed for potential enlargement. Upgrades should be made in response to storm drain system inspections, citizen complaints, and/or updated modeling of the system. In addition, sanitary sewer systems should be maintained in order to prevent infiltration and combined sewer overflows. Expansion of sanitary sewers to new development and existing buildings (already a common practice among municipalities) should continue wherever feasible.

Selected Urban Management Measures (BMPs).

- **Storm drain cleaning**. Photo: Ann Arundel County, Maryland.
- **Rain garden**. Photo: USEPA.
- **Pervious pavement**. Photo: Philadelphia Water.

**Primary goal addressed**: 2. Reduce Flooding/Mitigate Flood Damage

**Pollution reduction**: n/a

**Cost**: $81/linear foot (storm drain cleaning)
Tree planting (e.g., street trees)

Street trees are trees that are planted in the public right-of-way. They are an important component of municipal green infrastructure and provide benefits including reduction of stormwater runoff, filtration of pollutants in air and water, mitigating high “urban heat island” air temperatures, and providing pleasing aesthetics that increase property values.

When planting new street trees, site evaluations should be conducted to evaluate site considerations. Then, a suitable native tree species is selected. Factors such as growth rate, ornamental traits, size, canopy shape, shade potential, wildlife benefits, and leaf litter production should all be considered when choosing a tree species.

Municipalities with a strong tree program can become a member of Tree City USA, a program operated by the Arbor Day Foundation. It is a nationwide movement that provides the necessary framework to manage and expand public tree inventory. Cities can achieve Tree City USA status by meeting four core standards of sound urban forestry management: (1) maintaining a tree board or department, (2) having a community tree care ordinance, (3) spending at least $2 per capita on urban forestry, and (3) celebrating Arbor Day.

Stream and Lake Management Measures

Logjams – assessment and removal

A logjam is any woody vegetation, with or without other debris, which obstructs a stream channel and backs up stream water. Beaver populations can increase the number of logjams in an area. Reports of beavers in the Silver Creek corridor were made by residents in the watershed. Logjams occur naturally, providing beneficial stream structure and cover for fish and wildlife and allowing nutrient-rich sediments to be deposited on adjacent floodplain. Adding and maintaining logjams is sometimes a management improvement for fish habitat.

However, the benefits of logjams can sometimes be outweighed by the drawbacks. Logjams can impact water quality and impede the ability of streams in the watershed to drain and convey water from the land in a timely manner. They increase the impacts of flood events and contribute sediment when water scoursthe streambanks beside the logjam, taking soil and debris from the bank into the stream channel. Logjams can be beneficial or harmful depending on their size, location, the extent to which they stabilize streambanks, and the condition and land use of the riparian area. The decision to remove a logjam should be made following a thorough site inspection.

Localized assessment is recommended to determine whether logjam removal is appropriate and cost-effective at specific locations. The American Fisheries Society’s 1983 “Stream Obstruction Removal Guidelines” are a reliable source for determining what types of logjams should be removed.

Shoreline stabilization

The shoreline provides habitat for fish and wildlife, supports recreation for humans, and cleans stormwater runoff before it enters the water. Shoreline erosion is a natural process that occurs on lakes and rivers and along the coast. It is the gradual, although sometimes rapid, removal of sediments from the shoreline. It is caused by a number of factors...
including storms, wave action, rain, ice, winds, runoff, and loss of trees and other vegetation. Stabilizing the shoreline of lakes in the watershed can reduce sediment erosion and support vegetation and wildlife habitat.

**Streambank and channel restoration**

One of the mitigation actions in the St. Clair County Hazard Mitigation Plan is to “Conduct stream maintenance in Silver Creek” in order to lessen the impacts of flooding on new and existing infrastructure. Streambank and channel restoration includes several practices. Streambed erosion (incision) is the first consideration for treatment. Treatment methods include installation of pool-riffle complexes, which consist of areas of rapid water movement over coarse substrate (riffles) and areas with slower stream movement and a smooth surface (pools). Riffle-pool complexes help support healthy fish and wildlife habitat by increasing water depth and increasing DO.

Streambank stabilization methods use a combination of bioengineering with native vegetation and hard armoring. These practices are typically implemented together, often alongside riparian buffer improvements. They improve water quality by reducing sediment transport and increasing oxygen. Some practices, such as two-stage channels, help to store floodwater during periods of high flow. Selected Stream Management Measures (BMPs).

Creating a new meandering course for a stream, or reconnecting a cut-off meander, is known as stream re-meandering. This stream restoration practice is appropriate where streams have been highly channelized or where slower flow would be helpful in reducing erosion.

<table>
<thead>
<tr>
<th>Primary goal addressed:</th>
<th>1. Improve Surface Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addresses Critical Stream Reaches</td>
<td></td>
</tr>
<tr>
<td>Pollution reduction: 98% sediment, 90% P, 90% N</td>
<td></td>
</tr>
<tr>
<td>Cost: $78/linear foot</td>
<td></td>
</tr>
</tbody>
</table>


Stone toe protection, which prevents streambank erosion and shoreline erosion. Photo: Montgomery County, Maryland.
SECTION 5: MANAGEMENT MEASURES

Management Measure Selection
Best Management Practices (BMPs) for stormwater management and water quality were identified from several sources, including the Association of Illinois Soil and Water Conservation Districts (Illinois Urban Manual) and USEPA (e.g., the Water Quality Scorecard). Full descriptions of Management Measures selected are located in Appendix C.

The Management Measures were selected based on the following factors:

- Performance – Research-based pollutant reduction estimates for each BMP;
- Cost – The costs associated with installation and maintenance of each BMP;
- Public acceptance; and
- Ease of construction and maintenance.

Pollutant load reduction values associated with the Management Measures were identified from several sources, including the USEPA’s Region 5 Load Estimation Model Users Manual and the International Stormwater BMPs Database (see Appendix C).

Cost estimates were assembled from several sources, including the Illinois Nutrient Loss Reduction Strategy (2015), experienced local contractors, and other watershed-based plans (see Appendix C).

Levels of public acceptance for various Management Measures were gauged during stakeholder engagement activities. Data on ease of construction and maintenance were collected from sources including NRCS’s 2014 National Conservation Practice Standards.

Table 7 shows all Management Measures selected, with the primary goal addressed by each measure. Secondary and/or tertiary goals addressed are also identified. Estimates of the pollutant load reduction efficiencies of each measure are listed for sediment, Total Suspended Solids, phosphorus, and nitrogen. If implemented, these Management Measures will achieve the goals, objectives, and targets of this plan.

Some BMPs are more effective at pollutant reduction when implemented in a treatment train (e.g., a terrace leading to a wetland). The STEPL can assess the efficiency of several BMP combinations.

Note: All recommendations in this section are voluntary, and are not required by any federal, state, or local agency.
### Lower Silver Creek Watershed Plan

#### All Management Measures recommended

Table 7. All Management Measures recommended, goals addressed (see goal numbers in Section 2), and pollutant load reduction efficiency.

<table>
<thead>
<tr>
<th>Goals addressed</th>
<th>Pollutant load reduction efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary goal addressed</td>
<td>Secondary goal addressed</td>
</tr>
<tr>
<td><strong>Programmatic Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Conservation Development</td>
<td>3</td>
</tr>
<tr>
<td>Federal and state programs (CRP, CREP, etc.)</td>
<td>1</td>
</tr>
<tr>
<td>Financial support for stormwater infrastructure</td>
<td>2</td>
</tr>
<tr>
<td>Flood Damage Prevention Ordinance</td>
<td>2</td>
</tr>
<tr>
<td>Green infrastructure incentives</td>
<td>3</td>
</tr>
<tr>
<td>In-lieu fee mitigation</td>
<td>1</td>
</tr>
<tr>
<td>Monitoring (water quality, flow, and stream health)</td>
<td>1</td>
</tr>
<tr>
<td>Native landscaping</td>
<td>4</td>
</tr>
<tr>
<td>Open space and natural area protection</td>
<td>3</td>
</tr>
<tr>
<td>Private sewage monitoring</td>
<td>1</td>
</tr>
<tr>
<td>Riparian Buffer Ordinance</td>
<td>3</td>
</tr>
<tr>
<td>Sewage Treatment Plant upgrades</td>
<td>1</td>
</tr>
<tr>
<td>Stream Cleanup Team</td>
<td>4</td>
</tr>
<tr>
<td>Watershed Plan integrated in community efforts</td>
<td>5</td>
</tr>
<tr>
<td>Hydrologic/Flood Study</td>
<td>2</td>
</tr>
<tr>
<td><strong>Site-Specific Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Agricultural Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Animal waste treatment system</td>
<td>1</td>
</tr>
<tr>
<td>Bioreactor</td>
<td>1</td>
</tr>
<tr>
<td>Comprehensive Nutrient Management Plan (CNMP)</td>
<td>1</td>
</tr>
<tr>
<td>Conservation tillage</td>
<td>1</td>
</tr>
<tr>
<td>Contour buffer strips</td>
<td>1</td>
</tr>
<tr>
<td>Cover crops</td>
<td>1</td>
</tr>
<tr>
<td>Grassed waterways</td>
<td>1</td>
</tr>
<tr>
<td>Nutrient Management Plan (NMP)</td>
<td>1</td>
</tr>
<tr>
<td>Ponds</td>
<td>1</td>
</tr>
<tr>
<td>Riparian buffers</td>
<td>1</td>
</tr>
<tr>
<td>Terraces</td>
<td>1</td>
</tr>
<tr>
<td>Water and sediment control basins (WASCOBS)</td>
<td>1</td>
</tr>
<tr>
<td>Wetlands</td>
<td>1</td>
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<tr>
<td><strong>Forest Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Forest stand improvement</td>
<td>4</td>
</tr>
<tr>
<td><strong>Urban Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Bioswales</td>
<td>2</td>
</tr>
<tr>
<td>Dry detention basins, new</td>
<td>2</td>
</tr>
<tr>
<td>Wet detention basins, new</td>
<td>2</td>
</tr>
<tr>
<td>Detention basin retrofits (vegetated buffers, etc.)</td>
<td>2</td>
</tr>
<tr>
<td>Detention basin maintenance (dredging, invasives, etc.)</td>
<td>2</td>
</tr>
<tr>
<td>Pervious pavement</td>
<td>2</td>
</tr>
<tr>
<td>Rain gardens</td>
<td>1</td>
</tr>
<tr>
<td>Rainwater collection</td>
<td>2</td>
</tr>
<tr>
<td>Single property flood reduction strategies</td>
<td>2</td>
</tr>
<tr>
<td>Stormwater &amp; sanitary sewer maintenance &amp; expansion</td>
<td>2</td>
</tr>
<tr>
<td>Tree planting (e.g., street trees)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Stream and Lake Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Logjam assessment and removal</td>
<td>1</td>
</tr>
<tr>
<td>Shoreline stabilization</td>
<td>1</td>
</tr>
<tr>
<td>Streambank &amp; channel restoration</td>
<td>1</td>
</tr>
</tbody>
</table>

*Independently calculated sediment and total suspended solids (TSS) values were used where available. Where only one sediment or TSS value was available, the known sediment and TSS reduction efficiency was used (purple cells).
Summary of Site-Specific Management Measures recommended

Table 8 shows the Site-Specific Management Measures recommended, along with associated costs and estimated pollutant reductions for sediment, Total Suspended Solids (TSS), phosphorus, and nitrogen. All recommendations are for implementation by 2050, the long-term watershed planning horizon.

**Agricultural Management Measures** include 100 acres of animal waste storage/treatment systems for livestock waste management. This represents 1.3% of the approximately 7,708 acres of farms with livestock in the watershed.

*Bioreactors* are recommended at 323 locations, draining approximately 70 acres per bioreactor, for a total of 22,610 acres drained. The locations of 323 potential sites for bioreactors were determined by the ACPF model, which uses topography and soil type to estimate which fields in the watershed are likely to be tile drained.

**Comprehensive Nutrient Management Plans (CNMPs)** are recommended for 900 acres of farmland.

*Conservation tillage* is recommended for 7,738 acres of land. This number is relatively low because conservation tillage is already a popular practice—the 2015 Illinois Department of Agriculture Soil Conservation Survey reported that farmers in St. Clair County used some form of conservation tillage on more than 98% of corn fields and nearly 100% of soybeans fields in 2015.

*Contour buffer strips* are recommended to cover 167 acres with Critical, Very High, or High runoff risk. This represents 33% of the 507 acres of sites well suited for contour buffer strips identified by the ACPF model, which uses buffer strips 15 feet wide with a 90 foot minimum distance between them.

*Cover crops* are recommended for 38,692 acres of land. Cover crops are highly compatible with conservation tillage; a farmer planting cover crops will often find it more beneficial to till less or not at all.

*Grassed waterways* are recommended for 3,063 acres on agricultural land with Critical, Very High, or High runoff risk, as identified in the ACPF. This figure represents 75% of the grassed waterway locations identified in the ACPF, which are suited for drainage areas greater than six acres. Grassed waterways are a well-known practice among landowners and farmers in the watershed.

**Nutrient Management Plans (NMPs)** are recommended for 2,000 acres of agricultural land.

*Ponds* are recommended to cover 200 acres on agricultural land. Ponds are already a popular project for landowners in the watershed, who often use them for recreation and stock them with fish. Ponds are not eligible for funding by the major federal agricultural conservation programs such as CRP, but there appears to be high demand, and they function well as retention basins.

*Riparian buffers* are recommended for 464 acres along streams (assuming a 100-foot buffer width), or 38.3 miles, representing 75% of the 51 miles of streams identified as having poor or moderate riparian condition. The recommended area includes 100% of the Critical Riparian Areas in the watershed (14.1 miles) which are composed of “poor condition” riparian areas identified in the aerial assessment and areas identified in the ACPF as Critical Zones (see Appendix B).
Terraces are recommended for a total length of 100,000 feet (18.9 miles). Specific locations where terraces would be well-suited were not identified (and were not included in the ACPF tool), but it is likely that areas suitable for contour buffer strips would also be suitable for terraces. Over 140,000 feet of terraces have already been created on farmland in St. Clair County between 2010 and 2015.

WASCOBs are recommended for 584 acres on agricultural land with Critical, Very High, or High runoff risk. This area represents 100% of the WASCOB locations identified by the ACPF. Runoff risk classifications represent the risk of direct runoff contribution to stream channels from agricultural land. Runoff risk categories were assessed by distance to the nearest stream and slope steepness; the closer the stream and the steeper the slope, the greater the runoff risk. See Appendix B for more information on this assessment process.

Wetlands are recommended to be installed or restored on 671 acres in the watershed. This represents 100% of the Critical Wetland Areas identified using the ACPF and MoRAP’s wetland assessment. Much of the area surrounding Silver Creek is suitable for wetlands, including several areas identified as Critical Wetland Areas north of Scott Air Force Base and Route 50. Existing wetlands and sloughs that have filled with sediment over time could also be dredged to improve flood storage and as a part of habitat restoration.
Table 8. Summary of Site-Specific Management Measures recommended, including amount, cost (implementation cost), and pollutant load reduction.

<table>
<thead>
<tr>
<th>BMP Name</th>
<th>Amount</th>
<th>Unit</th>
<th>Cost per unit</th>
<th>Total Cost</th>
<th>Sediment (tons/yr)</th>
<th>Total Suspended Solids (lbs/yr)</th>
<th>Phosphorus (lbs/yr)</th>
<th>Nitrogen (lbs/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agricultural management practices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal waste storage/treatment system</td>
<td>100 systems</td>
<td>$260,000.00</td>
<td>$26,000,000</td>
<td>239</td>
<td>477,566</td>
<td>1,175</td>
<td>4,842</td>
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<td>Bioreactors</td>
<td>22,610 acres</td>
<td>$157.81</td>
<td>$3,568,100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>67,101</td>
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<tr>
<td>Comprehensive Nutrient Mgmt Plans (CNMPs)</td>
<td>900 acres</td>
<td>$54.97</td>
<td>$49,475</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Conservation tillage</td>
<td>7,738 acres</td>
<td>$58.65</td>
<td>$453,828</td>
<td>1,439</td>
<td>2,878,425</td>
<td>6,747</td>
<td>11,483</td>
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<tr>
<td>Contour buffer strips</td>
<td>167 acres</td>
<td>$175.11</td>
<td>$29,272</td>
<td>28</td>
<td>55,658</td>
<td>170</td>
<td>657</td>
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<tr>
<td>Grassed waterways</td>
<td>3063 acres</td>
<td>$8,653.00</td>
<td>$26,507,503</td>
<td>777</td>
<td>1,554,295</td>
<td>2,305</td>
<td>12,501</td>
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<tr>
<td>Nutrient Management Plans (NMPs)</td>
<td>2,000 acres</td>
<td>$13.83</td>
<td>$27,669</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Ponds</td>
<td>200 acres</td>
<td>$15,270.00</td>
<td>$3,054,000</td>
<td>36</td>
<td>84,986</td>
<td>161</td>
<td>460</td>
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<tr>
<td>Riparian buffers</td>
<td>464 acres</td>
<td>$52.65</td>
<td>$24,410</td>
<td>1,085</td>
<td>2,170,806</td>
<td>341</td>
<td>1,191</td>
<td></td>
</tr>
<tr>
<td>Terraces</td>
<td>100,000 feet</td>
<td>$3.36</td>
<td>$335,940</td>
<td>0</td>
<td>582</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Water and sediment control basin</td>
<td>584 acres</td>
<td>$366.48</td>
<td>$213,861</td>
<td>106</td>
<td>212,809</td>
<td>341</td>
<td>1,191</td>
<td></td>
</tr>
<tr>
<td>Wetlands</td>
<td>671 acres</td>
<td>$13,162.50</td>
<td>$8,832,038</td>
<td>166</td>
<td>331,939</td>
<td>494</td>
<td>996</td>
<td></td>
</tr>
<tr>
<td><strong>Forest related practices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest stand improvement</td>
<td>40 acres</td>
<td>$356.30</td>
<td>$14,252</td>
<td>3</td>
<td>5,306</td>
<td>14</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td><strong>Urban/Other Measures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bioswales</td>
<td>10,000 sq. ft.</td>
<td>$18.12</td>
<td>$181,200</td>
<td>0</td>
<td>539</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Dry detention basins, new</td>
<td>100 acres</td>
<td>$43,804.80</td>
<td>$4,380,480</td>
<td>88</td>
<td>175,344</td>
<td>209</td>
<td>1,070</td>
<td></td>
</tr>
<tr>
<td>Wet detention basins, new</td>
<td>100 acres</td>
<td>$48,122.10</td>
<td>$4,812,210</td>
<td>91</td>
<td>182,968</td>
<td>362</td>
<td>1,249</td>
<td></td>
</tr>
<tr>
<td>Detention basin retrofits (native vegetation buffers, etc.)</td>
<td>79 acres</td>
<td>$15,236.94</td>
<td>$213,861</td>
<td>63</td>
<td>175,417</td>
<td>285</td>
<td>1,124</td>
<td></td>
</tr>
<tr>
<td>Detention basin maintenance (dredging, mowing, burning, invasives, etc.)</td>
<td>79 acres</td>
<td>$992.09</td>
<td>$78,177</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Pervious pavement</td>
<td>100 acres</td>
<td>$100,557.50</td>
<td>$10,055,750</td>
<td>137</td>
<td>274,451</td>
<td>523</td>
<td>3,032</td>
<td></td>
</tr>
<tr>
<td>Rain gardens</td>
<td>20,000 sq. ft.</td>
<td>$9.27</td>
<td>$185,440</td>
<td>0</td>
<td>938</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Rainwater harvesting and reuse</td>
<td>100 rain barrels/ cisterns</td>
<td>$236.93</td>
<td>$23,693</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Single property flood reduction strategies</td>
<td>150 properties</td>
<td>$2,000.00</td>
<td>$300,000</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Storm drain system maintenance and expansion</td>
<td>10,000 feet</td>
<td>$80.55</td>
<td>$805,545</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Tree planting (e.g. street trees)</td>
<td>2,280,000 sq. ft. canopy</td>
<td>$2.78</td>
<td>$6,347,000</td>
<td>25</td>
<td>49,480</td>
<td>128</td>
<td>499</td>
<td></td>
</tr>
<tr>
<td><strong>Waterways</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logjam removal</td>
<td>500 feet</td>
<td>$31.20</td>
<td>$15,600</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Shoreline stabilization</td>
<td>4,589 feet</td>
<td>$83.48</td>
<td>$385,101</td>
<td>1,411</td>
<td>2,821,985</td>
<td>2,846</td>
<td>8,612</td>
<td></td>
</tr>
<tr>
<td>Streambank &amp; channel restoration</td>
<td>228,254 feet</td>
<td>$78.00</td>
<td>$17,803,843</td>
<td>2,278</td>
<td>4,205,898</td>
<td>11,087</td>
<td>49,202</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$86,793,176</td>
<td>9,815</td>
<td>19,340,242</td>
<td>50,889</td>
</tr>
<tr>
<td>% Reduction From Current Total:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Forest Management Measures** consist of 40 acres of *forest stand improvement*. This represents 0.22% of the forested area in the watershed (18,499 acres).

**Urban Management Measures** include 10,000 square feet of *bioswales*. If each bioswale treats an area of 10 acres or less, as is recommended, this represents minimum of 100 swales implemented.

*New dry detention basins* (100 acres) and *wet detention (or retention) basins* (100 acres) are recommended. New detention and retention basins are anticipated to be constructed alongside new residential, suburban, commercial, and industrial development in the watershed. Assuming an average basin size of 1 acre, 200 acres of basins represents 200 new basins in total.

*Detention basin retrofits* are recommended for 79 acres of existing detention/retention basins, which represents 20% of the 394 detention basins identified from aerial photographs in the watershed, assuming an average basin size of 1 acre. It is anticipated that all existing basins will benefit from upgrades by 2050. Several have already filled with sediment and fallen into disrepair, especially in older subdivisions. *Detention basin maintenance* for those 79 acres of detention/retention basins is also recommended, to ensure that appropriate maintenance techniques and schedules are designed and adhered to in future.

*Pervious pavement* is recommended for 100 acres in the watershed, or 2.8% of the total current impervious area in the watershed (approximately 3,527 acres). Pervious pavement is an increasingly popular paving choice, and has been used at pilot sites at Scott Air Force Base.

*Storm drain system maintenance and expansion* is recommended for 10,000 feet of stormwater ditches and storm sewers in the watershed. This includes cleaning out culverts, ditches, drains, and storm inlets, and expanding stormwater infrastructure to new development and increasing culverts and other features that are not appropriately sized to accommodate the flow received. If divided equally among the eight municipalities in the watershed, the 100,000 feet of maintenance and expansion comes to 1,250 ft per municipality.

*Rain gardens* are recommended to be installed on 20,000 square feet of urban land in the watershed. Rain gardens are gaining in popularity among homeowners because of their infiltration capacity and wildlife benefits, and they can be attractive community features as well.

*Rainwater collection* is recommended through the installation of 100 rain barrels or cisterns.

*Single-property flood reduction* projects are recommended for 150 properties. This number is a best estimate of properties with moderate to serious flooding/groundwater issues requiring upgrades by 2050. Building owners may wish to update or elevate their properties to reduce flood damage, or alter drainage on their properties by improving basement drainage, altering driveway grade, or other actions.

*Storm drain system maintenance and expansion* is recommended for 10,000 feet of storm drains, ditches, and sanitary sewers (expansion of 10,000 feet plus maintenance of all existing systems).

*Tree planting* of approximately 20,000 trees is recommended, especially along streets. With an estimated canopy area of 114 sq ft for a 10-year-old mature street tree, this amounts to 2,280,000 sq. ft. of recommended canopy cover. This is approximately 4% of the "high" and "very high" priority planting locations identified by Davey Resource Group in a 2018 analysis (see Appendix A).
Stream and Lake Management Measures recommended include 500 feet of *logjam removals*, which represents 0.02% of the streams in the watershed. Some stream reaches with many trees and unstable streambanks may need to have multiple logjams removed.

Shoreline stabilization is recommended for 4,589 feet of lake shoreline. This represents 10% of the total perimeter of the shorelines of named, major lakes in the watershed.

Streambank and channel restorations recommended for 228,254 feet of streams. This number represents 33% of all streams with high streambank erosion, and includes 100% of Critical Stream Reaches (which have high streambank erosion *and* high channelization). Streambank erosion is a major source of sediment and nutrient loading in the watershed.

Locations of Site-Specific Management Measures

Where data was available, Site-Specific Management Measures were recommended for implementation in certain locations. For example, Management Measures associated with Critical Areas are recommended for those areas.

Critical Areas and areas recommended for Management Measures through the USDA’s ACPF are provided in a spreadsheet with longitude and latitude data in Appendix G. Table 9 summarizes the Site-Specific Management Measures provided in Appendix G by HUC14 subwatershed.
Table 9. Area/length of three Site-Specific Management Measures (summary of Appendix G), and area/length of Critical Areas (summary of Critical Areas information in Section 3), organized by HUC14 subwatersheds. Greatest values in each category are shown in **bold red font.**

<table>
<thead>
<tr>
<th>HUC14 code</th>
<th>HUC14 name</th>
<th>Contour buffer strips (acres)</th>
<th>Grassed waterways (feet)</th>
<th>WASCOBs (acres)</th>
<th>Riparian area restoration (Critical Riparian Areas) (feet)</th>
<th>Wetland restoration (Critical Wetland Areas) (acres)**</th>
<th>Streambank stabilization (miles)***</th>
<th>Critical Stream Reaches (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>07140204050701</td>
<td>Upper Ogles Creek</td>
<td>46</td>
<td>122,717</td>
<td>48</td>
<td>9.8</td>
<td>0.4</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>07140204050702</td>
<td>Lower Ogles Creek</td>
<td>30</td>
<td>54,158</td>
<td>12</td>
<td>5.4</td>
<td>0.4</td>
<td>3.69</td>
<td></td>
</tr>
<tr>
<td>07140204050801</td>
<td>07140204050801-Little Silver Creek</td>
<td>24</td>
<td>527,173</td>
<td>30</td>
<td>9,346</td>
<td>111.3</td>
<td>80.7</td>
<td>2.13</td>
</tr>
<tr>
<td>07140204050802</td>
<td>Emerald Mound-Little Silver Creek</td>
<td>53</td>
<td>647,881</td>
<td>16</td>
<td>4,639</td>
<td>111.3</td>
<td>4.04</td>
<td>0.10</td>
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<tr>
<td>07140204050803</td>
<td>East Branch Little Silver Creek</td>
<td>22</td>
<td>631,631</td>
<td>48</td>
<td><strong>15,902</strong></td>
<td><strong>60.4</strong></td>
<td><strong>60.4</strong></td>
<td><strong>0.05</strong></td>
</tr>
<tr>
<td>07140204050804</td>
<td>City of Lebanon-Little Silver Creek</td>
<td>5</td>
<td>252,983</td>
<td>15</td>
<td>2,374</td>
<td>28.8</td>
<td>2.23</td>
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<tr>
<td>07140204050805</td>
<td>Village of Summerfield-Little Silver Creek</td>
<td>17</td>
<td>390,986</td>
<td>37</td>
<td>942</td>
<td>43.7</td>
<td>1.19</td>
<td></td>
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<tr>
<td>07140204050903</td>
<td>07140204050903-Silver Creek</td>
<td>13</td>
<td>51,013</td>
<td>3</td>
<td>6.4</td>
<td>0.39</td>
<td>0.39</td>
<td></td>
</tr>
<tr>
<td>07140204050904</td>
<td>Engle Creek</td>
<td>15</td>
<td>105,147</td>
<td>17</td>
<td>15.4</td>
<td>3.94</td>
<td>0.16</td>
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</tr>
<tr>
<td>07140204050905</td>
<td>Hageman Creek-Silver Creek</td>
<td><strong>75</strong></td>
<td>371,436</td>
<td><strong>60</strong></td>
<td><strong>6,538</strong></td>
<td><strong>206.3</strong></td>
<td><strong>8.44</strong></td>
<td><strong>5.99</strong></td>
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<tr>
<td>07140204051001</td>
<td>Scott Air Force Base Pond-Silver Creek</td>
<td>22</td>
<td>397,924</td>
<td>10</td>
<td>0</td>
<td>0.4</td>
<td>3.95</td>
<td></td>
</tr>
<tr>
<td>07140204051002</td>
<td>07140204051002-Union Cemetery</td>
<td>1</td>
<td>200,451</td>
<td>12</td>
<td>1,057</td>
<td>0.8</td>
<td>0.91</td>
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<tr>
<td>07140204051003</td>
<td>Hog River-Silver Creek</td>
<td>2</td>
<td>207,797</td>
<td>17</td>
<td>5,573</td>
<td>0.70</td>
<td>0.30</td>
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</tr>
<tr>
<td>07140204051101</td>
<td>Upper Loop Creek</td>
<td>11</td>
<td>2,624</td>
<td>19</td>
<td>1,147</td>
<td>57.4</td>
<td>0.18</td>
<td>0.08</td>
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<tr>
<td>07140204051102</td>
<td>Ash Creek</td>
<td>7</td>
<td>141,739</td>
<td>1</td>
<td>2,450</td>
<td>6.3</td>
<td>5.07</td>
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</tr>
<tr>
<td>07140204051103</td>
<td>Hazel Creek</td>
<td>29</td>
<td>307</td>
<td>21</td>
<td>9.6</td>
<td>2.08</td>
<td></td>
<td></td>
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<tr>
<td>07140204051104</td>
<td>Lower Loop Creek</td>
<td>17</td>
<td>152,054</td>
<td>22</td>
<td>6,633</td>
<td>6.8</td>
<td>0.39</td>
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</tr>
<tr>
<td>07140204051201</td>
<td>City of Mascoutah</td>
<td>3</td>
<td>39,800</td>
<td>8</td>
<td>6,045</td>
<td><strong>7.08</strong></td>
<td></td>
<td></td>
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<tr>
<td>07140204051202</td>
<td>Funk Cemetery-Silver Creek</td>
<td>6</td>
<td>54,856</td>
<td>2</td>
<td>3,067</td>
<td>4.18</td>
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<td></td>
</tr>
<tr>
<td>07140204051203</td>
<td>Heberers Branch-Silver Creek</td>
<td>20</td>
<td>133,067</td>
<td>33</td>
<td>9.7</td>
<td>6.90</td>
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<td></td>
</tr>
<tr>
<td>07140204051204</td>
<td>Jacks Run-Silver Creek</td>
<td>14</td>
<td>133,067</td>
<td>13</td>
<td>898</td>
<td>5.4</td>
<td>6.30</td>
<td>0.67</td>
</tr>
<tr>
<td>07140204051205</td>
<td>Biebell Lake-Silver Creek</td>
<td>33</td>
<td>224,122</td>
<td>27</td>
<td>7,844</td>
<td><strong>338.2</strong></td>
<td><strong>65.69</strong></td>
<td><strong>0.75</strong></td>
</tr>
<tr>
<td>TOTAL*</td>
<td></td>
<td>466</td>
<td>1,476,043</td>
<td>470</td>
<td>74,456</td>
<td>1002.7</td>
<td>131.39</td>
<td>8.89</td>
</tr>
</tbody>
</table>

* Totals for BMPs may be lower than the sum of those identified in each HUC14 because some BMPs overlap two or more HUC14 subwatersheds.

** Includes Nutrient Wetland Areas identified by the ACPF and wetland areas identified by MORAP wetland assessment.

*** Areas where aerial assessment showed "poor" streambank condition.
SECTION 6: INFORMATION & EDUCATION PLAN

This section is designed to provide an Information and Education component to spark interest in and enhance public understanding of the Watershed Plan, and to encourage early and continued participation in selecting, designing, and implementing its recommendations. It explores Goal 6 of this plan, “Promote public awareness, understanding and stewardship of the Lower Silver Creek watershed and the Watershed Plan.”

The Lower Silver Creek watershed faces challenges and threats from high nutrient and sediment loads, streambank erosion and channelization, increasing development and land use changes, invasive species, and widespread flooding. Key audiences lack the knowledge and resources to make informed decisions and adopt constructive behaviors to mitigate these challenges and threats.

Since a significant amount of the Lower Silver Creek watershed is held as private property, education and outreach efforts to engage those landowners and other key stakeholders are needed to improve water quality and achieve other goals of this plan. A single regulatory agency or group working alone cannot be as effective in reducing stormwater pollution as a combined effort with other groups in the watershed all working towards the same goal. Many people will commit to protecting and improving the watershed if they understand what to do and how it will help.

This Information and Education Plan will serve as an outline for outreach that supports achievement of the long-term goals and objectives of the Watershed Plan. The cumulative actions of individuals and communities across the watershed can accomplish these goals and objectives. County, municipal and township staffs, elected officials, and other key stakeholders have tools at their disposal to establish best practices in their activities and procedures. Developers can follow guidelines that consider watershed health, and residents in the watershed can be actively involved in monitoring, protecting, and restoring Silver Creek and its tributaries. As these stakeholders take action, the water quality and overall health of the watershed will improve.

Open House, February 2017
Information and Education Process
To develop the strategies for the Information and Education Plan, the following questions were asked:

- Who can affect this issue?
- What actions can people take to address it?
- What do people need to know before they can take action?

The list of activities has been divided into three broad timeline categories: short-term, medium-term, and long-term. The full list of objectives and activities can be found in Table 10. A rough estimate of the cost of the outreach activities outlined in this plan is $20,000, which includes many unforeseeable component costs including staff time and costs for rental and materials.

Target Audiences
Key stakeholder audiences that can effect significant changes in watershed health, and who should be reached by outreach and education, include:

- St. Clair County government departments and elected officials
- Municipal staff, township staff, and elected officials (including MS4 Co-Permittee Group Members)
- Community Partnership Group members
- Home Owners’ Associations (HOAs)
- Developers
- Residents with property adjacent to Silver Creek and its tributaries
- Residents throughout the watershed
- NRCS and Soil and Water Conservation Districts (SWCDs)
- Farmers and farm groups
- Students and schools/universities
- Local engineering clubs and societies

Decision-makers are an important audience that can impact all the other audiences by controlling long-term regulatory actions and policy initiatives. St. Clair County staff, members of the Community Partnership Group, and watershed residents can be messengers to reach the decision-maker audience.

Jurisdictions with Phase II MS4s are required to educate their communities on the pollution potential of common activities such as littering, disposing of trash and recyclables, disposing of pet waste, applying lawn chemicals, washing cars, changing motor oil on impervious driveways, and household behaviors like disposing leftover paint and household chemicals.

Some of the HOAs for subdivisions in the area have a shared detention or retention basin. However, these basins are often not covered by a maintenance agreement, and after some time will fill up with sediment and deteriorate in function. For new subdivisions, it is important for HOAs to designate funding and a maintenance schedule for management of detention and retention infrastructure. If possible, existing HOAs should adopt maintenance by-laws.

Residents of the watershed often feel a deep connection to their neighborhood and to the land on which they live. Several families in the watershed can trace their ancestry back for generations to European settlers who put down roots in the area in the 1800s. Outreach with messages that emphasize
sustaining the health of the soil and the landscape for the next generation is likely to resonate with this audience.

Residents with property adjacent to Silver Creek and its tributaries will be more willing to make changes to the creek on their property if they understand how it can enhance their property and its value. They should also be made aware of landscaping BMPs along the creek, in terms of beneficial or harmful structures, vegetation, and management practices.

Activities and Tools

Before the plan is complete
Making this Watershed Plan available to stakeholders, and informing them of its location and contents, is a major component of the Information and Education Plan. To this end, the Plan document is available for download on HeartLands Conservancy’s website at www.heartlandsconservancy.org/silvercreek.php. Printed copies of the Executive Summary and the full Plan will also be shared with key watershed stakeholders. Emails to stakeholders engaged in the planning process provided updates on the Plan’s progress and point to the website for all Plan materials.

After the plan is complete
Table 10 outlines each objective followed by recommended strategies that can be implemented to achieve the goals/objectives. For each activity, a target audience, suggested strategies, schedule, lead and supporting agencies, the desired outcomes and issues addressed, and estimated costs to implement is provided. Periodic review of the Watershed Plan is recommended, with meetings of the plan partners held twice a year, at six month intervals. Larger meetings may be held annually to include more stakeholders and the public. Plan revision should be considered at five-year intervals.

The Education Plan strategies are recommended for the short term (one to 10 years), medium term (10 to 20 years), long-term (20+ years), ongoing (for maintenance activities), or as needed. The Implementation Schedule also uses these timeframe options.
Lower Silver Creek Watershed Plan

Table 10. Information and Education Plan recommended programs and strategies. Acronyms used: HLC: HeartLands Conservancy; NGRREC: National Great Rivers Research and Education Center; SWCD: Soil and Water Conservation District; CRP: Conservation Reserve Program.

<table>
<thead>
<tr>
<th>Program</th>
<th>Target Audience(s)</th>
<th>Strategies</th>
<th>Schedule</th>
<th>Lead &amp; Supporting Orgs</th>
<th>Desired Outcomes/Issues Addressed</th>
<th>Est. Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal Outreach</td>
<td>Municipalities</td>
<td>• Connect officials and staff to resources about water quality, best practices for stormwater management, and flooding&lt;br&gt;• Provide sample permitting language, ordinances, and lists of preferred practices&lt;br&gt;• Discuss projects for shortlist of Management Measures on public land&lt;br&gt;• Invite FEMA to present about floodplain management and flood insurance.&lt;br&gt;• Share case studies of conservation development&lt;br&gt;• Present at municipal council and committee meetings&lt;br&gt;• Share sample funding structures for infrastructure changes&lt;br&gt;• Share GIS data and maps from the Watershed Plan to aid municipal decision-making</td>
<td>Long-Term</td>
<td>St. Clair County, Madison County, Clinton County</td>
<td>• Municipalities adopt green infrastructure practices as part of development plans, permits and ordinances.&lt;br&gt;• Developers follow recommended practices in new and retrofitted developments.&lt;br&gt;• More stormwater is infiltrated, water quality is improved, problematic flooding is reduced, and wildlife habitat is preserved.</td>
<td>Staff time</td>
</tr>
<tr>
<td>Watershed Plan Outreach</td>
<td>Watershed residents, developers, municipalities</td>
<td>• Mail or e-mail Executive Summary of the Watershed Plan to municipalities and key stakeholders&lt;br&gt;• Final plan and recommendations on web page. Post progress updates.&lt;br&gt;• Press release announcing completed plan.&lt;br&gt;• Meetings of the watershed plan partners held twice a year, at six month intervals. Possible larger annual meeting to include stakeholders and the public. Plan revision considered at 5-year intervals.</td>
<td>Short-Term, Mid-Term</td>
<td>Community Partnership Group, HLC, other partners</td>
<td>• Majority of watershed residents have knowledge of watershed conditions, possible behavior improvements, and key contacts to get involved and implement projects.&lt;br&gt;• The public begins to alter activities leading to watershed improvement.</td>
<td>Printing: $200</td>
</tr>
<tr>
<td>Program</td>
<td>Target Audience(s)</td>
<td>Strategies</td>
<td>Schedule</td>
<td>Lead &amp; Supporting Orgs</td>
<td>Desired Outcomes/Issues Addressed</td>
<td>Est. Cost</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Lower Silver Creek Watershed Plan</td>
<td></td>
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</tr>
<tr>
<td><strong>Objective 6.2:</strong> Connect watershed stakeholders to decision-makers and experts with knowledge about water quality, flooding issues, and solutions.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Agricultural BMP Workshop</td>
<td>Rural Landowners, Farmers</td>
<td>• Host workshop to inform about and demonstrate recommended BMPs.</td>
<td>Medium-Term</td>
<td>SWCD, NRCS, HLC</td>
<td>• Farmers and landowners learn about and implement BMPs, as well as funding/ program support.</td>
<td>$500 Materials + Staff time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide information about available funding for BMPs.</td>
<td></td>
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</tr>
<tr>
<td>BMP or Demonstration Project Tour</td>
<td>Watershed residents, developers, municipalities, farmers</td>
<td>• Take participants on a tour of BMPs in this area, such as NGRREC or a farm enrolled in the CRP.</td>
<td>Short-term</td>
<td>SWCD, NRCS, Farm Bureau, NGRREC</td>
<td>• Landowners/ stakeholders learn about BMPs and can visualize them on their property.</td>
<td>$1,000 per tour</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Host a demonstration project event, such as a demonstration on cover crops.</td>
<td></td>
<td></td>
<td>• Increase in landowners implementing BMPs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Soil erosion is reduced and stormwater is infiltrated.</td>
<td></td>
</tr>
<tr>
<td>Public Events Booth</td>
<td>Watershed residents</td>
<td>• Host a booth with materials about the plan, water quality, stormwater management, flooding, and BMPs at public events, such as county fairs, environmental fests, etc.</td>
<td>Ongoing</td>
<td>St. Clair County, Madison County, Clinton County, HLC, NGRREC</td>
<td>• Residents understand importance of healthy watershed.</td>
<td>$150 per event</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Property owners in flood-prone areas understand and monitor development upstream to prevent flood problems from increasing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Residents understand the location of floodplains and why they should obtain flood insurance.</td>
<td></td>
</tr>
<tr>
<td>Program</td>
<td>Target Audience(s)</td>
<td>Strategies</td>
<td>Schedule</td>
<td>Lead &amp; Supporting Orgs</td>
<td>Desired Outcomes/Issues Addressed</td>
<td>Est. Cost</td>
</tr>
<tr>
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</tr>
<tr>
<td>Field Days</td>
<td>Residents, Students, Non-Profits, Volunteer Groups</td>
<td>• Organize stream cleanup volunteer opportunities.</td>
<td>Medium-Term</td>
<td>HLC, St. Clair County, municipalities, Sierra Club, volunteer groups</td>
<td>• Amount of debris is reduced in streams.</td>
<td>$500 per event</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Promote volunteer field days through media, social media, and community groups.</td>
<td></td>
<td></td>
<td>• People develop an interest in watershed protection and conservation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Adopt a Stream” program (similar to Adopt a Road)</td>
<td></td>
<td></td>
<td>• Invasive species are removed and participants learn how to manage invasives on their own.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• HOA Basin/Pond Maintenance Field Days</td>
<td></td>
<td></td>
<td>• Leverages in-kind donations for future grants.</td>
<td></td>
</tr>
<tr>
<td>Educational Signs</td>
<td>Residents, Visitors</td>
<td>• Mark watershed boundaries and named streams with signs</td>
<td>Medium-Term</td>
<td>St. Clair County, Madison County</td>
<td>• People better understand the term “watershed.”</td>
<td>$2,000 (20 signs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Post warning signs about littering and illegal dumping</td>
<td></td>
<td></td>
<td>• Littering and illegal dumping is reduced.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Awareness of the watershed’s boundaries is increased.</td>
<td></td>
</tr>
<tr>
<td>School Projects</td>
<td>Students, Parents, Teachers, Administrators</td>
<td>• Develop age-appropriate project opportunities for schools or colleges such as rain gauge maintenance, rainscaping, wildlife habitat restoration, and geocaching.</td>
<td>Long-term</td>
<td>Schools, colleges</td>
<td>• Students and parents develop interest in watershed protection and conservation.</td>
<td>Equipment costs and staff time</td>
</tr>
<tr>
<td>Professional Development</td>
<td>Engineers</td>
<td>• Coordinate with engineering organizations to host professional development opportunities.</td>
<td>Long-term</td>
<td>Engineering clubs or societies</td>
<td>• Engineers receive continuing education on green infrastructure and BMPs.</td>
<td>Staff time</td>
</tr>
</tbody>
</table>
## Objective 6.4: Develop public recognition programs focused on the Watershed Plan’s goals.

<table>
<thead>
<tr>
<th>Program</th>
<th>Target Audience(s)</th>
<th>Strategies</th>
<th>Schedule</th>
<th>Lead &amp; Supporting Orgs</th>
<th>Desired Outcomes/Issues Addressed</th>
<th>Est. Cost</th>
</tr>
</thead>
</table>
| Watershed Protection Awareness  | All Stakeholders   | • Develop messaging based on goals in the Watershed Plan and disseminate the message using news media, social media, brochures, and other materials. | Medium-term | St. Clair County, Madison County, Clinton County | • Increased interest and understanding of watershed protection and the Watershed Plan’s goals.  
  • Water quality and habitat conditions are improved. | Cost of materials and ads     |
**Additional resources**

The following resources have been compiled either as other successful campaign examples, or as inspiration for ways to implement the activities identified in Table 11.

Table 11. Resources and tools for activities/campaigns.

<table>
<thead>
<tr>
<th>Activity / Campaign Examples</th>
<th>Activity / Campaign Tools and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surf Your Watershed</td>
<td>Links and information on stream flow, water quality, and groups working on environmental protection in your watershed, from USEPA. <a href="http://cfpub.epa.gov/surf/locate/index.cfm">http://cfpub.epa.gov/surf/locate/index.cfm</a></td>
</tr>
<tr>
<td>Native plants</td>
<td>List of Illinois native plant species: <a href="http://www.wildflower.org/collections">www.wildflower.org/collections</a></td>
</tr>
<tr>
<td>Flooding</td>
<td>How to prepare for and prevent flooding: <a href="http://www.ready.gov/floods">www.ready.gov/floods</a></td>
</tr>
<tr>
<td>Green Infrastructure</td>
<td>Chicago Wilderness Green Infrastructure Vision and data: <a href="http://www.cmap.illinois.gov/green-infrastructure">www.cmap.illinois.gov/green-infrastructure</a></td>
</tr>
<tr>
<td>Sustainable backyards</td>
<td>Sustainable backyard tours in St. Louis: <a href="https://sustainablebackyard.org/">https://sustainablebackyard.org/</a> Conservation@Home program The National Wildlife Federation’s Certified Wildlife Habitat program</td>
</tr>
</tbody>
</table>
SECTION 7: IMPLEMENTATION

Implementing the recommendations in this Watershed Plan will take time and commitment from partners and stakeholders. Successful implementation will require stakeholders working separately and together, using their individual strengths.

Implementation Schedule

The Implementation Schedule provides a timeline for when the recommended Management Measures should be implemented in relationship to each other, allowing reasonable amounts of time for preparing for and transitioning between projects.

The Management Measures are recommended for the short term (one to 10 years), medium term (10 to 20 years), long-term (20+ years), ongoing (for maintenance activities), or as needed. The Information and Education Plan also uses these timeframe options. The schedule is arranged to accommodate practices based on practice type, available funds, technical assistance needs, and timeframe for each recommendation. Higher scheduling priority was given to Management Measures that address an issue in a Critical Area, are recommended in greater amounts, have greater eligibility for state and federal programs, and are more widely known among stakeholders (Table 12).

<table>
<thead>
<tr>
<th>BMP/Management Measure Recommended</th>
<th>Responsible entity / entities</th>
<th>Priority</th>
<th>Sources of Technical Assistance</th>
<th>Implementation Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROGRAMMATIC MANAGEMENT MEASURES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conservation Development</td>
<td>Counties, municipalities, developers</td>
<td>Medium</td>
<td>Urban planners, planning resources, HLC</td>
<td>Medium term</td>
</tr>
<tr>
<td>Federal and state programs (e.g. CRP)</td>
<td>Landowners/farmers, NRCS, SWCD</td>
<td>Medium</td>
<td>NRCS, SWCD, NGRREC</td>
<td>Medium term</td>
</tr>
<tr>
<td>Financial support for stormwater infrastructure</td>
<td>Counties, municipalities</td>
<td>Medium</td>
<td>Regional/statewide community examples</td>
<td>Long term</td>
</tr>
<tr>
<td>Flood Damage Prevention Ordinance</td>
<td>Counties, municipalities</td>
<td>Medium</td>
<td>IDNR, FEMA, HLC</td>
<td>Medium term</td>
</tr>
<tr>
<td>Green infrastructure incentives</td>
<td>Counties, municipalities, developers</td>
<td>Low</td>
<td>IEPA, HLC, regional/statewide community examples</td>
<td>Long term</td>
</tr>
<tr>
<td>In-lieu fee mitigation</td>
<td>Developers, Counties, NGOs</td>
<td>High</td>
<td>USACE, IDNR</td>
<td>Ongoing (as development occurs)</td>
</tr>
<tr>
<td>Native landscaping ordinance</td>
<td>Counties, municipalities, developers, residents</td>
<td>Low</td>
<td>IDNR, regional/statewide community examples</td>
<td>Long term</td>
</tr>
<tr>
<td>Open space and natural area protection</td>
<td>Counties, municipalities, developers</td>
<td>Medium</td>
<td>IDNR, regional/statewide community examples</td>
<td>Medium term</td>
</tr>
<tr>
<td>Private sewage monitoring</td>
<td>Counties, residents, some HOAs</td>
<td>Medium</td>
<td>Counties, IEPA</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Riparian Buffer Ordinance</td>
<td>Counties, municipalities</td>
<td>Medium</td>
<td>IDNR, HLC</td>
<td>Medium term</td>
</tr>
<tr>
<td>Sewage Treatment Plant upgrades</td>
<td>Municipalities, STP operators</td>
<td>Low</td>
<td>IEPA, contractors</td>
<td>Long term</td>
</tr>
<tr>
<td>Stream Cleanup Team</td>
<td>Counties, NGOs, residents</td>
<td>Medium</td>
<td>Madison County, NGOs</td>
<td>Long term</td>
</tr>
<tr>
<td>Watershed Plan supported and integrated into community plans</td>
<td>Counties, municipalities</td>
<td>Low</td>
<td>Watershed Plan partners</td>
<td>Short term</td>
</tr>
<tr>
<td><strong>Information and Education Plan</strong></td>
<td>Several entities</td>
<td>High</td>
<td>Counties, IEPA, HLC</td>
<td>Ongoing</td>
</tr>
<tr>
<td><strong>Monitoring (water quality, flow, etc.)</strong></td>
<td>USGS, IEPA, NGRREC</td>
<td>High</td>
<td>USGS, IEPA, NGRREC, SIUE, SIU-Carbondale</td>
<td>Ongoing</td>
</tr>
<tr>
<td>BMP/Management Measure Recommended</td>
<td>Responsible entity / entities</td>
<td>Priority</td>
<td>Sources of Technical Assistance</td>
<td>Implementation Schedule</td>
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<tr>
<td><strong>SITE-SPECIFIC MANAGEMENT MEASURES</strong></td>
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<tr>
<td><strong>Agricultural Management Measures</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Riparian buffers</td>
<td>Landowners/ farmers</td>
<td>High: Critical Areas</td>
<td>NRCS, Ecological consultant/ contractor</td>
<td>Short term</td>
</tr>
<tr>
<td>Wetlands</td>
<td>Landowners/ farmers</td>
<td>High: Critical Areas</td>
<td>USACE, NRCS, Ecological consultant/ contractor</td>
<td>Short term</td>
</tr>
<tr>
<td>Animal waste storage/treatment systems</td>
<td>Landowners/farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, consultant/ contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td>Bioreactors</td>
<td>Landowners/farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td>CNMPs</td>
<td>Landowners/farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td>Conservation tillage</td>
<td>Landowners/ farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Contour buffer strips</td>
<td>Landowners/ farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td>Cover crops</td>
<td>Landowners/ farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Grassed waterways</td>
<td>Landowners/ farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td>NMPs</td>
<td>Landowners/ farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td>Ponds</td>
<td>Landowners/ farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td>Terraces</td>
<td>Landowners/ farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Long term</td>
</tr>
<tr>
<td>Water and sediment control basin</td>
<td>Landowners/ farmers</td>
<td>Medium</td>
<td>NRCS, SWCD, contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td><strong>Forest Management Measures</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Forest stand improvement</td>
<td>Landowners, St. Clair County, SAFB, MidAmerica Airport</td>
<td>Low</td>
<td>NRCS, SWCD, IDNR, USFWS, contractor</td>
<td>Long term</td>
</tr>
<tr>
<td><strong>Urban Management Measures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single property flood reduction strategies</td>
<td>Residents, industry/commercial</td>
<td>High</td>
<td>FEMA, municipalities, contractors</td>
<td>Short term</td>
</tr>
<tr>
<td>Bioswales</td>
<td>Developers, municipalities, HOAs</td>
<td>Medium</td>
<td>SWCD, contractor</td>
<td>Medium term</td>
</tr>
<tr>
<td>Dry detention basins, new</td>
<td>Developers, residents, municipalities, HOAs, landowners/farmers</td>
<td>Low</td>
<td>SWCD, contractor</td>
<td>Long term</td>
</tr>
<tr>
<td>Wet detention basins, new</td>
<td>Developers, residents, municipalities, HOAs, landowners/farmers</td>
<td>Low</td>
<td>SWCD, contractor</td>
<td>Long term</td>
</tr>
<tr>
<td>Detention basin retrofits (native vegetation buffers, etc.)</td>
<td>Municipalities, residents, HOAs, landowners/farmers</td>
<td>Medium</td>
<td>SWCD, contractor</td>
<td>Medium term</td>
</tr>
</tbody>
</table>
Table 12 continued.

<table>
<thead>
<tr>
<th>BMP/Management Measure Recommended</th>
<th>Responsible entity / entities</th>
<th>Priority</th>
<th>Sources of Technical Assistance</th>
<th>Implementation Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detention basin maintenance (dredging, mowing, burning, invasives, etc.)</td>
<td>Municipalities, residents, HOAs, landowners/farmers</td>
<td>Medium</td>
<td>SWCD, contractor</td>
<td>Ongoing/As needed</td>
</tr>
<tr>
<td>Pervious pavement</td>
<td>Developers, municipalities, residents</td>
<td>Low</td>
<td>NGRREC, IEPA</td>
<td>Long term</td>
</tr>
<tr>
<td>Rain gardens</td>
<td>Residents, industry/commercial</td>
<td>Medium</td>
<td>NGRREC, IEPA</td>
<td>Medium term</td>
</tr>
<tr>
<td>Rainwater collection</td>
<td>Residents, industry/commercial</td>
<td>Low</td>
<td>NGRREC, IEPA</td>
<td>Long term</td>
</tr>
<tr>
<td>Stormwater and sanitary sewer system maintenance and expansion</td>
<td>Municipalities, HOAs</td>
<td>Medium</td>
<td>Municipalities, IEPA, contractors</td>
<td>Ongoing/As needed</td>
</tr>
<tr>
<td>Tree planting</td>
<td>Municipalities, townships, counties</td>
<td>Medium</td>
<td>Municipalities, arborists, contractors, NRCS</td>
<td>Short term</td>
</tr>
</tbody>
</table>

Stream and Lake Management Measures

<table>
<thead>
<tr>
<th>BMP/Management Measure Recommended</th>
<th>Responsible entity / entities</th>
<th>Priority</th>
<th>Sources of Technical Assistance</th>
<th>Implementation Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logjam removal</td>
<td>Landowners/farmers, residents, municipalities</td>
<td>High</td>
<td>Ecological consultant/contractor</td>
<td>Short term</td>
</tr>
<tr>
<td>Streambank &amp; channel restoration</td>
<td>Landowners/farmers, residents, municipalities</td>
<td>High: Critical Areas</td>
<td>Ecological consultant/contractor</td>
<td>Short term</td>
</tr>
<tr>
<td>Shoreline stabilization</td>
<td>Municipalities, landowners, developers</td>
<td>Medium</td>
<td>Ecological consultant/contractor</td>
<td>Medium term</td>
</tr>
</tbody>
</table>
Funding Sources
Many opportunities are available to secure funding for the varied and diverse Management Measures recommended in this plan. Entities such as government agencies, non-profit organizations, and companies that provide funding for watershed improvement projects often require that partnerships are in place and funds are leveraged. Table 13 shows some of the potential funding sources for agricultural and stream and lake BMPs recommended in this plan. Table 14 provides a longer list of funding opportunities for management measures in this plan. More detail about these opportunities is included in Appendix E.

Funds may come from existing grant programs run by public agencies, from partner organizations, or through other avenues. Partners may wish to become involved if the project helps to achieve their objectives, is a priority, or provides networking opportunities. Partnerships are also critical for leveraging assets including political support; partners can leverage valuable goodwill and relationships that have the potential to lead to other assistance.

Identifying suitable partners to support a specific project involves assessing the organizations’ jurisdictional, programmatic, and fiscal priorities and limitations. Different partners will be attracted to different projects. It is beneficial to all partners to maintain relationships and communication, with each organization denoting a specific staff member responsible for maintaining these connections. One or two enthusiastic individuals or “champions” who believe that engagement in this process is in the interests of all the partners can make a huge difference in the success of a partnership.


<table>
<thead>
<tr>
<th>BMP/Management Measure Recommended</th>
<th>Program(s) for which Practices are Eligible</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agricultural Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Animal waste storage/treatment systems</td>
<td>EQIP, CPP, CSP, 319</td>
</tr>
<tr>
<td>Bioreactors</td>
<td>EQIP, CPP, CSP, 319</td>
</tr>
<tr>
<td>Comprehensive Nutrient Management Plans (NMPs)</td>
<td>EQIP, CPP, CSP, 319</td>
</tr>
<tr>
<td>Conservation tillage</td>
<td>EQIP (no-till only), CSP, 319</td>
</tr>
<tr>
<td>Contour buffer strips</td>
<td>CRP, CPP, EQIP, 319</td>
</tr>
<tr>
<td>Cover crops</td>
<td>EQIP, CPP, CSP, 319</td>
</tr>
<tr>
<td>Grassed waterways</td>
<td>CRP, EQIP, CPP, 319</td>
</tr>
<tr>
<td>Nutrient Management Plans (NMPs)</td>
<td>EQIP, CPP, CSP, 319</td>
</tr>
<tr>
<td>Ponds</td>
<td>EQIP (if sole livestock drinking water source), 319</td>
</tr>
<tr>
<td>Riparian buffers</td>
<td>CRP, CREP, EQIP, 319</td>
</tr>
<tr>
<td>Terraces</td>
<td>EQIP, CPP, 319</td>
</tr>
<tr>
<td>Waste storage structure</td>
<td>EQIP, 319</td>
</tr>
<tr>
<td>Water and sediment control basin</td>
<td>EQIP, CPP, CRP (as part of selected other structures), 319</td>
</tr>
<tr>
<td>Wetlands</td>
<td>CRP, CREP, WRE, 319</td>
</tr>
<tr>
<td><strong>Forest Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Forest stand improvement</td>
<td>EQIP, CRP, CPP, CSP, 319, USFWS</td>
</tr>
<tr>
<td><strong>Stream and Lake Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Shoreline restoration</td>
<td>EQIP, 319</td>
</tr>
<tr>
<td>Streambank &amp; channel restoration</td>
<td>SSRP, 319</td>
</tr>
</tbody>
</table>
Table 14. Funding sources for management measures recommended. See Appendix E for more information.

<table>
<thead>
<tr>
<th>Funding Sources</th>
<th>Grant Programs</th>
<th>Currently Funded (As of June 2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State/Federal Government</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illinois Environmental Protection Agency</td>
<td>Section 319(h) Nonpoint Source Pollution Control Financial Assistance Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>State Revolving Fund Loan Program, including:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Public Water Supply Loan Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>• Water Pollution Control Loan Program</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Streambank Cleanup and Lakeshore Enhancement Grants</td>
<td>No. Funding may be reinstated in the future.</td>
</tr>
<tr>
<td>Illinois Department of Agriculture</td>
<td>Streambank Stabilization and Restoration Program</td>
<td>No. Funding may be reinstated in the future.</td>
</tr>
<tr>
<td></td>
<td>Conservation Practice Program</td>
<td>No. Funding may be reinstated in the future.</td>
</tr>
<tr>
<td></td>
<td>Sustainable Agriculture Grant Program</td>
<td>Yes</td>
</tr>
<tr>
<td>Illinois Department of Natural Resources</td>
<td>Urban Flood Control Program</td>
<td>Yes</td>
</tr>
<tr>
<td>Illinois Emergency Management Agency</td>
<td>Flood Mitigation Assistance Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Pre-Disaster Mitigation Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Hazard Mitigation Grant Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Severe Repetitive Loss Program</td>
<td>Yes</td>
</tr>
<tr>
<td>Illinois Department of Commerce and Economic Opportunity</td>
<td>Illinois Development Assistance Program</td>
<td>Yes</td>
</tr>
<tr>
<td>U.S. Army Corps of Engineers</td>
<td>Continuing Authorities Program (not a grant)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Flood Plain Management Services (FPMS) Program (not a grant)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Planning Assistance to States (PAS) Program (not a grant)</td>
<td>Yes</td>
</tr>
<tr>
<td>U.S. Department of Defense</td>
<td>Readiness and Environmental Protection Integration Program (REPI)</td>
<td>Yes</td>
</tr>
<tr>
<td>U.S. Department of Housing and Urban Development</td>
<td>National Disaster Resilience Competition</td>
<td>No. Funding may be reinstated in the future.</td>
</tr>
<tr>
<td>U.S. Environmental Protection Agency</td>
<td>USEPA Source Reduction Assistance Grant Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Environmental Education Grants Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Environmental Justice Small Grants Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Urban Waters Small Grants Program</td>
<td>No. Funding may be reinstated in the future.</td>
</tr>
<tr>
<td></td>
<td>Technical assistance from EPA Regions for:</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>• Green stormwater management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Protection of healthy watersheds</td>
<td></td>
</tr>
<tr>
<td>U.S. Department of Agriculture</td>
<td>Conservation Reserve Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>CRP—Grasslands</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Conservation Reserve Enhancement Program (CREP)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Agricultural Conservation Easement Program, including:</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Agricultural Land Easements and Wetland Reserve Easements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental Quality Incentive Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Conservation Stewardship Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Healthy Forests Reserve Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Regional Conservation Partnership Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Conservation Innovation Grants</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Water and Waste Water Disposal Loan and Grant Program</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Forest Legacy Program</td>
<td>Yes</td>
</tr>
<tr>
<td>U.S. Fish and Wildlife Service</td>
<td>Partners for Fish and Wildlife Program</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 14. (Continued) Funding sources for management measures recommended.

<table>
<thead>
<tr>
<th>Funding Sources</th>
<th>Grant Programs</th>
<th>Currently Funded (As of June 2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Governmental Organizations (non-profit organizations, private foundations/companies, other) that support watershed management efforts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ducks Unlimited</td>
<td>Living Lake Initiative</td>
<td>N/A</td>
</tr>
<tr>
<td>Pheasants Forever</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Trees Forever</td>
<td>Working Watersheds: Buffers and Beyond</td>
<td>Yes</td>
</tr>
<tr>
<td>The Nature Conservancy</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>The National Fish and Wildlife Foundation</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>The National Wildlife Federation</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Water Environment Federation</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Coca-Cola Foundation</td>
<td>Community Support Program</td>
<td>Yes</td>
</tr>
<tr>
<td>Illinois American Water</td>
<td>2018 Environmental Grant Program</td>
<td>Yes</td>
</tr>
<tr>
<td>In-Lieu Fee Mitigation Program</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>McKnight Foundation</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Walton Family Foundation</td>
<td>N/A</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**Monitoring Plan**

As funding allows, the collection and analysis of monitoring data should be expanded in the watershed. For example, sampling at Silver Creek and its tributaries—such as at the outflow of HUC14 subwatersheds—would provide baseline data for a better understanding of watershed-wide pollutant contributions. This data would also help calibrate and ground-truth the pollutant modeling, such as the STEPL, used in this plan.

Opportunities for continuing or expanding the monitoring program should be evaluated in order to further assess water quality conditions throughout the watershed, the causes and sources of pollution, the impact of nonpoint source pollution, and changes in water quality related to implementation of the Watershed Plan as well as social indicator data related to the plan’s goals and objectives. A monitoring plan was developed with the NGRREC, a project partner with the expertise and capabilities to carry out this monitoring (Appendix D). Monitoring can be conducted on a 3-5 year cycle through the year 2030 (Table 14). Quality Assurance Project Plans (QAPP) should be developed for those monitoring opportunities that are selected for implementation in support of the watershed plan.

MEASURING SUCCESS

The success of the Watershed Plan can be measured by tracking several indicators at several milestone points in time. Success can be documented in terms of:

- Plan effectiveness: the absolute improvements seen in water quality, flooding, habitat, and other plan goals; and
- Plan implementation: the number and extent of Management Measures implemented, understood as a proxy for absolute improvements.

For both of these dimensions, measurement indicators were identified that would establish the progress made towards each goal of the plan. Interim milestones were established for each indicator so that improvements in effectiveness and extent of implementation could be tracked. Rather than waiting several years to measure the effectiveness of the plan, measuring ongoing improvement allows for more dynamic, directed, and effective implementation.

Measurement indicators

Measurement indicators were established to determine whether and how much progress is being made towards achieving each of the goals of the plan (Table 15).

Interim milestones

Milestones represent time periods or deadlines for meeting watershed plan objectives. Tracking milestones allows for adaptive management; if milestones are not being met, the most current information can be used to implement a course correction or a plan update.

Meetings of the watershed plan partners should be held twice a year, at six month intervals, in order to assess the progress of the plan and address deficiencies in its implementation. The partners may also hold a larger annual meeting to which stakeholders and the public will be invited. The need for a plan revision will be assessed at 5-year intervals. When deficiencies in plan implementation are identified, the plan’s timeline and focus should be revised to address the issues. The watershed planning process of issue identification, goal-setting, and management measure recommendation should be reiterated, paying special attention to current data and new data sources.

A set of Progress Report Cards was developed for the watershed with milestones for the short-term (1-10 years; 2018-2028), medium-term (10-20 years; 2028-2038), and long-term (20+ years; 2038+) timeframes. The milestones and scorecard can be used to identify and track plan implementation and effectiveness. Checking in on the measurement indicators at the appropriate milestones helps watershed partners to make corrections as necessary and ensure that progress is being made towards achieving the plan’s goals.

The Progress Report Cards provide for each goal:

1. Summaries of current conditions
2. Measures of progress (Measurement Indicators)
3. Milestones for short-, medium-, and long-term timeframes
4. Sources of data required to evaluate milestones
5. Notes section
Grades for each milestone term should be calculated using the following scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage milestones met</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>80-100%</td>
</tr>
<tr>
<td>B</td>
<td>60-79%</td>
</tr>
<tr>
<td>C</td>
<td>40-59%</td>
</tr>
<tr>
<td>Fail</td>
<td>&lt;40%</td>
</tr>
</tbody>
</table>

Lack of progress can be demonstrated where water quality monitoring results show no improvement, new environmental problems, lack of technical assistance, or lack of funds. These factors should be explained in the Notes section of the scorecard.

The Progress Report Cards should be used at every biannual meeting of the watershed plan partners, and should be fully filled out and evaluated every five years to determine if sufficient progress is being made and whether remedial actions are needed. The Progress Report Cards can be found in Appendix F.
Table 15. Measures of success and measurement indicators for each watershed plan goal. Specific interim milestones incorporating these measurement indicators can be found in the Progress Report Cards in Appendix F.

<table>
<thead>
<tr>
<th>Goal(s) Addressed</th>
<th>Measure of Success</th>
<th>Measurement Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>All goals</td>
<td>Projects and Practices Implemented: BMPs to manage stormwater runoff, including those that encourage infiltration, clean water of pollutants, and replenish groundwater.</td>
<td>Number and extent of Management Measures (BMPs) implemented on public and private land, wherever such data is available.</td>
</tr>
<tr>
<td>Financial and Technical Assistance Secured:</td>
<td>Sources of funding and technical assistance committed towards plan implementation.</td>
<td>Number of funding sources secured for plan implementation. Number of partnerships developed that provide technical and/or financial assistance.</td>
</tr>
<tr>
<td>Surface Water Quality</td>
<td>Use Impairments: The reduction of use impairments as defined by IEPA.</td>
<td>Removal of Little Silver Creek, Loop Creek, and Ogles Creek from the IEPA 303(d) list.</td>
</tr>
<tr>
<td>Pollutant Loads: A decrease in pollutants observed through water quality monitoring.</td>
<td></td>
<td>Concentrations and loads of in-stream pollutants including phosphorus and sediment (assessed by monitoring), to measure against plan target reductions.</td>
</tr>
<tr>
<td>Point-source Pollution Facility Upgrades:</td>
<td>Upgrades to facilities such as sewage treatment plants and others that require a NPDES permit.</td>
<td>Nutrient removal technologies incorporated into upgrades of wastewater treatment plants in the watershed. Measured pollutant loads in effluent.</td>
</tr>
<tr>
<td>Connecting to Public Sewers: Connection of new and existing properties to public sewers so that individual septic systems are no longer needed.</td>
<td></td>
<td>Percentage of new development projects with private sewer. Number of existing on-site treatment systems connected to public sewers.</td>
</tr>
<tr>
<td>Inspection and Maintenance of On-Site Waste Systems: Local government codes and programs for on-site treatment systems.</td>
<td></td>
<td>Number and extent of local ordinances requiring regular inspection and maintenance of on-site sewage systems. Number of county/municipal programs inspecting more frequently than is complaint-driven.</td>
</tr>
<tr>
<td>Surface Water Quality / Flooding and Flood Damage</td>
<td>Wetlands: Restoring and creating wetlands, which are very effective at storing and filtering stormwater.</td>
<td>Number and acreage of wetland construction/restoration, enhancement, and protection.</td>
</tr>
<tr>
<td>Flooding and Flood Damage</td>
<td>Stream Discharge: Moderate peak flows and adequate minimum stream flows.</td>
<td>Stream flow data from the USGS gauge on mainstem Silver Creek, plus flow data collected from monitoring at other HUC14 locations. Data correlated with rainfall.</td>
</tr>
<tr>
<td>Flood Protection Ordinances: Enacting local ordinances to restrict construction in floodplains and flood-prone areas.</td>
<td></td>
<td>Number and extent of flood damage prevention ordinances, riparian buffer ordinances, and other actions by local governments to restrict construction in floodplains and riparian areas.</td>
</tr>
<tr>
<td>Environmentally Sensitive Development Practices</td>
<td>Infiltration: Practices allowing stormwater to infiltrate to groundwater.</td>
<td>Area of impervious surfaces in new development (see NLCD Percent Developed Impervious Surface dataset) and number of detention basins or other stormwater infrastructure constructed and retrofitted to allow more infiltration.</td>
</tr>
</tbody>
</table>
Lower Silver Creek Watershed Plan

Table 15 continued.

<table>
<thead>
<tr>
<th>Goal(s) Addressed</th>
<th>Measure of Success</th>
<th>Measurement Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green Infrastructure Implementation: Encouragement of green infrastructure and native landscaping, including incentives for developers that design for or implement it.</td>
<td>Number of counties/municipalities implementing green infrastructure incentives, e.g., flexible regulation implementation, fee waivers, tax abatement, and streamlined development review process. Number of ordinance changes allowing/encouraging native landscaping.</td>
</tr>
<tr>
<td></td>
<td>In-Lieu Fee Mitigation: Program that allows and incentivizes wetland and streambank restoration in impactful locations</td>
<td>Number of acres wetland restored and number of feet streambank restored under in-lieu fee mitigation program.</td>
</tr>
<tr>
<td>Flooding and Flood Damage/ Fish and Wildlife Habitat</td>
<td>Riparian Buffers: Vegetated, undeveloped buffers adjacent to waterways.</td>
<td>Area and length of restored riparian corridors. Number and area of conservation easements for riparian areas. Number and extent of riparian buffer ordinances adopted by local government.</td>
</tr>
<tr>
<td>Fish and Wildlife Habitat</td>
<td>Improvements to Fish and Wildlife Habitat: Protection and restoration of stream areas for fish and wildlife.</td>
<td>Macroinvertebrate sampling results (diversity and stream health indicators) from Illinois RiverWatch volunteers and fish sample data collected by the Illinois Natural History Survey.</td>
</tr>
<tr>
<td></td>
<td>Stream Cleanup Efforts: Programs with funding and resources for stream cleanup.</td>
<td>Number of programs and participants for stream cleanup activities in the watershed.</td>
</tr>
<tr>
<td>Flooding and Flood Damage/ Organizational Frameworks</td>
<td>Financial Support for Stormwater Infrastructure: Funding sources directed to infrastructure maintenance and upgrades.</td>
<td>Number of counties/municipalities with dedicated funding for stormwater infrastructure, e.g., a Stormwater Utility. Dollar amount of revenue.</td>
</tr>
<tr>
<td>Organizational Frameworks/ Environmentally Sensitive Development Practices</td>
<td>Protection through Policy: Several aspects of local policy can protect watershed resources, including ordinances and agreements.</td>
<td>Number of watershed partners adopt and/or support (via a resolution) this plan as a “guidance document.” Number and extent of municipal ordinances that support: stormwater, flood management, green infrastructure, wetlands protection (e.g., in-lieu fee), and native landscaping.</td>
</tr>
<tr>
<td></td>
<td>Open Space and Natural Area Protection and Management: protection of sensitive natural areas/open space, creation of naturalized stormwater management systems, and long-term management of those features.</td>
<td>Number of new and redevelopment projects protecting sensitive natural areas/open space and creating naturalized stormwater systems. Area of land donated to a public agency/conservation organization for long-term management. Number of HOAs with rules about management of the natural areas in their bylaws.</td>
</tr>
<tr>
<td>Education &amp; Outreach</td>
<td>Public Involvement: Public awareness, understanding and action, which affect decisions in watersheds where individuals own most of the land.</td>
<td>Number of people reached by and involved in outreach efforts related to this Watershed Plan. Percent of county residents who know which watershed they live in (survey).</td>
</tr>
<tr>
<td></td>
<td>Education: Effective materials to encourage behavior changes for a healthier watershed.</td>
<td>Percent of attendees who rate watershed-related presentations and other public education and outreach activities and good or excellent and percent who commit to action or follow-up with the county. Percent of schools that incorporate a watershed-based project or learning session.</td>
</tr>
</tbody>
</table>
Glossary of Terms

Terms found in the Watershed Plan and Appendices:

**100-year floodplain:** Land adjoining the channel of a river, stream, watercourse, lake, or wetland that has been or may be inundated by floodwater during periods of high water that exceed normal bank-full elevations. The 100-year floodplain has a probability of 1% chance per year of being flooded.

**303(d) list of impaired waters:** The federal Clean Water Act requires states to submit a list of impaired waters to the U.S. Environmental Protection Agency for review and approval every two years using water quality assessment data from the Section 305(b) Water Quality Report. These impaired waters are referred to as “303(d) impaired waters.” States are then required to establish priorities for the development of Total Maximum Daily Load analyses for these waters and a long-term plan to meet them.

**305(b):** The Illinois 305(b) Water Quality Report is a water quality assessment of the state’s surface and groundwater resources compiled by the Illinois Environmental Protection Agency and submitted as a report to the U.S. Environmental Protection Agency as required under Section 305(b) of the Clean Water Act.

**Agricultural Conservation Easement Program (ACEP):** Provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits.

**Animal Feeding Operations (AFO):** Agricultural operations where animals are kept and raised in confined situations. Feed is brought to the animals rather than the animals grazing or otherwise seeking feed in pastures.

**Agricultural Conservation Planning Framework (ACPF):** A GIS model developed by USDA.

**Aquifer:** A layer of permeable rock, sand, or gravel through which groundwater flows, containing enough water to supply springs and wells.

**Base flow:** The flow to which a perennially flowing stream reduces during the dry season. It is commonly supported by groundwater seepage into the channel.

**Bedrock:** The solid rock that lays beneath loose material, such as soil, sand, clay, or gravel.

**Best Management Practices (BMPs):** See Management Measures.

**Biodiversity:** The variety of organisms (plants, animals and other life forms) that includes the totality of genes, species and ecosystems in a region.

**Center for Watershed Protection (CWP):** Non-profit 501(c)3 corporation founded in 1992 that provides government entities, watershed organizations, and others around the country with the tools to protect streams, lakes, rivers, and watersheds.
**Channelization:** The artificial straightening, deepening, or widening of a stream or river to accommodate increased stormwater flows, typically to increase the amount of adjacent developable land for urban development, agriculture, or navigation.

**Comprehensive Nutrient Management Plans (CNMPs):** A strategy for farmers to integrate livestock waste management into overall farm operations.

**Conservation Development:** A development designed to protect open space and natural resources for people and wildlife while at the same time allowing building to continue. See Appendix C for more detail.

**Conservation easement:** The transfer of land use rights without the transfer of land ownership. Conservation easements can be attractive to property owners who do not want to sell their land now, but would support perpetual protection from further development. Conservation easements can be donated or purchased.

**Conservation Practice Program (CPP):** Illinois Department of Agriculture program implemented by the Soil and Water Conservation Districts (SWCDs) in Illinois. Cost-share funds are available through the SWCDs for various conservation practices including Filter Strips, Grassed Waterways, No-Till, and Terraces. See Appendix E for more detail.

**Conservation Reserve Enhancement Program (CREP):** The country's largest private land conservation program, administered by the Farm Service Agency (FSA). An offshoot of the Conservation Reserve Program (CRP), CREP compensates farmers and landowners for removing environmentally sensitive land from production and implementing conservation practices. See Appendix E for more detail.

**Conservation Reserve Program (CRP):** A land conservation program administered by the FSA, which provides a yearly rental payment for farmers who remove environmentally sensitive land from agricultural production and plant species that will improve environmental health and quality. See Appendix E for more detail.

**Conservation Stewardship Program (CSP):** U.S. Department of Agriculture program that helps producers maintain and improve existing conservation systems and implement additional activities to address priority resources concerns. See Appendix E for more detail.

**Conservation tillage:** Any method of soil cultivation that leaves the previous year's crop residue (such as corn stalks or wheat stubble) on fields before and after planting the next crop, to reduce soil erosion and runoff.

**Contour Buffer Strip:** Strips of perennial vegetation that alternate with strips of row crops on sloped fields. The strips of perennial vegetation, consisting of adapted species of grasses or a mixture of grasses and legumes, slow runoff and remove from it sediment, nutrients, pesticides, and other contaminants. See Appendix C for more detail.

**Conveyance:** The act or means of carrying or transporting water from place to place.

**Cover crops:** Crops that protect soil from erosion by covering the ground in the fall and sometimes in the spring. See Appendix C for more detail.
**Described use:** Appropriate use of a waterbody as designated by states and tribes. Designated uses are identified by considering the use, suitability, and value of the water body for public water supply; protection of fish and wildlife; and recreational, agricultural, industrial, and navigational purposes. Determinations are based on its physical, chemical, and biological characteristics; geographical setting and scenic qualities; and economic considerations.

**Detention basin:** A man-made structure for the storage of stormwater runoff with controlled release during or immediately following a storm. Wet detention basins are also known as retention ponds. See Appendix C for more detail.

**Digital Elevation Model (DEM):** Grid of elevation points used to produce elevation maps.

**Discharge (streamflow):** The volume of water passing through a channel over a given time period, usually measured in cubic feet per second.

**Dissolved oxygen (DO):** The amount of oxygen in water, usually measured in milligrams/liter.

**East-West Gateway Council of Governments (EWG):** The metropolitan planning organization (MPO) for the 4,500 square miles encompassed by the City of St. Louis; Franklin, Jefferson, St. Charles, and St. Louis counties in Missouri; Madison, Monroe, and St. Clair counties in Illinois. EWG is a forum for local governments of the bi-state St. Louis area to work together to solve problems that cross jurisdictional boundaries.

**Environmental Quality Incentives Program (EQIP):** A program that provides financial and technical assistance to agricultural producers, helping them to plan and implement conservation practices that address natural resource concerns and improve natural resources on agricultural land and non-industrial private forestland. See Appendix E for more detail.

**Erosion:** The displacement of soil particles on land surfaces due to water or wind action.

**Federal Emergency Management Agency (FEMA):** Government agency within the Department of Homeland Security that responds to, plans for, coordinates recovery from, and mitigates against natural and man-made disasters and emergencies, including significant floods.

**Flash flood:** A rapid rise of water along a stream or low-lying area, usually produced when heavy localized precipitation falls over an area in a short amount of time. Flash floods are considered the most dangerous type of flood event because they offer little or no warning time and their capacity for damage, including the capability to induce mudslides.

**Flood Damage Prevention Ordinance:** Ordinance that imposes certain rules and limitations on development in floodplains in order to reduce the risk of flood damage. See Appendix C for more detail.

**Geographic Information System (GIS):** A computer-based approach to interpreting maps and images and applying them to problem-solving.

**Geology:** The scientific study of the structure of the Earth, focused primarily on the composition and origins of rocks, soil, and minerals.
Grassed waterways: Vegetated channels designed to prevent gully erosion by slowing the flow of surface water with vegetation. See Appendix C for more detail.

Green infrastructure: Green infrastructure can be defined as our region’s natural resources, including open space, woodlands, wetlands, gardens, trees, and agricultural land. It can also be defined as the nodes and corridors of vegetation over the region, or the site-scale structures and landscaping that recreate natural processes. See Appendix C for more detail.

Groundwater recharge: Primary mechanism for aquifer replenishment which ensures future sources of groundwater for commercial and residential use.

Headwaters: Upper reaches of streams and tributaries in a watershed.

HUC or HUC Code: A Hydrologic Unit Code (HUC) that refers to the division and subdivision of U.S. watersheds. The hydrologic units are arranged or nested within each other, from the largest geographic area (regions) to the smallest geographic area (cataloging units). Where two digits follow “HUC,” they refer to the length of the HUC code. For example, “HUC14” refers to the lowest-nested subwatershed level with a 14-digit long code, such as HUC 07140204050101.

Hydric soil: Soil units that are wet frequently enough to periodically produce anaerobic conditions, thereby influencing the species composition and/or growth of plants on those soils.

Hydrologic Soil Groups (HSG): Soil classifications from the Natural Resource Conservation Service based on the soil’s runoff potential. The four Hydrologic Soils Groups are A, B, C and D. A’s generally have the smallest runoff potential and D’s the greatest.

Hydrology: The scientific study of the properties, distribution, and effects of water in relation to the earth’s surface, in the soil and underlying rocks, and in the atmosphere.

Hydrophytic vegetation: Plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content; one of the indicators of a wetland.

Illinois Department of Natural Resources (IDNR): State government agency established to manage, protect, and sustain Illinois’ natural and cultural resources, provide resource-compatible recreational opportunities, and promote natural resource-related issues for the public’s safety and education.

Illinois Environmental Protection Agency (IEPA): State government agency established to safeguard environmental quality so as to protect health, welfare, property, and quality of life in Illinois.

Illinois Nature Preserves Commission (INPC): Commission responsible for protecting Illinois Nature Preserves, state-protected areas that are provided the highest level of legal protection, and have management plans in place.

Illinois Pollution Control Board (IPCB): An independent agency created in 1970 by the Environmental Protection Act. The Board is responsible for adopting Illinois’ environmental regulations and deciding contested environmental cases.
Impervious Cover Model: Simple urban stream classification model based on impervious cover and stream quality. The classification system contains three stream categories (sensitive, impacted, and non-supporting) based on the percentage of impervious cover.

Impervious cover/surface: An area covered with solid material or that is compacted to the point where water cannot infiltrate underlying soils (e.g. parking lots, roads, houses, etc.).

In-lieu fee: A payment made to a natural resource management entity for implementation of projects for wetland or other aquatic resource development, in lieu of (in place of) on-site restoration or site mitigation. See Appendix C for more detail.

Infiltration: Rainfall or surface runoff that moves downward from the surface into the subsurface soil.

Loess: An unstratified loamy deposit, usually buff to yellowish brown, chiefly deposited by the wind and thought to have formed by the grinding of glaciers.

Logjam: Any woody vegetation, with or without other debris, which obstructs a stream channel and backs up stream water like a natural dam.

Low Impact Development: Comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds.

Macroinvertebrates (aquatic): Invertebrates that can be seen by the unaided eye (macro). Most benthic invertebrates in flowing water are aquatic insects or the aquatic stage of insects, such as mayfly nymphs and midge larvae. They also include organisms such as leeches, clams, and worms. The presence of benthic (bottom-dwelling) macroinvertebrates that are intolerant of pollutants is a good indicator of good water quality.

Management Measures: Also known as Best Management Practices (BMPs). Methods or techniques that are the most effective or practical means to achieving objectives including improving water quality, reducing flooding, and improving fish and wildlife habitat. These practices include non-structural practices such as site planning and design aimed to reduce stormwater runoff and avoid adverse development impacts, or structural practices that are designed to store or treat stormwater runoff to mitigate flood damage and reduce pollution.

Marsh: An area of soft, wet, low-lying land, characterized by grassy vegetation and often forming a transition zone between water and land.

Missouri Resource Assessment Partnership (MoRAP): Program at the University of Missouri which develops, analyzes, and delivers geospatial data for natural and cultural resource management. MoRAP partnered with the East-West Gateway Council of Governments to deliver mapped data on wetland importance and wetland restoration value.

Mitigation: Measures taken to eliminate or minimize damage from development activities such as construction in wetlands.
**Municipal Separate Storm Sewer System (MS4):** A system that transports or holds stormwater, such as catch basins, curbs, gutters, and ditches, before discharging into local waterbodies.

**National Hydrography Dataset (NHD):** Digital database of surface water features, such as lakes, ponds, streams, and rivers. The NHD is used to make hydrology and watershed boundary maps.

**National Pollutant Discharge Elimination System (NPDES) Phase II:** Permit program authorized by the Clean Water Act requiring smaller communities and public entities that own and operate a Municipal Separate Storm Sewer System (MS4) to apply and obtain a NPDES permit for stormwater discharges to surface water. Permittees must develop, implement, and enforce a stormwater program designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable. Individual homes that use a septic system, are connected to a municipal system, or do not have a surface discharge do not need an NPDES permit. The NPDES permit program is administered by authorized states. In Illinois, the Illinois EPA administers the program.

**National Land Cover Database (NLCD):** Database with mapped land cover categories produced by the Multi-Resolution Land Characteristics (MRLC) Consortium with land cover classifications based on Landsat satellite data and ancillary data sources such as topography, census and agricultural statistics, soil characteristics, wetlands, and other land cover maps.

**Native landscaping:** A landscape that contains native plants or plant communities that are indigenous to a particular region.

**Natural Resources Conservation Service (NRCS):** Government agency under the U.S. Department of Agriculture (USDA) that provides technical assistance to landowners and land managers.

**Nitrogen:** A colorless, odorless, unreactive gas that constitutes about 78% of the earth’s atmosphere. The availability of nitrogen in soil is important for plant growth and ecosystem processes, and nitrogen is used in many fertilizers.

**No-till:** No-till farming (also called zero tillage) is a way of growing crops or pasture from year to year without disturbing the soil through tillage. It uses herbicides to control weeds and results in reduced soil erosion and the preservation of soil nutrients. See Appendix C for more detail.

**Nonpoint source pollution (NPS pollution):** Any source of water pollution that is not from a discrete outflow point. Instead, NPS pollution comes from diffuse sources and is carried into waterways with runoff from the land. Pollutants can include oil, grease, sediment, and nutrients in excess fertilizer.

**Nutrients:** Substances needed for the growth of plants and animals, such as phosphorous and nitrogen. The addition of too many nutrients to a waterway causes problems to the aquatic ecosystem by promoting nuisance vegetation including excess algae growth.

**Nutrient Management Plans (NMPs):** A strategy for obtaining the maximum return from on- and off-farm fertilizer resources in a manner that protects the quality of nearby water resources.

**Overland flood:** Flooding that occurs when rainfall collects on saturated or frozen ground. When surface runoff cannot find a channel, it may flow out over a large area at a somewhat uniform depth in sheet flow or collect in depressions as ponding.
**Partners:** Key watershed stakeholders who take an active role in the watershed management planning process and implementing the watershed plan.

**Pervious pavement:** Pavement type (also referred to as porous or permeable pavement) that allows water to infiltrate to the soil or a storage area below. See Appendix C for more detail.

**Phosphorus:** A nonmetallic element that occurs widely in many combined forms especially as inorganic phosphates in minerals, soils, natural waters, bones, and teeth and as organic phosphates in all living cells.

**Point source pollution:** Pollution that discharges in water from a single, discrete source, such as an outfall pipe from an industrial plant or wastewater treatment facility.

**Pollutant load:** The amount of any pollutant deposited into waterbodies from point source discharges, combined sewer overflows, and/or stormwater runoff.

**Private sewage:** Sewage systems that are the responsibility of the owners or occupiers of the properties connected to them. These systems can include septic tanks, lagoons, and leach fields.

**Rain garden:** Vegetated depression that cleans and infiltrates stormwater from rooftops and sump pump discharges, typically planted with deep-rooted native wetland vegetation. See Appendix C for more detail.

**Rainwater Harvesting:** The accumulation and storing of rainwater for reuse before it reaches an aquifer. See Appendix C for more detail.

**Retention basin:** A man-made structure with a permanent pool of water for the storage of stormwater runoff. Also known as a wet pond, or wet detention basin.

**Retrofit:** Modifications to improve problems with existing stormwater control structures such as detention basins and conveyance systems such as ditches and storm sewers. See Appendix C for more detail on detention basin retrofits.

**Riparian:** The riverside or riverine environment adjacent to the stream channel. For example, riparian, or streamside, vegetation grows next to (and over) a stream.

**Riparian Buffer:** An undisturbed naturally vegetated strip of land adjacent to a body of water, such as a stream or lake. Riparian buffers have water quality, flooding, and habitat benefits.

**Riverine flood:** The gradual rise of water in a river, stream, lake, reservoir, or other waterway that results in the waterway overflowing its banks. This type of flooding generally occurs when storm systems remain in the area for extended periods of time, when winter or spring rains combine with melting snow to create higher flows, or when obstructions, such as logjams, block normal water flow.

**Runoff:** The portion of precipitation that does not infiltrate into the ground and is discharged into streams by flowing over the ground.
**Sediment:** Soil particles that have been transported from their natural location by wind or water action.

**Special Flood Hazard Area:** The area inundated during the base flood is called the Special Flood Hazard Area or 100-year floodplain.

**Special Service Area (SSA):** Special taxing districts in counties and municipalities that are established by ordinance. Taxes from SSAs are used to pass on the costs of items such as streets, landscaping, water lines, and sewer systems in new development to homeowners who reside within it. See Appendix C for more detail.

**Stakeholders:** Individuals, organizations, or enterprises that have an interest or a share in a project.

**Stream reach:** A stream segment having fairly homogenous hydraulic, geomorphic, riparian cover, and land use characteristics.

**Streambank stabilization:** Techniques used for stabilizing eroding streambanks.

**Streambank Stabilization and Restoration Program (SSRP):** Illinois Department of Agriculture (IDOA) program designed to demonstrate effective streambank stabilization at demonstration sites using inexpensive vegetative and bio-engineering techniques. See Appendix E for more detail.

**Subwatershed:** Any drainage basin within a larger drainage basin or watershed.

**Terrace:** Ridges and channels constructed across the slope of a field to intercept runoff water, reducing soil erosion. See Appendix C for more detail.

**Threatened and endangered species:** A “threatened” species is one that is likely to become endangered in the foreseeable future. An “endangered” species is one that is in danger of extinction throughout all or a significant portion of its range.

**Topography:** The relative elevations of a landscape describing the configuration of its surface.

**Total Maximum Daily Load (TMDL):** The highest amount of discharge of a particular pollutant that a waterbody can handle safely per day.

**Total Suspended Solids (TSS):** The organic and inorganic material suspended in the water column greater than 0.45 micron in size.

**U.S. Army Corps of Engineers (USACE):** Federal group of civilian and military engineers and scientists that provide services for planning, designing, building, and operating water resources and other Civil Works projects. These include flood control and environmental protection projects.

**U.S. Department of Agriculture (USDA):** Federal government agency that provides leadership on food, agriculture, natural resources, rural development, nutrition, and related issues. The USDA administers several programs to encourage land conservation and agricultural best practices.

**U.S. Environmental Protection Agency (USEPA):** Federal agency whose mission is to protect human health and the environment. USEPA enforces the Clean Water Act, among other laws.
**U.S. Fish and Wildlife Service (USFWS):** Federal government agency within the U.S. Department of the Interior dedicated to the management of fish and wildlife and their habitats.

**U.S. Geological Survey (USGS):** Federal government agency established with the responsibility to provide reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect quality of life.

**Urban runoff:** Runoff that runs over urban developed surfaces such as streets, lawns, and parking lots, entering directly into storm sewers rather than infiltrating the land upon which it falls.

**Wastewater Treatment:** Process that treats wastewater to alter its characteristics such as its biological oxygen demand, chemical oxygen demand, pH, etc. in order to meet effluent or water discharge standards.

**Water and Sediment Control Basin (WASCOB):** Small earthen ridge-and-channel or embankment built across a small watercourse or area of concentrated flow in a field. See Appendix C for more detail.

**Watershed:** The area of land that contributes runoff to a single point on a waterbody (in this case, the outlet of Silver Creek from Madison County to St. Clair County).

**Watershed-Based Plan:** A strategy and work plan for achieving water resource goals that provides assessment and management information for a geographically defined watershed, including the analysis, actions, participants, and resources related to development and implementation of the plan.

**Wetland:** Lands that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation adapted for life in saturated soil conditions (known as hydrophytic vegetation). A wetland is identified based upon the three attributes: 1) hydrology, 2) hydric soils, and 3) hydrophytic vegetation. A wetland is considered a subset of the definition of the Waters of the United States.

**Wetland Reserve Easement (WRE) program:** Component of the Agricultural Conservation Easement Program (ACEP) that provides technical and financial assistance to restore, protect, and enhance wetlands. See Appendix E for more detail.